Whittier Choice Neighborhood

Roxbury, Massachusetts

Expanded Project Notification Form

June 15, 2015

submitted to the **Boston Redevelopment Authority**

submitted by **POAH Madison Associates LLC**
a partnership between Preservation of Affordable Housing
and Madison Park Development Corporation

prepared by **Fort Point Associates, Inc.**

in association with **The Architectural Team**
Nitsch Engineering
Rojas Design, Inc.
Howard Stein Hudson

Fort Point Associates, Inc.
Urban Planning Environmental Consulting Project Permitting

PRESERVATION OF AFFORDABLE HOUSING

Madison Park Development Corporation
184 Dudley Street, Suite 102, Roxbury, MA 02119

June 15, 2015

Mr. Brian Golden, Director
Boston Redevelopment Authority
Boston City Hall, 9th Floor
Boston, MA 02201
Attn: Mr. Dana Whiteside, Deputy Director
Mr. Gary Uter, Project Assistant

Re: Whittier Choice Neighborhood
Expanded Project Notification Form

Dear Director Golden:

POAH Madison Associates LLC, (the "Proponent") is submitting this Expanded Project Notification Form ("EPNF"), in accordance with the Article 80B Large Project Review requirements of the Boston Zoning Code to complete the phased demolition and redevelopment of the four existing buildings comprising Whittier Street Apartments. Phase I of the proposed development includes the demolition of a 68 unit building at 155-195 Cabot St., and the new construction of 83 residential units (flats and townhouses), to be served by 22 parking spaces in a private parking lot on site.

In accordance with Boston Redevelopment Authority ("BRA") requirements, please find attached 10 copies of the EPNF plus an electronic copy of the filing for upload to the BRA website for public review.

The Proposed Project will lead to new construction, and since the gross floor area is greater than 50,000 GSF, Article 80 requirements will be triggered and preparation of filing(s) under the City of Boston / BRA Large Project Review are required, pursuant to Article 80B of the Code. A Letter of Intent to file an EPNF was filed with the BRA for the Proposed Project on March 27, 2015 (attached as Appendix A to the EPNF).

The project team has had an opportunity to present its plans to the BRA project and urban design staffs, the Mayor's Office of Neighborhood Services and other city departments, the residents of Whittier Street Apartments and adjacent Madison Park Village communities, Roxbury neighborhood residents, the Roxbury Strategic Master Plan Oversight Committee, and local elected and appointed officials for the neighborhood, in order to identify issues/concerns as well as design requirements related to the Proposed Project.

The public notice for the EPNF is scheduled to appear in the June 16, 2015 issue of the Boston Herald.

On behalf of the entire project team, we would like to thank you and the BRA staff assigned to the Whittier Choice Neighborhoods project, particularly Dana Whiteside, Deputy Director and Gary Uter, Project Assistant for their invaluable assistance allowing the Proponent to achieve this comprehensive EPNF filing.

We believe that the Proposed Project will be a significant addition to the Roxbury neighborhood to help address the need for additional housing.

Sincerely,

POAH Madison Associates, LLC

Rodger L. Brown, Managing Director of Real Estate Development, Preservation of Affordable Housing

Attachment: Whittier Choice Neighborhoods, Expanded Project Notification Form
(10 hard copies and 1 electronic copy)

Cc: Erico Lopez, BRA
Cory Mian, Vice President of Real Estate Development, Preservation of Affordable Housing
Charlie Dirac, Project Manager, Preservation of Affordable Housing
Judith Kohn, Fort Point Associates
James Greene, Rubin & Rudman LLC

TABLE OF CONTENTS

1.0 Project Summary

1.1 Project Identification 1-1
1.2 Project Site 1-1
1.3 Project Summary 1-1
1.3.1 Compliance with Area Plans 1-2
1.3.2 Project Description 1-2
1.4 Public Review Process 1-4
1.5 Public and Community Benefits 1-4
1.6 Summary of Anticipated Permits and Approvals 1-5
1.7 Project Team 1-6

2.0 Project Description

2.1 Project Site and Surroundings 2-1
2.2 Planning Context 2-1
2.3 Project Description 2-2
2.3.1 Project Program 2-3
2.3.2 Ground Floor Use 2-4
2.3.3 Residential Units 2-4
2.3.4 Parking and Access 2-5
2.3.5 Open space and Landscape Treatments 2-6
2.4 Regulatory Controls and Permits 2-6

3.0 Urban Design

3.1 Introduction 3-1
3.2 Urban Context 3-2
3.3 Massing 3-3
3.3.1 Building 1 3-4
3.3.2 Building 4 3-4
3.3.3 Building 5 3-5
3.4 Character and Materials 3-5

3.4.1 Building 1 3-5
3.4.2 Building 4 and Building 5 3-6
3.5 Views 3-6
3.6 Open Space 3-6
3.7 Landscape 3-7
3.7.1 Interior Courtyard/Ameneties 3-7
3.7.2 Tremont Street 3-7
3.7.3 Cabot and Ruggles Street Plaza 3-8
3.7.4 Central Plaza 3-8
3.8 Vehicular Circulation/Loading 3-8
3.9 Pedestrian Environment 3-8

4.0 Transportation

4.1 Introduction 4-1
4.1.1 Project Description 4-1
4.1.2 Study Area 4-2
4.1.3 Study Methodology 4-2
4.2 Existing Conditions 4-3
4.2.1 Existing Roadway Conditions 4-3
4.2.2 Existing Intersection Conditions 4-4
4.2.3 Existing Traffic Conditions 4-6
4.2.4 Existing Traffic Operations 4-7
4.2.5 Existing Parking and Curb Use 4-11
4.2.6 Existing Public Transportation Facilities 4-11
4.2.7 Existing Pedestrian Facilities 4-14
4.2.8 Existing Bicycle Facilities 4-14
4.3 Future Conditions 4-16
4.3.1 No-Build Conditions 4-16
4.3.2 Build Conditions 4-22
4.4 Transportation Mitigation Measures 4-31
4.5 Transportation Demand Management 4-32
4.6 Evaluation of Short-Term Construction Impacts 4-33

5.0 Sustainability

5.1 Sustainable Design....5-1
5.2 Article 37/LEED Compliance....5-1
5.2.1 Innovation and Design Process....5-2
5.2.2 Location and Linkages....5-3
5.2.3 Sustainable Sites....5-4
5.2.4 Water Efficiency....5-5
5.2.5 Energy and Atmosphere....5-6
5.2.6 Materials and Resources....5-7
5.2.7 Indoor Environmental Quality....5-8
5.2.8 Awareness and Education....5-9
5.3 Future Phase Checklists/Overview....5-10

6.0 Environmental

6.1 Introduction....6-1
6.2 Wind....6-1
6.3 Shadow....6-2
6.4 Daylight....6-4
6.5 Solar Glare....6-4
6.6 Air Quality....6-5
6.6.1 Traffic sources....6-5
6.6.2 Parking sources....6-5
6.6.3 Building Operation Sources....6-6
6.7 Noise....6-6
6.8 Flood Zones....6-6
6.9 Groundwater....6-7
6.10 Geotechnical....6-7
6.11 Solid and Hazardous Waste....6-8
6.12 Construction Impacts....6-9
6.12.1 Construction Management Plan....6-9
6.12.2 Construction Activity Schedule....6-9
6.12.3 Construction Traffic IMpacts....6-9
6.12.4 Construction Worker Parking....6-10

6.12.5 Construction Air Quality....6-10
6.12.6 Construction Noise Impacts....6-11
6.12.7 sediment control measures....6-11
6.12.8 Construction Noise Impacts....6-12
6.12.9 Rodent Control....6-12
6.13 Wildlife Habitat....6-12
6.14 Historic Resources....6-12
6.14.1 Historic Resources on the Project Site....6-12
6.14.2 Historic Resources in the Vicinity of the Project Site....6-12

7.0 Infrastructure

7.1 Introduction....7-1
7.2 Wastewater....7-1
7.3 Water System....7-6
7.4 Storm Drainage....7-8
7.5 Electrical Services....7-14
7.6 Telecommunications System....7-14
7.7 Natural Gas System....7-14
7.8 Utility Protection During Construction....7-14

LIST OF FIGURES

Figure 1-1 Locus Map
Figure 1-2 Aerial View
Figure 1-3 Project Site Plan

Figure 2-1 Aerial View Looking North
Figure 2-2 Aerial View Looking South
Figure 2-3 Existing Conditions Survey
Figure 2-4 Photographic Locations Plan
Figure 2-5 Existing Conditions Photographs
Figure 2-6 Existing Conditions Photographs
Figure 2-7 Existing Conditions Photographs
Figure 2-8 Project Site Plan Phase 1
Figure 2-9 Project Site Plan
Figure 2-10 Perspective
Figure 2-11 Perspective

Figure 2-12 Perspective
Figure 2-13 Perspective
Figure 2-14 Perspective
Figure 2-15 Perspective
Figure 2-16 Landscape Plan

Figure 3-1 Neighborhood Context
Figure 3-2 Floor Plan- Level P2
Figure 3-3 Floor Plan- Level P1
Figure 3-4 Floor Plan- Ground Floor
Figure 3-5 Floor Plan- Level 2
Figure 3-6 Floor Plan- Level 3
Figure 3-7 Floor Plan- Level 5
Figure 3-8 Floor Plan- Level 6
Figure 3-9 Floor Plan- Level 9
Figure 3-10 Floor Plan- Level 11
Figure 3-11 Roof Plan
Figure 3-12 Typical Unit Plans
Figure 3-13 Typical Unit Plans
Figure 3-14 Whittier Street Elevation
Figure 3-15 Cabot Street Elevation
Figure 3-16 Ruggles Street Elevation
Figure 3-17 Tremont Street Elevation

Figure 4-1 Study Area Intersections
Figure 4-2 Existing Conditions (2014) Turning Movement Volumes, am Peak Hour
Figure 4-3 Existing Conditions (2014) Turning Movement Volumes, pm Peak Hour
Figure 4-4 On-Street Parking
Figure 4-5 Public Transportation
Figure 4-6 Existing Conditions (2014) Pedestrian Volumes, am and pm Peak Hour
Figure 4-7 Existing Conditions (2014) Bicycle Volumes, am and pm Peak Hour
Figure 4-8 Car Sharing
Figure 4-9 Bike Sharing
Figure 4-10 Background Projects
Figure 4-11 No-Build Conditions (2019) Turning Movement Volumes, am Peak Hour
Figure 4-12 No-Build Conditions (2019) Turning Movement Volumes, pm Peak Hour
Figure 4-13 Trip Distribution
Figure 4-14 Project Generated Trips, a.m. Peak Hour
Figure 4-15 Project Generated Trips, p.m. Peak Hour
Figure 4-16 Build Conditions (2019) Turning Movement Volumes a.m. Peak Hour
Figure 4-17 Build Conditions (2019) Turning Movement Volumes p.m. Peak Hour
Figure A-1 Existing Site Trips (2-Way Whittier Street Scenario), a.m. Peak Hour
Figure A-2 Existing Site Trips (2-Way Whittier Street Scenario), p.m. Peak Hour

Figure 5-1 LEED Scorecard Building 1
Figure 5-2 LEED Scorecard Building 1(continued)
Figure 5-3 LEED Scorecard Building 4
Figure 5-4 LEED Scorecard Building 4 (continued)
Figure 5-5 LEED Scorecard Building 5
Figure 5-6 LEED Scorecard Building 5 (continued)

Figure 6-1 Shadow Studies, March 21, 9am
Figure 6-2 Shadow Studies, March 21, 12pm
Figure 6-3 Shadow Studies, March 21, 3pm
Figure 6-4 Shadow Studies, June 21, 9am
Figure 6-5 Shadow Studies, June 21, 12pm
Figure 6-6 Shadow Studies, June 21, 3pm
Figure 6-7 Shadow Studies, June 21, 6pm
Figure 6-8 Shadow Studies, September 21, 9am
Figure 6-9 Shadow Studies, September 21, 12pm
Figure 6-10 Shadow Studies, September 21, 3pm
Figure 6-11 Shadow Studies, December 21, 9am
Figure 6-12 Shadow Studies, December 21, 12pm
Figure 6-13 Shadow Studies, December 21, 3pm
Figure 6-14 Historic Resources

Figure 7-1 Existing BWSC Sewer Systems
Figure 7-2 Existing BWSC Water Systems
Figure 7-3 Existing BWSC Drain Systems

LIST OF TABLES

Table 1-1 Anticipated Project Approvals
Table 1-2 Project Team

Table 2-1 Building Program
Table 2-2 Unit Mix

Table 4-1 Level of Service Criteria (HCM Excerpt)
Table 4-2 Existing Conditions (2014) Capacity Analysis Summary, a.m. Peak Hour
Table 4-3 Existing Conditions (2014) Capacity Analysis Summary, p.m. Peak Hour
Table 4-4 MBTA Transit Services
Table 4-5 No-Build Conditions (2020) Capacity Analysis Summary, a.m. Peak Hour
Table 4-6 No-Build Conditions (2020) Capacity Analysis Summary, p.m. Peak Hour
Table 4-7 Peak Hour Mode Split Assumptions
Table 4-8 Project Vehicle Trip Generation
Table 4-9 Build (2020) Level of Service Summary, a.m. Peak Hour

Table 1-1 Anticipated Project Approvals
Table 4-10 Build (2020) Level of Service Summary, p.m. Peak Hour
Table 4-11 Project Transit Trips
Table 4-12 Project Pedestrian/Bicycle Trips

Table 6-1 Shadow Study Dates and Times
Table 6-2 Individual Historic Resources in the Vicinity of the Project Site
Table 6-3 Motor Vehicle Crash Data Summary

Table 7-1 Sanitary Flows
Table 7-2 Sewer Hydraulic Capacity Analysis

APPENDICES

Appendix A Letter of Intent
Appendix B Transportation Technical Appendix
Appendix C Pedestrian Level Wind Study
Appendix D Accessibility Checklist
Appendix E Climate Change Preparedness and Resiliency Checklist

Chapter 1

PROJECT SUMMARY

CHAPTER 1: PROJECT SUMMARY

1.1 PROJECT IDENTIFICATION

Project Name: Whittier Choice Neighborhood

Address/Location: Tremont Street between Whittier Street and Ruggles Street in Boston, MA

Project Proponent: POAH Madison Park Associates LLC, a partnership between: Preservation of Affordable Housing and Madison Park Development Corporation

Assessor's Parcel Number: 0902643000

1.2 PROJECT SITE

POAH Madison Associates LLC (the "Proponent") proposes to construct The Whittier Choice Neighborhood (the "Project) at 1158 Tremont Street on a 165,194 square foot (3.8 acres) parcel (the "Project Site") owned by the Boston Housing Authority (BHA). The Project Site is located 0.08 miles from the MBTA's Ruggles Station in Roxbury, and is bounded by Tremont Street to the north, Ruggles Street to the east, Cabot Street to the south and Whittier street to the west. Northeastern University's International Village lies directly across Tremont Street. Roxbury Community College and Whittier Street Health Center are located east of the Site along Tremont Street. A large parcel of undeveloped land known as "Parcel 3" or "Tremont Crossing" is located to the southwest across from Whittier Street. The "Crescent Parcel" is situated at the corner of Tremont and Melnea Cass Boulevard. This parcel is slated for redevelopment with mixed uses. The Dudley Square business district and MBTA Station are located only 0.3 miles southeast of the Site.

The Project Site is currently occupied by the Whittier Street public housing development, one of Boston Housing Authority's oldest and most distressed public housing sites. The four existing low- and mid-rise buildings contain 200 units of low and moderate-income housing. The existing buildings have antiquated HVAC systems, undersized units, and building and site design issues that are impossible to correct without redevelopment. The existing structures pose extreme challenges to residents.. See Figure 1-1, Locus Plan and Figure 1-2, Site Aerial.

1.3 PROJECT SUMMARY

The Proponent proposes to redevelop the Project Site by the phased demolition of the existing buildings and housing, and the phased construction of three new buildings that will provide approximately 387 rental units, active ground floor uses and open space. Approximately 7,680 square feet (sf) of commercial/retail and amenity space is programmed

in addition to publicly-accessible open space and streetscape improvements such as upgraded street trees, benches and sidewalks, new lighting, bicycle parking, and a designated passive recreation area. Approximately 121 off-street, below-grade parking spaces will be provided. Additional parking will be provided on a new public street layout which bisects the Project Site, and which will be designated one-way, and striped for 14 parallel spaces. The new public street is proposed to be called "Hampshire Street Extension."

1.3.1 COMPLIANCE WITH AREA PLANS

The Boston Redevelopment Authority's (BRA) 2004 Roxbury Strategic Master Plan (the "Plan") advocated for increased housing opportunities at different income levels, the retention of affordable housing, and enhanced opportunities for small businesses. In recognition of these goals, the existing affordable housing will be either re-created on-site or elsewhere, and the Project will also provide the neighborhood with high-quality, pedestrian friendly, street-facing residential, commercial, and retail spaces that will activate the Tremont Street corridor, will reinforce the Tremont Street wall, and will leverage future development at Parcel 3 and the nearby Madison Park Development Area. The Project will increase pedestrian activity in the area– many residents and visitors will access the Site via transit or the nearby Southwest Corridor Park or South Bay Harbor Trail bicycle paths. The Project's redeveloped buildings will be more energy efficient, and will create healthier and more secure living environments for residents and visitors. Additionally, the addition of increased density at this superior TOD site is in line with housing goals set by Mayor Walsh's 2014 Housing a Changing City: Boston 2030 report.

1.3.2 PROJECT DESCRIPTION

The Proponent proposes to construct three buildings on the Project Site (the "Full Build Project") over a period of approximately 48 to 60 months.

The first phase of development (Phase One) will be comprised of Building 1, which will be moderate in scale to meet the needs of the neighborhood in an appropriately scaled and dense manner. Building 1 will be five stories with 83 units. The first two floors will contain townhouse units, with single-story units on three the floors above. Three of the four existing buildings on-site will remain in place and occupied during the construction of Phase 1. See Figure 1-3, Phase 1 Site Plan.

The remaining components of the Full Build Project will include a proposed residential/mixed use building (Building 4), located on Tremont and Whittier Streets, which will be approximately 15 stories along Tremont Street, with a 10-story wing fronting on Whittier Street. Building 4 will include approximately 241 units with

7,680 sf of ground floor commercial space. Building 4 will also house the garage parking for up to 121 cars. See Figure 1-3, Project Site Plan.

Building 5 will front on Ruggles Street, and will include up to 63 units with two-story townhomes on the first two floors, and single-story units on the remaining three floors.

Rental and condominium units will range in size from studios, to one-, two-, three- and four-bedroom units. The Project will incorporate multiple green building measures and will be Leadership in Energy and Environmental Design (LEED) certifiable as required by Article 37 of the City of Boston Zoning Code, with a goal of LEED Silver.

The new public street proposed to be called Hampshire Street Extension will be designed to efficiently move vehicles into an on-site street network that will provide approximately 135 parking spaces, including 14 surface spaces and 121 below-grade parking in Building 4. The internal street and parking network will be accessible from Ruggles Street with a one way direction proposed to exit onto Whittier Street. As further discussed in Chapter 4, Transportation, this public street is proposed to be one-way extending from Ruggles Street to Whittier Street, but allows for a right-of-way with the required width to adjust accordingly if two-way is desired in the future. As a one-way route, the design limits travel through the Project Site which will be especially important when the planned development of Parcel 3 occurs. Service access will be located off of Ruggles Street, and will not be designed as a pubic way. This service drive will enhance the Whittier Choice Neighborhood as a pedestrian environment. The Project has been designed with a 0.35 ratio of parking spaces to housing units in consideration of the Project's transit, pedestrian and bicycle orientation. In summary, there will be 135 vehicle parking spaces provided for residents and visitors. See Figure 1-4, Project Site Master Plan.

Bicycle storage racks will be provided at each building to accommodate residents and visitors of the Project. All bicycle racks, signs, and parking areas will conform to BTD guidelines and be located in safe, secure locations. The Proponent will work with BTD to identify the most appropriate quantity and location for bicycle racks on the Project Site as part of the Transportation Access Plan Agreement (TAPA) process.

When completed, the overall Project Site will be significantly improved. A total of 187 net new housing units and 59 net new parking spaces will be provided in the Project.

1.4 PUBLIC REVIEW PROCESS

The Proponent has met with local elected officials, several public agencies, the Roxbury Strategic Master Plan Oversight Committee, neighborhood representatives, local organizations and other interested parties seeking their input on the process. A letter of intent (LOI) was filed with the BRA on March 27, 2015 notifying the BRA of the Proponent's intent to file this Expanded Project Notification Form in accordance with the requirements of Article 80B. In accordance with the Mayor's Executive Order Relative to the Provision of Mitigation by Development Projects in Boston, an impact advisory group (IAG) will be appointed with up to 15 representatives from areas surrounding the Project Site and with local representation. The LOI is included as Appendix A.

1.5 PUBLIC AND COMMUNITY BENEFITS

The Project Site is a unique property in the City of Boston. It contains a transit-oriented, affordable housing development in a primarily institutional area of the City. Since the construction of this Whittier Street public housing development in 1953, these apartments have been a critical affordable and workforce housing resource to the City of Boston. Without the major reinvestment and redevelopment effort that is proposed, the functionality of the existing property is in jeopardy. By redeveloping this Site, the existing Whittier residents and future residents to come will be able to take advantage of the superior transit connections in a newly created vibrant community with close proximity to the Dudley Square neighborhood.

The Proponent has committed to provide a number of public benefits that will improve the neighborhood and the surrounding area, and include:

- Allow for the redevelopment of the Site and the construction of new residential buildings, which will bring more residents to the area and add to the diversity of the housing stock through the creation of approximately 387 units of housing. On-site affordable units will be provided in accordance with the City of Boston's Inclusionary Development Policy.

- Facilitate Transit Oriented Development (TOD) by increasing residential density in proximity to the multi-modal Ruggles Station and Southwest Corridor Park, and by accommodating bicycle storage on-site.

- Add ground-floor commercial and retail space that will enhance the pedestrian environment activate the public realm and strengthen the street wall along Tremont Street.

- Improved street network connectivity through the Proposed Hampshire Street Extension.

- Increase potential and desirability for future development along the Tremont Street corridor, including Parcel 3 and the nearby Madison Park Development Area.

- Support the City's goals for a sustainable future through the development of an energy-efficient and environmentally friendly building that will strive to be certified as LEED Silver.

- Increase property tax revenues to the City.

- Provide significant contributions toward the Mayor Walsh's 2014 Housing a Changing City: Boston 2030 report.

- Provide high quality construction-related jobs and full-time equivalent jobs and stimulate the local and regional economy.

- Increased useable and creative open space for public use.

1.6 SUMMARY OF ANTICIPATED PERMITS AND APPROVALS

The following table is a list of anticipated approvals for the Project. The list of approvals will be finalized following consultation with City and State Agencies.

Table 1-1: Anticipated Project Approvals

APPROVAL	AGENCY
Local	
Mayor of the City of Boston	• Approval Authorizing Disposition of Property
Boston City Council	• Approval Authorizing Disposition of Property
Boston Housing Authority	• Approval Authorizing Disposition of Property
Boston Redevelopment Authority (BRA)	• Article 80 B Large Project Review • Cooperation Agreement • Boston Residents Construction Employment Plan • Certificate of Compliance with Article 80 • Affordable Housing Agreement
Boston Civic Design Commission	• Recommendation to the BRA Board

APPROVAL	AGENCY
Boston Transportation Department	• Transportation Access Plan Agreement • Construction Management Plan
Boston Water and Sewer Commission	• Site Plan Approval • Sewer Connection Permit
Inspectional Services Department	• Building Permit • Certificate of Occupancy
Boston Public Works Department	• Street Opening Permit
Boston Public Improvement Commission	• Various Permits for Work in Public Ways
State	
Department of Environmental Protection	• Source Registration for Sewer Discharge • Source Registration for Emergency Generator • Notification Prior to Construction or Demolition • Response Action Outcome
Federal	
Environmental Protection Agency	• Notice of Intent for Construction Dewatering • NPDES Stormwater Management Notice of Intent • Notice of Proposed Construction – Crane/Building
Department of Housing and Urban Development	• Demolition and Disposition Authorization • Funding

1.7 PROJECT TEAM

Table 1-2: Project Team

PROJECT ROLE	CONTACTS
Proponent	Preservation for Affordable Housing Inc. (POAH) 40 Court Street Suite 700 Boston, MA 02108 Contact: Cory Mian (617) 449-0867 cmian@poah.org Madison Park Development Corporation (MPDC) 184 Dudley St Roxbury, MA 02119

PROJECT ROLE	CONTACTS
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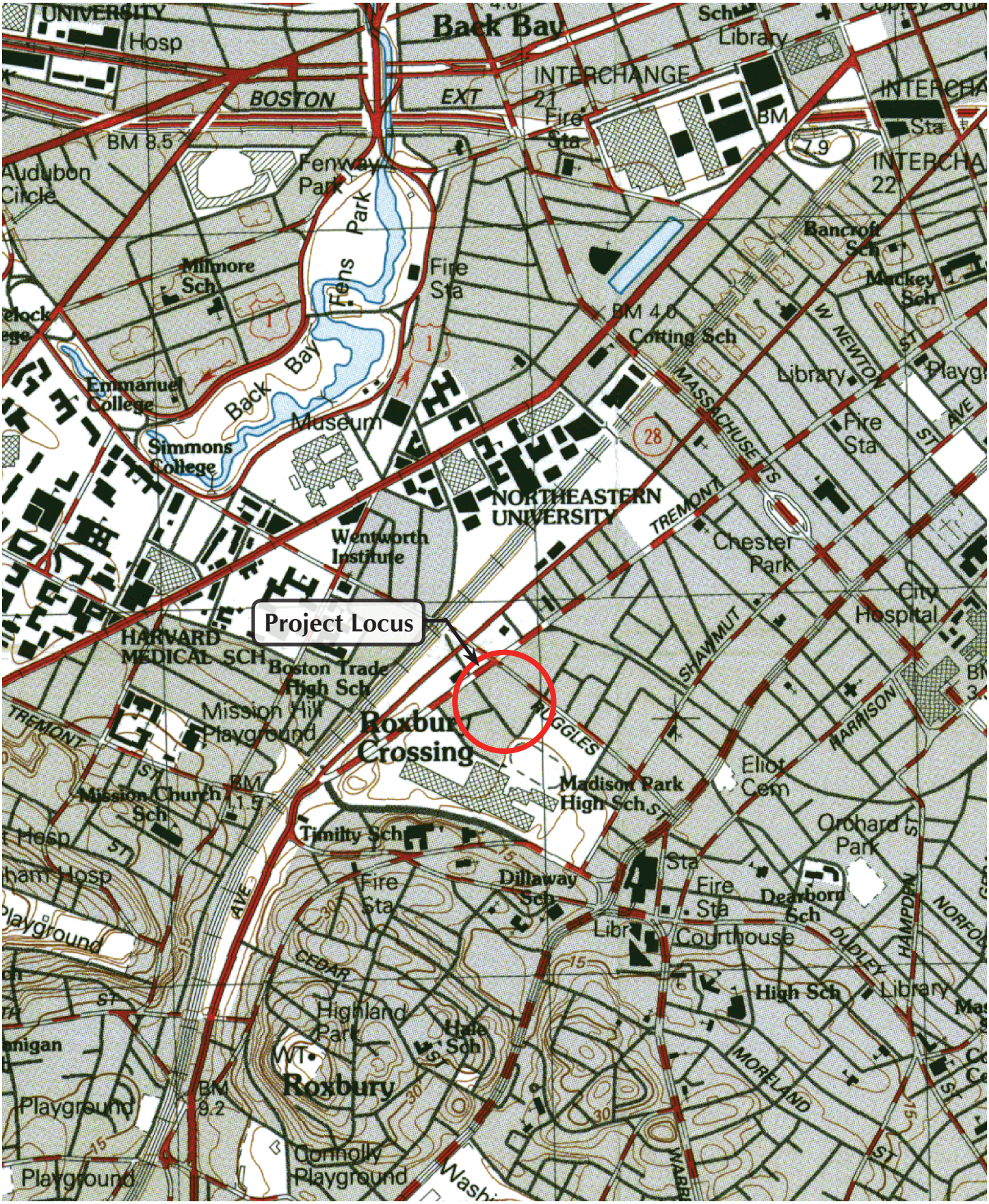
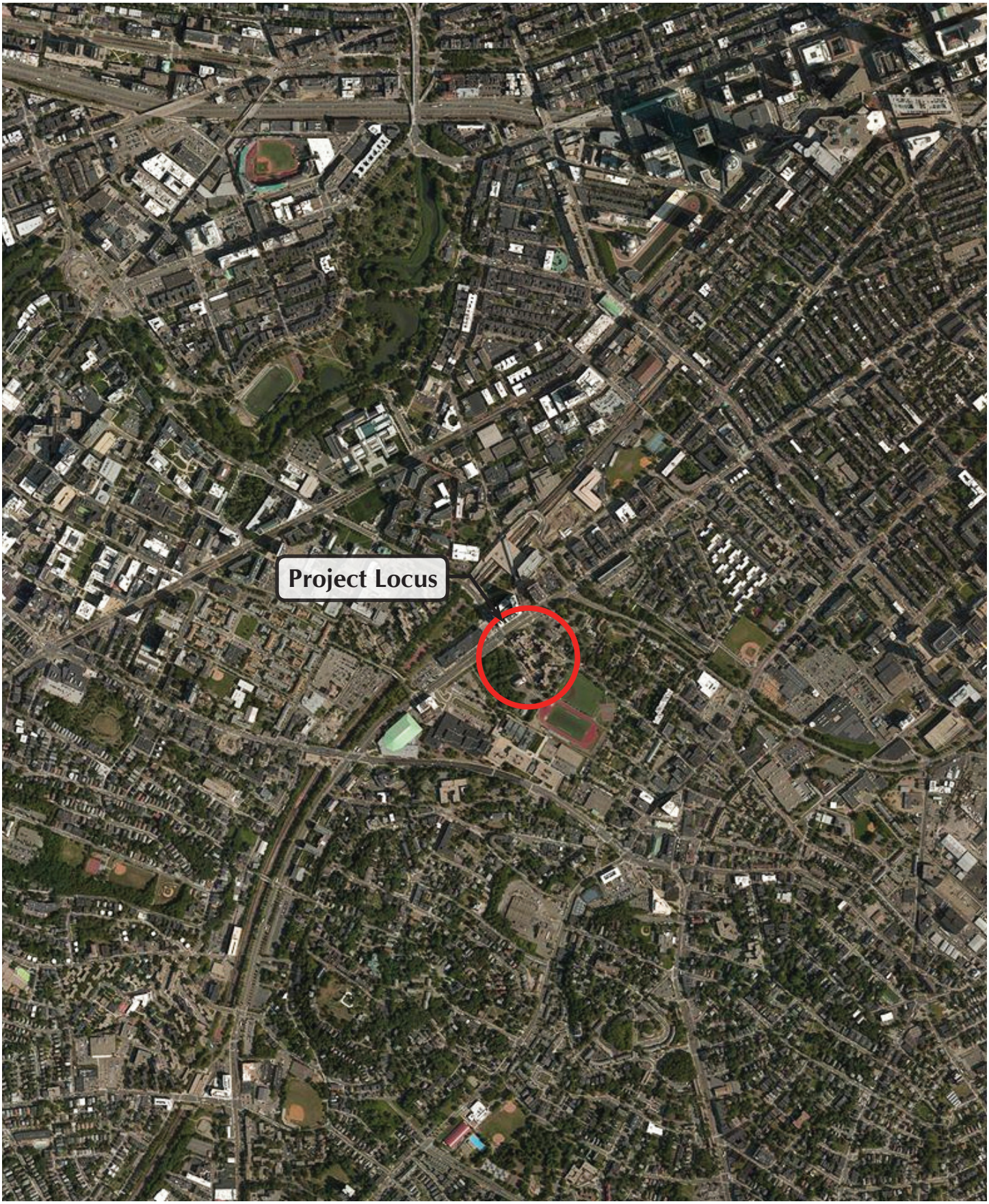
Owner	Boston Housing Authority 52 Chauncy Street Boston, MA 02111 Contact: Kate Bennett, Director of Planning (617) 988-4108 kate.bennett@bostonhousing.org
Legal	Rubin and Rudman LLP 50 Rowes Wharf Boston, MA 02110 Contact: James H. Greene 617-330-7097 jgreene@rubinrudman.com
Planning and Permitting	Fort Point Associates, Inc. 33 Union Street, 3rd Floor Boston, MA 02108 Contact: Jamie Fay, President, President (617) 357-7044 X204 jfay-@fpa-inc.com Contact: Judy Kohn, Vice President (617) 357-7044 X211 jkohn@fpa-inc.com
Architect	The Architectural Team, Inc. 50 Commandants Way Chelsea, MA 02150 Contact: Michael Liu, Partner 617-889-4402 mliu@architecturalteam.com Contact: Tom Schultz, Project Manager 617-889-4402 Tschultz@architecturalteam.com
Landscape Architect	Rojas Design, Inc. 1500 Soldiers Field Road

PROJECT ROLE	CONTACTS
	Brighton, MA 02135-1105 Contact: Andres T. Rojas, ASLA 617-720-4100 andy@rojasdesigninc.com
Transportation	Howard/Stein Hudson Associates, Inc. 11 Beacon Street, Suite1010 Boston, MA 02111 Contact: Michael Santos (617) 482-7080 Msantos@hshassoc.com
GeoEnvironmental and Geotechnical Consulting	McPhail Associates, Inc. 2269 Massachusetts Avenue Cambridge, MA 02140 Contact: Joe Lombardo, Project Manager (617) 868-1420 X344 jpl@mcphailgeo.com
Civil Engineer	Nitsch Engineering 2 Center Plaza, Suite 430 Boston, MA 02108 Contact: Deborah Danik, PE (857)206-8737 DDanik@nitscheng.com
Wind	Novus Environmental Inc. Research Park Centre 150 Research Lane, Suite 105 Guelph, Ontario Canada N1G 4T2 Contact: Jenny Vesely, B. Eng. EIT (226) 706-8080 jennyv@novusenv.com
Sustainability	New Ecology, Inc. 15 Court Square; Suite 420 Boston, MA 02108 Contact: Ashley Wisse, EIT, LEED AP (617) 557-1700 wisse@newecology.org



Roxbury, Massachusetts

Figure 1-1
Locus Map
Source: USGS



Roxbury, Massachusetts

Figure 1-2
Aerial View
Source: Bing Maps, 2015

Roxbury, Massachusetts

Figure 1-3
Project Site Plan
Source: The Architectural Team, 2015

Chapter 2

PROJECT DESCRIPTION

CHAPTER 2: PROJECT DESCRIPTION

2.1 PROJECT SITE AND SURROUNDINGS

The Whittier Choice Neighborhood development (the "Project) is in the Lower Roxbury Neighborhood of Boston located at 1158 Tremont Street (the "Project Site") between Ruggles Street and Whittier Street, only one block away from the MBTA's Ruggles Station. See Figure 2-1, Aerial View Looking North. The Project Site is 3.8 acres, and is bounded by Tremont Street to the north, Ruggles Street to the east, Cabot Street to the south and Whittier street to the west. The Site is located approximately 0.08 miles from the MBTA's Ruggles Station in Roxbury, and Northeastern University's International Village lies directly across Tremont Street. Roxbury Community College and Whittier Street Health Center are located east of the Site along Tremont Street. Dudley Square business district is located only 0.3 miles southeast of the Site. A variety of local shops and restaurants are accessible by foot and bicycle on Tremont Street, with Slades Bar & Grill located approximately 0.3 miles away. A Stop & Shop supermarket is located just over one mile away on Tremont Street. Additionally, the brand new Tropical Foods Grocery store has recently opened just a half-mile away. See Figure 2-2, Aerial View Looking South, Figure 2-3, Aerial View Looking North, and Figure 2-3, Existing Conditions Plan.

2.2 PLANNING CONTEXT

The existing Whittier Street affordable housing development was built in 1953 as part of the City of Boston's efforts to provide housing to families that were unable to afford housing without public subsidies. The Boston Housing Authority (BHA) has owned and managed the Site since the buildings were constructed. The Site currently comprises 200 units in four buildings with a mix of low-rise and mid-rise elevations. The existing units range from one to four bedroom apartments. Rents for current tenants are calculated at 30% of a resident's income. As part of the Proponent's proposed residential units, on-site affordable units will be provided in accordance with the City of Boston's Inclusionary Development Policy (the "IDP")."

The Project is located in the Lower Roxbury neighborhood and is consistent with the 2004 Roxbury Strategic Master Plan (the "Plan"). The Plan sets forth a number of community-wide goals for improving existing housing opportunities at all income levels, upgrading and retaining publicly owned and affordable housing, creating new housing units on publicly-owned land and enhancing local economic and educational opportunities. In addition, the Plan seeks to create new development opportunities for transit-oriented development, which will promote the building of mixed-use higher density housing around existing and future transportation stops. The Plan highlights the Site's proximity to Ruggles Station, acknowledging that the Site can and should accommodate high-density development. In

addition, creating and maintaining a diversified housing stock that is accessible, affordable, and energy-efficient are important priorities for the City of Boston. The BRA implements the City's IDP to preserve access to affordable housing opportunities in all of Boston's neighborhoods. In collaboration with the city's Department of Neighborhood Development and Office of Fair Housing and Equity, the BRA works toward achieving the goals articulated in Mayor Walsh's 2014 Housing a Changing City: Boston 2030 report. The Project contributes substantially to Mayor Walsh and the BRA's vision, and is noted specifically as a priority project in the report.

The Project Site is located within an area of significant planning and transportation improvement activities. The Boston Housing Authority has requested $30 million in Choice Neighborhood Implementation funding that includes $17.5 million for housing development which includes support for the Proposed Project. In addition, the City of Boston has committed $7.5 million to be supplemented by federal and state matching funds for the adjacent Melnea Cass Boulevard reconstruction project. The proposed design calms traffic, provides new landscaping, promotes neighborhood businesses, facilitates bike and pedestrian travel, and provides a better connection between the overall Lower Roxbury neighborhood and the Dudley Square Business District.

A more detailed description of urban design components of the Project can be found in Chapter 3 – Urban Design.

2.3 PROJECT DESCRIPTION

The Project involves the demolition of the existing buildings and housing on site, and the construction of three new buildings. Building 4 is an L shaped building located on Tremont Street that will include rental apartments and ground floor commercial/retail. Building 4 will be approximately 15 stories along Tremont Street with a 10-story wing on Whittier Street. The remaining two buildings will be stepped back or reduced in scale to meet the needs of the neighborhood in an appropriately scaled and dense manner. Building 1, which also fronts on Whittier Street as well as Cabot Street, will be up to five stories and will include rental units with first-floor town homes. Building 5, which will be up to five stories, including two-story town homes, will front on Ruggles Street.

Building 1 is intended to be the first phase of development, and as-such, is proposed to be developed through to final design phases immediately following approval of this EPNF by the BRA. Building One will be subject to BCDC and BRA Design Review requirements. Subsequently, Buildings 4 and 5 will be developed through to final design phases and undertake BRA Design Review at a future date.

2.3.1 PROJECT PROGRAM

Although the Site is currently a residential development, it does not encourage internal or external pedestrian activity. The four existing buildings on Project Site are positioned to discourage use of the interior open space, and limits pedestrian connections and view corridors between Tremont Street, Ruggles Street and Whittier Street. In support of the Roxbury Strategic Master Plan, the Project will create a dense, street-focused human scale community that will provide enhanced pedestrian activation to nearby properties and public transportation while providing significant amounts of open green and recreational outdoor space for residents. The Project will stimulate redevelopment and pedestrian realm improvements along Tremont Street, including Parcel 3 to the west of the Project Site, as well as the underdeveloped Crescent parcel to the east.

The total building footprint is approximately 65,660 sf, covering 46.36% of the Site. The total gross floor area (GFA) of the building is approximately 472,095 sf, and the Projects Floor Area Ratio (FAR) is 2.93, which is less than the allowable FAR in this "U" Urban Renewal Overlay District.

Table 2-1: Building Program

Project Component	Building 1	Building 4	Building 5	Dimensions/Count
Project Site	N/A	N/A	N/A	165,194 sf (3.8 acres)
Gross Floor Area	111,115 sf	358,060 sf	70,000 sf	472,095 sf
Residential	90,065 sf	222,600 sf	54,600 sf	360,982 sf
Floor Area Ratio	N/A	N/A	N/A	2.93
Commercial/ Retail	0	7,680 sf	0	7,680 sf
Vehicle Parking	0	121	14 on street	136
Open Space	N/A	N/A	N/A	75,911 sf (46.36%)

2.3.2 GROUND FLOOR USE

The proposed footprints for the Project are approximately 23,000 sf for Building 1, approximately 29,300 sf for Building 4, and approximately 13,360 sf for Building 5. Building 4 will contain approximately 7,680 sf of ground floor commercial/retail space that will activate Tremont Street. Publicly accessible open space, new street trees, street lights, pedestrian benches and sidewalks, along with ground floor townhouses with street facing entrances will enhance the pedestrian level environment along Whittier, Cabot and Ruggles Streets.

Vehicle parking will be provided on an internal street network and in below-grade parking in Building 4. Approximately 14 surface spaces, which will become part of the City's public on-street parking, and 121 below-grade spaces will be available to tenants and visitors to the Project. Approximately 287 bicycle spaces will be provided onsite and within the garage of building 4. No additional or new parking will be provided with the construction of Building 1. Existing parking will remain unchanged or reduced slightly following the construction of Building 1.

2.3.3 RESIDENTIAL UNITS

The proposed new housing will replace the existing substandard public housing on the Project Site with a diverse mix of affordable and market-rate housing for the Lower Roxbury neighborhood. It is expected that these units will appeal to renters that appreciate the proximity to transit access, the nearby shops and restaurants, and the neighborhoods abundant green space.

There will be a total of 387 residential apartments, which will consist of one-, two, three-, and four-bedroom units, many of which will be two-story town houses. The Project will replace public housing units with continued deeply subsidized units – either public housing or Project Based Voucher units. In total 200 public housing units will be replaced as a result of coordinated projects to be constructed within the Whittier/Madison Park/Crescent parcels by individual development entities.

The layout and shape of the buildings is designed to make the most efficient use of the Project Site, provide public and private open space, and consistent frontage along the perimeter of the site facing Tremont Street, Whittier and Ruggles Streets.

Table 2-2: Unit Mix

Unit Type	Building 1	Building 4	Building 5
Studio	0	42	24
One Bedroom	30	78	27
Two Bedroom	28	85	0
Three Bedroom	16	36	8
Four Bedroom	9	0	4
Town House (2, 3 & 4 Bedroom)	18	8	12

2.3.4 PARKING AND ACCESS

Vehicular

The Project is accessible via vehicular access from multiple points. The existing access to the Project Site has been maintained and an additional access route through the site is added. Currently, vehicular access to the site is available via Tremont Street, Ruggles Street, and Raynor Circle. Going forward a new public street with surface parking is proposed through the site, shown in Figure 2-9, Project Site Plan Full Build, as proposed Hampshire Street Extension. This street provides the access to the underground parking garage beneath Building 4, allows for surface parking, and breaks up the site to allow for a more pedestrian scale environment.

A service-only road is proposed between Buildings 4 and 5 with entry from Ruggles Street. Deliveries, loading and trash pick-up for Building 4 will use the northern portion of this service road.

Bicycle

Bicycle storage racks will be provided at each building to accommodate residents and visitors of the Project. All bicycle racks, signs, and parking areas will conform to BTD guidelines and be located in safe, secure locations. The Proponent will work with BTD to identify the most appropriate quantity and location for bicycle racks on the Project Site as part of the Transportation Access Plan Agreement (TAPA) process.

Accessibility

The Site's three access/egress points from Whittier and Ruggles Street will contain a variety of traffic calming and pedestrian safety amenities such as striped crosswalks.

All of the Project's main entrances will be located at ground level and will be accessible by persons in wheelchairs. Of the 121 below grade parking spaces, four will be accessible and two of the 14 on grade spaces will be accessible.

2.3.5 OPEN SPACE AND LANDSCAPE TREATMENTS

The public landscapes at the Project will create a rich diversity of urban outdoor experiences. The most publicly-visible open space is centrally located at the heart of the Project, between the mixed-use and residential buildings. The space is conceived as both a visual amenity and an urban green space where residents and visitors interact and animate the space. There will be hardscape elements suitable for pedestrian use, complemented by softer green elements, which are largely visual amenities that act as a buffer for the internal roadway behind. A paved circular plaza is located near the corner of Ruggles and Cabot Streets and will serve as a unique seating and gathering space for residents and visitors. Another urban meeting space is located at the corner of Tremont and Ruggles Street and will serve as a pedestrian gateway into the site. A small tot-lot is proposed adjacent to Building 1.

While the Project Site will accommodate higher density than existing conditions, the Project has been designed to maximize view corridors and connectivity to the surrounding neighborhood. Tree lined sidewalks and internal pedestrian pathways provide visual and physical connection between all site areas as well as to the Madison Park High School Athletic Fields south of the Site, to the Raynor Circle Residential area to the east of the Project Site, and to future development on Parcel 3 west of the Project Site. Building entry areas are accentuated with decorative pavements, seating areas, urban-hardy plant materials, lighting and other pedestrian amenities. Service areas for all buildings are part of the pedestrian and vehicular circulation system. The pedestrian site circulation system is designed to maximize accessibility and connectivity between the site's many features and elements. See Figure 2-11, Landscape Plan.

2.4 REGULATORY CONTROLS AND PERMITS

The Project Site was the subject of a larger zoning map amendment (Map Amendment No. 597), approved by the Boston Zoning Commission on January 14, 2015, and by the Mayor on January 15, 2015. In accordance with this zoning map amendment, the Project Site has been designated as being within a "U" Urban Renewal Area Overlay District. Based upon the approvals by the BRA, Zoning Commission and the Mayor, the use and dimensional requirements applicable to the Project are set forth in the Campus High Urban Renewal Plan, which stipulates that the Project Site may be used for residential and commercial use, and that the dimensional controls applicable to the Project are to determined by the Authority Approval.

Additionally, the proposed buildings shall be consistent and compatible with surrounding development respecting material, form and scale, subject also to Authority Approval. As set forth in the Authority's Development Agreement with the Developer, and as referenced in the Land Use and Building requirements set forth below, the Proposed Project is consistent with the dimensional and use restrictions within the applicable Urban Renewal Plans. Therefore, upon the issuance of a design approval certification for the Proposed Project by the Authority, and the Authority's determination of other requirements such as off-street parking and loading which will be reviewed in accordance with the Article 80 process, the Proposed Project will be in compliance with the Zoning Code. Design elements of the Proposed Project will also be reviewed pursuant to Large Project Review. See Table 2-3.

Table 2-3: Land Use and Building Requirements

Categories	Urban Renewal Requirement	Proposed Project
Permitted Land Use	Residential/Commercial on First Floor	Residential/Commercial
Maximum Setback	AA	Complies
Maximum Height	AA	Complies
Maximum Net Density	AA	Complies
Minimum Parking Ratio	AA	Complies
Planning and Design Requirements	B	Complies

AA – Subject to Authority Approval

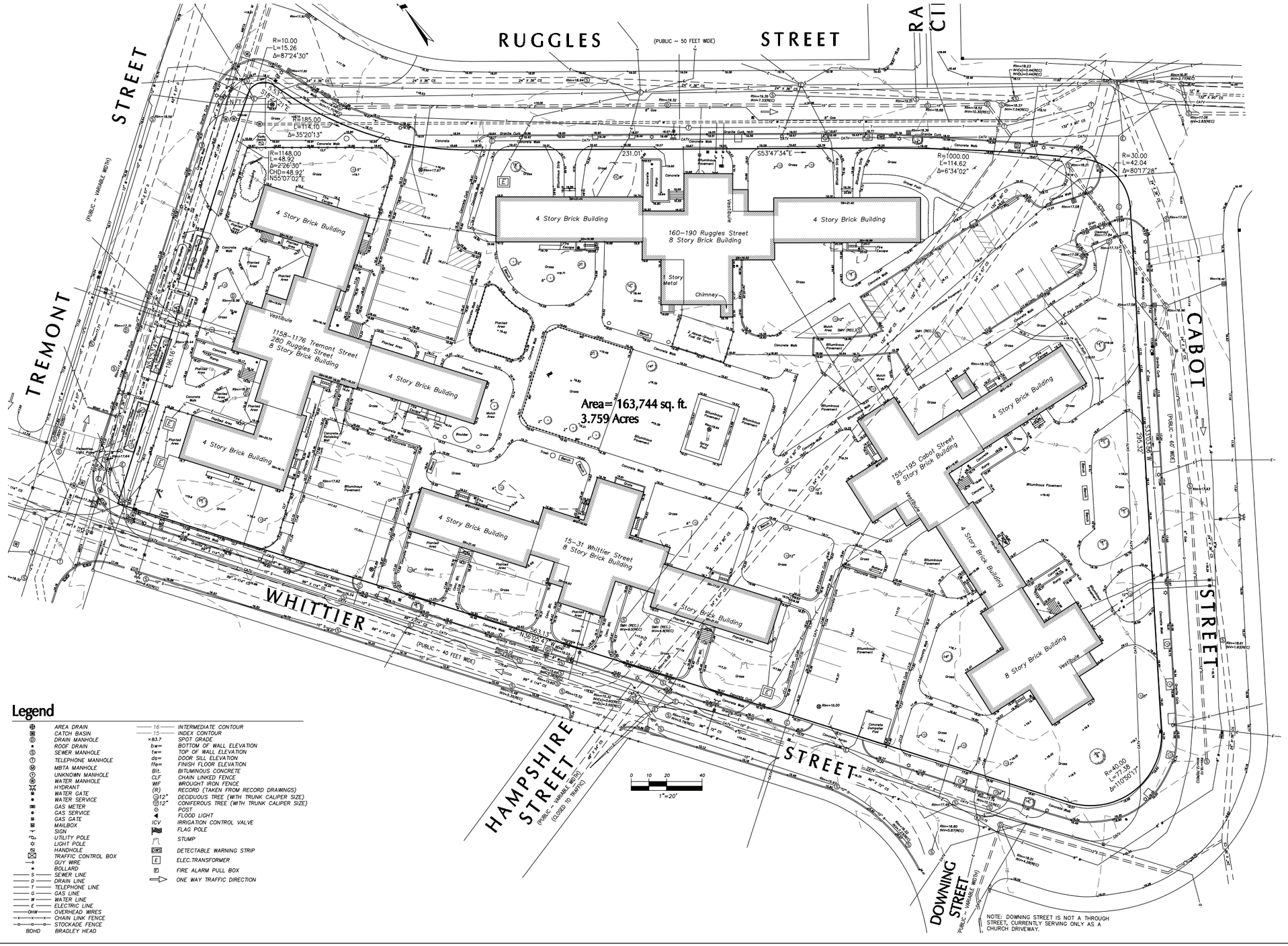
B – Development shall be consistent with and compatible with the surrounding existing and proposed Development respecting material, form and scale, subject to Authority Approval.

Roxbury, Massachusetts

Figure 2-1
Oblique View of Existing Site- Looking North
Source: Fort Point Associates Inc., Bing Maps, 2015

Roxbury, Massachusetts

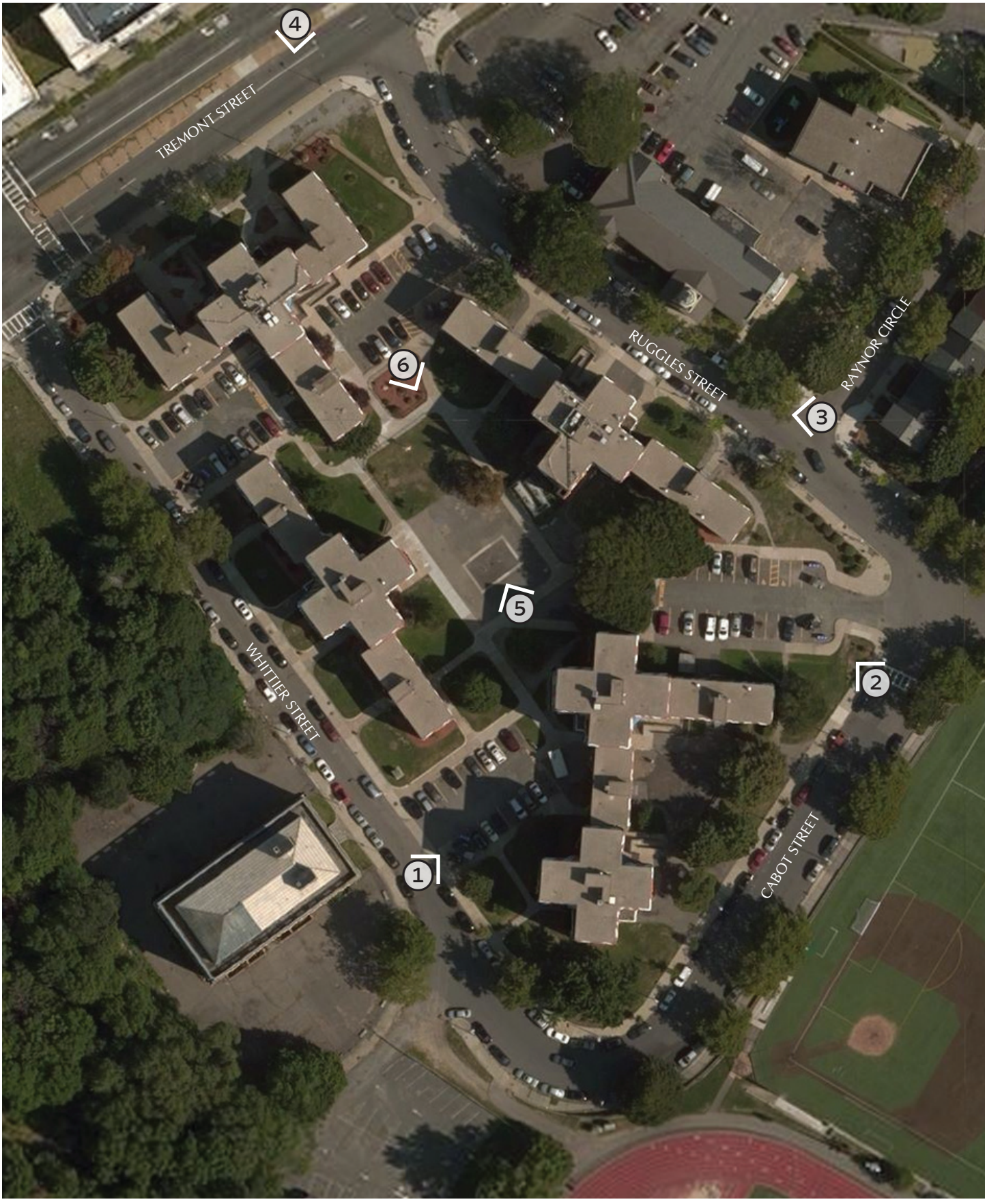
Figure 2-2
Oblique View of Existing Site- Looking South
Source: Fort Point Associates Inc., Bing Maps 2015



Legend

- AREA DRAIN
- CATCH BASIN
- DRAIN MANHOLE
- ROOF DRAIN
- SEWER MANHOLE
- TELEPHONE MANHOLE
- MBTA MANHOLE
- UNKNOWN MANHOLE
- WATER MANHOLE
- HYDRANT
- WATER GATE
- WATER SERVICE
- GAS METER
- GAS SERVICE
- GAS GATE
- MAILBOX
- SIGN
- UTILITY POLE
- LIGHT POLE
- HANDHOLE
- TRAFFIC CONTROL BOX
- GUY WIRE
- BOLLARD
- S —— SEWER LINE
- D —— DRAIN LINE
- T —— TELEPHONE LINE
- G —— GAS LINE
- W —— WATER LINE
- E —— ELECTRIC LINE
- OHW —— OVERHEAD WIRES
- CHAIN LINK FENCE
- STOCKADE FENCE
- BDHD BRADLEY HEAD
- 16 —— INTERMEDIATE CONTOUR
- 15 —— INDEX CONTOUR
- ×83.7 SPOT GRADE
- bw= BOTTOM OF WALL ELEVATION
- tw= TOP OF WALL ELEVATION
- ds= DOOR SILL ELEVATION
- ffe= FINISH FLOOR ELEVATION
- Bit. BITUMINOUS CONCRETE
- CLF CHAIN LINKED FENCE
- WIF WROUGHT IRON FENCE
- (R) RECORD (TAKEN FROM RECORD DRAWINGS)
- 12" DECIDUOUS TREE (WITH TRUNK CALIPER SIZE)
- 12" CONIFEROUS TREE (WITH TRUNK CALIPER SIZE)
- POST
- FLOOD LIGHT
- ICV IRRIGATION CONTROL VALVE
- FLAG POLE
- STUMP
- DWS DETECTABLE WARNING STRIP
- E ELEC.TRANSFORMER
- FIRE ALARM PULL BOX
- ONE WAY TRAFFIC DIRECTION

Figure 2-3
Existing Conditions Plan
Source: Samiotes Consultants, Inc., 2014



Roxbury, Massachusetts

Figure 2-4
Photograph Location Key Plan
Source: Fort Point Associates Inc., 2015

Photograph #1: View of Project Site looking northeast from Whittier Street

Photograph #2: View of Project Site looking northwest from Ruggles Street

Photograph #3: View of Project Site looking west from Raynor Circle

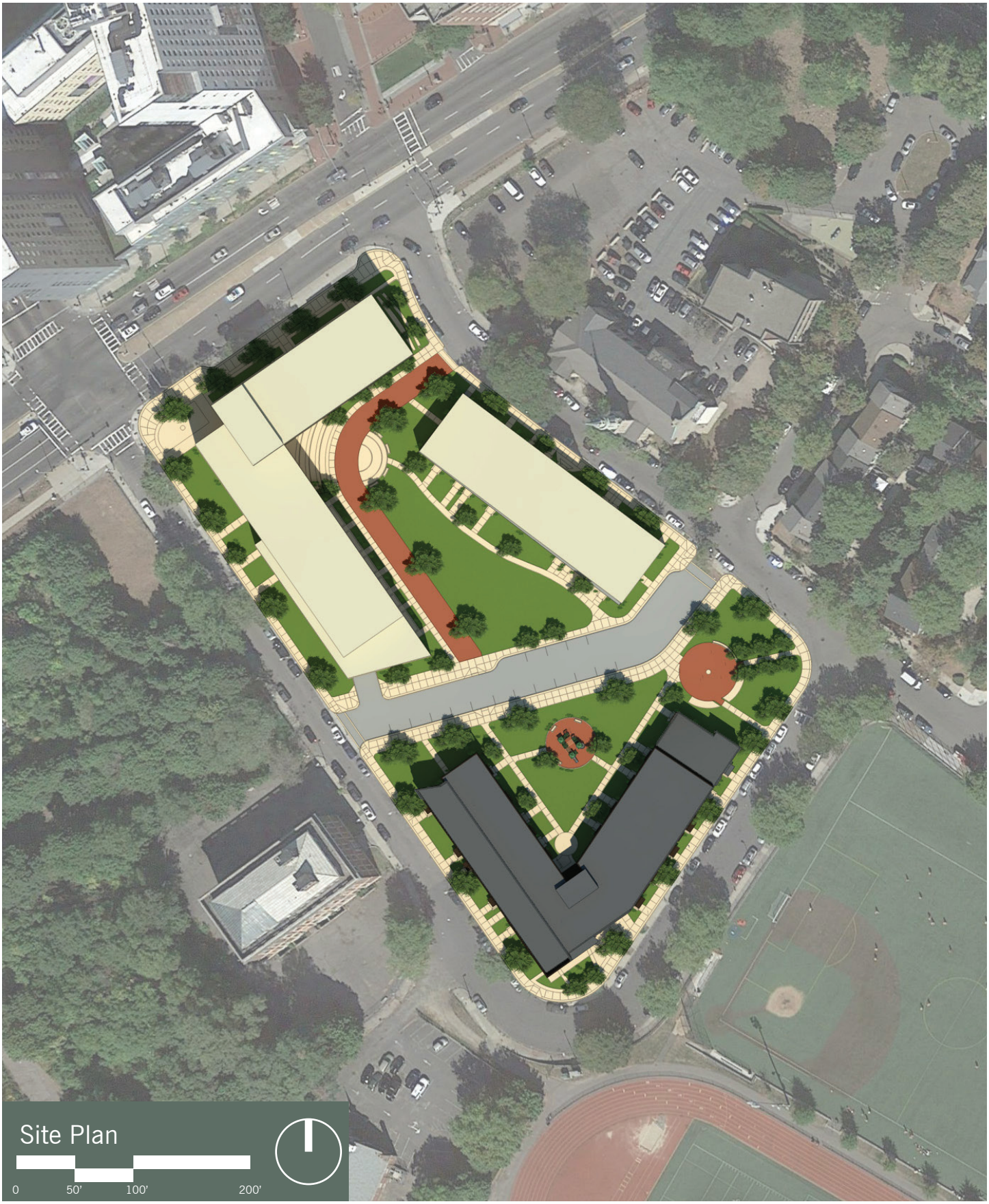
Photograph #4: View of Project Site looking south from Tremont Street

Photograph #5: View of interior open space, central to the Project Site, looking north

Photograph #6: View of interior open space, central to the Project Site, looking south

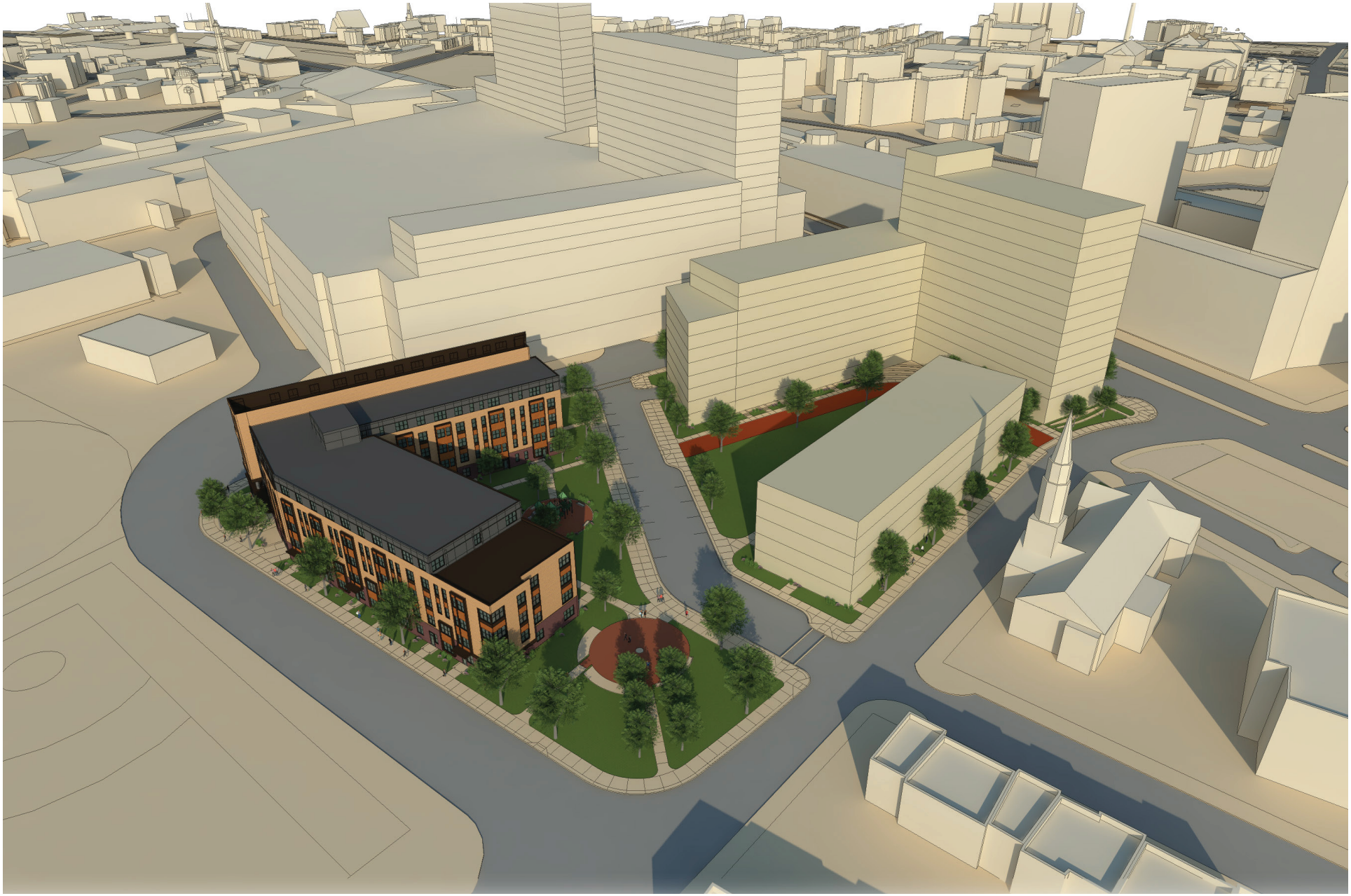
Roxbury, Massachusetts

Figure 2-8
Project Site Plan Phase 1
Source: The Architectural Team, 2015



Roxbury, Massachusetts

Figure 2-9
Project Site Plan Full Build
Source: The Architectural Team, 2015



Roxbury, Massachusetts

Figure 2-10
Rendered Perspective
Source: The Architectural Team, 2015

Roxbury, Massachusetts

Figure 2-11
Rendered Perspective
Source: The Architectural Team, 2015

Roxbury, Massachusetts

Figure 2-12
Rendered Perspective
Source: The Architectural Team, 2015

Roxbury, Massachusetts

Figure 2-13
Rendered Perspective
Source: The Architectural Team, 2015

Roxbury, Massachusetts

Figure 2-14
Rendered Perspective
Source: The Architectural Team, 2015

Roxbury, Massachusetts

Figure 2-15
Rendered Perspective
Source: The Architectural Team, 2015

Roxbury, Massachusetts

Figure 2-16
Landscape Plan
Source: Rojas Design, Inc., 2015

Chapter 3

URBAN DESIGN

CHAPTER 3: URBAN DESIGN

3.1 INTRODUCTION

The Whittier Choice Neighborhood Development (the "Project") is conceived as the critical first phase of a long-term revitalization of Roxbury's Tremont Street corridor by creating high-density, transit-oriented development that will support housing opportunities at diverse income levels, activate the pedestrian realm and foster economic and educational growth opportunities.

As discussed briefly in Chapter 1, The Boston Redevelopment Authority's (BRA) Roxbury Strategic Master Plan (the "Plan"), a community-based planning effort completed in 2004 imagines a reactivated and continuous streetscape animated by retail and residential uses, and physically defined by building masses fronting on the street. The full vision identifies the potential for multiple underutilized publicly-owned sites to transform the neighborhood from a scattering of industrial and infrastructure-related uses to a vital, mixed-use neighborhood anchored by a major transportation hub. Implementation of this vision has been slow, especially on the Whittier Neighborhood parcels.

The existing Whittier Street development is currently one of the oldest and most underutilized sites in the Boston Housing Authority's federal portfolio. Although currently home to hundreds of residents and employees, and located along important Boston Public Streets, the Project Site lacks urban vitality. The existing buildings are repetitive, uniform, and deteriorated, with aged systems. Residents are isolated in a large block that lacks connection to neighborhood and community resources. The buildings are internally oriented with minimal open space that is underutilized and disconnected. The current buildings do not engage the street in a positive way for pedestrians. The notable lack of activity and divided open space compromises the pedestrians experience significantly.

Despite these challenges, the potential for the redevelopment of the Whittier Street neighborhood is substantial. While the Project Site is presently inefficient and deteriorating, the broader surrounding Roxbury neighborhood is attractive and stable. Located near public transportation, lively commercial activity and Institutions, the Project Site is just a few minute's walk to Ruggles T-station on the Orange line and commuter rail opening up access to several job centers in the region. The proponent recognizes that there is a great and unique opportunity to transform and re-energize the Whittier Neighborhood into a vibrant mixed-use development, and in the process improve the public realm for an entire city block.

The Project will represent a major first step in realizing the goals of a reconnected neighborhood by transforming an under-utilized area into a lively and dense residential

community with added retail and community uses. Because the Project Site is almost completely disconnected from the surrounding neighborhoods, the Project must concentrate the uses to create a sense of place. It will need to act as a destination that operates on both a regional scale as a Transit Oriented Development, and at a local scale, as a neighborhood destination and source of added residential life.

When completed, the Project will enhance the Tremont Street corridor by animating the edges of what is now an inactive and uninviting sidewalk. New street trees and lighting, residential scaled entries and lobbies, and commercial/retail and amenity spaces will activate the south side of Tremont Street once building 4 is complete. See Figure 3-1, Neighborhood Context.

The Project is proposed to be constructed in two phases. Building 1 will be placed within the existing building and site context to minimize demolition and disruption in the three remaining buildings until such time as Buildings 4 and 5 are constructed.

3.2 URBAN CONTEXT

The Project is located in a transitional area of Roxbury along the Tremont Street corridor. To the south is Madison Park, one of Roxbury's long-standing residential communities. To the north across Tremont Street is Northeastern University's recently developed International Village. To the east is a vacant site, referred to as the Crescent Parcel. And to the west is another vacant parcel known as P-3 that is slated for redevelopment. See Figure 3-1, Neighborhood Context.

The urban design principles for the redevelopment of the Project Site seek to reinforce the vitality and quality of life that is found in many areas of the surrounding sub-neighborhoods and improve connectivity to neighboring areas by creating a pedestrian friendly and active public realm.

Specifically, the urban design principles governing this project are to:

- Enhance the public realm and pedestrian experience by creating strong street edges with streetscape improvements and new ground floor uses.
- Recognize, respect, and reinforce the scale and character of the surrounding area.
- Create new public open space and improve existing open spaces as outdoor amenities for residents and the public.
- Connect Whittier Street block and the broader Roxbury neighborhood.
- Create a healthy and sustainable community.
- Breakdown large existing block with new, neighborhood-scale, pedestrian-friendly streets and open spaces.
- Create attractive retail and continue the Tremont street character from the South End
- Provide access and view corridors thru the site.
- Create new buildings with diverse architecture and heights, responsive to the surrounding context

The proposed design incorporates these urban design goals by dividing the site with a new network of streets and open spaces, organized to manifest the neighborhood scale. The existing block is broken down with a new proposed public street and open spaces that connect Whittier Street and Ruggles through the development. The street layout has been coordinated with the anticipated Parcel 3 project to the west for street connectivity across multiple mixed-use sites. In addition, the main entrance to Building 1 is located to avoid direct pedestrian and visual connections to the entrance to the Building 4 parking garage.

As noted above, the existing streetscape and public realm surrounding the existing Whittier Street development does not currently offer a positive pedestrian experience. In its current state, the ground plane has minimal interface with the interior outdoor spaces. The existing buildings entrances are often elevated or depressed from street level and feel more like entering egress stairs than main entrances. All of the existing units are accessed via internal circulation routes.

3.3 MASSING

The proposed Full Build Project respects and complements the existing surrounding context while balancing the need for density and a sense of place with a variety of distinct edge conditions. The height and massing is designed to complement the scale and character of the existing surrounding buildings as well as future developments slated for the Parcel 3 and Crescent sites.

The Full Build Project creates three new building footprints, whose heights, and massing's vary, responding to the surrounding context, while providing a diversity of housing types. The ensemble of buildings is oriented to establish street walls along the sites perimeter as well as allow for thru-site connectivity. The overall massing strategy places the height along the Tremont Corridor and transitions to the south where lower scale Madison Park neighborhood exists. At ground level, the buildings define a landscaped courtyard which creates a larger grouped open space. The buildings massing allows for pedestrian, visual and vehicular connections between them from East to West. Direct entrances to the residential units face all streets including Whittier, Cabot and Ruggles Streets while commercial retail and amenity spaces line the entire length of Tremont Street. The lobbies are setback from the street edge allowing a deeper and wider open space at those locations. Individual buildings massing and architecture takes its cues from the building organization and provide a rhythm and articulation that responds to its direct context.

The majority of the street edges will be at five stories in order to establish the appropriate residential scale and a consistent base-line height. This podium is punctuated by the taller massing that is set back from the Madison Village neighborhood. The presence of these taller components, organized along Tremont Street, is measured to enhance the sense of

place by revealing the density of its occupation and to animate the streetscape at a larger scale.

The height and density of building 4 is appropriately concentrated along Tremont Street, relating well to the larger massing, scale and urban fabric of the existing commercial, mixed-use and institutional buildings to the north, while buildings One and Five have a transitional height that relates well to the existing Madison Park to the east and south.

3.3.1 BUILDING 1

Building 1 is a mid-rise residential building oriented along the corner of Whittier and Cabot Streets. At five-stories, the building acts as a transition from the larger scale along Tremont to the Madison Park neighborhood. The main entrance is envisioned along Cabot Street (near the corner with Whittier) while the balance of the ground plane has a rhythm of townhouse style units including direct access entrances along Whittier St., Cabot St. and the internal courtyard. The main building mass is further reduced to 4-stories at the corner of Cabot and Ruggles completing the transition to the lower scale residences to the southeast. The overall scale of the building although modest is furthermore alleviated by the use of two story projections that provide a rhythm of entrances and creates a comfortable datum roughly 24′ above the sidewalks. The reduction in height of the building projections helps integrate the building to the overall scale of the neighborhood while maintaining a strong identity as southwest corner of the block.

3.3.2 BUILDING 4

Building 4 is located at the northwestern edge of the site along Tremont and Whittier Streets. Its massing is organized as three layers which act as a height transition from 15-stories along Tremont to 8-stories at the southern tip. Building 4 creates a strong urban edge along Tremont Street while a generous setback allows for a large but yet urban green buffer between the residential units and the public realm. The setback encourages wider sidewalks that will enhance the pedestrian experience and promote retail uses similar to that found further east in the south end. With the completion of the adjacent blocks to the east and west, following this urban design impetus, a comfortable and vibrant pedestrian experience will be created along Tremont and throughout the neighborhood. The main lobby and the residential amenities are located on the corner of Tremont and Whittier Streets allowing for a more public, transparent façade with a secondary entrance on the opposing interior corner of the building, permitting residents to walk through the building. The use of individual residential entrances on Whittier Street addresses the scale and character of the future mixed use residential street and enhances the pedestrian experience. Access to the below grade garage is located on the

southwest façade along the proposed Hampshire Street Extension as shown on Figure 3-4.

3.3.3 BUILDING 5

Building 5, is sited along Ruggles street across from St Katharine Drexel Parish Center and aligns with Raynor Street to the east. Also at five stories, the height of Building 1, the building transitions the mass and scale from the taller context along Tremont to the Madison Park neighborhood. The main entrance is envisioned mid-block along Ruggles Street. Similar to Building 1 the ground plane will have a rhythm of direct entrances associated with two-story townhomes, with semipublic front-entry stoops and bay windows, creating neighborhood-scale and pedestrian-friendly streets. The overall scale of the building although modest is furthermore alleviated by the use of two story projections reminiscent of row house proportions. The reduction in height of the building projections helps integrate the building to the overall scale of the neighborhood and creates a layer of semi-privacy between the private residential units and the urban realm all while increasing the site porosity.

3.4 CHARACTER AND MATERIALS

The character of the Project is mixed-use in its scale and urbanism, expressed in a transitional architectural language. The general façade articulation is organized via a base-middle-top approach common to this archetype. This elevation configuration develops a sense of scale as well as allows the three buildings to tie together as a whole. The three buildings are intended to stand as individual buildings with architectural vocabularies appropriate to their specific context, but work together as an ensemble in a mutually reinforcing and coordinated manner. The materials selected for Whittier Street were chosen to reinforce and enhance the existing urban fabric while creating diversity in the architecture.

3.4.1 BUILDING 1

Building 1 has a strong masonry base that is broken by multi-storied vertical elements celebrating special uses within the project or relating surrounding context. The ground plane is further perforated via a rhythm of two story townhouse elements creating an added layer of depth between the private entrances and the public realm. This threshold space is demarcated by a second floor datum, varied hardscapes including a stoop and planting zone. The upper portions combine strong horizontal planks that are juxtaposed by vertical window groupings which are organized and sized to celebrate the internal residential semi-public and private uses. Building 1 is further articulated at its top level along Cabot Street with lighter materials framed by a strong cornice.

3.4.2 BUILDING 4 AND BUILDING 5

Buildings 4 and 5 are contemplated as phase 2 of the Full Build Project and have yet to be designed to the level of detail as Building 1. However, building 4 is a larger scale, in keeping with its face on Tremont Street, and contains more public elements at the ground plane, requiring greater transparency and expressions that are more consistent with their mixed uses. The ground floor commercial/retail/amenity elements and the residential lobbies will use glass storefronts and metal frame elements appropriate for an urban public space. The primary façade material is planned to be precast but has yet to be articulated.

The overall design strategy is to create a transitional building language that fits in contextually. The underlying tripartite façade organization is apparent throughout the project, yet is developed uniquely through changing scales, material, fenestration, color and detailing for each building to stand on its own. This allows the project to have visual variety and still relate to the diverse context that the urban setting offers while harmonizing as a whole.

3.5 VIEWS

The Project Site presents a variety of urban edge conditions – the active Tremont Street corridor to the north, Madison Park Village to the southeast and Parcel 3 to the west. The building form has been shaped to specifically complement and augment views from each of these vantage points.

The prominence of Building 4 will frame vistas along the Tremont Street corridor and act as a gateway to travelers marking the entrance into Roxbury Crossing. The lower scale Building 1 and 5 will promote south facing views from Building 4 and the anticipated future development on Parcel 3.

3.6 OPEN SPACE

Significant improvements are proposed for the Project's open space features. A new public plaza is proposed, providing a unique outdoor space with numerous trees, planting, specialty paving and ample seating. This important corner will be greatly enhanced and activated for pedestrians. The public landscapes at the Project will create a rich diversity of urban outdoor experiences. The space is conceived as both a visual amenity and an urban green space where residents and visitors interact and animate the space. There will be hardscape elements suitable for pedestrian use, complemented by softer green elements, which are largely visual amenities that act as a buffer for the internal roadway behind. A paved circular plaza is located near the corner of Ruggles and Cabot Streets and will serve as a unique seating and gathering space for residents and visitors. Another urban meeting

space is located at the corner of Tremont and Ruggles Street and will serve as a pedestrian gateway into the site. A small tot-lot is proposed adjacent to Building 1.

3.7 LANDSCAPE

The landscape of the Whittier Street Apartments is designed to allow for communal outdoor activities and facilities as well as for more private and individual uses. The overall landscape will be responsive to the surrounding urban context as well as that of this new residential community. Many units will have individual entrances, front yards and rear yard spaces landscaped for privacy and visual enhancement. Foundation plantings gracefully tie the building to the larger landscape. Activities and public spaces within the site are connected via pedestrian walkways and encourage community participation and circulation. Shade trees along the streets define the residential quadrants and allow for visual separation between vehicular and pedestrian areas. The streetscapes and plantings along the perimeter Tremont, Whittier, Ruggles and Cabot Streets reinforce the urban context, buffer entrances from the adjacent roadways and enhance connections to adjacent amenities and other properties. Public open spaces at key perimeter locations help to activate the streetscape and encourage pedestrian activity.

3.7.1 INTERIOR COURTYARD/AMENETIES

The central courtyard accommodates a variety of distinct open spaces and activities that allow for neighbors to interact – passively or actively. The central east-west walkway promenade, from Ruggles Street to the Hampshire Street extension, will allow for safe and efficient pedestrian flow and complete accessibility to all site areas. This wide paved walkway will also allow for servicing the commercial uses and for the normal move in-out activities of residents. Entry plazas, comfortable seating, gathering spaces, connecting walkways and communal garden areas will accommodate more passive uses. All areas will be appropriately landscaped with shade trees, ornamental flowering trees and evergreen and deciduous shrubs and grass.

3.7.2 TREMONT STREET

The Tremont Street landscape will be an urban landscape that enhances building entries and gestures toward this major public way. The entry and plaza spaces at the Whittier Street and Ruggles Street corners will include decorative pavements & patterns, shade trees, ornamental plantings, seating and urban-hardy site amenities will create an exciting front face to the development and integrate it into the larger urban fabric and transportation network. This perimeter landscape will acknowledge the community's urban location while the interior spaces will provide a quiet personal landscape environment that will best serve the residents.

3.7.3 CABOT AND RUGGLES STREET PLAZA

At the northeast sector of the site near the corner of Cabot & Ruggles Street is a large paved plaza with seating, decorative pavements, shade trees, ornamental plantings, communal garden areas and a central flagpole. This plaza establishes one of the main gateways into the residential site. Just below this plaza in the green lawn open space is a new Tot-Lot designed for young children to actively enjoy the lovely landscape environment. The tot-lot will include age-specific play equipment designed for 3-6 year olds. Seating and shade/ornamental trees are provided around the tot-lot for the comfort and enjoyment of caregivers and kids. At the corner of Cabot and Whittier Street there is also an entry plaza for Building 1 that relates to the main entry and the interior public spaces. Flexible and expanded use of all outdoor public spaces is a goal throughout the project.

3.7.4 CENTRAL PLAZA

A pedestrian-scaled walkway connects the Cabot & Ruggles Street Plaza to another semi-circular plaza area at the western end of the central green space that is the internal focus of the complex. This Central Plaza, which also relates to the entry area for Building 4, will include seating, shade trees, ornamental plantings, decorative pavements and lighting to allow for passive enjoyment of the verdant landscape. It will also be a central gathering spot for community activities and events. The pedestrian-scaled walkway will also connect to several unit entrances and will contribute to an effective pedestrian network throughout the site.

3.8 VEHICULAR CIRCULATION/LOADING

Loading for the project is via an internal multi-use service drive area located off Ruggles with a connection to the new proposed Hampshire Street Extension, which will connect Raynor Street and Whittier Street. The loading area is proposed to serve Building 4's residential and retail spaces. Building 5 will utilize either Ruggles Street or the Hampshire Street extension for its move-ins and move-outs, while Building 1 will utilize Cabot Street. Service areas for all buildings are part of the pedestrian and vehicular circulation system. Through traffic and resident's vehicular access will be focused on one new street. Parallel parking on either side of the proposed one-way Hampshire Street Extension between Ruggles Street and Whittier Street will serve the residents and others in the neighborhood. Two cross-block crossings will encourage a residential scale and traffic calming on this new street.

3.9 PEDESTRIAN ENVIRONMENT

While the Project Site will accommodate higher density occupancy than existing conditions, the Project has been designed to maximize connectivity to the surrounding

neighborhood. Tree lined sidewalks and internal pedestrian pathways provide visual and physical connection between all site areas as well as to the Madison Park High School Athletic Fields south of the Site, the Raynor Circle Residential are to the east of the Project Site and to future development on Parcel 3 west of the Project Site. Building entry areas are accentuated with decorative pavements, seating areas, urban-hardy plant materials, lighting and other pedestrian-focused amenities. The pedestrian site circulation system is designed to maximize accessibility and connectivity between the site's many features and elements. See Figure 2-11, Landscape Plan.

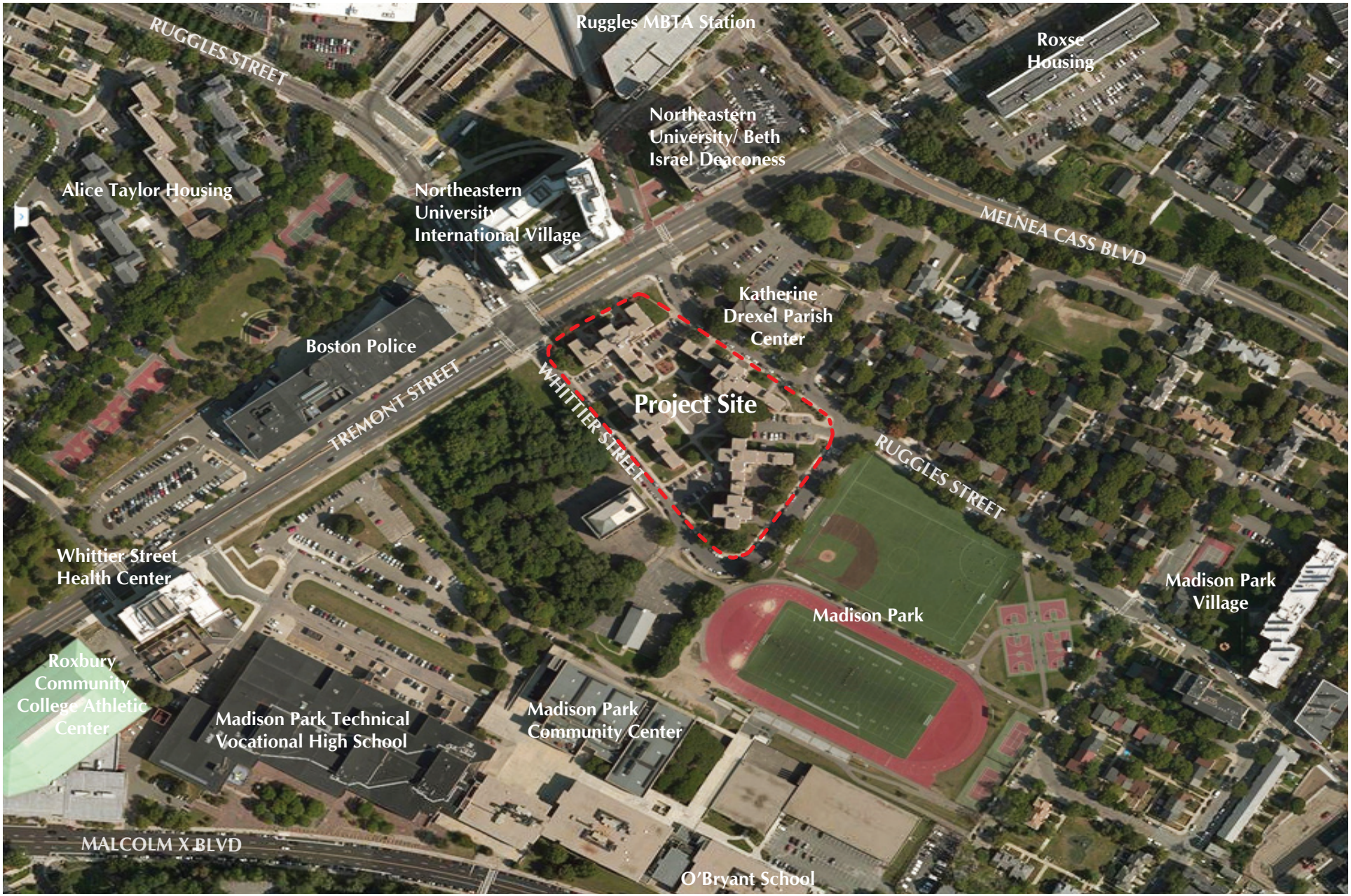


Figure 3-1
Neighborhood Context
Source: Bing Maps

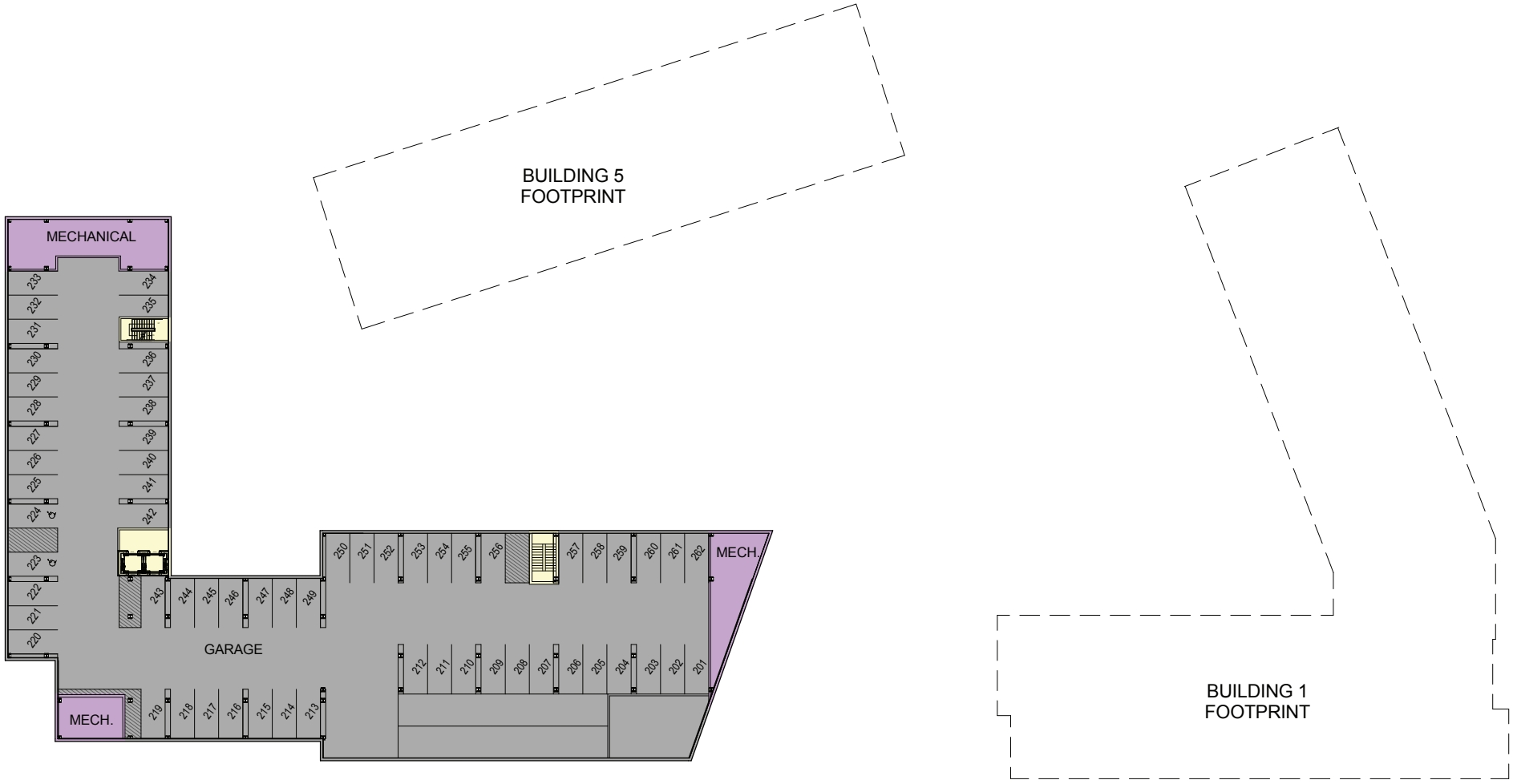


Figure 3-2
Floor Plan- Level P2
Source: The Architectural Team, 2015

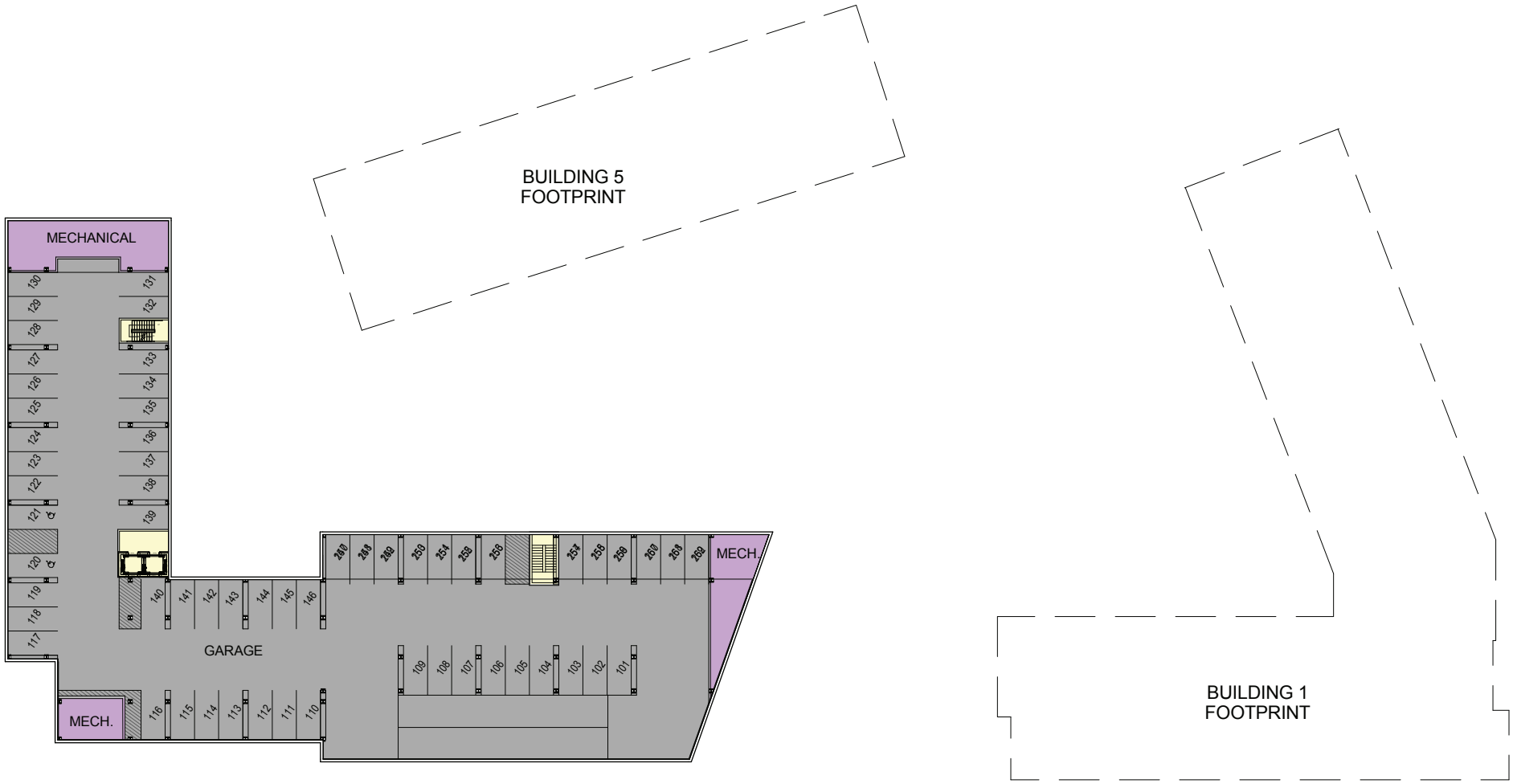


Figure 3-3
Floor Plan- Level P1
Source: The Architectural Team, 2015

Figure 3-4
Floor Plan- Ground Floor
Source: The Architectural Team, 2015

Figure 3-5
Floor Plan- Level 2
Source: The Architectural Team, 2015

Figure 3-6
Floor Plan- Level 3
Source: The Architectural Team, 2015

Figure 3-7
Floor Plan- Level 5
Source: The Architectural Team, 2015

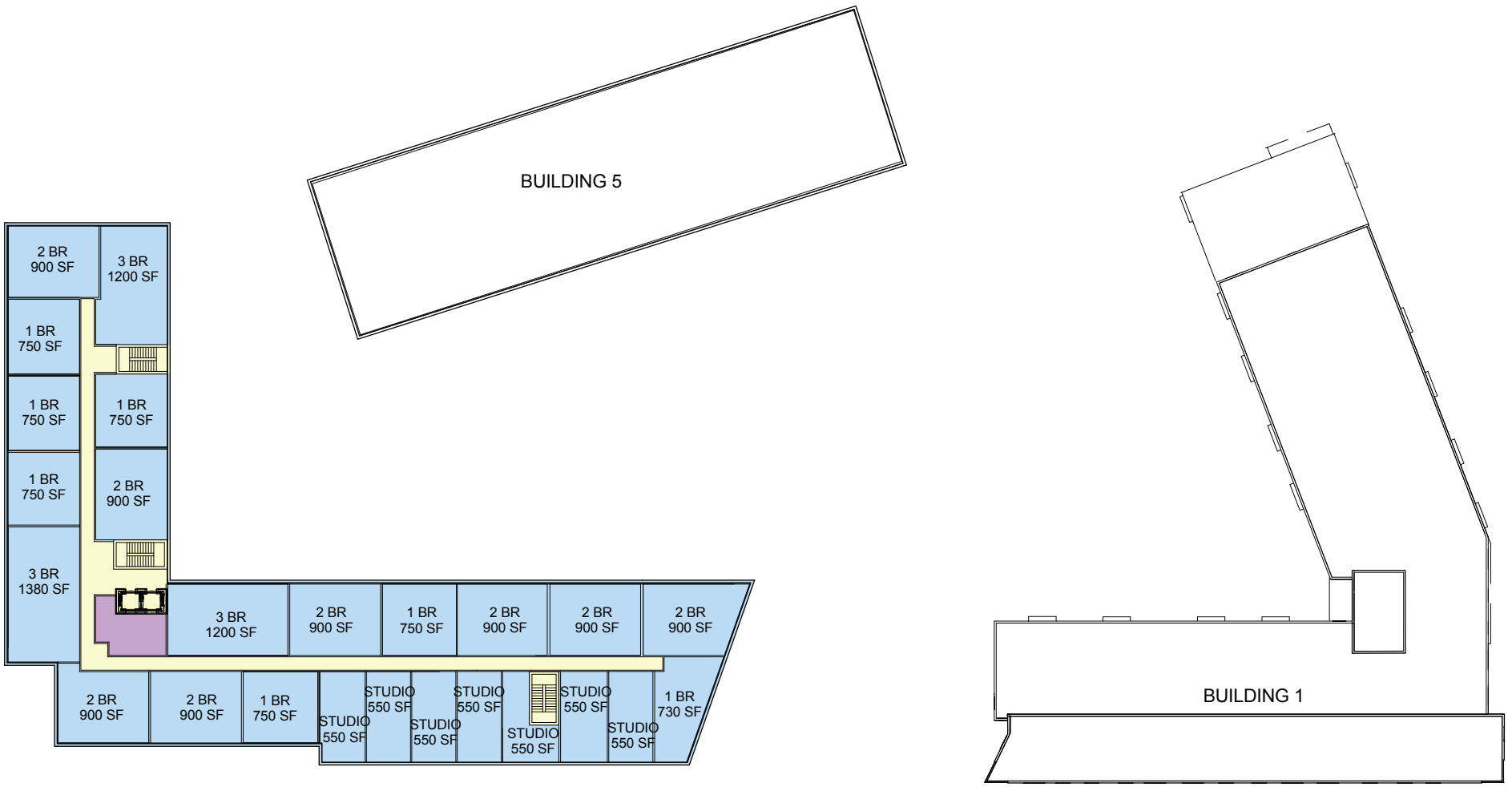


Figure 3-8
Floor Plan- Level 6
Source: The Architectural Team, 2015

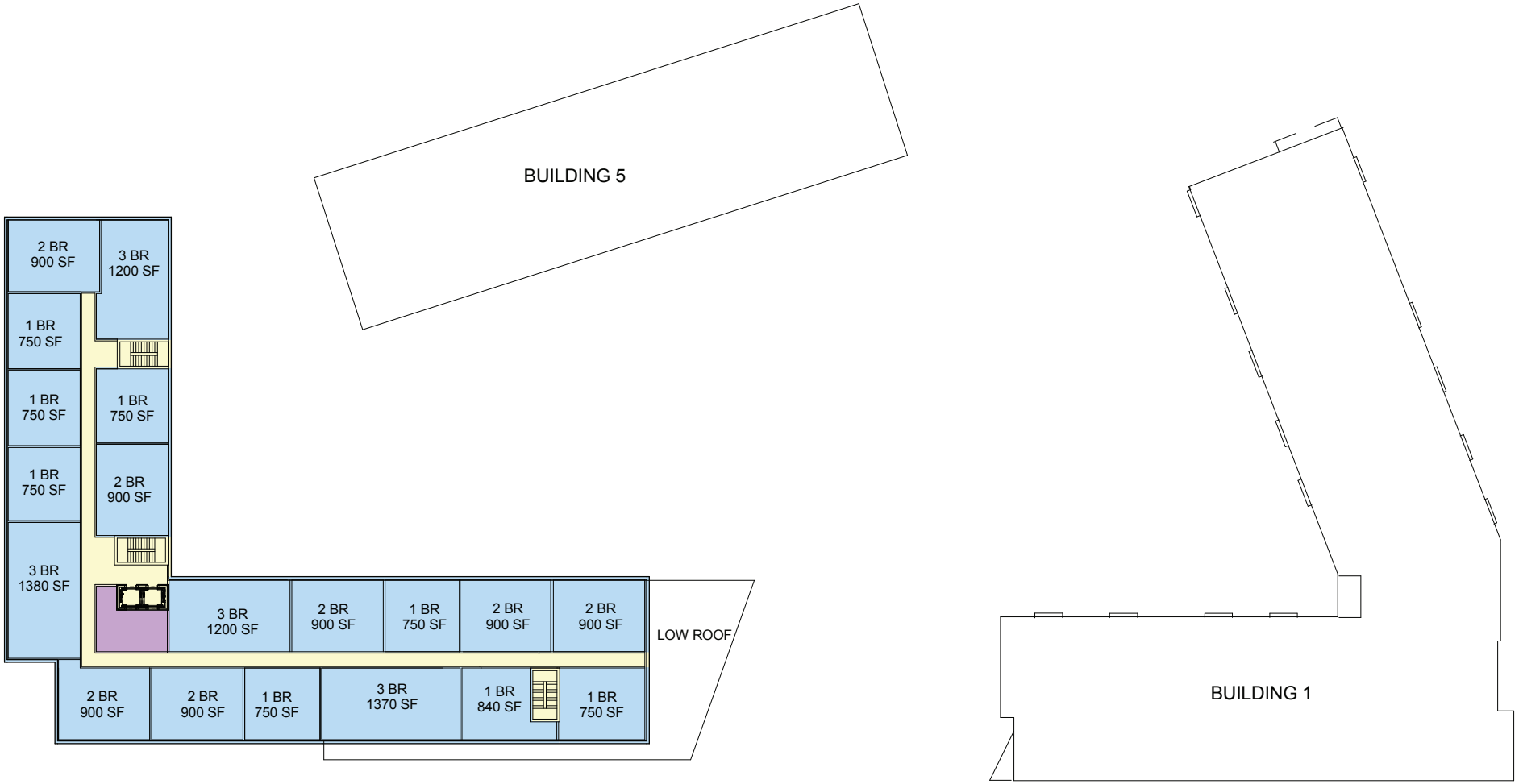


Figure 3-9
Floor Plan- Level 9
Source: The Architectural Team, 2015

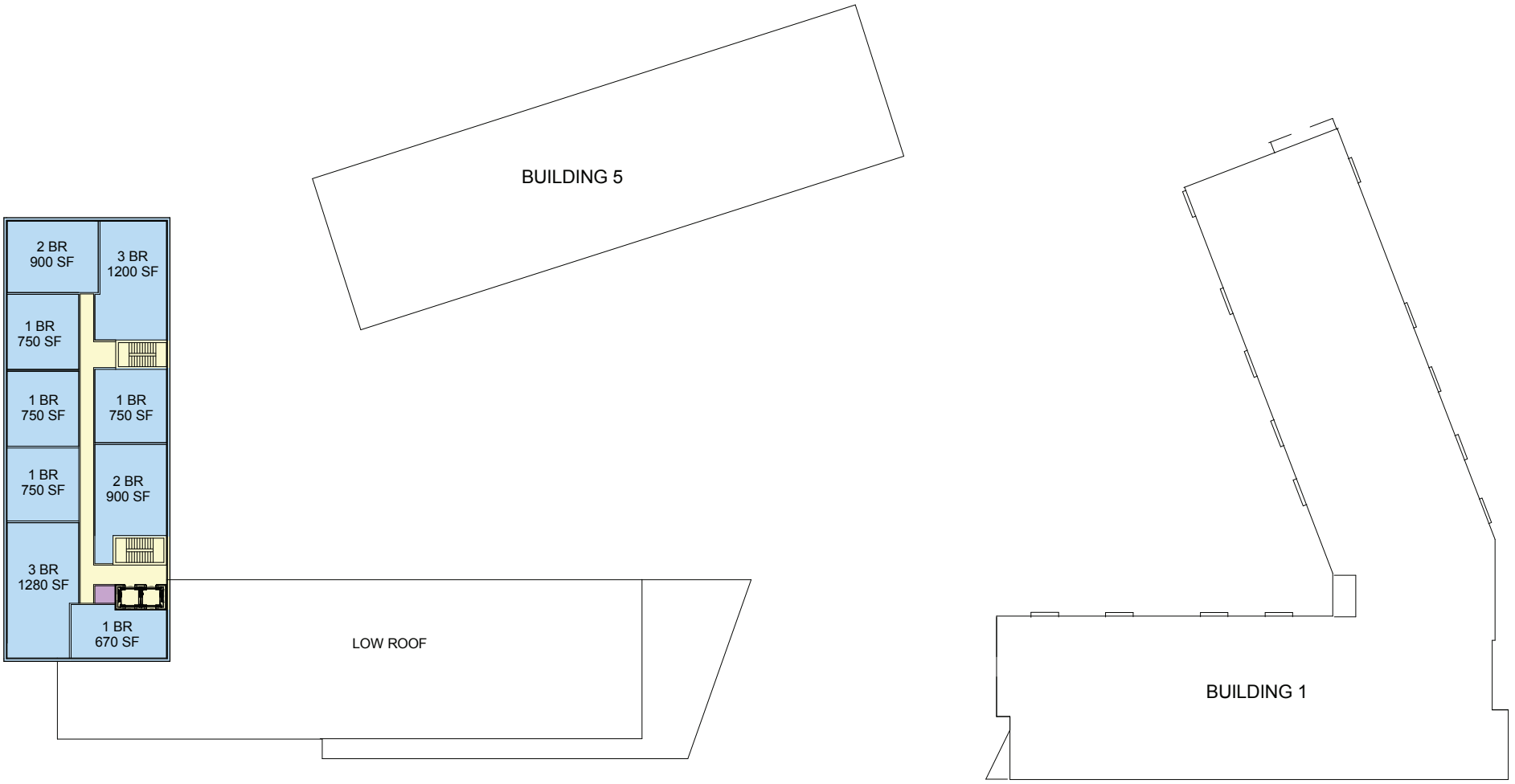
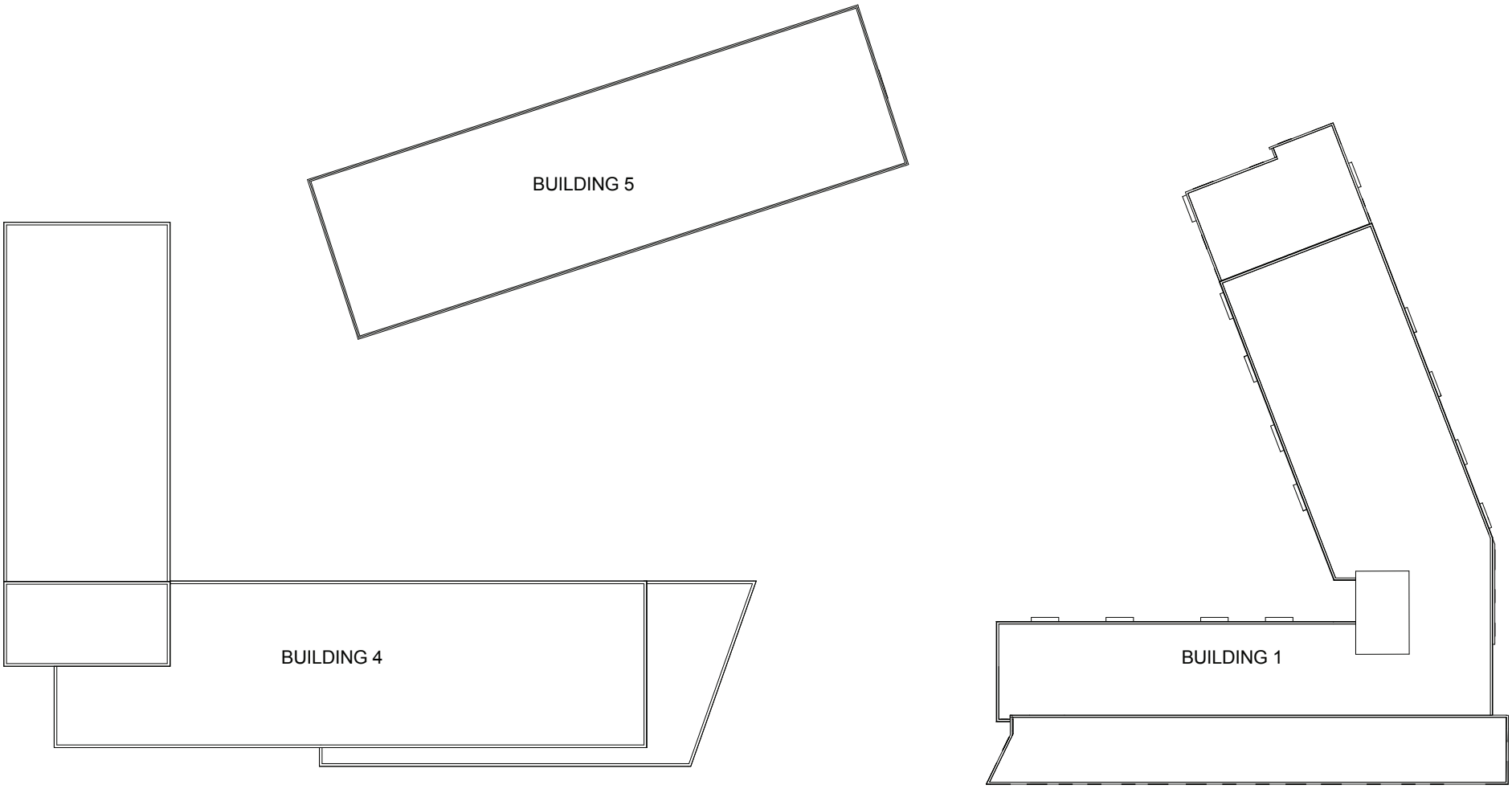
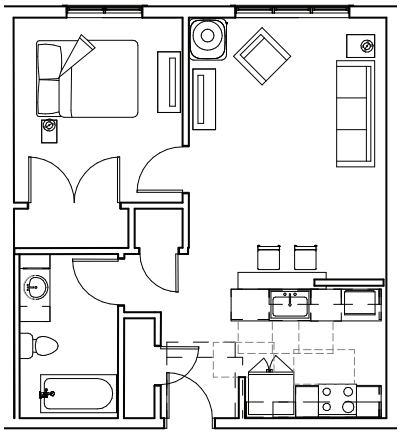


Figure 3-10
Floor Plan- Level 11
Source: The Architectural Team, 2015

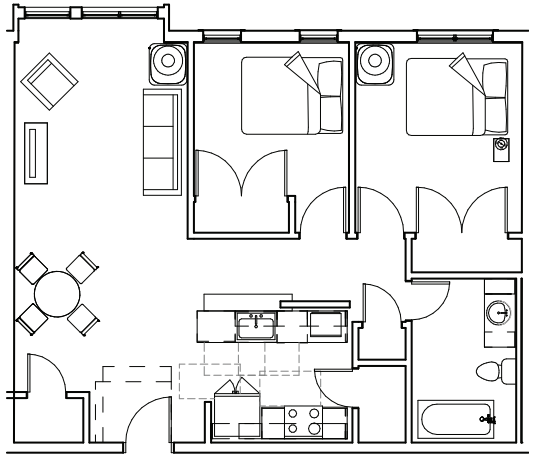


Roxbury, Massachusetts

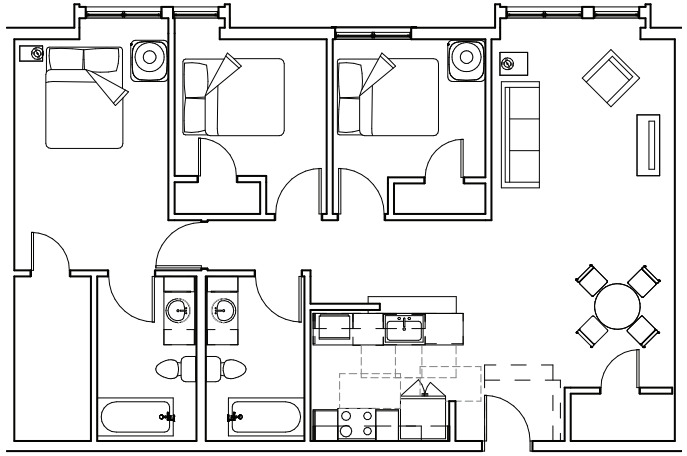
Figure 3-11
Roof Plan
Source: The Architectural Team, 2015



1 BR UNIT
Scale : 1/8" = 1'-0"

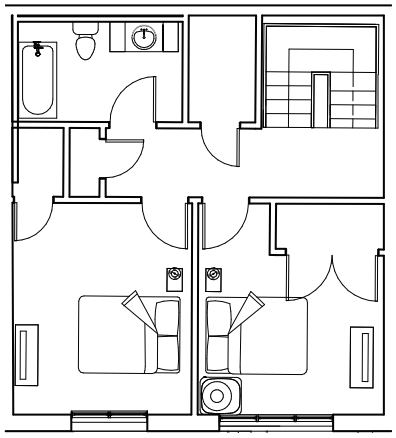


2 BR UNIT
Scale : 1/8" = 1'-0"

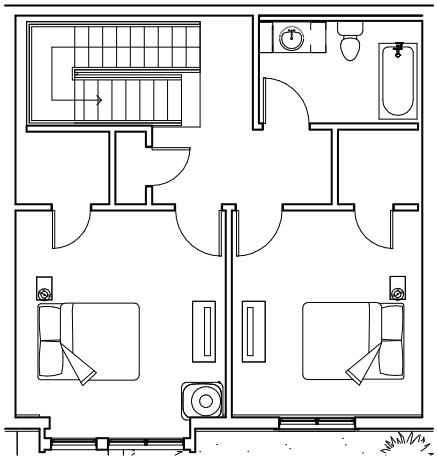


3 BR UNIT
Scale : 1/8" = 1'-0"

Figure 3-12
Typical Unit Plans
Source: The Architectural Team, 2015



2 BR TH LEVEL 2
Scale : 1/8" = 1'-0"



3 BR TH LEVEL 2
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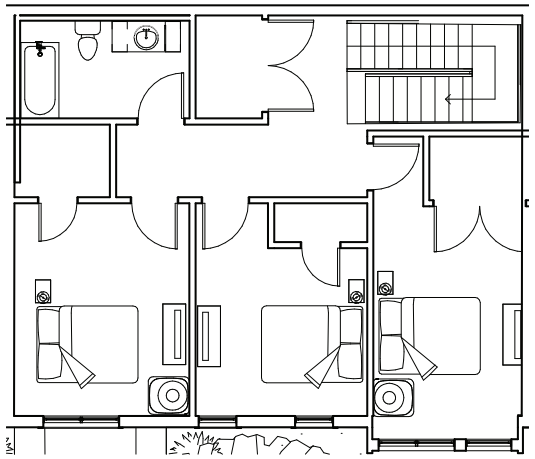
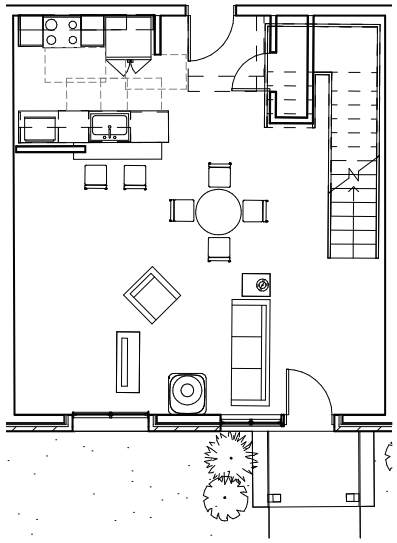


4 BR TH LEVEL 2
Scale : 1/8" = 1'-0"



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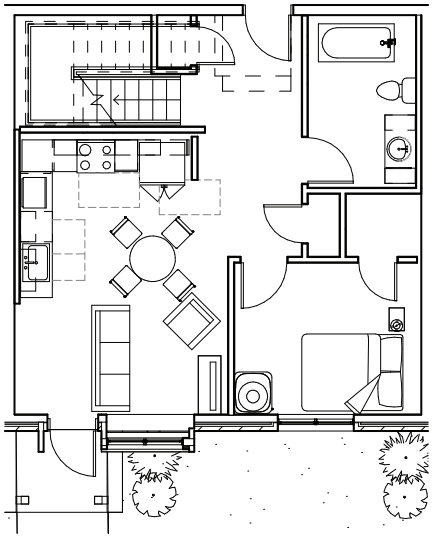
Scale : 1/8" = 1'-0"



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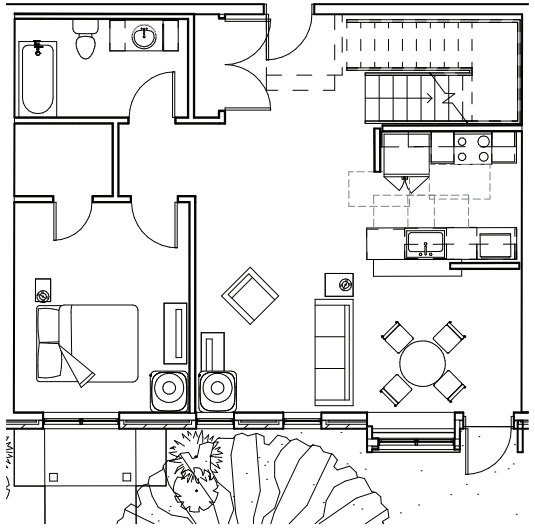


4 BR TH
Scale : 1/8" = 1'-0"

Figure 3-13
Typical Unit Plans
Source: The Architectural Team, 2015

Figure 3-14
Whittier Street Elevation
Source: The Architectural Team, 2015

Figure 3-15
Cabot Street Elevation
Source: The Architectural Team, 2015

Figure 3-16
Ruggles Street Elevation
Source: The Architectural Team, 2015

Cabot Street Interior Courtyard Elevation- Building 1

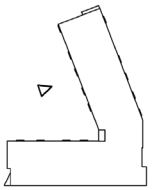


Figure 3-17
Tremont Street Elevation
Source: The Architectural Team, 2015

Chapter 4

TRANSPORTATION

CHAPTER 4: TRANSPORTATION

4.1 INTRODUCTION

Howard Stein Hudson (HSH) has conducted an evaluation of the transportation impacts of the redevelopment of the Whittier Street Apartments, a proposed project containing 387 residential units in three new buildings, 176 parking spaces and 7,680 square feet (sf) of ground floor retail space located at 1158 Tremont Street (the "Project") in Boston's Roxbury neighborhood. The site currently contains a 200-unit residential complex and will be demolished to accommodate the Project. This transportation study adheres to the Boston Transportation Department (BTD) *Transportation Access Plan Guidelines* and Article 80 development review process. This study includes an evaluation of existing conditions, future conditions with and without the Project, projected parking demand, loading operations, transit services, and pedestrian and bicycle activity. The Project will have minimal impact on the study area intersections and the pedestrian and public transportation facilities in the area.

4.1.1 PROJECT DESCRIPTION

The Site is located at 1158 Tremont Street in Boston's Roxbury neighborhood, south of the Massachusetts Bay Transportation Authority (MBTA) Ruggles Station. The site is bounded by Tremont Street to the northwest; Cabot Street to the southeast; Ruggles Street to the northeast; and Whittier Street to the southwest. The Project site currently contains four buildings housing 200 residential units with approximately 75 parking spaces provided on site in four separate surface lots.

The Project includes the demolition of the existing buildings and the construction of three new residential buildings with approximately 387 residential units ranging from studios to four-bedrooms, 7,680 square feet (sf) of ground floor retail space, 176 parking spaces. The parking will be accommodated by 121 underground garage parking spaces and 14 surface spaces.

Bicycle storage racks will be provided at each building to accommodate residents and visitors of the Project. All bicycle racks, signs, and parking areas will conform to BTD guidelines and be located in safe, secure locations. The Proponent will work with BTD to identify the most appropriate quantity and location for bicycle racks on the Project Site as part of the Transportation Access Plan Agreement (TAPA) process.

Vehicular access/egress will be provided by a new roadway that bisects the site, connecting Whittier Street and Ruggles Street. This roadway will have on-street parallel parking and will be open to the public. The garage entrance/exit will be accessed from the north side of the new roadway.

4.1.2 STUDY AREA

The study area includes intersections along Tremont Street and Ruggles Street in the vicinity of the Site. As shown in Figure 4-1, the study area includes the following five intersections:

- Tremont Street/Ruggles Street/Whittier Street (signalized);
- Tremont Street/Ruggles Street/Columbus Avenue (signalized);
- Ruggles Street/Cabot Street (unsignalized);
- Ruggles Street/Dewitt Drive (unsignalized) and
- Ruggles Street/Shawmut Avenue (signalized).

4.1.3 STUDY METHODOLOGY

This transportation study and supporting analyses were conducted in accordance with BTD guidelines and is described below.

The existing conditions analysis includes an inventory of the existing transportation conditions such as roadway capacities, traffic characteristics, parking and curb usage, transit, pedestrian circulation, bicycle facilities, loading, and site conditions. Existing vehicle, bicycle, and pedestrian counts were obtained from recent traffic counts conducted for this project and projects in the vicinity of the study area. The traffic counts form the basis for the transportation analysis conducted as part of this evaluation.

The future transportation conditions analysis evaluates potential transportation impacts associated with the Project. Long-term impacts are evaluated for the year 2020, based on a five-year horizon from the year of filing (2015). Expected roadway, parking, transit, pedestrian, bicycle accommodation, and loading capacities and deficiencies are identified. This section includes the following scenarios:

- The 2020 No-Build conditions scenario includes both general background traffic growth and traffic growth associated with specific developments that

are planned in the vicinity of the Site. Transportation infrastructure improvements in the study area are identified and incorporated into the 2020 No-Build conditions.

- The 2020 Build conditions scenario includes Project-generated traffic volume estimates added to the traffic volumes developed as part of the 2020 No-Build conditions scenario.

The final part of the transportation study identifies measures to mitigate Project-related impacts and to address any traffic, pedestrian, bicycle, transit, safety, or construction related issues that are necessary to accommodate the Project.

An evaluation of short-term traffic impacts associated with construction activities is also provided.

4.2 EXISTING CONDITIONS

This section includes descriptions of existing study area roadway geometries, intersection traffic control, peak-hour vehicular and pedestrian volumes, average daily traffic volumes, transit availability, parking and curb usage, and loading conditions.

4.2.1 EXISTING ROADWAY CONDITIONS

The study area roadways are described below. The descriptions reflect functional classifications by the Massachusetts Department of Transportation (MassDOT) Highway Division's Office of Transportation Planning.

Tremont Street is a two-way, six-lane roadway (three lanes in each direction) located adjacent to the north side of the Project site. Tremont Street is classified as an urban principal arterial roadway under BTD jurisdiction that runs predominately in the east-west direction between Cambridge Street in Downtown Boston to the east and Huntington Avenue in Mission Hill to the west. Parking is prohibited along Tremont Street within the study area. Sidewalks are provided along both sides of the street and range in width from nine to 24 feet.

Ruggles Street is a two-way, two-lane roadway, north of Tremont Street, and a one-way, one-lane roadway, located adjacent to the east side of the Project site, south of Tremont Street. Ruggles Street is classified as an urban minor arterial under BTD jurisdiction that runs in a north-south direction between Huntington Avenue to the north and Washington Street to the south. Ruggles Street is offset at Tremont Street, with the southern one-way segment located to the east of the site and northern two-way segment located northwest of the site. Within the study area, Ruggles Street is

a one-lane, one-way southbound roadway with parking on both sides. Sidewalks are provided along both sides of the roadway and range in width from eight to 12 feet.

Whittier Street is a one-way, one-lane roadway located adjacent to the west side of the Project site. Whittier Street is classified as an urban local roadway that runs in a north-south direction between Cabot Street to the south and Tremont Street to the north. Whittier Street provides on-street parking along both sides of the roadway. Pavement markings are not provided along Whittier Street. Near the intersection with Tremont Street, parking is restricted along Whittier Street and the roadway functions as two lanes. Sidewalks are provided along both sides of the road and are approximately eight feet wide.

Cabot Street is a one-way, one-lane roadway located adjacent to the south side of the Project site. Cabot Street is classified as an urban local roadway under BTD jurisdiction that runs in an east-west direction between Ruggles Street to the east and Whittier Street to the west. On-street parking is provided along both sides of the roadway. Pavement markings are not provided along Cabot Street. Sidewalks along both sides of the road are approximately eight feet wide.

Dewitt Drive is a two-way, two-lane roadway located southeast of the Project site. Dewitt Drive is classified as an urban local road under BTD jurisdiction that runs in a northeast-southwest direction. Both termini of Dewitt Drive intersect with Shawmut Avenue. Parking is provided along both sides of Dewitt Drive. Pavement markings are not provided along Dewitt Drive. Sidewalks are provided on both sides of the roadway and range from 5 feet to 8 feet wide.

Shawmut Avenue is a one-way, two-lane roadway located southeast of the Project site. Shawmut Avenue is classified as an urban minor arterial roadway under BTD jurisdiction that runs between Tremont Street to the northeast and Washington Street to the southwest. Within the study area, on-street parking is provided along both sides of Shawmut Avenue. Pavement markings are not provided along Shawmut Avenue. Sidewalks are provided on both sides of the roadway and range from 5 feet to 8 feet wide.

4.2.2 EXISTING INTERSECTION CONDITIONS

Tremont Street/Ruggles Street/Whittier Street is a four-legged, signalized intersection with four approaches. The Tremont Street eastbound approach consists of a left-turn lane and three through lanes. The Tremont Street westbound approach consists of two through lanes and one right-turn lane. The Tremont Street eastbound and westbound travel lanes are separated by a raised median. Whittier Street is one-way northbound entering the intersection and consists of one left-

turn/through/right-turn lane with no visible pavement markings. The Ruggles Street southbound approach consists of two left-turn lanes, a five-foot bicycle lane, and a right-turn lane.

Concrete sidewalks are provided along both sides of all approaches. Crosswalks, handicap accessible ramps, and count-down pedestrian signal indications are provided across all of the intersection approaches.

Tremont Street/Ruggles Street/Columbus Avenue is a four-legged, signalized intersection with three approaches. The Tremont Street eastbound approach consists of two through lanes and a shared through/right-turn lane and also accommodates an MBTA bus stop. The Tremont Street westbound approach consists of three through lanes. The rightmost travel lane becomes a right-turn only lane at the downstream intersection of Tremont Street/Ruggles Street/Whittier Street. The Tremont Street eastbound and westbound travel lanes are separated by a raised median. The Columbus Avenue approach is one-way southbound and accommodates right turns. Ruggles Street is one-way departing the intersection in the southbound direction.

Sidewalks are provided along both sides of all approaches. Crosswalks, handicap-accessible ramps, and count-down pedestrian signals are provided across all approaches except for the Tremont Street eastbound approach. Currently, the crosswalk across Ruggles Street is in poor condition and mostly faded.

Ruggles Street/Shawmut Avenue is a four-legged, signalized intersection with three approaches. The Shawmut Avenue westbound approach is one-way and consists of one unmarked left-turn/through lane that functions as two lanes. The Ruggles Street southbound approach consists of one through/right-turn lane with parking on the left side and an MBTA bus stop on the right side of the roadway. The Ruggles Street northbound approach consists of one right-turn only lane with an adjacent parking lane. Shawmut Avenue is one-way in the westbound direction departing the intersection.

Concrete sidewalks are provided along both sides of all approaches. Crosswalks, handicap accessible ramps, and count-down pedestrian signal indications are provided across all of the intersection approaches.

Ruggles Street/Cabot Street is a four-legged, unsignalized intersection. Ruggles Street is one-way in the southbound direction. The Ruggles Street southbound approach consists of one left-turn/through lane with parking on both sides of the roadway. Cabot Street is a one-way street in the westbound direction departing the

intersection. A driveway intersects the intersection from the northwesterly direction, allowing vehicles to turn right onto Cabot Street or Ruggles Street.

Concrete sidewalks are provided along both sides of all approaches. Handicap-accessible ramps are provided to cross the driveway and Cabot Street. Additionally a marked crosswalk is provided along Cabot Street.

Ruggles Street/Dewitt Drive is an unsignalized intersection with four approaches. The eastbound Dewitt Drive approach consists of one through/right-turn lane with stop control and parking on both sides of the roadway. The westbound Dewitt Drive approach consists of one left-turn/through lane with stop control and parking on both sides of the roadway. The southbound Ruggles Street approach consists of one left-turn/through/right-turn lane with free control and parking on both sides of the roadway.

Concrete sidewalks are provided along both sides of all approaches. Crosswalks and handicap accessible ramps are provided across all of the intersection approaches.

4.2.3 EXISTING TRAFFIC CONDITIONS

Traffic movement data were obtained from traffic studies conducted for the Northeastern University Institutional Master Plan (IMP) Project for the intersections of Tremont Street/Ruggles Street/Whittier Street and Tremont Street/Ruggles Street/Columbus Avenue. The counts were conducted on September 25, 2012. Traffic counts at the remaining study area intersections were conducted on October 15th, 2014.

Manual turning movement counts (TMCs) and vehicle classification counts were conducted during the weekday a.m. and p.m. peak periods (7:00 – 9:00 a.m. and 4:00 – 6:00 p.m., respectively) at the study area intersections. The vehicle classification counts included car, truck, pedestrian, and bicycle movements.

To represent 2014 traffic volume conditions, an adjustment to the traffic data was necessary to account for traffic growth since 2012; therefore a background traffic growth rate of 0.5 percent per year was applied to the 2012 counts. A more detailed discussion of the background traffic growth rate is provided later in this chapter.

Based on the vehicle counts, the weekday morning and evening peak hours were determined for each individual intersection. Generally, the a.m. peak hour occurs between 7:15 a.m. – 8:15 a.m. and the p.m. peak hour occurs between 4:45 p.m. – 5:45 p.m. Figure 4-2 and Figure 4-3 show the existing peak-hour turning volumes

for the study area intersections for the a.m. and p.m. peak hours, respectively. Complete traffic count data are provided in Appendix B Transportation.

4.2.4 EXISTING TRAFFIC OPERATIONS

The criterion for evaluating traffic operations is level of service (LOS), which is determined by assessing average delay incurred by vehicles at intersections and along intersection approaches. Trafficware's Synchro (version 8) software package was used to calculate average delay and associated LOS at the study area intersections. This software is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 *Highway Capacity Manual* (HCM). Field observations were performed by HSH to collect intersection geometry such as number of turning lanes, lane length, and lane width that were then incorporated into the operations analysis.

LOS designations are based on average delay per vehicle for all vehicles entering an intersection. Table 4-1 displays the intersection level of service criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst condition. LOS D or better is typically considered acceptable in an urban area. However, LOS E or F is often typical for a stop controlled minor street that intersects a major roadway and does not necessarily indicate that the operations at the intersection are poor or failing.

Table 4-1, Level of Service Criteria (HCM Excerpt)

Level of Service	Average Stopped Delay (sec./veh.)	
	Signalized Intersection	Unsignalized Intersection
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: *2000 Highway Capacity Manual,* Transportation Research Board.

In addition to delay and LOS, the operational capacity and vehicular queues are calculated and used to further quantify traffic operations at intersections. The following describes these other calculated measures.

The volume-to-capacity (v/c) ratio is a measure of congestion at an intersection approach. A v/c ratio below one indicates that the intersection approach has adequate capacity to process the arriving traffic volumes over the course of an hour. A v/c ratio of one or greater indicates that the traffic volume on the intersection approach exceeds capacity.

The 50th percentile queue length, measured in feet, represents the maximum queue length during a cycle of the traffic signal with typical (or median) entering traffic volumes.

The 95th percentile queue length, measured in feet, represents the farthest extent of the vehicle queue (to the last stopped vehicle) upstream from the stop line during five percent of all signal cycles. The 95th percentile queue will not be seen during each cycle. The queue would be this long only five percent of the time and would typically not occur during off-peak hours. Since volumes fluctuate throughout the hour, the 95th percentile queue represents what can be considered a "worst case" scenario. Queues at the intersection are generally below the 95th percentile queue throughout the course of the peak hour. It is also unlikely that the 95th percentile queues for each approach to the intersection will occur simultaneously.

Table 4-2 and Table 4-3 present the 2014 Existing conditions operational analysis for the study area intersections during the a.m. and p.m. peak hours, respectively. The detailed analysis sheets are provided in the Appendix B Transportation.

Table 4-2, Existing Conditions (2014) Capacity Analysis Summary, a.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue length (feet)	95th Percentile Queue length (feet)
Signalized Intersections					
Tremont Street/Ruggles Street/Whittier Street	**D**	**37.8**	**-**	**-**	**-**
Tremont Street EB left	D	47.2	0.81	110	#269
Tremont Street EB thru|thru|thru	C	23.5	0.59	306	444
Tremont Street WB thru|thru	D	36.1	0.80	384	#584
Tremont Street WB right	C	30.1	0.77	500	#747
Whittier Street NB left/thru/right	E	65.2	0.55	78	121
Ruggles Street SB left|left	F	>80.0	0.97	294	#374
Ruggles Street SB right	A	3.8	0.31	0	19
Tremont Street/Ruggles Street/Columbus Avenue	**A**	**0.9**	**-**	**-**	**-**
Tremont Street EB thru|thru|thru/right	A	0.5	0.51	0	m0
Tremont Street WB thru|thru|thru	A	1.2	0.36	15	m74
Columbus Avenue SB right	A	9.2	0.34	0	6
Ruggles Street/Shawmut Avenue	**B**	**19.5**	**-**	**-**	**-**
Shawmut Avenue WB left/thru	B	11.3	0.40	110	265
Ruggles Street NB left	D	43.2	0.57	55	91
Ruggles Street SB thru/right	C	29.7	0.53	34	53
Unsignalized Intersections					
Ruggles Street/Cabot Street/Private Way	**-**	**-**	**-**	**-**	**-**
Ruggles Street SB left/thru	A	0.0	0.13	-	0
Private Way SEB bear right/hard right	A	9.2	0.01	-	1
Ruggles Street/Dewitt Drive	**-**	**-**	**-**	**-**	**-**
Dewitt Drive EB thru/right	B	13.1	0.26	-	26
Dewitt Drive WB left/thru	B	11.8	0.02	-	2
Ruggles Street SB left/thru/right	A	1.0	0.01	-	1

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.
m = Volume for 95th percentile queue is metered by an upstream signal.
Grey shading indicates LOS E or LOS F.

Table 4-3, Existing Conditions (2014) Capacity Analysis Summary, p.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue length (feet)	95th Percentile Queue length (feet)
Signalized Intersections					
Tremont Street/Ruggles Street/Whittier Street	**D**	**37.7**	**-**	**-**	**-**
Tremont Street EB left	C	30.7	0.63	80	140
Tremont Street EB thru|thru|thru	C	24.8	0.54	271	354
Tremont Street WB thru|thru	D	42.2	0.72	423	#571
Tremont Street WB right	C	20.7	0.71	372	#562
Whittier Street NB left/thru/right	E	69.0	0.74	150	147
Ruggles Street SB left|left	E	77.6	0.94	276	#376
Ruggles Street SB right	A	3.6	0.33	0	28
Tremont Street/Ruggles Street/Columbus Avenue	**A**	**4.2**	**-**	**-**	**-**
Tremont Street EB thru|thru|thru/right	A	2.8	0.58	308	23
Tremont Street WB thru|thru|thru	A	3.8	0.37	73	m85
Columbus Avenue SB right	C	25.2	0.51	37	90
Ruggles Street/Shawmut Avenue	**C**	**23.1**	**-**	**-**	**-**
Shawmut Avenue WB left/thru	B	17.1	0.65	232	#544
Ruggles Street NB left	D	43.2	0.56	54	59
Ruggles Street SB thru/right	D	37.3	0.65	63	114
Unsignalized Intersections					
Ruggles Street/Cabot Street/Private Way	**-**	**-**	**-**	**-**	**-**
Ruggles Street SB left/thru	A	0.0	0.19	-	0
Private Way SEB bear right/hard right	A	9.8	0.01	-	1
Ruggles Street/Dewitt Drive	**-**	**-**	**-**	**-**	**-**
Dewitt Drive EB thru/right	B	14.7	0.21	-	20
Dewitt Drive WB left/thru	B	14.3	0.07	-	5
Ruggles Street SB left/thru/right	A	0.5	0.01	-	1

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.
m = Volume for 95th percentile queue is metered by an upstream signal.
Grey shading indicates LOS E or LOS F.

The intersection of **Tremont Street/Ruggles Street/Whittier Street** currently operates at LOS D during both the weekday a.m. and p.m. peak hours. The Whittier Street northbound approach currently operates at LOS E in both the a.m. and p.m. peak hours. The Ruggles Street southbound left turn approach currently operates at LOS F during the a.m. peak hour and operates at LOS E during the p.m. peak hour. The longest queues at the intersection occur in the Tremont Street westbound right-turn lane during the a.m. peak hour and in the Tremont Street westbound through lanes during the p.m. peak hour. The intersection generally operates at or below capacity. However, some movements at the intersection are near their operating capacity over the course of the peak hours and experience some moments of exceeding the available capacity provided by the traffic signal.

The intersection of **Tremont Street/Ruggles Street/Columbus Avenue** currently operates at LOS A during both the weekday a.m. and p.m. peak hours. The longest queues at the intersection occur in the Tremont Street westbound through lanes during the a.m. peak hour and in the Tremont Street eastbound through lanes during the p.m. peak hour.

The intersection of **Ruggles Street/Shawmut Avenue** currently operates at LOS B during the weekday a.m. peak hour and at LOS C during the weekday p.m. peak hour. The longest queues at the intersection occur along the Shawmut Avenue westbound approach during both the a.m. and p.m. peak hours.

All movements at the intersection of **Ruggles Street/Cabot Street/Private Way** operate at LOS A with minimal queues.

At the intersection of **Ruggles Street/Dewitt Drive**, the Dewitt drive eastbound and westbound approaches both currently operate at LOS B during the weekday a.m. and p.m. peak hours. The Ruggles Street southbound approach currently operates at LOS A during both the weekday a.m. and p.m. peak hours.

Based on the results of this analysis and field observations, Tremont Street experiences moderate levels of congestion during the peak hours in the vicinity of the study area due to high traffic volumes, turning movements, and the presence of heavy vehicles and MBTA buses that serve Ruggles Station at the intersection of Tremont Street/Ruggles Street/Whittier Street.

4.2.5 EXISTING PARKING AND CURB USE

Curb use regulations adjacent to the Project site include unrestricted parking, 2-hour parking, and resident only parking. Parking is prohibited along Tremont Street and Ruggles Street north of Tremont Street. Parking on Ruggles Street, Cabot Street, and Whittier Street adjacent to the project site consists of a mix of unrestricted, two-hour parking, and residential parking. An MBTA bus stop serving several bus routes is provided along Tremont Street and Ruggles Street within the study area. Figure 4-4 illustrates the on-street parking regulations in the vicinity of the study area.

4.2.6 EXISTING PUBLIC TRANSPORTATION FACILITIES

The Project Site is well-served by public transportation and is less than a quarter mile south of the Ruggles MBTA Station, which provides bus, rapid transit, and commuter rail service. The MBTA public transportation services are shown in Figure 4-5 and summarized in Table 4-4.

Table 4-4, MBTA Transit Services

Line/Route #	Description	Peak-hour Headways (minutes)[1]
Rapid Transit Routes		
Orange Line	Ruggles Station	5
Local Bus Routes		
#8	Harbor Point/UMASS – Kenmore Station via B.U. Medical Center & Dudley Station	14
#15	Kane Square or Fields Corner Station – Ruggles Station via Uphams Corner	20
#19	Fields Corner Station – Kenmore or Ruggles Station via Grove Hall and Dudley Station	9-14
#22	Ashmont Station – Ruggles Station via Talbot Avenue & Jackson Square	7-8
#23	Ashmont Station – Ruggles Station via Washington Street	5-6
#28	Mattapan Station – Ruggles Station via Dudley Station	7
#42	Forest Hills Station – Dudley or Ruggles Station via Washington Street	15
#43	Ruggles Station – Park & Tremont Station via Tremont Street	18-22
#44	Jackson Sq. Station – Ruggles Station via Seever Street & Humboldt Avenue	12-14
#45	Franklin Park Zoo – Ruggles Station via Blue Hills Avenue	10
#47	Central Square Cambridge – Broadway Station via B.U. Medical Center, Dudley Station & Longwood Medical Area	10-20
CT2	Sullivan Station – Ruggles Station via Kendall/MIT	20
CT3	Beth Israel Deaconess Medical Center – Andrew Station via B.U. Medical Center	20
Commuter Rail Routes[2]		
Needham	Needham – Ruggles Station	30-55
Providence/Stoughton	Providence/Stoughton – Ruggles Station	30-55
Franklin	Franklin – Ruggles Station	25-45

[1] Headway is the scheduled time between trains or buses. Source: www.mbta.com, November 2014

[2] Commuter rail routes have irregular headways; customers typically plan trips according to schedule rather than using walk-up services.

4.2.6.1 RAPID TRANSIT ROUTES

The MBTA Orange Line subway provides service between Forest Hills Station in Jamaica Plain and Oak Grove Station in Malden, Massachusetts via downtown Boston. The Orange Line provides inbound and outbound service approximately every five minutes Monday through Friday and every ten minutes on nights and weekends. The Project is located less than a quarter mile southwest of the Ruggles MBTA Orange Line Station. Ruggles Station provides access to approximately 10,433 entering passengers throughout the day.

4.2.6.2 LOCAL BUS ROUTES

The Project site is located within a convenient walking distance to Ruggles Station, which is less than a quarter mile away. A total of 13 different MBTA bus routes operate out of Ruggles Station. The specific routes are shown in Table 4-4. The primary MBTA bus route serving the Project site is the #47 bus, which provides service along Tremont Street. The buses operate on 10-15 minute headways in the a.m. and p.m. peak periods and on 30-minute headways during off-peak periods.

4.2.6.3 COMMUTER RAIL ROUTES

Ruggles Station provides access to three MBTA commuter rail lines including the Needham, Providence/Stoughton, and Franklin lines.

The Needham MBTA commuter rail line provides access between Needham Heights and South Station in downtown Boston. On a weekday, the Needham Line has 16 inbound trains that run between 6:10 a.m. and 10:47 p.m. and 16 outbound trains that run between 7:05 a.m. and 11:09 p.m. A total of 12 inbound and outbound trains stop at Ruggles Station. An additional 10 trains operate on Saturday between 8:00 a.m. and 11:35 p.m. with headways of two hours. Sunday service is not provided.

The Providence/Stoughton MBTA commuter rail line provides access between either Wickford Junction, Rhode Island or Stoughton and South Station in downtown Boston. On a weekday, the Providence/Stoughton line has 36 inbound trains that run between 4:50 a.m. and 12:25 a.m. and 41 outbound trains that run between 5:11 a.m. and 1:06 a.m. A total of 10 inbound trains and 24 outbound trains stop at Ruggles Station. An additional 9 trains on Saturday and 7 trains on Sunday

operate on the Providence/Stoughton Line with limited stops, however all weekend trains stop at Ruggles Station.

The Franklin MBTA commuter rail line provides access between Forge Park/495 and South Station in Downtown Boston. On a weekday, the Franklin line has 19 inbound trains that run between 5:05 a.m. and 12:41 a.m. and 18 outbound trains that run between 4:00 a.m. and 12:51 a.m. A total of 7 inbound and 12 outbound trains stop at Ruggles Station. An additional 9 trains on Saturday and 7 trains on Sunday operate on the Franklin Line with limited stops, however all weekend trains stop at Ruggles Station.

4.2.7 EXISTING PEDESTRIAN FACILITIES

Pedestrian counts at the intersections of Tremont Street/Whittier Street/Ruggles Street and Tremont Street/Ruggles Street/Columbus Avenue were obtained from the traffic study prepared for the Northeastern University IMP Project. Counts at the remaining intersections were conducted on October 15, 2014. The 2014 existing a.m. and p.m. peak-hour pedestrian volumes appear in Figure 4-6. Detailed pedestrian count data is provided in the Appendix.

The highest volume of pedestrians occurs at the crossing of Tremont Street at Ruggles Street. Pedestrians crossing this roadway are most likely associated with Ruggles Station. There were 115 pedestrians observed using this crosswalk during the a.m. peak hour and 153 pedestrians during the p.m. peak hour.

Sidewalks in the Project area are in good condition and supply adequate capacity. Based on field observations, tree roots and overgrown vegetation have created cracks and uneven surfaces along segments of some sidewalks in the vicinity of the Project site. In addition, the presence of utility poles, street lights, and overgrown vegetation greatly reduce the effective width of the sidewalk adjacent to the Project Site. Handicapped-accessible ramps and crosswalks are provided at most study area intersections.

4.2.8 EXISTING BICYCLE FACILITIES

In recent years, bicycle use has increased dramatically throughout the City of Boston. The Project Site is conveniently located within a quarter mile of the South Bay Harbor Trail and Southwest Corridor Park. The South Bay Harbor trail runs between Ruggles Station and Boston's Harborwalk on the Fort Point Channel, which provides approximately 3.5 miles of biking, walking and jogging paths. Within the study area, the South Bay Harbor Trail runs along the east side of Melnea Cass

Boulevard. The Southwest Corridor Park runs between Forest Hills and Back Bay Station, which provides approximately 4.7 miles of biking, walking, and jogging paths. Within the study area, the Southwest Corridor Park runs adjacent to Ruggles Station.

The roadways adjacent to the Project site have no designated bicycle lanes or markings. In the vicinity of the study area, Ruggles Street is designated as an intermediate bike route, suitable for riders with some on road experience, on the 2013 Boston Bikes Map. The Southwest Corridor Path and the South Bay Harbor Trail are both designated as beginner-level bike routes, suitable for all types of cyclists including newer cyclists, cyclists with limited on-road experience, and/or children.

The 2014 existing a.m. and p.m. peak-hour bicycle turning movement counts appear in Figure 4-7. Detailed bicycle counts provided in Appendix B Transportation.

Car and bike sharing Services

Car sharing enables easy access to short term vehicular transportation. Vehicles are rented on an hourly or daily basis, and all vehicle costs (gas, maintenance, insurance, and parking) are included in the rental fee. Vehicles are checked out for a specific time period and returned to their designated location.

Nearby car sharing services provide an important transportation option and reduce the need for private vehicle ownership. A map of all car sharing locations within the Project site vicinity is shown in Figure 4-8.

Hubway is the bicycle sharing system in the Boston area, which was launched in 2011 and consists of over 140 stations and 1,300 bicycles. The nearest Hubway station is located at Ruggles Station approximately 500 feet to the northeast of the Project site and contains approximately 15 bicycle docks.

4.3 FUTURE CONDITIONS

For transportation impact analyses, it is standard practice to evaluate two future conditions: No-Build conditions (without the proposed project) and Build conditions (with the proposed project). In accordance with BTD guidelines, these conditions are projected to a future date five years from the year of filing the traffic study. For this evaluation of this Project, 2020 was selected as the horizon year for the future conditions analyses.

This section presents a description of the 2020 future conditions scenarios and includes an evaluation of the transportation facilities under the No-Build and Build conditions.

4.3.1 NO-BUILD CONDITIONS

The No-Build conditions reflect a future scenario that incorporates any anticipated traffic volume changes independent of the Project and any planned infrastructure improvements that will affect travel patterns throughout the study area. Infrastructure improvements include roadway, public transportation, pedestrian and bicycle improvements. Background traffic growth is based on two factors: an annual growth rate and growth associated with specific developments near the project.

4.3.1.1 BACKGROUND TRAFFIC GROWTH

Two methodologies are used to account for future traffic growth, independent of the Project. The first methodology accounts for general background traffic growth that may be affected by changes in demographics, automobile usage, and automobile ownership. Based on an assessment of traffic volume data collected in the vicinity of the Project, from 2000 to 2013 traffic volumes have remained relatively constant. However, to account for any unforeseen growth, this analysis assumes a general background growth rate of one-half percent per year.

The second methodology identifies any specific planned developments that are expected to affect traffic patterns throughout the study area within the future analysis time horizon. The following projects, which are depicted in Figure 4-10, are located in the vicinity of the study area and, where appropriate, traffic volumes associated with these projects were also incorporated into the future conditions traffic volumes.

- ***Tremont Crossing (P-3)***. This proposed mixed-use building consists of 438,275 gross square feet (gsf) of retail space, 233,784 gsf of office space, 300 residential units, 37,520 gsf of

museum space, 200 hotel rooms, and 1,502 parking spaces. This project is located along Tremont Street and Whittier Street, opposite the Project site and is currently under review.

- ***Northeastern University* – Interdisciplinary Science and Engineering Center.** This project calls for the construction of a 197,000 gsf of research and office space, including new faculty, interdisciplinary research clusters and collaborative space, specialized teaching labs, classrooms, student space, and café open to the public. This project is currently under construction.

- ***Melnea Hotel and Residencies (Parcel 9).*** This proposed mixed-use building consists of 145 hotel rooms, 50 housing rental units, 8,000 gsf of ground-floor retail space, and 3,600 gsf of ballroom space, with approximately 120 parking spaces and covered secure storage for 70 bicycles. This project has been approved.

- ***Madison Tropical (Parcel 10).*** This proposed mixed-use project consists of three buildings with approximately 40,000 sf of supermarket (Tropical Foods), 54,000 sf of office/retail building and the rehabilitation of a 44,000 sf existing structure for the provision of residential units and retail space. This project is currently under construction.

- ***Madison Park Apartments.*** This proposed project consists of two buildings containing approximately 76 residential units and 29 parking spaces located east of the Project site along Raynor Circle and Brooke Marshall Road. This project is currently under review.

4.3.1.2 PLANNED INFRASTRUCTURE IMPROVEMENTS

The following public infrastructure project is planned to be implemented within the five-year analysis horizon of this traffic study.

Melnea Cass Boulevard Improvement Project – The BTD is working with the Roxbury community to redesign Melnea Cass Boulevard with the goal of making it a neighborhood friendly corridor. The scope includes the development of roadway and streetscape designs that create a pedestrian friendly environment, ensure efficient traffic flow, accommodate transit vehicles and bicycles and promote economic development.

The design is progressing in collaboration with the Roxbury and other surrounding communities and with all relevant city and state agencies, neighborhood groups and corridor abutters. The BTD, as lead agency on the project, aims to incorporate the city's new "Complete Streets" strategy as well as the goals of the Roxbury Strategic Master Plan (RSMP) and the state-devised Urban Ring project. The Complete Streets approach focuses on the needs of pedestrians, bicyclists and transit users as well as drivers, and on environmentally sustainable design.

Because a design option has not yet been finalized, this project was not included in background traffic projections.

Whittier Street Reconfiguration – As part of the proposed Tremont Crossing (P-3) redevelopment project, mitigation is proposed that would convert Whittier Street from a one-way northbound roadway to a two-way two lane roadway. This modification will affect the intersection of Tremont Street/Ruggles Street/Whittier Street by adding a receiving lane along Whittier Street southbound and turn-lanes along Tremont Street. The traffic signal will need phasing and timing adjustments; however no official plans have been developed.

The timing of this proposed improvement is reliant on the progress of the Tremont Crossing project. The future conditions analysis assumes that the Whittier Street improvements will be in place and the proposed mitigation for the Tremont Crossing project was incorporated into both the No-Build and Build conditions. The mitigation includes the addition of a Tremont Street westbound left-turn lane, the southbound receiving lane along Whittier Street, and an optimal traffic signal timing and phasing plan.

4.3.1.3 NO-BUILD CONDITIONS TRAFFIC VOLUMES

To develop the 2020 No-Build conditions traffic volumes at the study area intersections a half-percent per year annual growth rate was applied to the 2014 Existing conditions traffic volumes, then the traffic volumes associated with the background development projects listed above were added.

The 2020 No-Build a.m. and p.m. peak hour traffic volumes are show in Figure 4-11 and Figure 4-12, respectively.

4.3.1.4 NO-BUILD CONDITIONS TRAFFIC OPERATIONS

The 2020 No-Build conditions scenario analysis uses the same methodology as the 2014 existing conditions scenario analysis. Table 4-5 and Table 4-6 present the 2020 No-Build conditions operations analysis for the a.m. and p.m. peak hours, respectively. The detailed analysis sheets are provided in Appendix B Transportation.

Table 4-5, No-Build Conditions (2020) Capacity Analysis Summary, a.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue length (feet)	95th Percentile Queue length (feet)
Signalized Intersections					
Tremont Street/Ruggles Street/Whittier Street	**D**	**51.4**	**-**	**-**	**-**
Tremont Street EB left	E	79.6	0.94	168	#354
Tremont Street EB thru|thru|thru/right	C	24.9	0.64	343	490
Tremont Street WB left	C	21.4	0.16	4	m18
Tremont Street WB thru|thru	F	>80.0	0.95	490	#693
Tremont Street WB right	D	35.3	0.82	525	#786
Whittier Street NB left/thru/right	E	66.0	0.58	84	129
Ruggles Street SB left|left/thru	F	>80.0	0.98	305	#390
Ruggles Street SB right	B	12.6	0.50	9	68
Tremont Street/Ruggles Street/Columbus Avenue	**A**	**1.2**	**-**	**-**	**-**
Tremont Street EB thru|thru|thru/right	A	0.5	0.54	0	m0
Tremont Street WB thru|thru|thru	A	1.6	0.39	19	m89
Columbus Avenue SB right	B	18.2	0.40	0	26
Ruggles Street/Shawmut Avenue	**B**	**19.8**	**-**	**-**	**-**
Shawmut Avenue WB left/thru	B	11.7	0.42	118	280
Ruggles Street NB left	D	43.3	0.58	57	93
Ruggles Street SB thru/right	C	30.3	0.55	36	55
Unsignalized Intersections					
Ruggles Street/Cabot Street/Private Way	**-**	**-**	**-**	**-**	**-**
Cabot Street EB right	A	9.1	0.00	-	0
Ruggles Street SB left/thru	A	0.0	0.12	-	0
Ruggles Street/Dewitt Drive	**-**	**-**	**-**	**-**	**-**
Dewitt Drive EB thru/right	B	13.2	0.27	-	27
Dewitt Drive WB left/thru	B	11.9	0.02	-	2
Ruggles Street SB left/thru/right	A	0.9	0.01	-	1

= 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.

m = Volume for 95th percentile queue is metered by an upstream signal.

Grey shading indicates a decrease to LOS E or F when compared to Existing conditions analysis

Table 4-6, No-Build Conditions (2020) Capacity Analysis Summary, p.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue length (feet)	95th Percentile Queue length (feet)
Signalized Intersections					
Tremont Street/Ruggles Street/Whittier Street	**D**	**52.6**	**-**	**-**	**-**
Tremont Street EB left	E	74.6	0.90	144	#281
Tremont Street EB thru|thru|thru/right	C	29.0	0.64	346	435
Tremont Street WB left	D	41.0	0.26	16	m59
Tremont Street WB thru|thru	F	>80.0	0.95	~526	#750
Tremont Street WB right	C	29.3	0.79	420	#734
Whittier Street NB left/thru/right	E	75.3	0.84	197	186
Ruggles Street SB left|left/thru	E	76.3	0.94	282	#387
Ruggles Street SB right	B	10.8	0.50	14	90
Tremont Street/Ruggles Street/Columbus Avenue	**A**	**4.7**	**-**	**-**	**-**
Tremont Street EB thru|thru|thru/right	A	2.6	0.63	26	32
Tremont Street WB thru|thru|thru	A	4.4	0.42	91	m117
Columbus Avenue SB right	D	37.2	0.58	66	124
Ruggles Street/Shawmut Avenue	**C**	**24.3**	**-**	**-**	**-**
Shawmut Avenue WB left/thru	B	18.6	0.69	260	#596
Ruggles Street NB left	D	43.2	0.57	55	60
Ruggles Street SB thru/right	D	37.7	0.66	66	119
Unsignalized Intersections					
Ruggles Street/Cabot Street/Private Way	**-**	**-**	**-**	**-**	**-**
Cabot Street EB right	A	9.8	0.00	-	0
Ruggles Street SB left/thru	A	0.0	0.19	-	0
Ruggles Street/Dewitt Drive	**-**	**-**	**-**	**-**	**-**
Dewitt Drive EB thru/right	B	14.9	0.22	-	21
Dewitt Drive WB left/thru	B	14.5	0.07	-	6
Ruggles Street SB left/thru/right	A	0.5	0.01	-	1

~/# = 50th/95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.
m = Volume for 95th percentile queue is metered by an upstream signal.
Grey shading indicates a decrease to LOS E or F when compared to Existing conditions analysis

The intersection of **Tremont Street/Ruggles Street/Whittier Street** continues to operate at LOS D during both the weekday a.m. and p.m. peak hours under the No-Build conditions scenario. The improvements at this intersection proposed as part of the Tremont Crossing project were incorporated into the No-Build conditions analysis. The Tremont Street eastbound left-turn movements worsen from LOS D to LOS E during the a.m. peak hour and from LOS C to LOS E during the p.m. peak hour. The Tremont Street westbound through approach decreases from LOS D to LOS F during both the a.m. and p.m. peak hours. The longest queues at the intersection continue to occur in the Tremont Street westbound right-turn lane during the a.m. peak hour and in the Tremont Street westbound through lanes during the p.m. peak hour.

The intersection of **Tremont Street/Ruggles Street/Columbus Avenue** continues to operate at LOS A during both the weekday a.m. and p.m. peak hours under the No-Build conditions scenario. The longest queues at the intersection continue to occur in the Tremont Street westbound through lanes during the a.m. peak hour, however during the p.m. peak hour the longest queue occur at the Tremont Street westbound through lanes.

The intersection of **Ruggles Street/Shawmut Avenue** continues to operate at LOS B during the weekday a.m. peak hour and at LOS C during the weekday p.m. peak hour under the No-Build conditions scenario. The longest queues at the intersection occur along the Shawmut Avenue westbound approach during both the a.m. and p.m. peak hours.

All movements continue to operate at LOS A with minimal queues under the No-Build conditions scenario at the intersection of **Ruggles Street/Cabot Street/Private Way**.

All movements continue to operate at LOS A or LOS B with minimal queues under the No-Build conditions scenario at the intersection of **Ruggles Street/Dewitt Drive**.

Based on the results of the analysis, the intersections will continue to operate similarly to the Existing conditions.

4.3.2 BUILD CONDITIONS

As previously summarized, the Whittier Street Apartments will consist of approximately 387 residential units consisting of studios to four bedroom units in three new buildings, 7,680 sf of ground floor retail space and 176 parking spaces (121 garage spaces and 14 surface spaces). Bicycle storage racks will be provided at each building to accommodate residents and visitors of the Project. All bicycle racks, signs, and parking areas will conform to BTD guidelines and be located in safe, secure locations. The Proponent will work with BTD to identify the most appropriate quantity and location for bicycle racks on the Project Site as part of the Transportation Access Plan Agreement (TAPA) process.

The 2020 Build conditions reflect a future scenario that removes existing trips from residents living in the buildings to be demolished and adds anticipated Project-generated trips to the 2020 No-Build conditions traffic volumes.

4.3.2.1 SITE ACCESS AND CIRCULATION

Vehicular access/egress will be provided by a new roadway (the Proposed Hampshire Street Extension) that bisects the site, connecting Whittier Street and Ruggles Street. This roadway will provide one-way travel in the westbound direction between Ruggles Street and Whittier Street and will be 28 feet in width. Some on-street parking will be provided along both sides of the roadway. The garage will be accessed off of the new roadway and will be located under Building 4.

In addition to the new roadway that will bisect the site, a 20 foot-wide private access roadway that serves emergency vehicles and loading activity will be constructed between Ruggles Street and the new roadway that will bisect the site. This access roadway will primarily serve move-in/move-out activity and the Building 4 commercial service needs.

Sidewalks will be upgraded and/or constructed around the perimeter of the site and along the new roadway.

The proposed site access plan is illustrated in Figure 4-13.

4.3.2.2 TRIP GENERATION

Trip generation is a complex, multi-step process that produces an estimate of vehicle trips, transit trips, walk trips, and bicycle trips associated with a proposed project and a specific land use program. A project's location and proximity to different modes determines how people will travel to and from that project site.

To estimate the number of trips expected to be generated by the Project, data published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual*[1] were used. ITE provides data to estimate the total number of unadjusted vehicular trips associated with the Project. In an urban setting well served by transit, adjustments are necessary to account for other travel mode shares such as walking, bicycling, and transit.

Trip generation estimates for the Project were derived using the following Land Use Codes (LUC):

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

LUC 220 – Apartment. The apartment land use can be a rental dwelling unit located within the same building with at least three other dwelling units.

LUC 820 – Shopping Center. The shopping center land use is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. The trip generation characteristics of this LUC are expected to provide a conservative estimate for the proposed retail space.

Existing Site Trip Generation. As previously discussed, the existing uses on the Project Site will be eliminated. Therefore, to account for the trips currently being generated by the existing uses on the site, additional trip generation calculations were made for the 200 residential units that exist on site today. LUC 220 – Apartment was also used to estimate the trip generation for the existing uses on the site.

4.3.2.3 MODE SPLIT

The BTD publishes vehicle, transit, and walking mode split rates for different areas of Boston. The Project is located within designated Area 15 - Roxbury. The unadjusted vehicular trips were converted to person trips by using vehicle occupancy rates published by the Federal Highway Administration (FHWA)[2]. The BTD's travel mode share data for Area 15 are shown in Table 4-7.

[2] *Summary of Travel Trends: 2009 National Household Travel Survey*; FHWA; Washington, D.C.; June 2011.

Table 4-7, Peak Hour Mode Split Assumptions

Land Use		Walk/Bike Share[1]	Transit Share[1]	Auto Share[1]	Local Vehicle Occupancy Rate[2]
Daily					
Residential	In	26%	17%	57%	1.13
	Out	26%	17%	57%	1.13
Retail	In	35%	12%	53%	1.78
	Out	35%	12%	53%	1.78
a.m. Peak Hour					
Residential	In	19%	27%	54%	1.13
	Out	29%	27%	44%	1.13
Retail	In	13%	36%	51%	1.78
	Out	21%	37%	42%	1.78
p.m. Peak Hour					
Residential	In	29%	27%	44%	1.13
	Out	19%	27%	54%	1.13
Retail	In	21%	37%	42%	1.78
	Out	13%	36%	51%	1.78

[1] Boston Transportation Department mode share data for Area 15 for the residential and retail use.
[2] 2009 National Household Travel Survey.

4.1.1.1 VEHICLE TRIP GENERATION

The trip generation process described above yields the adjusted vehicle trips associated with the Project. The Project-generated new vehicle trips as well as the existing trips are summarized in **Table 4-8**, with detailed trip generation information provided in Appendix B, Transportation.

Table 4-8, Project Vehicle Trip Generation

Time Period	Direction	Existing[a]	Proposed Apartments[b]	Proposed Retail[c]	Proposed Total	Net New Trips
Daily	In	379	731	339	1,070	691
	Out	379	731	339	1,070	691
	Total	**758**	**1,462**	**678**	**2,140**	**1,382**
a.m. Peak Hour	In	11	21	10	31	20
	Out	36	69	5	74	38
	Total	**47**	**90**	**15**	**105**	**58**
p.m. Peak Hour	In	35	69	22	91	55
	Out	23	45	29	74	51
	Total	**58**	**114**	**51**	**165**	**106**

a Based on ITE LUC 220 – Apartment, 200 units.
b Based on ITE LUC 220 – Apartment, 387 units.
c Based on ITE LUC 820 – Shopping Center, 7,680 sf.

As shown in Table 4-8, the Project is expected to generate approximately 1,382 new daily vehicle trips (691 entering and 691 exiting), with 58 new vehicle trips during the a.m. peak hour (20 entering and 38 exiting) and 106 new vehicle trips during the p.m. peak hour (55 entering and 51 exiting). This corresponds to an increase of approximately 1 vehicle trips every minute during the a.m. peak hour and 2 vehicle trips every minute during the p.m. peak hour on adjacent roadway network during the peak periods.

4.3.2.4 TRIP DISTRIBUTION

The trip distribution identifies the various travel paths for vehicles arriving and leaving the Project Site. Trip distribution patterns for the Project were based on BTD's origin-destination data for Area 15. The trip distribution patterns were refined based on existing traffic patterns and review of the adjacent roadway network. The trip distribution pattern for the Project is illustrated in Figure 4-14.

The Project-generated vehicle trips were assigned to the study area roadway network based on the trip distribution patterns shown in Figure 4-14 and are shown in Figure 4-15 and Figure 4-16 for the a.m. and p.m. peak hours, respectively. The Project-generated trips were added to the 2020 No-Build conditions traffic volumes to develop the 2020 Build conditions peak hour traffic volume networks and are shown in Figure 4-17 and Figure 4-18 for the a.m. and p.m. peak hours, respectively.

4.3.2.5 BUILD CONDITIONS TRAFFIC OPERATIONS

The 2020 Build conditions scenario analyses use the same methodology as the 2014 Existing and 2020 No-Build conditions scenario analyses. The results of the 2020 Build conditions traffic analysis at study area intersections are presented in **Table 4-9** and **Table 4-10** for the a.m. and p.m. peak hours, respectively. The detailed analysis sheets are provided in the **Appendix**.

Table 4-9, Build (2020) Level of Service Summary, a.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue length (feet)	95th Percentile Queue length (feet)
Signalized Intersections					
Tremont Street/Ruggles Street/Whittier Street	**D**	**53.7**	**-**	**-**	**-**
Tremont Street EB left	F	>80.0	0.95	172	#358
Tremont Street EB thru|thru|thru/right	C	25.6	0.65	352	493
Tremont Street WB left	D	35.8	0.40	15	#78
Tremont Street WB thru|thru	F	>80.0	0.96	491	#693
Tremont Street WB right	D	36.7	0.82	525	#786
Whittier Street NB left/thru/right	E	67.9	0.63	95	144
Ruggles Street SB left|left/thru	F	>80.0	0.98	304	#389
Ruggles Street SB right	B	12.9	0.51	11	70
Tremont Street/Ruggles Street/Columbus Avenue	**A**	**1.3**	**-**	**-**	**-**
Tremont Street EB thru|thru|thru/right	A	0.6	0.55	7	m5
Tremont Street WB thru|thru|thru	A	1.6	0.40	20	m90
Columbus Avenue SB right	B	20.0	0.40	0	29
Ruggles Street/Shawmut Avenue	**C**	**20.5**	**-**	**-**	**-**
Shawmut Avenue WB left/thru	B	12.2	0.44	120	280
Ruggles Street NB left	D	43.3	0.58	57	93
Ruggles Street SB thru/right	C	31.1	0.59	39	59
Unsignalized Intersections					
Ruggles Street/Cabot Street/Private Way	**-**	**-**	**-**	**-**	**-**
Cabot Street EB right	A	0.0	0.00	-	0
Ruggles Street SB left/thru	A	0.0	0.14	-	0
Ruggles Street/Dewitt Drive	**-**	**-**	**-**	**-**	**-**
Dewitt Drive EB thru/right	B	13.4	0.27	-	28
Dewitt Drive WB left/thru	B	12.0	0.02	-	2
Ruggles Street SB left/thru/right	A	0.9	0.01	-	1

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.
m = Volume for 95th percentile queue is metered by an upstream signal.
Grey shading indicates a decrease to LOS E or F when compared to No-Build conditions analysis

Table 4-10, Build (2020) Level of Service Summary, p.m. Peak Hour

Intersection/Approach	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue length (feet)	95th Percentile Queue length (feet)
Signalized Intersections					
Tremont Street/Ruggles Street/Whittier Street	**E**	**59.5**	**-**	**-**	**-**
Tremont Street EB left	E	73.7	0.89	145	#278
Tremont Street EB thru|thru|thru/right	C	30.9	0.67	367	442
Tremont Street WB left	F	>80.0	0.90	78	#167
Tremont Street WB thru|thru	F	>80.0	1.00	~564	#750
Tremont Street WB right	C	32.3	0.82	423	#733
Whittier Street NB left/thru/right	E	77.8	0.88	226	213
Ruggles Street SB left|left/thru	E	76.2	0.94	281	#385
Ruggles Street SB right	B	11.8	0.52	20	99
Tremont Street/Ruggles Street/Columbus Avenue	**A**	**4.8**	**-**	**-**	**-**
Tremont Street EB thru|thru|thru/right	A	2.1	0.63	31	35
Tremont Street WB thru|thru|thru	A	4.8	0.44	105	m130
Columbus Avenue SB right	D	40.4	0.59	72	131
Ruggles Street/Shawmut Avenue	**C**	**24.8**	**-**	**-**	**-**
Shawmut Avenue WB left/thru	B	19.1	0.70	264	#601
Ruggles Street NB left	D	43.2	0.57	55	60
Ruggles Street SB thru/right	D	37.9	0.68	70	124
Unsignalized Intersections					
Ruggles Street/Cabot Street	**-**	**-**	**-**	**-**	**-**
Cabot Street EB right	A	0.0	0.00	-	0
Ruggles Street SB left/thru	A	0.0	0.20	-	0
Ruggles Street/Dewitt Drive	**-**	**-**	**-**	**-**	**-**
Dewitt Drive EB thru/right	C	15.1	0.23	-	22
Dewitt Drive WB left/thru	B	14.7	0.07	-	6
Ruggles Street SB left/thru/right	A	0.5	0.01	-	1

# = 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after 2 cycles.
m = Volume for 95th percentile queue is metered by an upstream signal.
Grey shading indicates a decrease to LOS E or F when compared to No-Build conditions analysis

The intersection of **Tremont Street/Ruggles Street/Whittier Street** continues to operate at LOS D during the weekday a.m. peak hour and will operate at LOS E during the p.m. peak hour under the Build conditions scenario. The Tremont Street eastbound left decreases from LOS E to LOS F during the a.m. peak hour. The Tremont Street westbound left approach decreases from LOS D to LOS F during the p.m. peak hour. The longest queues at the intersection continue to occur in the Tremont Street westbound right-turn lane during the a.m. peak hour and in the Tremont Street westbound through lanes during the p.m. peak hour.

The intersection of **Tremont Street/Ruggles Street/Columbus Avenue** continues to operate at LOS A during both the weekday a.m. and p.m. peak hours under the Build conditions scenario. The longest queues at the intersection continue to occur in the Tremont Street westbound through lanes during the a.m. peak hour the Tremont Street westbound through lanes during the p.m. peak hour.

The intersection of **Ruggles Street/Shawmut Avenue** continues to operate at LOS B during the weekday a.m. peak hour and at LOS C during the weekday p.m. peak hour under the Build conditions scenario. The longest queues at the intersection occur along the Shawmut Avenue westbound approach during both the a.m. and p.m. peak hours.

At the intersection of **Ruggles Street/Cabot Street,** all movements continue to operate at LOS A with minimal queues under the Build conditions scenario.

At the intersection of **Ruggles Street/Dewitt Drive**, all movements continue to operate at LOS A or LOS B with minimal queues under the Build conditions scenario.

Based on the results of this analysis, the Project is expected to have minimal impact to the study area intersections during the peak hours. The intersection of Tremont Street/Ruggles Street/Whittier Street remains the critical location throughout the study area and some movements will continue to operate near their capacity during the weekday peak hours.

4.3.2.6 PARKING

The Project will provide parking for approximately 135 on-site parking spaces for the residential and retail uses. Of the 176 spaces provided, 121 spaces will be in a two story underground garage under Building 4. The remaining 14 spaces will be surface spaces located throughout the campus along the street network.

The on-site parking supply has been discussed with the BTD, has been determined to be acceptable, and will accommodate all of the parking needs for the Project. In addition to the on-site parking spaces that will be provided, on-street parking will be maintained along both sides of Ruggles, Cabot and Whittier Street adjacent to the Project Site.

4.3.2.7 PUBLIC TRANSPORTATION

Based on the transit mode shares presented in Table 4-7, the future transit trips associated with the Project were estimated and are summarized in Table 4-11.

Table 4-11, Project Transit Trips

Time Period	Direction	Apartments [a]	Retail [b]	Total
Daily	In	247	137	384
	Out	247	137	384
	Total	**494**	**274**	**768**
a.m. Peak Hour	In	8	5	13
	Out	51	4	55
	Total	**59**	**9**	**68**
p.m. Peak Hour	In	51	20	71
	Out	18	13	31
	Total	**69**	**33**	**102**

a Based on ITE LUC 220 – Apartment, 387 units.
b Based on ITE LUC 820 – Shopping Center, 7,680 sf.

As shown in Table 4-12, the Project will generate an estimated 768 new transit trips daily. Approximately 68 new transit trips will occur during the a.m. peak hour (13 alighting and 55 boarding), and 102 new trips will occur during the p.m. peak hour (71 alighting and 31 boarding). These transit trips will be made on the Orange Line or the many buses that stop in the vicinity of the Project.

4.3.2.8 PEDESTRIANS/BICYCLES

Based on the walk/bike mode shares presented in Table 4-7, the future walk trips were estimated and are summarized in Table 4-12.

Table 4-12, Project Pedestrian/Bicycle Trips

Time Period	Direction	Apartment [a]	Retail [b]	Total
Daily	In	377	399	776
	Out	377	399	776
	Total	**754**	**798**	**1,552**
a.m. Peak Hour	In	12	13	25
	Out	48	8	56
	Total	**60**	**21**	**81**
p.m. Peak Hour	In	48	34	82
	Out	26	36	62
	Total	**74**	**70**	**144**

a Based on ITE LUC 220 – Apartment, 387 units.
b Based on ITE LUC 820 – Shopping Center, 7,680 sf.

Over the course of a day, the Project will generate an estimated 1,552 new pedestrian/bicycle trips and an additional 768 new transit trips that will require a walk to or from the Site. This results in an additional 2,320 new pedestrian trips per day. Approximately 81 new pedestrian trips (with an additional 68 transit trips) will occur during the a.m. peak hour and 144 new pedestrian trips (with an additional 102 transit trips) will occur during the p.m. peak hour.

4.3.2.9 BICYCLE ACCOMMODATIONS

BTD has established guidelines requiring projects subject to Transportation Access Plan Agreements to provide secure bicycle parking for residents and employees and short-term bicycle racks for visitors. Bicycle storage racks will be provided at each building to accommodate residents and visitors of the Project. All bicycle racks, signs, and parking areas will conform to BTD guidelines and be located in safe, secure locations. The Proponent will work with BTD to identify the most appropriate quantity and location for bicycle racks on the Project Site as part of the Transportation Access Plan Agreement (TAPA) process.

All bicycle racks, signs, and parking areas will conform to BTD guidelines and be located in safe, secure locations. The Proponent will work with BTD to identify the most appropriate quantity and location for bicycle racks on the Project Site as part of the Transportation Access Plan Agreement (TAPA) process.

4.3.2.10 LOADING AND SERVICE ACCOMMODATIONS

Loading at Building 4 will occur on-site along the new 20 foot private access road. The access road will accommodate all loading and service activity for the commercial space and can accommodate the majority of the move-in/move-out activity for the residential uses. The residences will typically only receive standard mail and packages with occasional move-in/move-out activity. The service road will accommodate vehicles up to the size of an SU-36 truck. Move-in and move-out activities for Buildings 1 and Building 5 will be on the public streets.

4.4 TRANSPORTATION MITIGATION MEASURES

While the traffic impacts associated with the new Project generated trips are minimal, the Proponent will continue to work with the City of Boston to create a Project that efficiently

serves vehicle trips, improves the pedestrian environment, and encourages transit and bicycle usage. As part of the Project, the Proponent will bring all abutting sidewalks and pedestrian ramps to the City of Boston standards in accordance with the Boston Complete Streets design guidelines. This will include the reconstruction and widening of the sidewalks where possible, the installation of new, accessible ramps, improvements to street lighting where necessary, planting of street trees, and providing bicycle storage racks surrounding the Project Site, where appropriate.

The Proponent is responsible for preparation of the Transportation Access Plan Agreement (TAPA), a formal legal agreement between the Proponent and the BTD. The TAPA formalizes the findings of the transportation study, mitigation commitments, elements of access and physical design, travel demand management measures, and any other responsibilities that are agreed to by both the Proponent and BTD. Because the TAPA must incorporate the results of the technical analysis, it must be executed after these other processes have been completed. The transportation improvements to be undertaken as part of this Project will be defined and documented in the TAPA.

The Proponent will also produce a Construction Management Plan (CMP) for review and approval by BTD. The CMP will detail the schedule, staging, parking, delivery, and other associated impacts of the construction of the Project. See Section 4.6 for additional information related to the CMP.

4.5 TRANSPORTATION DEMAND MANAGEMENT

The Proponent is committed to implementing Transportation Demand Management (TDM) measures to reduce dependence on automobiles. TDM will be facilitated by the nature and location of the Project.

On-site management will keep a supply of transit information (schedules, maps, and fare information) to be made available to the residents and patrons of the Site. The Proponent will work with the City to develop a TDM program appropriate to the Project and consistent with its level of impact.

The Proponent is prepared to take advantage of the good transit access in marketing the site to future residents by working with them to implement the following demand management measures to encourage the use of non-vehicular modes of travel.

TDM measures for the Project may include but are not limited to the following:

- **Orientation Packets:** The Proponent will provide orientation packets to new residents and tenants containing information on available transportation choices, including transit routes/schedules and nearby Zipcar locations. On-site

management will work with residents and tenants as they move in to help facilitate transportation for new arrivals.

- **Bicycle Accommodation:** The Proponent will provide bicycle storage in secure, sheltered areas for residents. Secure bicycle storage will also be made available to employees of the retail portion of the site to encourage bicycling as an alternative mode of transportation. Subject to necessary approvals, public use bicycle racks for visitors will be placed near building entrances.

- **Electric Vehicle Charging:** The Proponent is currently exploring the feasibility of providing electric vehicle charging stations on-Site.

- **Shared-car Services:** The Proponent is committed to working with a shared car service (e.g. Zipcar) to provide on-site spaces that will be easily accessible to the residents of the Site and the surrounding neighborhood.

- **Transportation Coordinator:** The Proponent will designate a transportation coordinator to oversee transportation issues including parking, service and loading, and deliveries and will work with residents as they move in to raise awareness of public transportation, bicycling, and walking opportunities.

- **Project Web Site:** The web site will include transportation-related information for residents, workers, and visitors.

4.6 EVALUATION OF SHORT-TERM CONSTRUCTION IMPACTS

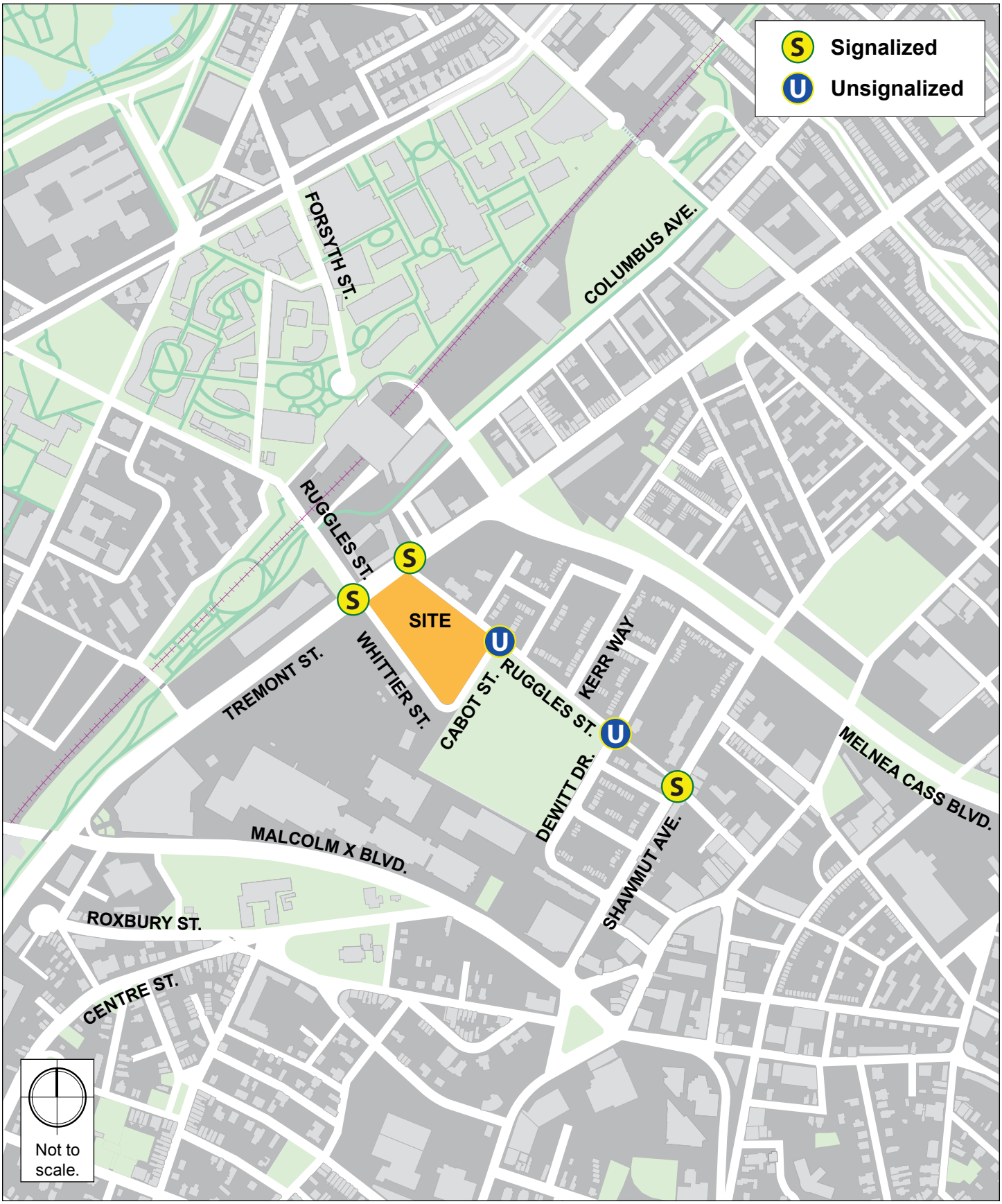
Details of the overall construction schedule, working hours, number of construction workers, worker transportation and parking, number of construction vehicles, and routes will be addressed in detail in a Construction Management Plan (CMP) to be filed with BTD in accordance with the City's transportation maintenance plan requirements. The CMP will also address the need for pedestrian detours, lanes closures, and/or parking restrictions, if necessary, to accommodate a safe and secure work zone.

To minimize transportation impacts during the construction period, the following measures will be incorporated into the Construction Management Plan:

- Construction workers will be encouraged to use public transportation and/or carpool.

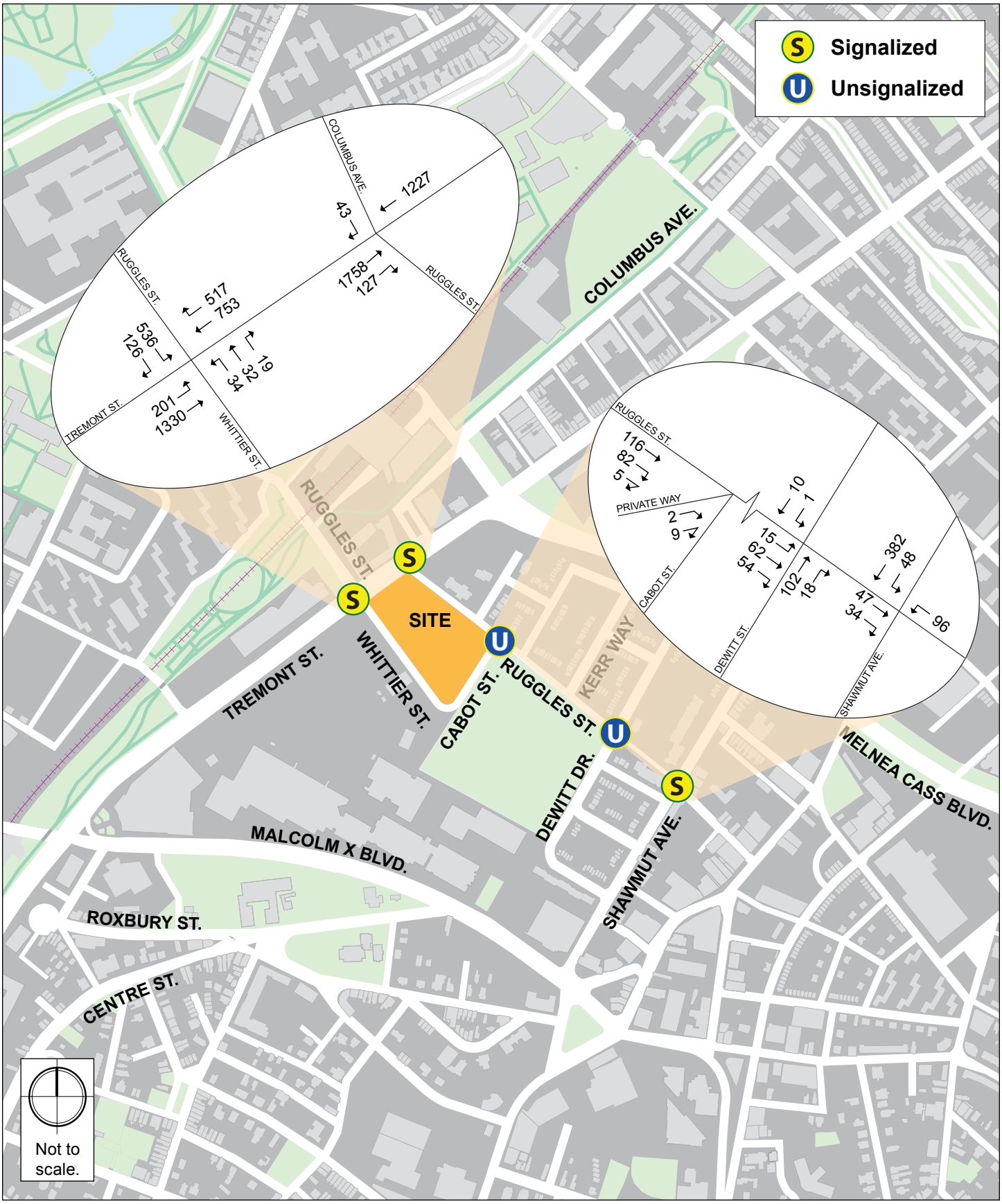
- A subsidy for MBTA passes will be considered for full-time employees; and

- Secure spaces will be provided on-site for workers' supplies and tools so they do not have to be brought to the site each day.



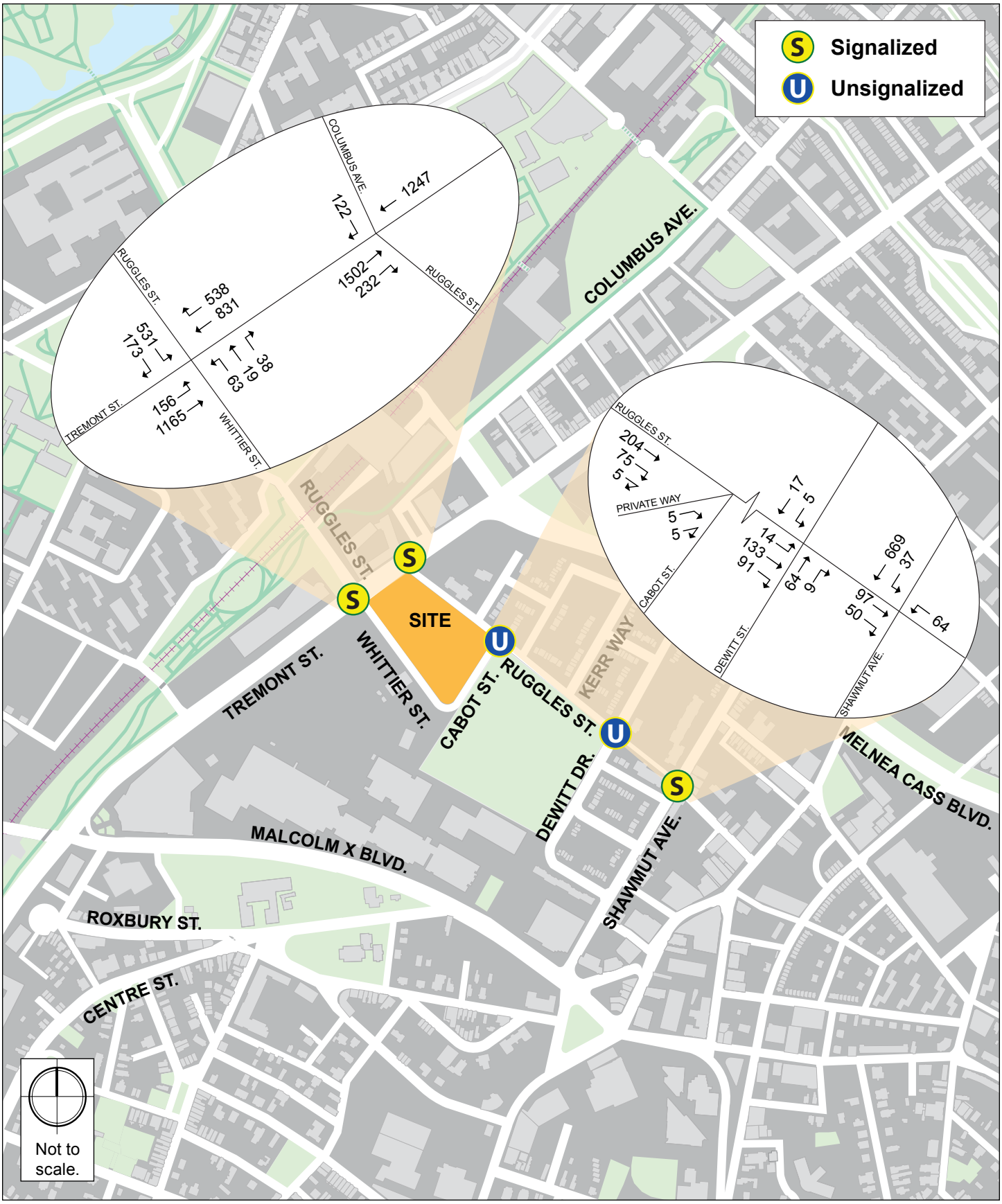
Whittier Street Apartments
Roxbury, MA

Figure 4-1
Study Area Intersections



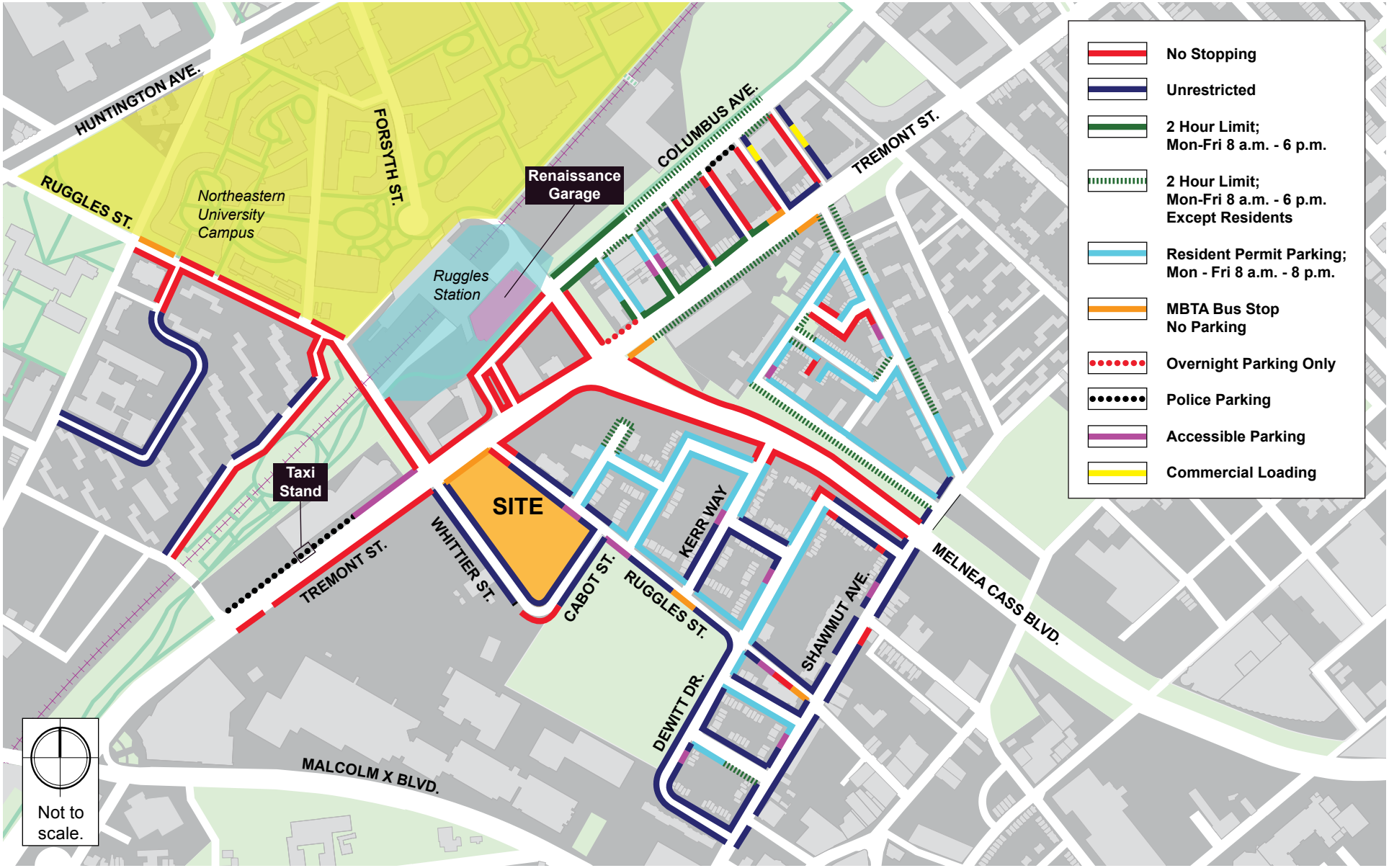
Whittier Street Apartments
Roxbury, MA

Figure 4-2
Existing Conditions (2014) Turning Movement Volumes, a.m. Peak Hour



Whittier Street Apartments
Roxbury, MA

Figure 4-3
Existing Conditions (2014) Turning Movement Volumes, p.m. Peak Hour

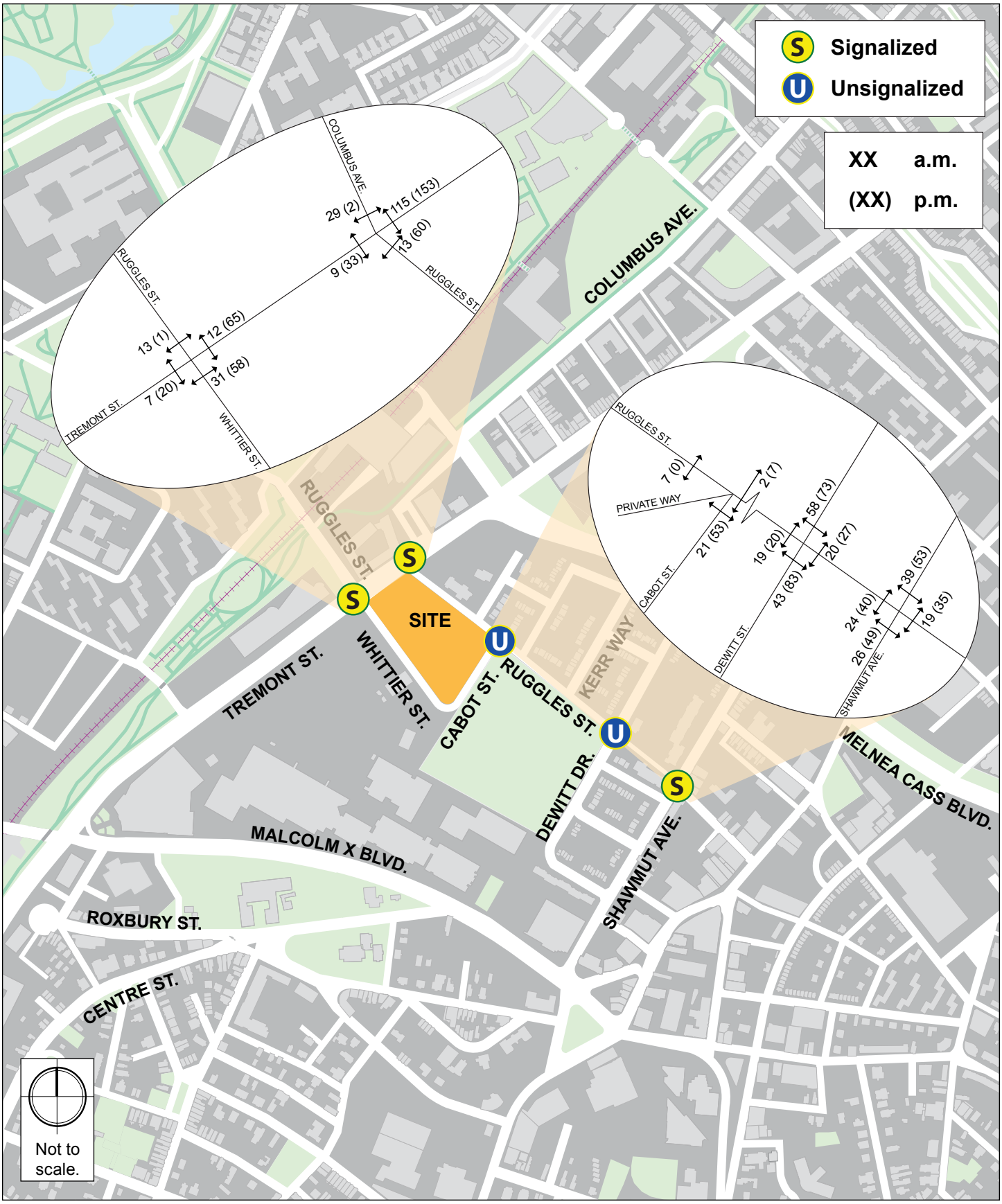


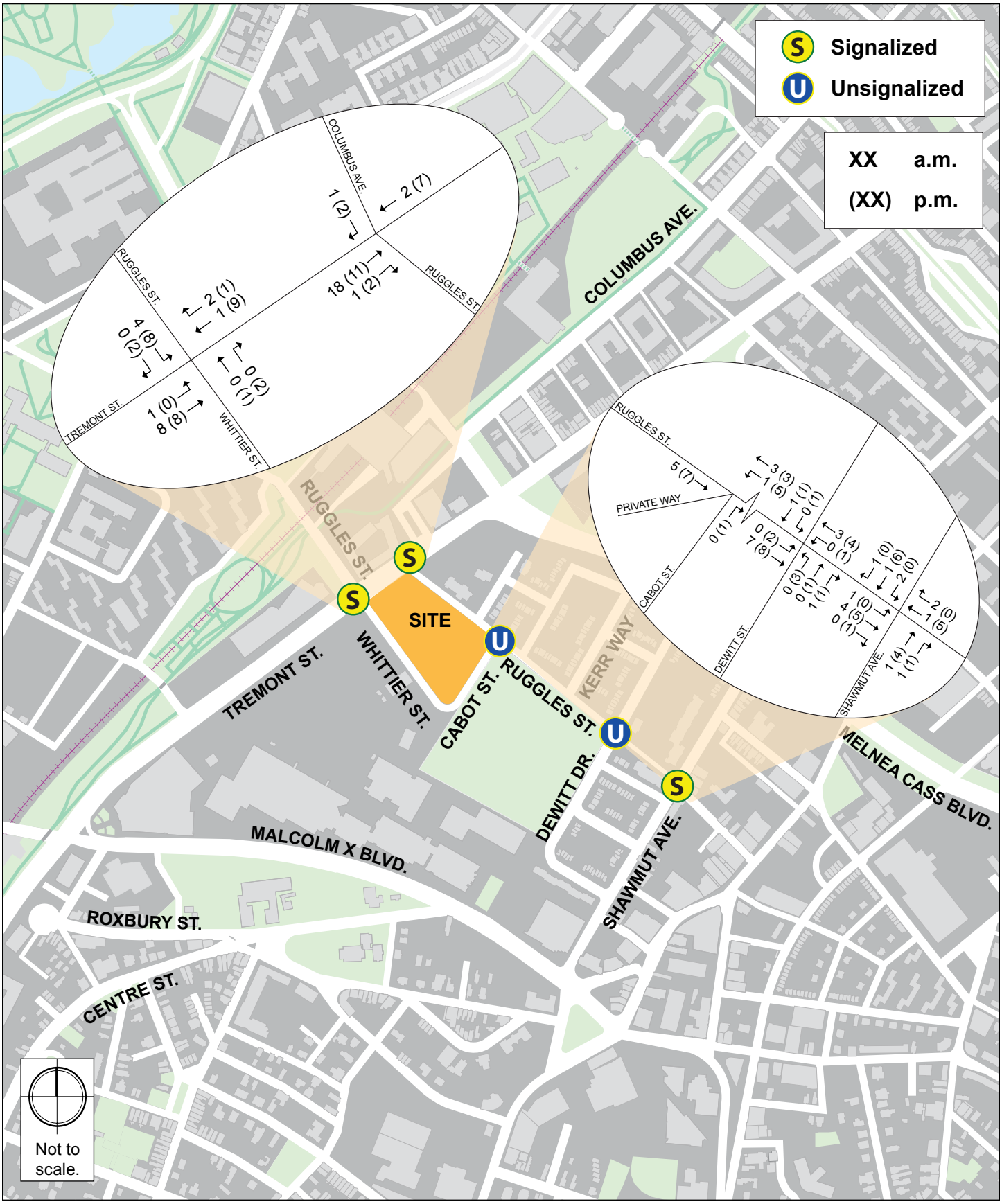
Whittier Street Apartments
Roxbury, MA

Figure 4-4
On-Street Parking

Whittier Street Apartments
Roxbury, MA

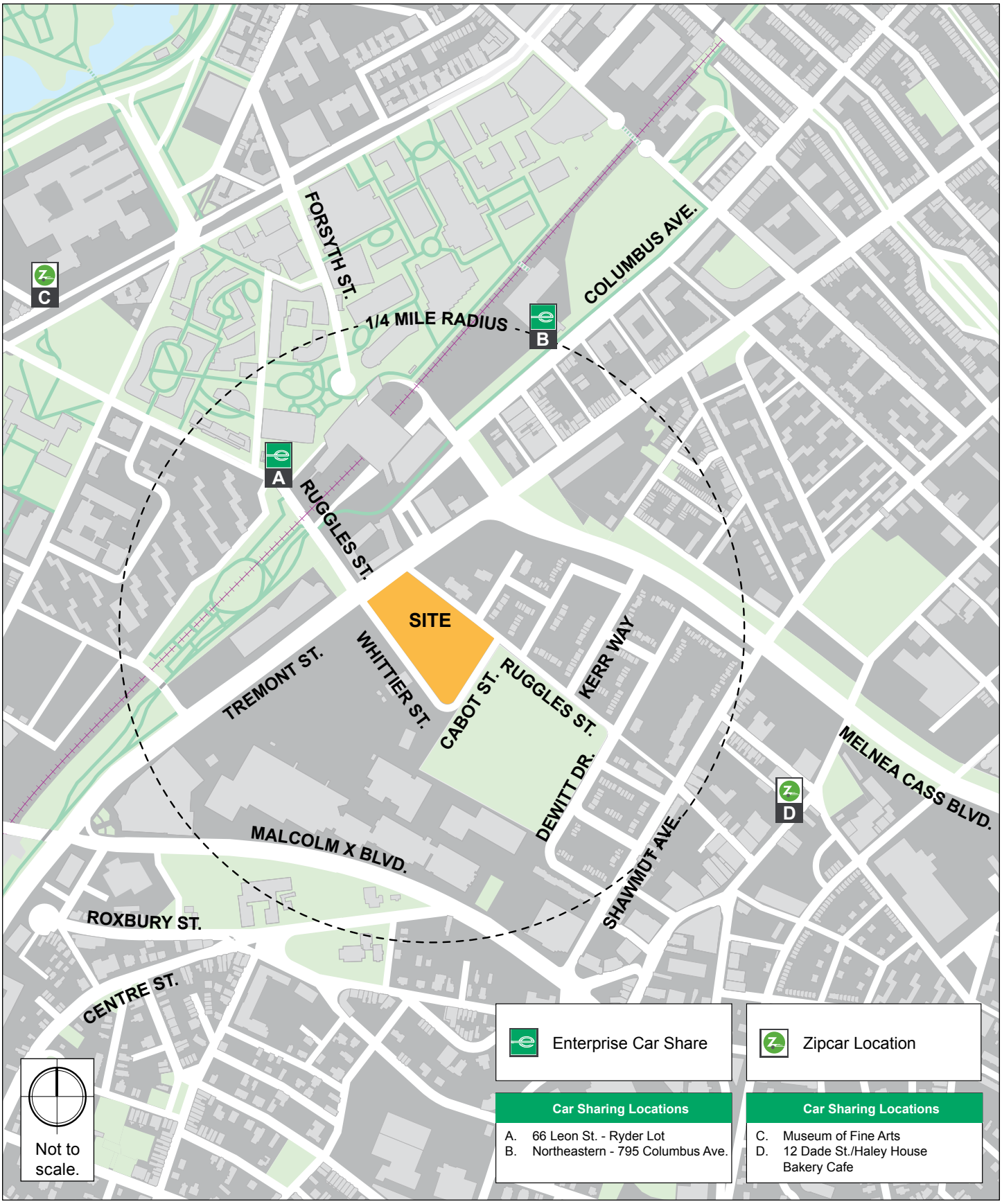
Figure 4-5
Public Transportation


S Signalized
U Unsignalized
XX a.m.
(XX) p.m.
COLUMBUS AVE.
RUGGLES ST.
TREMONT ST.
WHITTIER ST.
CABOT ST.
DEWITT DR.
SHAWMUT AVE.
KERR WAY
PRIVATE WAY
DEWITT ST.
SHAWMUT AVE.
MELNEA CASS BLVD.
MALCOLM X BLVD.
ROXBURY ST.
CENTRE ST.
SITE
29 (2)
115 (153)
13 (60)
9 (33)
13 (1)
12 (65)
7 (20)
31 (58)
7 (0)
2 (7)
21 (53)
19 (20)
58 (73)
43 (83)
20 (27)
24 (40)
39 (53)
26 (49)
19 (35)
Not to scale.



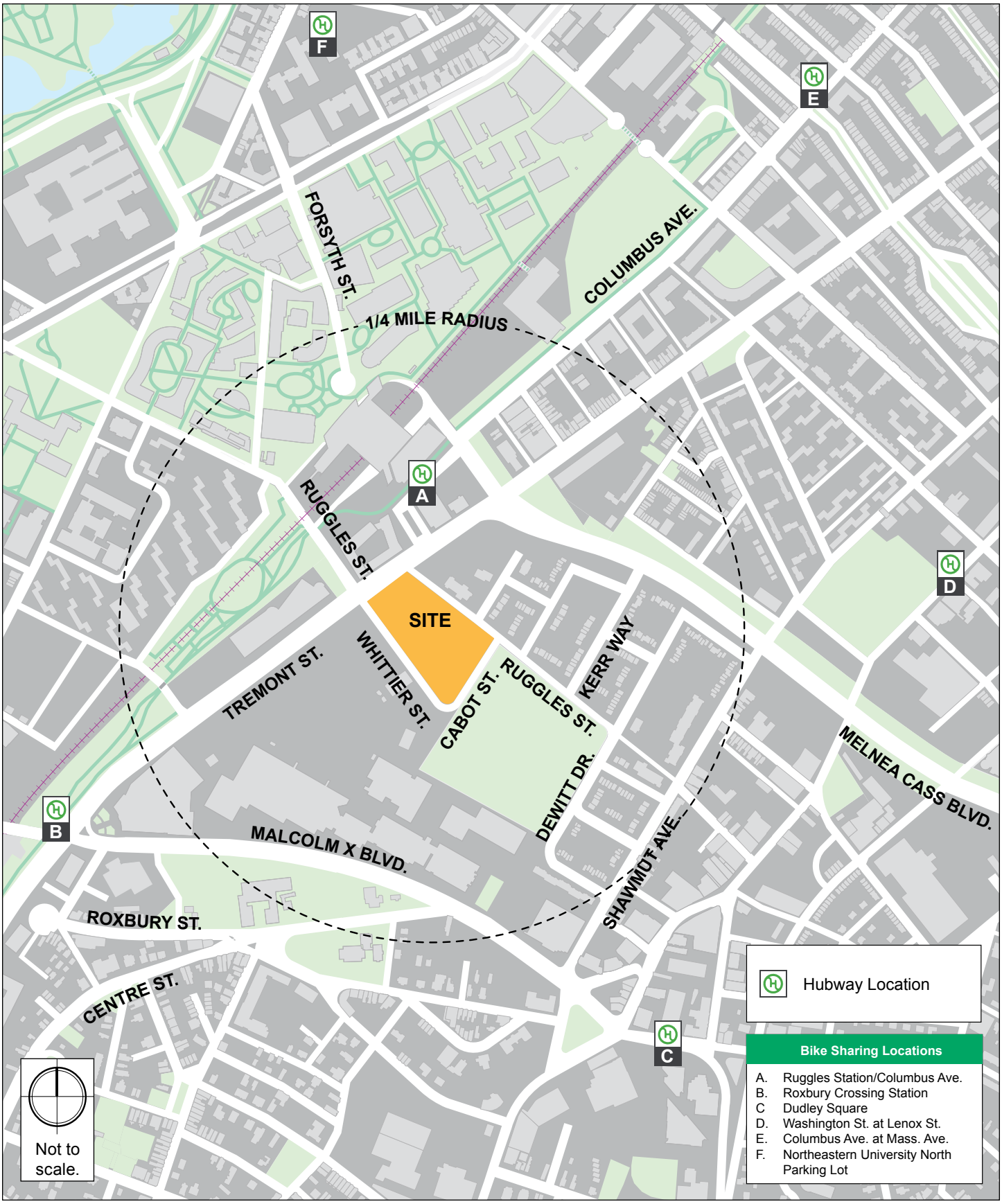
Whittier Street Apartments
Roxbury, MA

Figure 4-7
Existing Conditions (2014) Bicycle Volumes, a.m. and p.m. Peak Hour



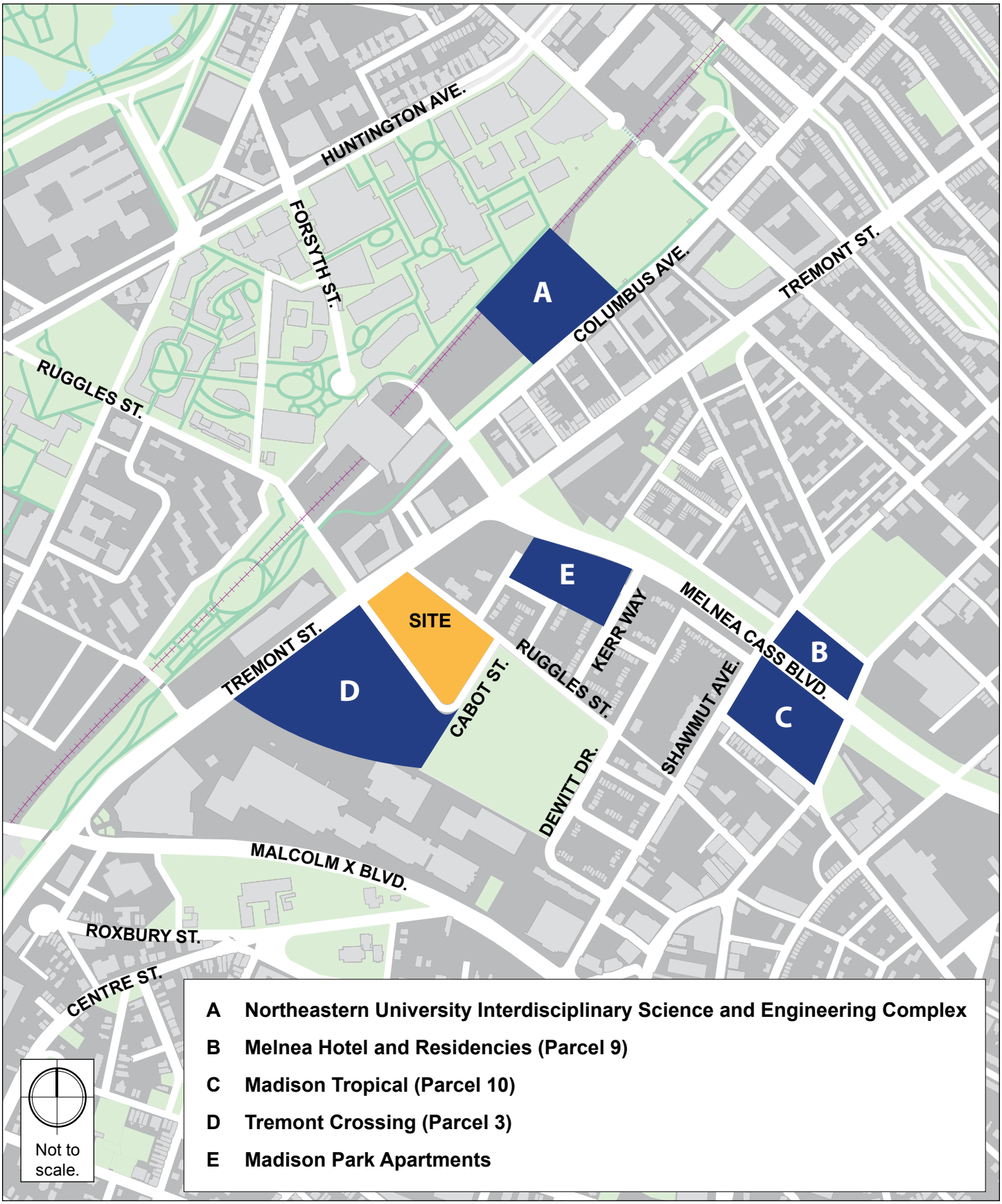
Whittier Street Apartments
Roxbury, MA

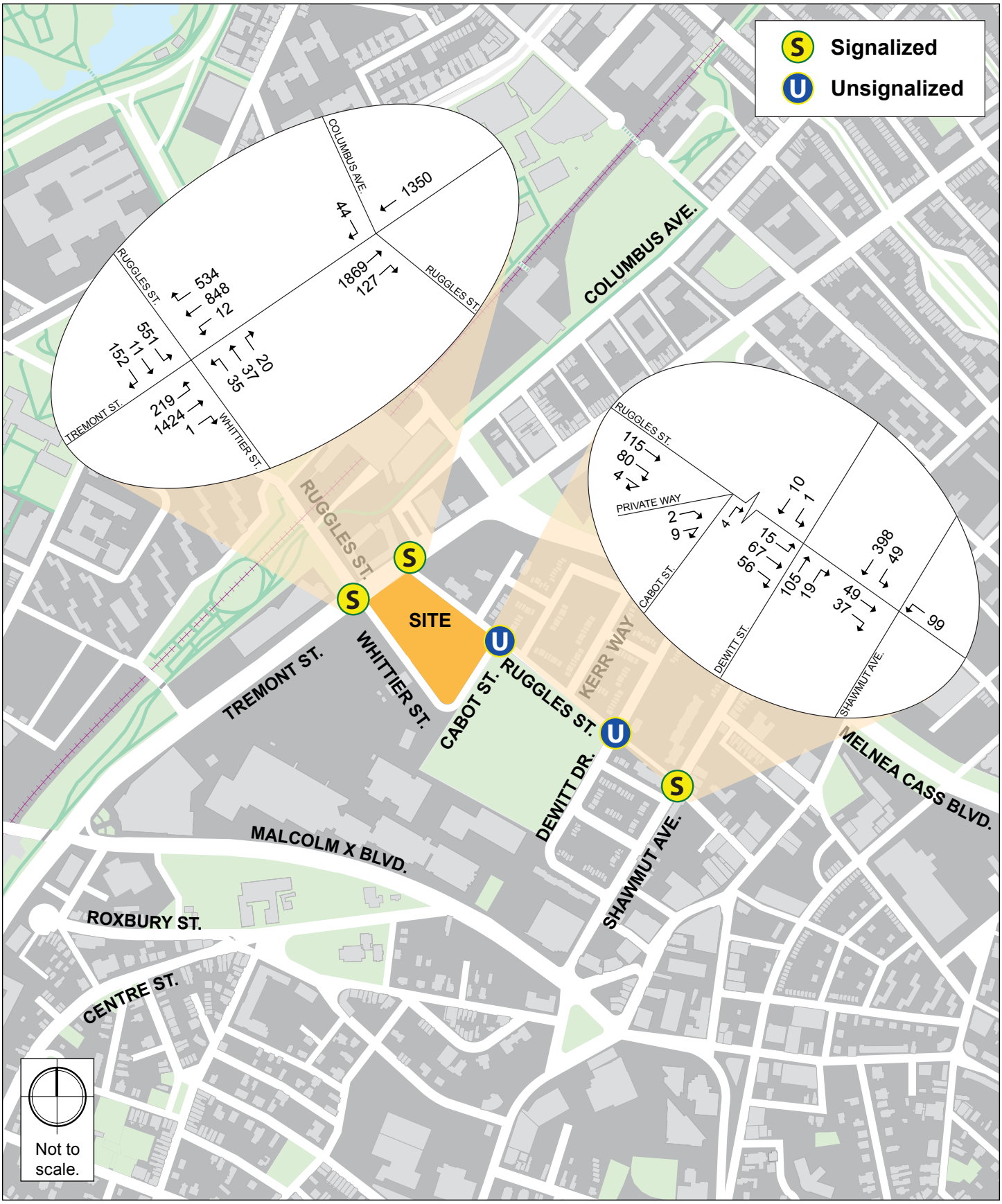
Figure 4-8
Car Sharing



Whittier Street Apartments
Roxbury, MA

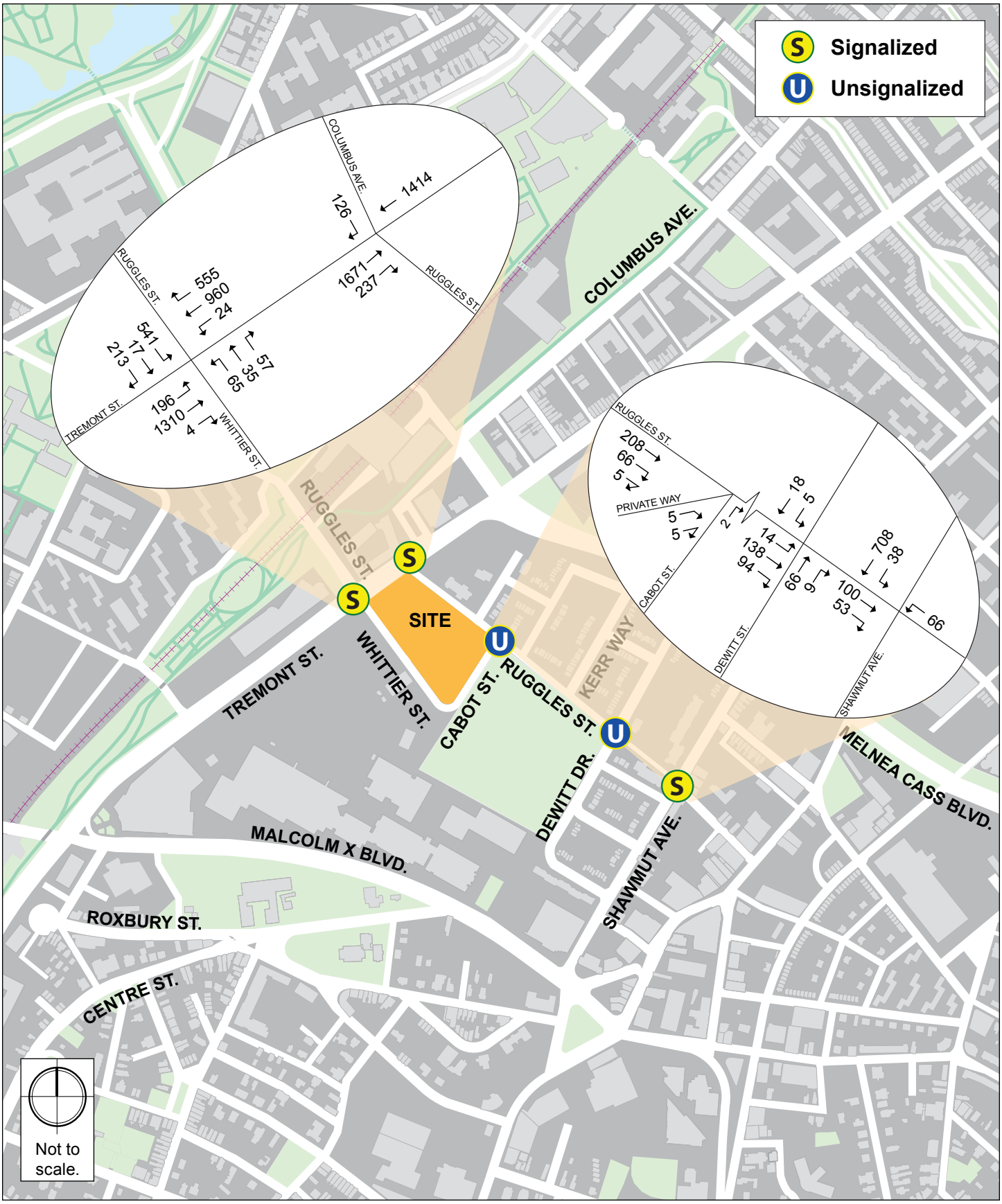
Figure 4-9
Bike Sharing


HUNTINGTON AVE.
FORSYTH ST.
RUGGLES ST.
COLUMBUS AVE.
TREMONT ST.
A
SITE
E
D
B
C
KERR WAY
MELNEA CASS BLVD.
CABOT ST.
RUGGLES ST.
SHAWMUT AVE.
DEWITT DR.
MALCOLM X BLVD.
ROXBURY ST.
CENTRE ST.
Not to scale.
A Northeastern University Interdisciplinary Science and Engineering Complex
B Melnea Hotel and Residencies (Parcel 9)
C Madison Tropical (Parcel 10)
D Tremont Crossing (Parcel 3)
E Madison Park Apartments



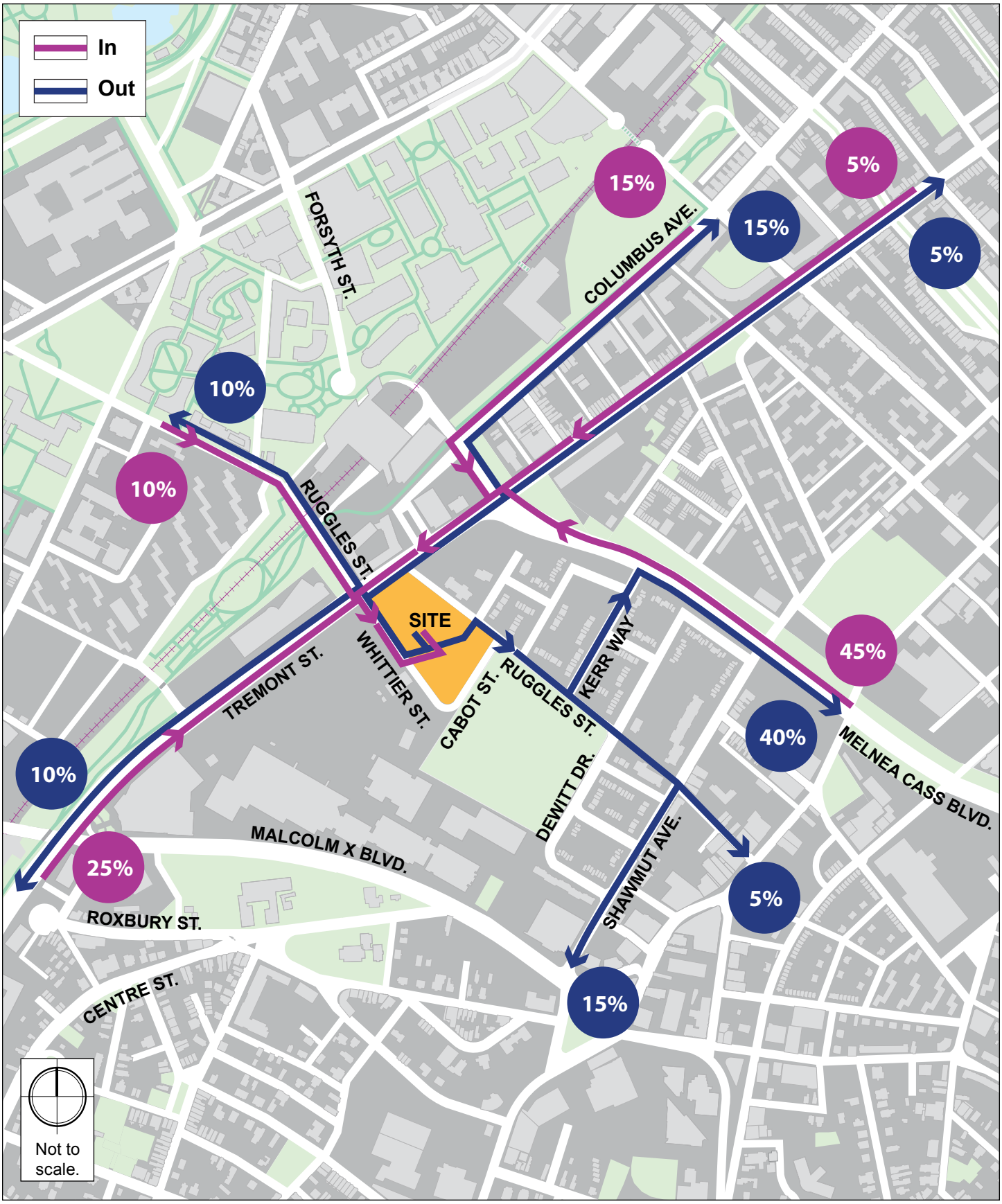
Whittier Street Apartments
Roxbury, MA

Figure 4-11
No-Build Conditions (2020) Turning Movement Volumes, a.m. Peak Hour



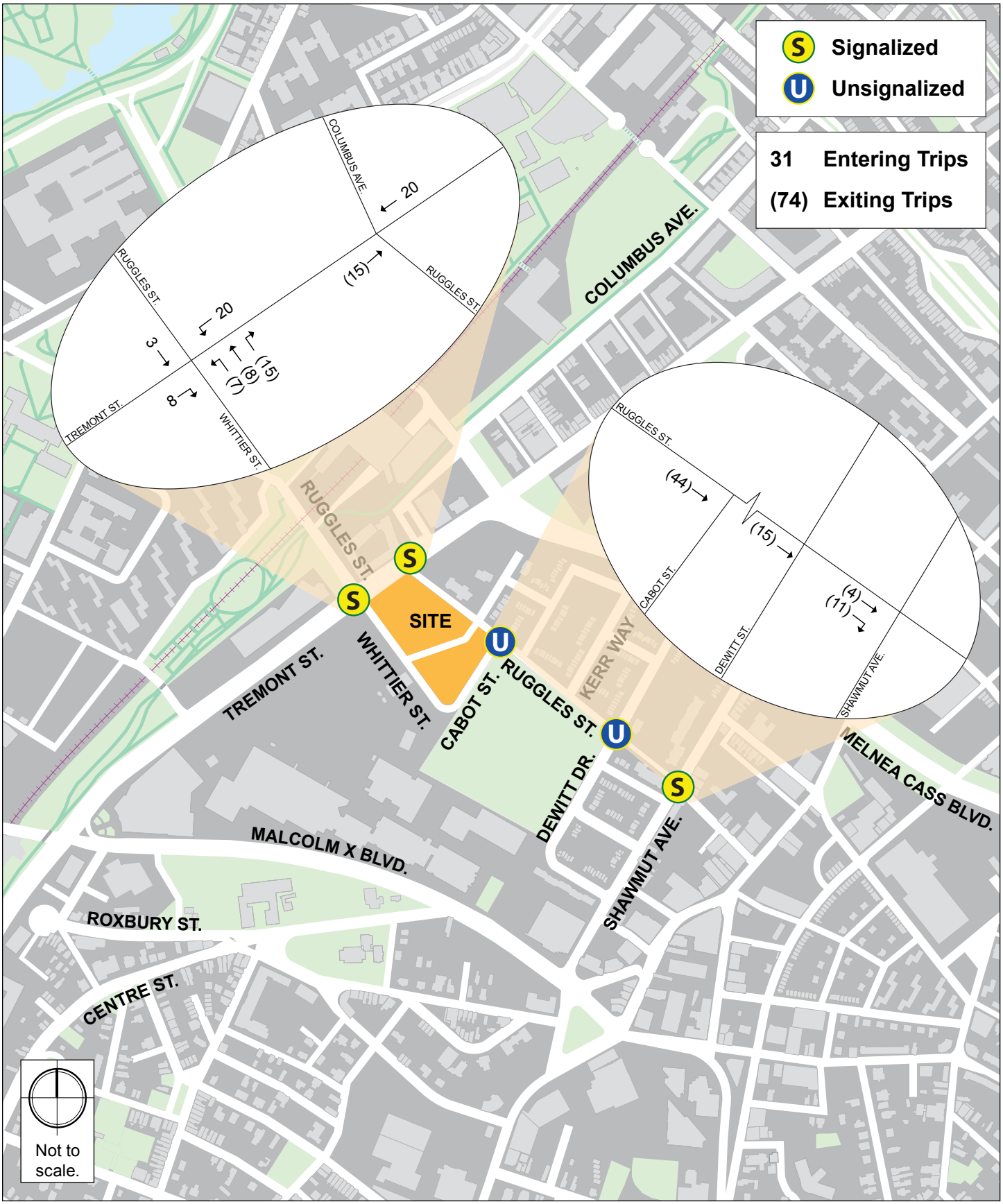
Whittier Street Apartments
Roxbury, MA

Figure 4-12
No-Build Conditions (2020) Turning Movement Volumes, p.m. Peak Hour



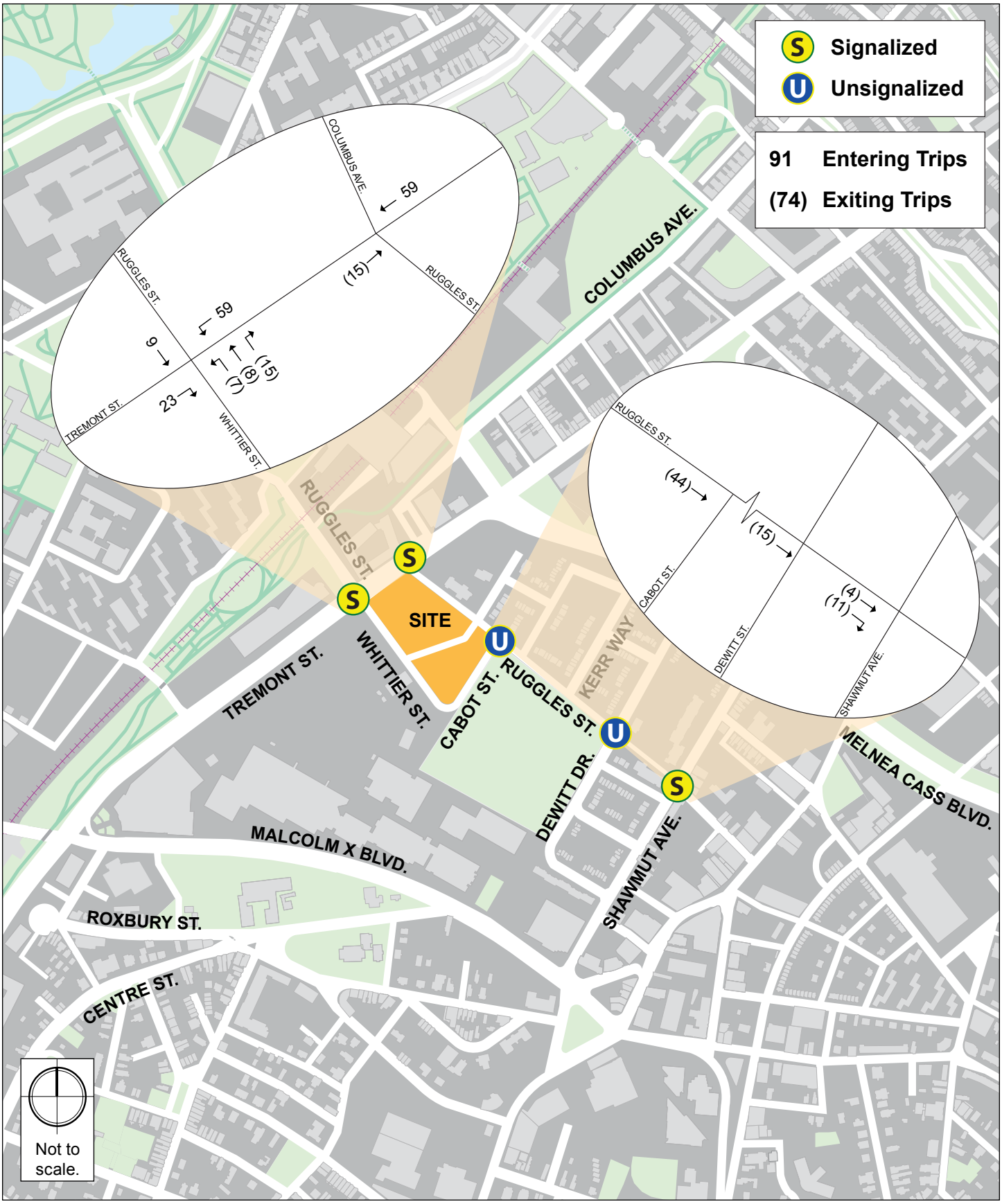
Whittier Street Apartments
Roxbury, MA

Figure 4-14
Trip Distribution



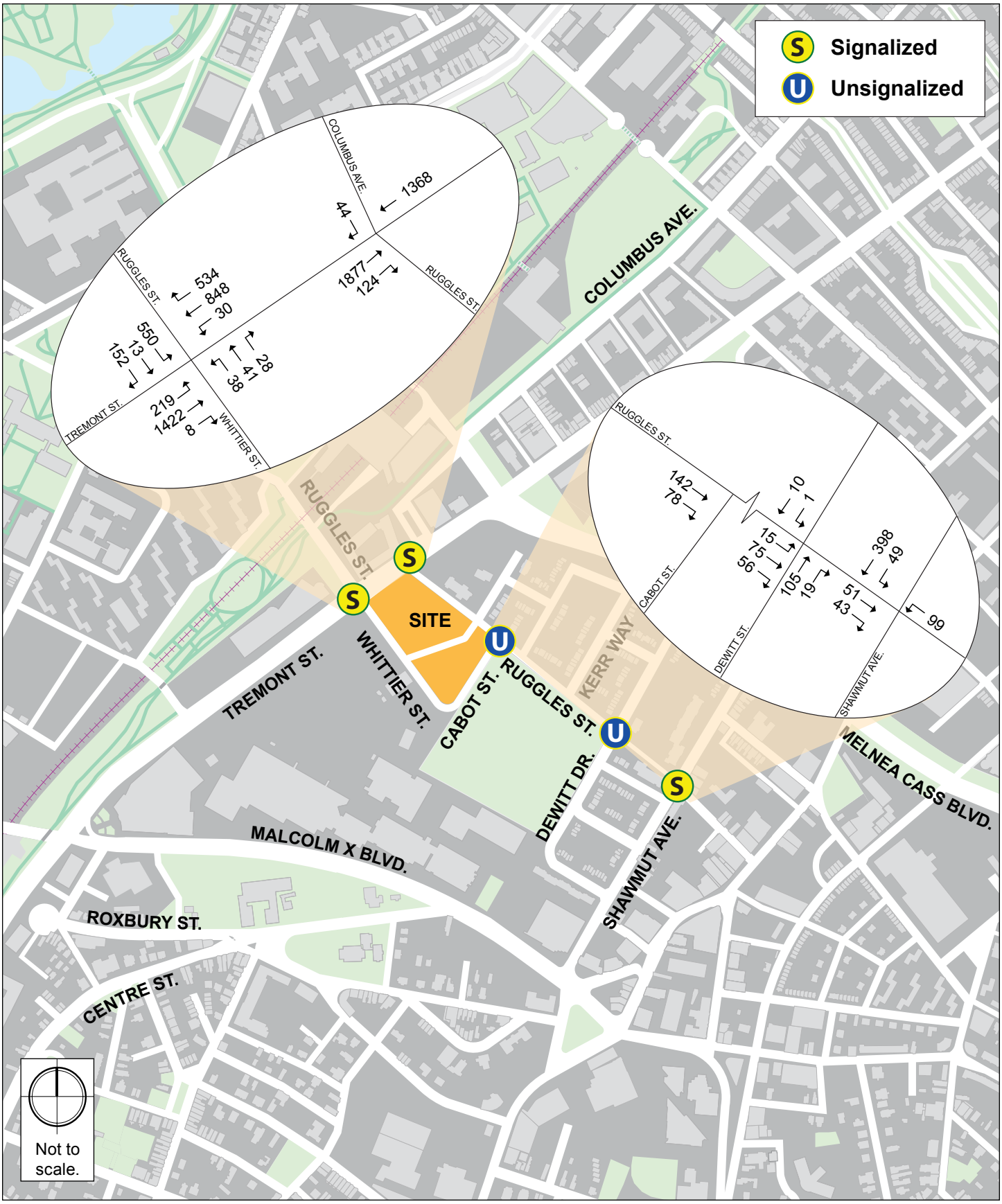
Whittier Street Apartments
Roxbury, MA

Figure 4-15
Project Generated Trips, a.m. Peak Hour



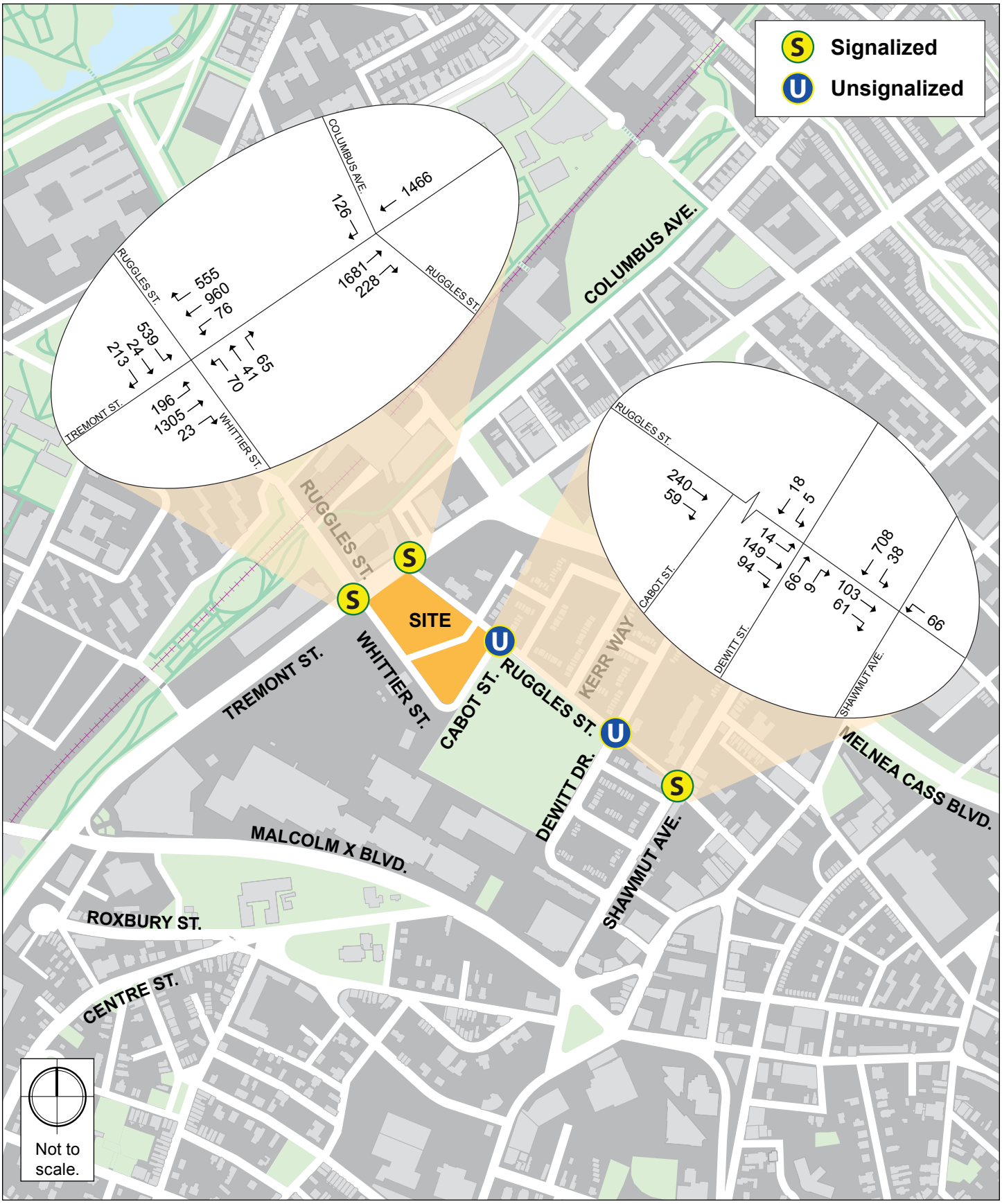
Whittier Street Apartments
Roxbury, MA

Figure 4-16
Project Generated Trips, p.m. Peak Hour



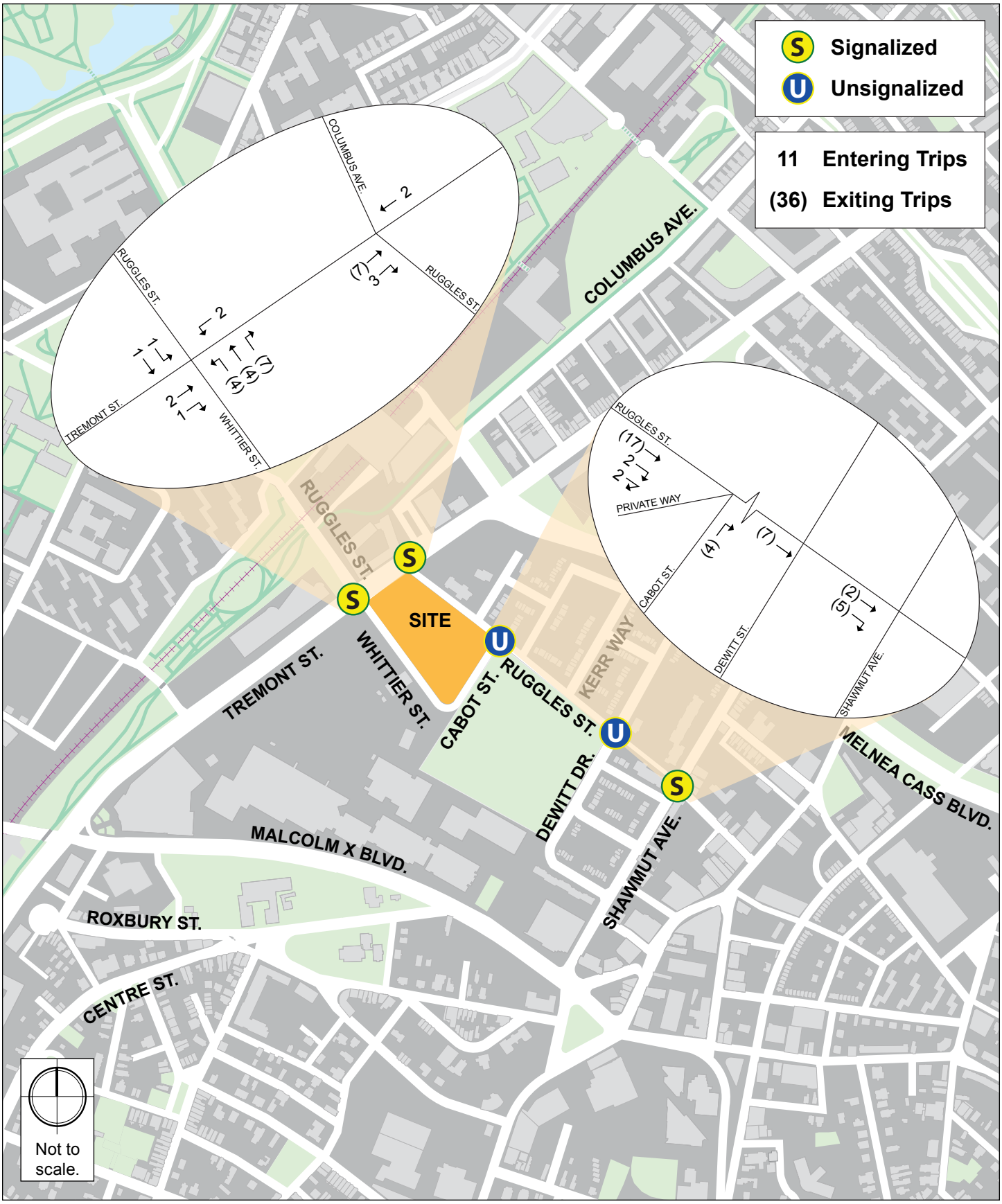
Whittier Street Apartments
Roxbury, MA

Figure 4-17
Build Conditions (2020) Turning Movement Volumes a.m. Peak Hour



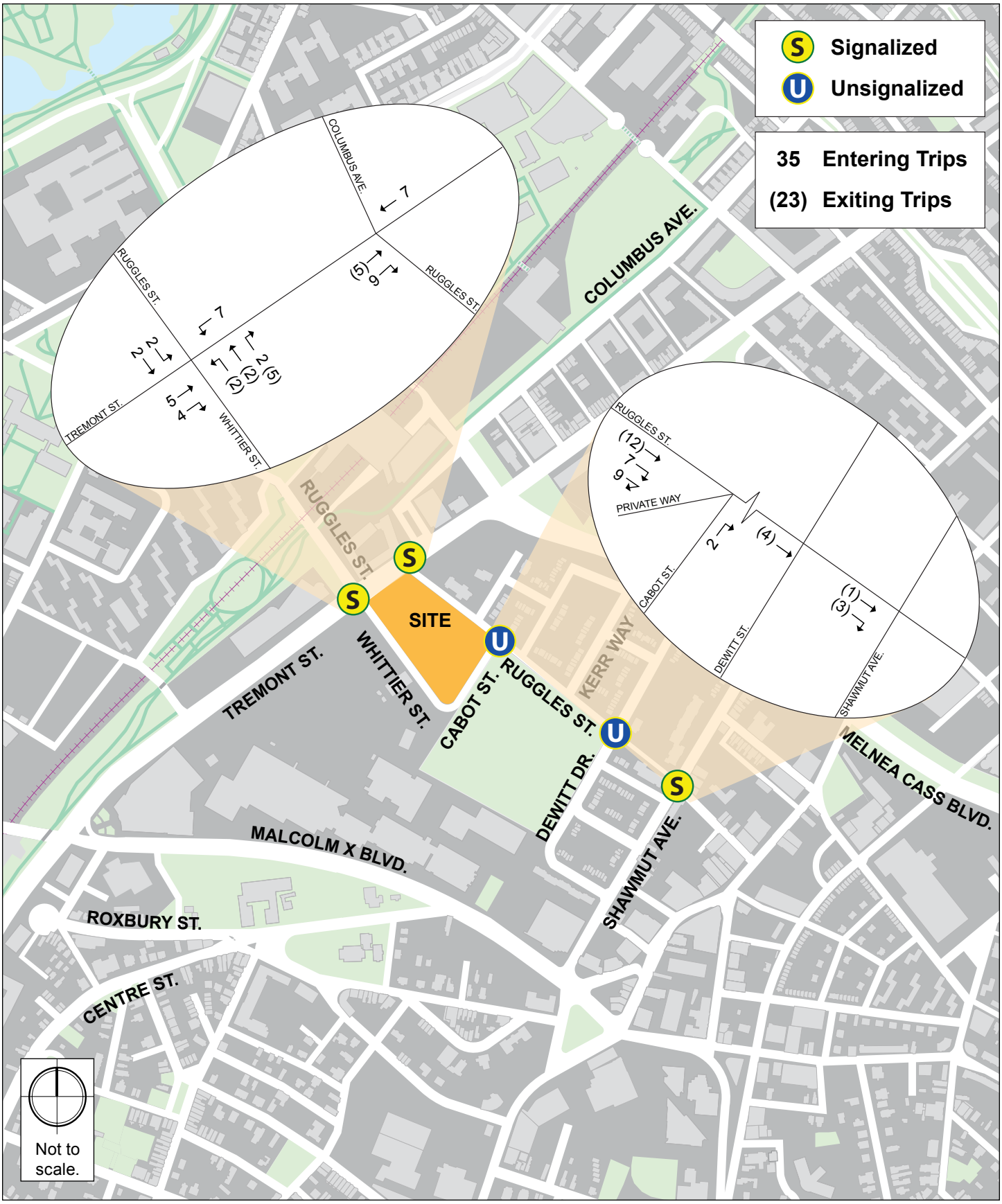
Whittier Street Apartments
Roxbury, MA

Figure 4-18
Build Conditions (2020) Turning Movement Volumes p.m. Peak Hour



Whittier Street Apartments
Roxbury, MA

Figure A-1
Existing Site Trips (2-Way Whittier Street Scenario), a.m. Peak Hour



Whittier Street Apartments
Roxbury, MA

Figure A-2
Existing Site Trips (2-Way Whittier Street Scenario), p.m. Peak Hour

Chapter 5

SUSTAINABILITY

CHAPTER 5: SUSTAINABILITY

5.1 SUSTAINABLE DESIGN

The Project will incorporate sustainable principles into its design, construction, and continued operation activities. The project will meet the Boston Zoning Code's Article 37 requirement, with each building achieving a minimum of silver level certifiability through the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating systems. Depending on height and use, each building will follow either the LEED for Homes (LEED H; 3-stories or less), LEED for Homes Mid-rise (LEED Mid-rise; 4-6 stories), or LEED for New Construction rating systems (LEED NC; 7-stories or more). Implementation of LEED certifiability ensures that the project design includes the following sustainable principles:

- An integrated team, members of which will be in constant communication throughout the design and construction process;
- Environmentally friendly site design and consideration of landscaping that benefits both residents and the surrounding habitats;
- Efficient water use that minimizes waste and maximizes applicable technology;
- Energy efficiency through installation of high-efficiency equipment and a right-sized system design;
- Healthy materials and finishes throughout all interior spaces, reducing health effects on residents; and
- Effective ventilation and exhaust systems design to ensure continued health and air quality throughout the life of each building.

The Proponent has retained New Ecology, Inc (NEI) as the green building consultant to facilitate the implementation and compliance process. The narrative below details the strategies by which the Project will meet various prerequisite and credit requirements under this rating system.

5.2 ARTICLE 37/LEED COMPLIANCE

This section outlines the LEED compliance strategy for Building 1 which will follow the LEED for Homes: Mid-rise (LEED Mid-rise) rating system checklist. See Figure 5-1 for the LEED Checklist. Buildings 4 and 5 will be further detailed when they proceed through BRA design review at a future date.

5.2.1 INNOVATION AND DESIGN PROCESS

IDp1.1: Integrated Project Planning- Preliminary Rating

Preliminary understanding indicates the Project will achieve a Silver level of certifiability, with 59 "yes" points and 7 "maybe" points that will be confirmed as the Project design progresses. The Silver level threshold is 51.5 points.

IDp1.2: Integrated Project Planning- Energy Expertise for Mid-rise

The Project team will select a MEP engineering firm that has extensive experience in engineering midrise energy systems and components and ASHRAE 90.1 energy modeling.

IDc1.3: Integrated Project Planning- Professional Credentialed with Respect to LEED for Homes

Ashley Wisse, of New Ecology, Inc., holds a LEED AP Homes credential and is an integrated member of the Project Team.

IDc1.4: Integrated Project Planning- Design Charrette

The team will participate in a design charrette to discuss systems design and integration of sustainability and efficiency goal; charrette discussion will inform all future decisions.

ID p2.1 Durability Planning

The Project will complete a Durability Risk Evaluation for the surrounding site and proposed construction methodology. This evaluation will inform the Durability Checklist- a list of designed risk mitigation features to be confirmed for installation during construction.

ID p2.2 Durability Management

Throughout the construction process, New Ecology will conduct monthly inspections to ensure adequate installation of proposed durability risk mitigation strategies.

IDc3.1: Innovative or Regional Design- Exemplary Performance for Public Transportation Access

Due to the existing location, the Project achieves Exemplary Performance for Sustainable Sites credit 7.1 Public Transportation Access. Nearby transpiration stations provide residents and building users with access to over 120 rides per day.

IDc3.2: Innovative or Regional Design- Street Network

Due to the existing location, the Project qualifies for the LEED pilot credit: "street network". Qualifying projects must be located in areas surrounded by development with at least 90 intersections per square mile.

IDc3.3: Innovative or Regional Design- Building Network Partnership

The Project will track and benchmark all utility usage once construction is complete. This information will inform the building owner of possible issues within the systems equipment and/or likely tenant behavior issues.

IDc3.4: Innovative or Regional Design- Bicycle Network

Due to the existing location, the Project qualifies for another LEED Pilot Credit titled "Bicycle Network". Qualifying projects are located within a 200-yard walking distance to an existing bicycle network that connects to a school, employment centers, or at least ten community resources within 3-miles of the Project.

5.2.2 LOCATION AND LINKAGES

The Location and Linkages (LL) category addresses reduction of urban sprawl and rewards development on and near previously existing infrastructure, public transportation, and developed land.

LLc2: Site Selection

The Project is located on an urban infill location and does not include any area in the following categories: below the 100-year FEMA floodplain, habitat for threatened or endangered species, within 100-feet of water, public parkland, and/or prime, unique, or significant soils.

LLc3.2: Preferred Locations- Infill Site

The Project is located on an urban infill site and is surrounded by previously developed urban land.

LLc4: Existing Infrastructure

The Project is served by existing utility lines.

LLc5.3: Community Resources/Transit- Outstanding Community Resources

Due to the existing location, the Project is located within a ½-mile of at least 14 basic community resources.

LLc6: Access to Open Space

Due to the existing location, the Project is located within a ½-mile of Madison Park, which is greater than ¾-acre in size.

5.2.3 SUSTAINABLE SITES

The Sustainable Sites (SS) category addresses environmental issues related to landscape and site design, ensuring a seamless co-existence between the built environment and the natural environment.

SSp1.1: Erosion Controls During Construction

The Project will create a Stormwater Pollution Prevention Plan (SWPPP) to minimize runoff and wind erosion from the site throughout Construction. Daily, Weekly, and Monthly inspections will ensure that installed methodology is kept in good condition.

SSc1.2 Minimize Disturbed Area The Project will achieve a density greater than 40 units per acre.

SSp2.1: No Invasive Plants

The Project will not install any invasive plantings onsite.

SSc2.2: Basic Landscaping Design

The Project landscaping plan will include drought-tolerant turf, no turf installed in densely shaded areas, no turf in areas of slope greater than or equal to 25%, added mulch or soil amendments where necessary, and all compacted soil will be tiled to at least 6-inches.

SSc2.3 Limit Conventional Turf

The Project will seek to minimize turf installation to less than 40% of all softscape onsite.

SSc2.4 Drought-Tolerant Plants

The Project landscaping plan will include at least 90% drought-tolerant plantings, based on total plant count.

SSc3.2: Reduce Roof Heat Island Effects

The Project will install roofing materials with high-albedo Solar Reflective Index (SRI) values for at least 75% of the surface area.

SSc4.1 Permeable Lot

The Project will seek to ensure that at least 70% of the site area is permeable material.

SSc4.3: Surface Water Management- Stormwater Quality Control

The site will meet the city of Boston stormwater runoff requirements, which is above and beyond the LEED credit requirements.

SSc5.5: Nontoxic Pest Control

The Project will include designs to keep all exterior wood at least 12-inches above the finished soil, seal all external cracks, and include no wood-to-concrete connections without sill seal material.

SSc6.1: Compact Development The Project will achieve a density of at least 40 units/acre.

SSc7.1: Alternative Transportation- Public Transit

Due to the existing location, the Project has nearby access to Transportation stations providing more than 60 rides per day.

SSc7.2: Alternative Transportation- Bicycle Storage

The Project will provide bicycle storage for a minimum of 15% of the Project's residents.

SSc7.3: Alternative Transportation- Parking Capacity/LEV

The Project will size additional parking not to exceed minimum zoning requirements for the city of Boston.

5.2.4 WATER EFFICIENCY

The Water Efficiency (WE) category addresses environmental degradation related to overuse of potable water within residential buildings and irrigation systems.

WEc2.1: Indoor Water Use- High Efficiency Irrigation System

The Project will utilize high-efficiency irrigation systems for the limited turf areas. At a minimum, this installation will included head-to-head coverage, a central shut-off valve, and a submeter for water use.

WEc3.1 & 3.2: Indoor Water Use- High & Very High Efficiency Fixtures and Fittings

The Project will utilize water fixtures including toilets with maximum 1.3 gallons per flush, lavatory faucets with maximum flow rate of 1.5 gallons per minute, and showers with maximum flow rate of 1.75 gallons per minute.

WEc3.3: Indoor Water Use- Water Efficient Appliances

The Project will utilize water-efficient clothes washers and dishwasher equipment for resident use.

5.2.5 ENERGY AND ATMOSPHERE

The Energy and Atmosphere (EA) category addresses ongoing energy usage and continued building performance.

EAp1.1: Optimize Energy Performance- Minimum Energy Performance

In accordance with the Massachusetts Stretch Energy Code, the Project will achieve a minimum 20% reduction in total Energy usage from an ASHRAE 90.1-2007 baseline building.

EAp1.2: Optimize Energy Performance- Testing and Verification

The Project will follow Option 2 and utilize a third-party Commissioning Agent for Fundamental Commissioning services and will pass the mandatory duct leakage testing for each installed heating and cooling system with ductwork.

EAp1.3: Optimize Energy Performance

In accordance with the Massachusetts Stretch Energy Code, the Project will achieve a minimum 20% reduction in total Energy Usage from an ASHRAE 90.1-2007 baseline building.

EAc7.2: Water Heating- Pipe Insulation

The Project will design all domestic hot water piping to include continuous, minimum R-4 insulation.

EAp11.1: Residential Refrigerant Management- Refrigerant Charge Test

All installed refrigerant equipment will be tested upon installation to ensure adequate charge.

EAc11.2: Residential Refrigerant Management- Appropriate HVAC Refrigerants

All installed refrigerant equipment will utilize environmentally friendly refrigerants, such as R410A or Puron.

5.2.6 MATERIALS AND RESOURCES

The Materials and Resources (MR) category addresses all installed materials, including framing and interior finishes, as well as diversion of waste from landfills.

MRp1.1: Framing Order Waste Factor

The Project will limit all framing waste onsite to less than 10%, by cost.

MRc1.5: Off-Site Fabrication

The Project will utilize penalization, where possible and feasible.

MRp2.1 FSC Certified Tropical Wood

The Project will strive to utilize non-tropical wood products or FSC-certification for necessary woods from tropical countries.

MRc2.2: Environmentally Preferable Products

All finish materials will be chosen for environmental benefits such as regional sourcing, low-Volatile Organic Compound (VOC) release, and green certifications for health benefits. Cement materials will be sourced within 500-miles of the project site; paints, primers, adhesives, sealants will be reviewed for VOC compliance with the South Coast Air Quality Management District Rule #1113 and #1168; and, all flooring materials will include Green Label Plus certification (rugs) or FloorScore certification (resilient flooring), as applicable.

MRp3.1: Waste Management- Construction Waste Management

The Project will provide a Waste Management Plan which identifies all waste types to be generated, hired waste hauler transportation plan and disposal location, as well as final destinations and recycling methodology for all generated materials.

MRc3.2: Waste Management- Construction Waste Reduction

During demolition and construction on-site, all waste produced will be tracked to maximize diversion from landfills. The Project will achieve a minimum diversion rate of 50% during demolition and 75% during construction.

5.2.7 INDOOR ENVIRONMENTAL QUALITY

The Indoor Environmental Quality (IEQ) category addresses the exhaust and ventilation of all interior spaces within the building, ensuring a consistent healthy environment for building residents.

IEQp2: Basic Combustion Venting Measures

All installed combustion equipment will be directly vented to the exterior and each floor of each unit, as well as all common spaces, will be equipped with combination smoke and carbon dioxide detectors.

IEQp4.1: Basic Outdoor Air Ventilation

The Project will design all residential areas to meet the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 62.2-2007 standard and all common spaces areas to meet the ASHRAE 62.1-2007 standard.

IEQc4.2 Enhanced Outdoor Air Ventilation

The Project will consider inclusion of an Energy Recovery System (ERV) to minimize heating and cooling energy losses due to Ventilation and Exhaust.

IEQp5.1: Basic Local Exhaust

The Project will design all residential areas to meet the ASHRAE 62.2-2007 standard and all common spaces areas to meet the ASHRAE 62.1-2007 standard.

IEQc5.2: Enhanced Local Exhaust

The Project will install a minimum of one continuously operating bath fan in each unit.

IEQp6.1: Distribution of Space Heating and Cooling- Room-by-Room Load Calculations

All ductwork will be designed in accordance with the Air Conditioning Contractors of America (ACCA) Manual J Heating and Cooling Loads, and Manual D Duct Sizing, standards.

IEQp7.1: Air Filtering- Good Filters

All installed mechanical equipment will include minimum MERV 8 filtration media to ensure that harmful particulates are filtered out of the air stream, prior to entry into the interior spaces.

IEQc8.1: Contaminant Control- Indoor Contaminant Control During Construction

During construction, all installed ductwork will be protected from contamination, from delivery on-site until final cleaning and occupancy.

IEQp9.1: Radon Protection- Radon-Resistant Construction in High-Risk Areas

The Project is not located within a high-risk radon area.

IEQp10.1: No HVAC in Garage and c10.3 No Garage

The Project does not include garage space.

IEQc11: Environmental Tobacco Smoke Control

The Project will not allow smoking within the building or within 25-feet of all entryways, outdoor air intakes, or operable windows.

IEQp12.1: Compartmentalization of Units

Each residential unit will be sealed for compartmentalization, per the Massachusetts Multifamily High-Rise Utility Rebate program standards, which aligns with the LEED Mid-rise prerequisite requirements. The maximum air leakage from each unit to both the exterior and adjacent spaces will be 7Air Changes per Hour (ACH) at 50 Pascals (Pa).

IEQc12.2 Enhanced Compartmentalization

The Project will seek to enhance the compartmentalization strategies and may achieve a maximum of 5 ACH at 50 Pa.

5.2.8 AWARENESS AND EDUCATION

The Awareness and Education category ensures that the owner, building residents, and maintenance staff are aware of the installed equipment and materials- especially those conditions unique to sustainable and environmentally conscious development.

AEp1.1: Basic Operations Training and AEc2.1 Education of the Building Owner

New Ecology will work with the Proponent to develop an Operations Training Manual and Resident Green Guide to be distributed to applicable staff and residents at Construction Completion. Distribution will be accompanied by a minimum 1-hour walk-through of the building and units to highlight installed LEED-related items.

5.3 FUTURE PHASE CHECKLISTS/OVERVIEW

After completion of Building 1, the Whittier Apartments Project will turn to the Construction of Building 4 and 5. These buildings will pursue LEED certifiability under the LEED Building Design and Construction (LEED for New Construction) and LEED for Homes rating systems, respectively. Full Green Building reports for each building will be provided at a later date; however, the preliminary checklists are attached in Figures 5 -2 and 5-3 for review.

for Homes

LEED for Homes Mid-rise Simplified Project Checklist

Builder Name:	***Unknown at this time***
Project Team Leader (if different):	***Charles Dirac, Preservation of Affordable Housing***
Home Address (Street/City/State):	***Tremont Street, Boston, Massachusetts***

Project Description:

Building type: ***Mid-rise multi-family*** # of stories: ***5***

# of units: ***82*** Avg. Home Size Adjustment: ***-8.5***

Adjusted Certification Thresholds

Certified: ***36.5*** Gold: ***66.5***

Silver: ***51.5*** Platinum: ***81.5***

Project Point Total

Prelim: ***59 + 7 maybe pts*** Final: ***9.5***

Certification Level

Prelim: ***Silver*** Final: ***Not Certified***

Final Credit Category Total Points

ID: 0 ***SS: 0*** ***EA: 7*** ***EQ: 0***

LL: 0 ***WE: 0*** ***MR: 2.5*** ***AE: 0***

Minimum Point Thresholds Not Met for Final Rating

date last updated :
last updated by :

					Max Pts	Project Points Preliminary Y/Pts	Maybe	No	Final Y/Pts
Innovation and Design Process (ID)			(No Minimum Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Integrated Project Planning		1.1	Preliminary Rating		Prereq	Y			
		1.2	Energy Expertise for MID-RISE		Prereq	Y			
		1.3	Professional Credentialed with Respect to LEED for Homes		1	1	0		0
		1.4	Design Charrette		1	1	0		0
		1.5	Building Orientation for Solar Design		1	0	0	N	0
		1.6	Trades Training for MID-RISE		1	0	0	N	0
2. Durability Management Process		2.1	Durability Planning		Prereq	Y			
		2.2	Durability Management		Prereq	Y			
		2.3	Third-Party Durability Management Verification		3	0	0	N	0
3.Innovative or Regional Design	✎	3.1	Innovation #1	***Exemplary Performance SS 7.1 Transportati***	1	1	0		0
	✎	3.2	Innovation #2	***Street Network***	1	1	0		0
	✎	3.3	Innovation #3	***Building Network Partnership***	1	1	0		0
	✎	3.4	Innovation #4	***Bicycle Network***	1	1	0		0
				Sub-Total for ID Category:	***11***	6	0		0
Location and Linkages (LL)			(No Minimum Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. LEED ND		1	LEED for Neighborhood Development	**LL2-6**	10	0	0	N	0
2. Site Selection	✎	2	Site Selection		2	2	0		0
3. Preferred Locations		3.1	Edge Development		1	0	0	N	0
		3.2	Infill	**LL 3.1**	2	2	0		0
		3.3	Brownfield Redevelopment for MID-RISE		1	0	0	N	0
4. Infrastructure		4	Existing Infrastructure		1	1	0		0
5. Community Resources/ Transit		5.1	Basic Community Resources for MID-RISE		1	0	0	N	0
		5.2	Extensive Community Resources for MID-RISE	**LL 5.1, 5.3**	2	0	0	N	0
		5.3	Outstanding Community Resources for MID-RISE	**LL 5.1, 5.2**	3	3	0		0
6. Access to Open Space		6	Access to Open Space		1	1	0		0
				Sub-Total for LL Category:	***10***	9	0		0
Sustainable Sites (SS)			(Minimum of 5 SS Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Site Stewardship		1.1	Erosion Controls During Construction		Prerequisite	Y			
		1.2	Minimize Disturbed Area of Site for MID-RISE		1	1	0		0
2. Landscaping	✎	2.1	No Invasive Plants		Prerequisite	Y			
	✎	2.2	Basic Landscape Design	**SS 2.5**	1	1	0		0
	✎	2.3	Limit Conventional Turf for MID-RISE	**SS 2.5**	2	0	1		0
	✎	2.4	Drought Tolerant Plants for MID-RISE	**SS 2.5**	1	1	0		0
	✎	2.5	Reduce Overall Irrigation Demand by at Least 20% for MID-RISE		3	0	0	N	0
3. Local Heat Island Effects	✎	3.1	Reduce Site Heat Island Effects for MID-RISE		1	0	0	N	0
	✎	3.2	Reduce Roof Heat Island Effects for MID-RISE		1	1	0		0
4. Surface Water Management	✎	4.1	Permeable Lot for MID-RISE		2	0	1		0
		4.2	Permanent Erosion Controls		1	0	0	N	0
	✎	4.3	Stormwater Quality Control for MID-RISE		2	2	0		0
5. Nontoxic Pest Control		5	Pest Control Alternatives		2	1.5	0		0
6. Compact Development		6.1	Moderate Density for MID-RISE		2	0	2		0
		6.2	High Density for MID-RISE	**SS 6.1, 6.3**	3	0	0		0
		6.3	Very High Density for MID-RISE	**SS 6.1, 6.2**	4	0	0		0
7. Alternative Transportation		7.1	Public Transit for MID-RISE		2	2	0		0
		7.2	Bicycle Storage for MID-RISE		1	1	0		0
		7.3	Parking Capacity/Low-Emitting Vehicles for MID-RISE		1	1	0		0
				Sub-Total for SS Category:	***22***	11.5	4		0

Figure 5-1
LEED Scorecard Building 1
Source: New Ecology, 2015

LEED for Homes Mid-rise Pilot Simplified Project Checklist (continued)

					Max Pts	Project Points Preliminary			Final
Water Efficiency (WE)			(Minimum of 3 WE Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Water Reuse		1	Water Reuse for MID-RISE		5	0	0	N	0
2. Irrigation System		2.1	High Efficiency Irrigation System for MID-RISE	**WE 2.2**	2	0	0		0
		2.2	Reduce Overall Irrigation Demand by at Least 45% for MID-RISE		2	0	0	N	0
3. Indoor Water Use		3.1	High-Efficiency Fixtures and Fittings		3	1	0		0
		3.2	Very High Efficiency Fixtures and Fittings		6	4	0		0
		3.3	Water Efficient Appliances for MID-RISE		2	2	0		0
				Sub-Total for WE Category:	**15**	7	0		0
Energy and Atmosphere (EA)			(Minimum of 0 EA Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Optimize Energy Performance		1.1	Minimum Energy Performance for MID-RISE		Prereq	Y			
		1.2	Testing and Verification for MID-RISE		Prereq				
		1.3	Optimize Energy Performance for MID-RISE		34	7	0		7
7. Water Heating		7.1	Efficient Hot Water Distribution		2	0	0	N	0
		7.2	Pipe Insulation		1	1	0		0
11. Residential Refrigerant Management		11.1	Refrigerant Charge Test		Prereq				
		11.2	Appropriate HVAC Refrigerants		1	1	0		0
				Sub-Total for EA Category:	**38**	9	0		7
Materials and Resources (MR)			(Minimum of 2 MR Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Material-Efficient Framing		1.1	Framing Order Waste Factor Limit		Prereq	Y			
		1.2	Detailed Framing Documents	**MR 1.5**	1	0	0		0
		1.3	Detailed Cut List and Lumber Order	**MR 1.5**	1	0	0		0
		1.4	Framing Efficiencies	**MR 1.5**	3	0	0		0
		1.5	Off-site Fabrication		4	4	0		0
2. Environmentally Preferable Products		2.1	FSC Certified Tropical Wood		Prereq	Y			
		2.2	Environmentally Preferable Products		8	3	0		0
3. Waste Management		3.1	Construction Waste Management Planning		Prereq	Y			
		3.2	Construction Waste Reduction		3	2.5	0		2.5
				Sub-Total for MR Category:	**16**	9.5	0		2.5
Indoor Environmental Quality (EQ)			(Minimum of 6 EQ Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
2. Combustion Venting		2	Basic Combustion Venting Measures		Prereq	Y			
3. Moisture Control		3	Moisture Load Control		1	0	0	N	0
4. Outdoor Air Ventilation		4.1	Basic Outdoor Air Ventilation for MID-RISE		Prereq	Y			
		4.2	Enhanced Outdoor Air Ventilation for MID-RISE		2	0	2		0
		4.3	Third-Party Performance Testing for MID-RISE		1	0	0	N	0
5. Local Exhaust		5.1	Basic Local Exhaust		Prerequisite	Y			
		5.2	Enhanced Local Exhaust		1	1	0		0
		5.3	Third-Party Performance Testing		1	0	0	N	0
6. Distribution of Space Heating and Cooling		6.1	Room-by-Room Load Calculations		Prereq				
		6.2	Return Air Flow / Room by Room Controls		1	0	0	N	0
		6.3	Third-Party Performance Test / Multiple Zones		2	0	0	N	0
7. Air Filtering		7.1	Good Filters		Prereq	Y			
		7.2	Better Filters	**EQ 7.3**	1	0	0	N	0
		7.3	Best Filters		2	0	0	N	0
8. Contaminant Control		8.1	Indoor Contaminant Control during Construction		1	1	0		0
		8.2	Indoor Contaminant Control for MID-RISE		2	0	0	N	0
		8.3	Preoccupancy Flush		1	0	0	N	0
9. Radon Protection		9.1	Radon-Resistant Construction in High-Risk Areas		Prereq			N/A	
		9.2	Radon-Resistant Construction in Moderate-Risk Areas		1	0	0	N	0
10. Garage Pollutant Protection		10.1	No HVAC in Garage for MID-RISE		Prereq	Y			
		10.2	Minimize Pollutants from Garage for MID-RISE	**EQ 10.3**	2	0	0	N	0
		10.3	Detached Garage or No Garage for MID-RISE		3	3	0		0
11. ETS Control		11	Environnmental Tobacco Smoke Reduction for MID-RISE		1	1	0		0
12. Compartmentalization of Units		12.1	Compartmentalization of Units		Prereq	Y			
		12.2	Enhanced Compartmentalization of Units		1	0	1		0
				Sub-Total for EQ Category:	**21**	6	3		0
Awareness and Education (AE)			(Minimum of 0 AE Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Education of the Homeowner or Tenant		1.1	Basic Operations Training		Prereq	Y			
		1.2	Enhanced Training		1	0	0	N	0
		1.3	Public Awareness		1	0	0	N	0
2. Education of Building Manager		2	Education of Building Manager		1	1	0		0
				Sub-Total for AE Category:	**3**	1	0		0

Figure 5-2

LEED Scorecard Building 1 (continued)

Source: New Ecology, 2015

LEED 2009 for New Construction and Major Renovations

Project Checklist

Y	?	N			
19		**7**	**Sustainable Sites**	**Possible Points:**	**26**
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and 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 and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
		2	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
4		**6**	**Water Efficiency**	**Possible Points:**	**10**
Y			Prereq 1	Water Use Reduction—20% Reduction	
2		**2**	Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
2		**2**	Credit 3	Water Use Reduction	2 to 4
9		**24**	**Energy and Atmosphere**	**Possible Points:**	**35**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
5		**12**	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
		2	Credit 4	Enhanced Refrigerant Management	2
		3	Credit 5	Measurement and Verification	3
2			Credit 6	Green Power	2
4		**10**	**Materials and Resources**	**Possible Points:**	**14**
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Figure 5-3

LEED Scorecard Building 4

Source: New Ecology, 2015

Whitter Apartments: Building 4

6/11/15

Materials and Resources, Continued

Y	?	N			
1		1	Credit 4	Recycled Content	1 to 2
1		1	Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
		1	Credit 7	Certified Wood	1

9 | | 6 Indoor Environmental Quality — Possible Points: 15

Y		Prereq 1	Minimum Indoor Air Quality Performance	
Y		Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	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 and Sealants	1
1		Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1		Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1		Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
	1	Credit 5	Indoor Chemical and 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 and Views—Daylight	1
1		Credit 8.2	Daylight and Views—Views	1

6 | | | Innovation and Design Process — Possible Points: 6

1		Credit 1.1	Innovation in Design: Specific Title	1
1		Credit 1.2	Innovation in Design: Specific Title	1
1		Credit 1.3	Innovation in Design: Specific Title	1
1		Credit 1.4	Innovation in Design: Specific Title	1
1		Credit 1.5	Innovation in Design: Specific Title	1
1		Credit 2	LEED Accredited Professional	1

2 | | 2 Regional Priority Credits — Possible Points: 4

1		Credit 1.1	Regional Priority: SS 6.1 Stormwater: Quantity Control	1
1		Credit 1.2	Regional Priority: SS 7.2 Heat Island: Roof	1
	1	Credit 1.3	N/A	1
	1	Credit 1.4	N/A	1

53 | | 55 Total — Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Figure 5-4

LEED Scorecard Building 4 (continued)

Source: New Ecology, 2015

LEED for Homes Simplified Project Checklist

for Homes

Builder Name:	***Unknown at this time***
Project Team Leader (if different):	***Charles Dirac, Preservation of Affordable Housing***
Home Address (Street/City/State):	***Tremont Street, Boston, Massachusetts***

Project Description:

Building type: ***Multi-family*** Project type:

# of units: ***0*** Avg. Home Size Adjustment: ***-6.5***

Adjusted Certification Thresholds

Certified: ***38.5*** Gold: ***68.5***

Silver: ***53.5*** Platinum: ***83.5***

Project Point Total

Prelim: *70 + 8.5 maybe pts* Final: *18.5*

Certification Level

Prelim: *Gold* Final: *Not Certified*

Final Credit Category Total Points

ID: 0 *SS: 3* *EA: 13* *EQ: 0*

LL: 0 *WE: 0* *MR: 2.5* *AE: 0*

Minimum Point Thresholds Not Met for Final Rating

date last updated :
last updated by :

					Max Points	Project Points Preliminary Y/Pts	Maybe	No	Final Y/Pts
Innovation and Design Process (ID)			(No Minimum Points Required)		Max				
1. Integrated Project Planning		1.1	Preliminary Rating		Prereq	Y			
		1.2	Integrated Project Team		1	1	0		0
		1.3	Professional Credentialed with Respect to LEED for Homes		1	1	0		0
		1.4	Design Charrette		1	1	0		0
		1.5	Building Orientation for Solar Design		1	0	0	N	0
2. Durability Management Process		2.1	Durability Planning		Prereq	Y			
		2.2	Durability Management		Prereq	Y			
		2.3	Third-Party Durability Management Verification		3	0	0	N	0
3.Innovative or Regional Design		3.1	Innovation #1	***Exemplary Performance SS 5 Resources***	1	1	0		0
		3.2	Innovation #2	***Street Network***	1	1	0		0
		3.3	Innovation #3	***Building Performance Partnership***	1	1	0		0
		3.4	Innovation #4	***Bike Network***	1	1	0		0
				Sub-Total for ID Category:	***11***	*7*	*0*		***0***
Location and Linkages (LL)			(No Minimum Points Required)	*OR*	Max				
1. LEED ND		1	LEED for Neighborhood Development	**LL2-6**	10	0	0	N	0
2. Site Selection		2	Site Selection		2	2	0		0
3. Preferred Locations		3.1	Edge Development	**LL 3.2**	1	0	0	N	0
		3.2	Infill		2	2	0		0
		3.3	Previously Developed		1	1	0		0
4. Infrastructure		4	Existing Infrastructure		1	1	0		0
5. Community Resources/ Transit		5.1	Basic Community Resources / Transit	**LL 5.2, 5.3**	1	0	0	N	0
		5.2	Extensive Community Resources / Transit	**LL 5.3**	2	0	0	N	0
		5.3	Outstanding Community Resources / Transit		3	3	0		0
6. Access to Open Space		6	Access to Open Space		1	1	0		0
				Sub-Total for LL Category:	***10***	*10*	*0*		***0***
Sustainable Sites (SS)			(Minimum of 5 SS Points Required)	*OR*	Max				
1. Site Stewardship		1.1	Erosion Controls During Construction		Prereq	Y			
		1.2	Minimize Disturbed Area of Site		1	1	0		0
2. Landscaping		2.1	No Invasive Plants		Prereq	Y			
		2.2	Basic Landscape Design	**SS 2.5**	2	2	0		0
		2.3	Limit Conventional Turf	**SS 2.5**	3	2	1		2
		2.4	Drought Tolerant Plants	**SS 2.5**	2	1	1		1
		2.5	Reduce Overall Irrigation Demand by at Least 20%		6	0	0	N	0
3. Local Heat Island Effects		3	Reduce Local Heat Island Effects		1	0	0	N	0
4. Surface Water Management		4.1	Permeable Lot		4	0	1		0
		4.2	Permanent Erosion Controls		1	0	0	N	0
		4.3	Management of Run-off from Roof		2	2	0		0
5. Nontoxic Pest Control		5	Pest Control Alternatives		2	1.5	0		0
6. Compact Development		6.1	Moderate Density	**SS 6.2, 6.3**	2	0	2	N	0
		6.2	High Density	**SS 6.3**	3	0	0	N	0
		6.3	Very High Density		4	4	0		0
				Sub-Total for SS Category:	***22***	*13.5*	*5*		***3***

Figure 5-5
LEED Scorecard Building 5
Source: New Ecology, 2015

LEED for Homes Simplified Project Checklist (continued)

					Max Points	Project Points Preliminary			Final
Water Efficiency (WE)			(Minimum of 3 WE Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Water Reuse		1.1	Rainwater Harvesting System	**WE 1.3**	4	0	0	N	0
		1.2	Graywater Reuse System	**WE 1.3**	1	0	0	N	0
		1.3	Use of Municipal Recycled Water System		3	0	0	N	0
2. Irrigation System	✎	2.1	High Efficiency Irrigation System	**WE 2.3**	3	3	0		0
		2.2	Third Party Inspection	**WE 2.3**	1	0	0	N	0
	✎	2.3	Reduce Overall Irrigation Demand by at Least 45%		4	0	0	N	0
3. Indoor Water Use		3.1	High-Efficiency Fixtures and Fittings		3	1	0		0
		3.2	Very High Efficiency Fixtures and Fittings		6	4	0		0
				Sub-Total for WE Category:	**15**	8	0		0
Energy and Atmosphere (EA)			(Minimum of 0 EA Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Optimize Energy Performance		1.1	Performance of ENERGY STAR for Homes		Prereq	Y			
		1.2	Exceptional Energy Performance		34	13	0		13
7. Water Heating	✎	7.1	Efficient Hot Water Distribution		2	0	0	N	0
		7.2	Pipe Insulation		1	0	1		0
11. Residential Refrigerant Management		11.1	Refrigerant Charge Test		Prereq	Y			
		11.2	Appropriate HVAC Refrigerants		1	1	0		0
				Sub-Total for EA Category:	**38**	14	1		13
Materials and Resources (MR)			(Minimum of 2 MR Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. Material-Efficient Framing		1.1	Framing Order Waste Factor Limit		Prereq	Y			
		1.2	Detailed Framing Documents	**MR 1.5**	1	0	0	N	0
		1.3	Detailed Cut List and Lumber Order	**MR 1.5**	1	0	0	N	0
		1.4	Framing Efficiencies	**MR 1.5**	3	0	0	N	0
		1.5	Off-site Fabrication		4	4	0		0
2. Environmentally Preferable Products	✎	2.1	FSC Certified Tropical Wood		Prereq	Y			
	✎	2.2	Environmentally Preferable Products		8	3	0.5		0
3. Waste Management		3.1	Construction Waste Management Planning		Prereq	Y			
		3.2	Construction Waste Reduction		3	2.5	0		2.5
				Sub-Total for MR Category:	**16**	9.5	0.5		2.5
Indoor Environmental Quality (EQ)			(Minimum of 6 EQ Points Required)	*OR*	Max	Y/Pts	Maybe	No	Y/Pts
1. ENERGY STAR with IAP		1	ENERGY STAR with Indoor Air Package		13	0	0	N	0
2. Combustion Venting		2.1	Basic Combustion Venting Measures	**EQ 1**	Prereq	Y			
		2.2	Enhanced Combustion Venting Measures	**EQ 1**	2	2	0		0
3. Moisture Control		3	Moisture Load Control	**EQ 1**	1	0	0	N	0
4. Outdoor Air Ventilation	✎	4.1	Basic Outdoor Air Ventilation	**EQ 1**	Prereq	Y			
	✎	4.2	Enhanced Outdoor Air Ventilation		2	0	2		0
		4.3	Third-Party Performance Testing	**EQ 1**	1	0	0	N	0
5. Local Exhaust	✎	5.1	Basic Local Exhaust	**EQ 1**	Prereq	Y			
		5.2	Enhanced Local Exhaust		1	1	0		0
		5.3	Third-Party Performance Testing		1	0	0	N	0
6. Distribution of Space Heating and Cooling	✎	6.1	Room-by-Room Load Calculations	**EQ 1**	Prereq	Y			
		6.2	Return Air Flow / Room by Room Controls	**EQ 1**	1	0	0	N	0
		6.3	Third-Party Performance Test / Multiple Zones	**EQ 1**	2	0	0	N	0
7. Air Filtering		7.1	Good Filters	**EQ 1**	Prereq	Y			
		7.2	Better Filters	**EQ 7.3**	1	0	0	N	0
		7.3	Best Filters		2	0	0	N	0
8. Contaminant Control	✎	8.1	Indoor Contaminant Control during Construction	**EQ 1**	1	1	0		0
		8.2	Indoor Contaminant Control		2	0	0	N	0
	✎	8.3	Preoccupancy Flush	**EQ 1**	1	0	0	N	0
9. Radon Protection	✎	9.1	Radon-Resistant Construction in High-Risk Areas	**EQ 1**	Prereq	N/A			
	✎	9.2	Radon-Resistant Construction in Moderate-Risk Areas	**EQ 1**	1	0	0	N	0
10. Garage Pollutant Protection		10.1	No HVAC in Garage	**EQ 1**	Prereq	Y			
		10.2	Minimize Pollutants from Garage	**EQ 1, 10.4**	2	0	0	N	0
		10.3	Exhaust Fan in Garage	**EQ 1, 10.4**	1	0	0		0
		10.4	Detached Garage or No Garage	**EQ 1**	3	3	0		0
				Sub-Total for EQ Category:	**21**	7	2		0
Awareness and Education (AE)			(Minimum of 0 AE Points Required)		Max	Y/Pts	Maybe	No	Y/Pts
1. Education of the Homeowner or Tenant	✎	1.1	Basic Operations Training		Prereq	Y			
	✎	1.2	Enhanced Training		1	0	0	N	0
		1.3	Public Awareness		1	0	0	N	0
2. Education of Building Manager	✎	2	Education of Building Manager		1	1	0		0
				Sub-Total for AE Category:	**3**	1	0		0

Figure 5-6

LEED Scorecard Building 5 (continued)

Source: New Ecology, 2015

Chapter 6

ENVIRONMENTAL PROTECTION

CHAPTER 6: ENVIRONMENTAL PROTECTION

6.1 INTRODUCTION

The Whittier Choice Neighborhood Project (The Project) will be built in full compliance with local, state and federal environmental regulations. The Project will substantially improve the environmental context and quality of the Project Site by enhancing and improving soil conditions, landscape, open space and by removing outdated and hazardous building materials. The Project will not create undue wind, shadow, noise solar glare or air quality impacts in the immediate or surrounding area. The Proponent will ensure that remediation activities are undertaken in accordance with federal and state regulations.

6.2 WIND

Novus Environmental undertook a Pedestrian Wind Assessment for the Project. This is attached as Appendix C. The study concluded that the Project is not expected to have significantly increased new pedestrian level wind impacts adjacent and in the vicinity of the Project Site. The main building entrances are well situated and suitable for the intentional usage. Surrounding the development, wind conditions in the Build Configuration are generally similar to the No Build Configuration.

Building 1 will not have a significant or detrimental effect on pedestrian level wind conditions.

Existing dangerous wind conditions are present in the No Build Configuration. The proposed Project shifts some of these wind conditions along Tremont Street, wrapping around the northeast corner of Building 4. Therefore, the proposed development does not significantly change wind conditions in the area, rather it relocates some of the higher impact areas.

Recommendations for mitigation at the northeast corner of Building 4:

- Incorporating a horizontal element (i.e., podium or canopy) between the second and fourth floors along the north and east facades. This should be a minimum of 15 ft wide.

- Extending the upper canopy along the entire north facade, with a minimum width of 15 ft. The extension of this canopy around the east side will be considered during the advancement of Buildings 4 and 5.

6.3 SHADOW

A shadow analysis was conducted for the Project to ensure that the proposed new buildings would not create adverse new shadow impacts. Table 6-1, Shadow Study Dates and Times identifies the dates and times for which shadow conditions have been simulated.

Table 6-1, Shadow Study Dates and Times

Date	Time
Vernal Equinox — March 21st	9:00 a.m., 12:00 p.m., 3:00 p.m.
Summer Solstice — June 21st	9:00 a.m., 12:00 p.m., 3:00 p.m., 6:00 p.m.
Autumnal Equinox — September 21st, EDT	9:00 a.m., 12:00 p.m., 3:00 p.m.
Winter Solstice — December 21st, EST	9:00 a.m., 12:00 p.m., 3:00 p.m.

The following description is in reference to the shadow study images show in Figures 6-1 to 6-4. All net new shadows are shown in light blue and existing shadow is shown in gray. Areas where new shadow is captured within existing shadow is shown in a green.

Vernal Equinox — March 21st (Figure 6-1)

During the vernal equinox, no new shadow will be cast onto surrounding existing open spaces, including Madison Park. At 9:00 a.m., shadows are cast in a northwesterly direction. New shadow is cast onto a portion of the proposed Hampshire Street Extension and its sidewalks. The Project's new open spaces will be both shaded and unshaded, with only portions shaded by new shadow.

At 12:00 p.m., shadow will be cast in a northerly direction. New shadow will be cast onto small portions of Tremont Street's northern sidewalk, as well as portions of Ruggles Street.

The Project's new open spaces will be both shaded and unshaded, with only portions shaded by new shadow.

At 3:00 p.m., shadow will be cast in a northeasterly direction. New shadow will be cast onto portions of Ruggles Street and its sidewalks, the new multi-use path, and a small portion of the proposed Hampshire Street Extension and its southern sidewalk. The Project's new open spaces will be both shaded and unshaded, with only portions shaded by new shadow.

Summer Solstice — June 21st (Figure 6-2)

During the summer solstice, no new shadow will be cast onto surrounding existing open spaces, except for minor shadows on Madison Park to the south at 6:00pm.

At 9:00 a.m., shadow will be cast in a westerly direction. New shadow will be cast onto portions of Tremont Street and its southern sidewalks and a portion of Whittier Street and its eastern sidewalk. The Project's new open spaces will be both shaded and unshaded, with only portions shaded by new shadow.

At 12:00 p.m., shadow will be limited to areas directly adjacent to the new buildings. New shadow will be cast onto portions of Tremont Street, and very minor portions of the Project's new open spaces, creating areas of shade allowing users to find comfort on hot days.

At 3:00 p.m., shadow will be cast in a northeasterly direction. New shadow will be cast onto minor portions of Ruggles eastern sidewalk and portions of Cabot Street's northern sidewalk. Portions of the Project's new open spaces will be shaded, providing areas out of the sun allowing users to find comfort on hot days.

At 6:00 p.m., shadow will be cast in an easterly direction. New shadow will be cast onto Ruggles Street and its sidewalks and portions of Cabot Street and its sidewalks. Areas of the Project's new open spaces will have new shadow cast on them, with areas of sunlight still available.

Autumnal Equinox — September 21st (Figure 6-3)

During the autumnal equinox, no new shadow will be cast onto surrounding existing open spaces, including Madison Park.

At 9:00 a.m., shadow will be cast in a westerly direction. New shadow will be cast across portions of Tremont Street and its sidewalks and Whittier Street and its sidewalks. The Project's new open spaces will be both shaded and unshaded, with only portions shaded by new shadow.

At 12:00 p.m., shadow will be cast in a northerly direction. New shadow will be cast onto portions of Tremont Street and its sidewalks and minor portions of Ruggles Streets southern sidewalk. The Project's new open spaces will be both shaded and unshaded, with only minor portions shaded by new shadow.

At 3:00 p.m., shadow will be cast in a northeasterly direction. New shadow will be cast onto portions of Ruggles Street and its sidewalks, and minor portions of Cabot Street's western sidewalk. The Project's new open spaces will be both shaded and unshaded, with only portions shaded by new shadow.

Winter Solstice — December 21st (Figure 6-4)

The winter solstice creates the least favorable conditions for sunlight in New England. The sun angle during the winter is lower than in any other season, causing the shadows in urban areas to elongate and be cast onto large portions of the surrounding area.

At 9:00 a.m. during the winter solstice, new shadow will be cast in a northwesterly direction. New shadow will be cast onto portions of Tremont Street and its sidewalks, Whittier Street and its sidewalks, and a portion of the proposed Hampshire Street Extension and its sidewalks. Most of the Project's new open spaces will be under shadow, but only a portion will be under new shadow.

At 12:00 p.m., new shadow will be cast in a northerly direction. New shadow will be cast onto portions of Tremont Street and its sidewalks and Ruggles Street and its sidewalks. The Project's open spaces will include areas of sun and shade, with only portions under new shadow. No new shadow will be cast on existing surrounding open spaces, including Madison Park.

At 3:00 p.m., new shadow will be cast in a northwesterly direction. New shadow will be cast onto Ruggles Street and its sidewalks and the proposed Hampshire Street Extension and its sidewalks. Most of the Project's new open spaces will be under shadow. No new shadow will be cast onto Madison Park.

The Project will create limited new shadow in the area. New shadow will generally be cast onto the adjacent streets and their sidewalks. New shadow will be cast onto the open space within the Whittier Street development during periods of time and on limited areas of Madison Park. However, no new shadow will be cast onto other existing open spaces in the surrounding area. The Project's new open spaces will include both shaded and unshaded areas during all time periods studied, with only a portion of the shadow resulting from the Project.

6.4 DAYLIGHT

The Project is being constructed in relatively a low-density area for an urban setting. The width of Tremont Street and the absence of a street wall on the other side of it will ensure adequate daylight on all sides of the proposed buildings. The generous open space between the Project's proposed buildings ensures sufficient daylight will reach different surfaces.

6.5 SOLAR GLARE

A solar glare analysis is intended to measure potential reflective glare from the buildings onto streets, public open spaces, and sidewalks in order to determine the likelihood of visual impairment or discomfort due to reflective spot glare. As a result of the design and use of generally non-reflective materials and the distance between the new buildings and

existing buildings, it is not anticipated that the Project will have adverse solar glare impacts or create solar heat buildup in nearby buildings. Trees in front of the buildings will further absorb sunlight to minimize its reflection off of the building onto the street and sidewalk.

6.6 AIR QUALITY

This section provides a qualitative review of air quality sources and impacts as a result of the Project from traffic, parking, and heating and mechanical ventilation systems. Impacts from construction and operations are addressed in Section 6.13, Construction Impacts.

6.6.1 **TRAFFIC SOURCES**

Due to the relatively modest number of new vehicle trips contributed to the local network by the Project, the impact of project trips on the performance of the transportation study area intersections relative to air quality is minor. The BRA typically requires a future air quality CO analysis for any intersection where the level of service (LOS) is expected to fall to a D or lower and the proposed Project causes a 10% increase in traffic; or where the LOS is E or F and the project contributes to a reduction in LOS.

Transportation Demand Management (TDM) strategies are a significant component of this Project and are anticipated to assist in minimizing traffic impacts and, by extension, air quality impacts. The following measures aim to keep traffic levels at acceptable volumes, promoting alternative means of transportation that have lesser impacts on overall air quality for the Project:

- Parking management
- Promotion of public transit and dissemination of transit information
- Secure, covered bicycle storage for Project's residents
- Publicly accessible bicycle storage for Project's visitors

6.6.2 **PARKING SOURCES**

A two-level underground parking garage is planned as part of the Project beneath Building 4, totaling 121 spaces. 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.

6.6.3 BUILDING OPERATION SOURCES

An emergency generator, if necessary, will be located on Project Site. It would be selected and sited to be in compliance with Department of Environmental Protection (DEP) standards, and its noise would be abated appropriately.

6.7 NOISE

The Proponent does not anticipate an increase in noise impacts associated with the residential or commercial uses at the Site. The Boston Air Pollution Control Commission regulates noise in the City of Boston based on zoning and land use classification. The regulations set fixed noise limits for daytime and nighttime use of equipment serving the building (for residential areas, a maximum level of 60 dBA for daytime use, and 50 dBA for nighttime use is required). These levels are limits for equipment sound assessed at the property lines of the Project. The limits apply to equipment that operates on a significant basis to serve the building, such as air conditioning equipment and fans. In addition to the overall sound level requirements, the regulations list specific octave band frequency limits for daytime and night time periods.

The primary sources of exterior sound for the Project will include proposed individual unit heating and cooling systems, and a minimal number of rooftop condensing units serving individual common areas and commercial areas. Based on the general equipment design, the rooftop equipment is not expected to produce significant sound levels at the building property lines, though noise control measures will be provided if required.

Intermittent increases in noise levels will occur in the short-term during construction. Construction work will comply with the requirements of the City of Boston Noise Ordinance. Noise impacts will be controlled during construction, as appropriate, through the use of mufflers on heavy equipment, construction hour restrictions, and other noise mitigation.

6.8 FLOOD ZONES

In the past decade, climate change adaptation has gained national attention as a critical environmental factor that must be addressed in new development projects. In Boston, sea level rise has become a serious concern as recent weather patterns and future modeling are demonstrating that storms impacting the city are likely to continue to intensify.

As part of its administration of the National Flood Insurance Program (NFIP), the Federal Emergency Management Agency (FEMA) publishes flood hazard maps, called Flood Insurance Rate Maps (FIRM). The purpose of a FIRM is to show the areas in a community that are subject to flooding and the risk associated with these flood hazards. A new map

was published in 2009 that updated the flood zones for this area. According to FEMA, the Project Site is not contained in a flood zone.

6.9 GROUNDWATER

Available subsurface information indicates that the site is covered by a surficial deposit of miscellaneous fill material extending to depths of approximately 9 to 17 feet below existing ground surface. Underlying the fill deposit, a 2 to 9.5-foot thick organic deposit was generally encountered across the majority of the subject site. The organic deposit generally consists of a very soft to firm, gray to dark brown sandy organic silt with peat fibers. The fill deposit and/or organics are underlain by interbedded layers of glacial outwash sand and marine clay that extend to depths of 88.5 to 98 feet below the existing ground surface. The interbedded layers of glacial outwash and marine clay deposit is underlain by a deposit of glacial till which directly overlays the bedrock surface at depths of 100 to 107.5 feet below existing ground surface. Groundwater was documented to have been encountered across the site at depths ranging from 6.5 to 13.4 feet below ground surface.

Dewatering during excavation for site utilities and new foundations at Buildings 1 and 5 (no below-grade space) is anticipated to be accomplished through use of localized sumping methods and on-site groundwater recharge. At Building 4 (2 levels of below-grade parking space), dewatering will likely require the use of strategically placed deep wells and/or well point systems to control groundwater during excavation. Excavation and construction of the 2-level below-grade garage will extend to depths of roughly 24 feet below ground surface, about 15 feet below the observed groundwater level, and thus will require a temporary lateral earth support system that is anticipated to consist of interlocking steel sheet piling. The project will obtain a temporary construction dewatering discharge permit through either the US EPA or MWRA in conjunction with BWSC approval to discharge pumped groundwater to the City of Boston storm drain system or MWRA combined sewer system. The project site is not located within the Groundwater Conservation Overlay District (GCOD) as outlined in Article 32 of the City of Boston Zoning Code. However, the Project will include the installation of groundwater observation wells in the vicinity of the site before site excavation to facilitate monitoring of the groundwater levels before, during, and following construction.

6.10 GEOTECHNICAL

Based upon the proposed scope of development and the anticipated subsurface conditions, preliminary foundation design of the proposed mid-rise Buildings 1 and 5 are anticipated to consist of conventional spread footing foundations bearing on aggregate pier improved soil. Preliminary foundation design of the proposed high-rise Building 4 is anticipated to consist of a water-proofed mat foundation with waterproofed foundation walls bearing on the natural marine clay or glacial outwash sand deposits.

Ground vibrations will be produced as a result of the steel sheet pile and aggregate pier installation procedures. Based on our experience, impacts from these vibrations are not anticipated to result in structural damage to existing, adjacent structures. Vibration monitoring with seismographs will be performed during the steel sheet pile and aggregate pier installation activities.

6.11 SOLID AND HAZARDOUS WASTE

The majority of the site was undeveloped land until the late 1880s. Past uses of the site included machine and metal shops and an auto repair facility. The existing Whittier Street Housing Project was constructed in the early 1950s. Previous environmental assessments indicated records of underground storage tanks (USTs) and above ground storage tanks (ASTs).

The Project site is a MADEP listed release site with the MA Department of Environmental Protection (DEP) with six (6) documented releases associated with leaking USTs that were present at the subject site or due to overfilling of a fuel oil storage tank. Remedial response actions have been completed in regards to each of these releases which included cleaning and removal of tanks and excavation and off-site reuse of contaminated soil. A Class A-1 or A-2 Response Action Outcome (RAO) Statements were filed with the MADEP for five of the six release sites. A Class A-1 or A-2 RAO documents that a Permanent Solution was achieved, a Condition of No Significant Risk exists for current and future conditions, and that the implementation of an Activity and Use Limitation (AUL) was not required to maintain that condition. For the sixth release site, the DEP issued a determination of Not a Disposal Site. Hence, no further action was required.

A Phase I Environmental Site Assessment (ESA) report has been completed for this Project. A Phase II ESA has been completed. The scope of the Phase II ESA included the completion of a subsurface exploration program consisting borings, installation of groundwater monitoring wells, and soil and groundwater quality testing prior to construction to identify possible affects to the subsurface from historical site use and/or from off-site nearby DEP releases or uses, and to determine the options for on-site and/or off-site reuse, recycling, or disposal of excavated soil. Groundwater testing will be conducted to further assess potential impacts from the contaminants of concern at the site and to facilitate filing of a temporary construction dewatering discharge permit application. Remedial activities that may be performed at the Project site will be managed in compliance with the provisions of the Massachusetts Contingency Plan 310 CMR 40.0000. (MCP).

Excess excavated soil will require characterization to assess its disposition for off-site reuse, disposal, treatment or recycling in accordance with DEP policy and the MCP. The results of the soil pre-characterization program will be documented in a Soil Management Plan which will be provided to the Contractor for construction.

6.12 CONSTRUCTION IMPACTS

6.12.1 CONSTRUCTION MANAGEMENT PLAN

A Construction Management Plan ("CMP"), in compliance with the City of Boston's Construction Management Program, will be submitted to the Boston Transportation Department (BTD). This plan will include detailed information about construction activities, specific construction mitigation measures, and construction materials access and staging area plans to minimize impact on the surrounding neighborhood.

Construction methodologies that ensure public safety and protect nearby residents will be employed. Techniques such as barricades, walkways, and signage will be used. Construction management and scheduling will minimize impacts on the surrounding environment and will include plans for construction worker commuting, routing plans for trucking and deliveries, and control of noise and dust. Although the design of the new building is in process, the Proponent has begun to develop a plan for how traffic, parking, and construction staging will be managed during construction.

6.12.2 CONSTRUCTION ACTIVITY SCHEDULE

Demolition and construction of the Project are expected to proceed over the course of 48 to 60 months. Demolition of one existing building and construction of Building 1 will be initiated while the remaining buildings are occupied. The Proponent will work with the City and with the community to ensure that planned construction activities are scheduled and communicated as required.

6.12.3 CONSTRUCTION TRAFFIC IMPACTS

The number of workers required for the construction of the Project will vary depending upon the stage of construction. Construction workers will typically arrive and depart prior to peak traffic conditions and the construction trips are not expected to substantially impact traffic conditions.

The general contractor will be responsible for educating all construction workers about public transit options and encouraging the use of High Occupancy Vehicles (HOVs). All construction workers will be encouraged to utilize mass transit and ridesharing options to access the construction site and to minimize vehicle traffic and parking on the local streets. As part of the program to promote public transportation, the following will be implemented:

- Providing on-site secured space for workers' tool storage
- Posting transit schedules and maps at the jobsite

- Distributing informational brochures regarding public transportation
- Notifying all subcontractors and suppliers of the worker access/parking limitations and options

The Proponent will submit a Boston Residents Construction Employment Plan in accordance with the Boston Jobs Policy. The Plan will provide that the Proponent make good faith efforts to employ local tradespeople from the City of Boston. In this effort, the Proponent will meet with local agencies prior to the start of construction to establish a community outreach program.

6.12.4 CONSTRUCTION WORKER PARKING

The number of workers required for the construction of the Project will vary depending upon the stage of construction. Construction workers will typically arrive and depart prior to peak traffic conditions and the construction trips are not expected to substantially impact traffic conditions.

The general contractor will be responsible for educating all construction workers about public transit options and encouraging the use of High Occupancy Vehicles (HOVs). All construction workers will be encouraged to utilize mass transit and ridesharing options to access the construction site and to minimize vehicle traffic and parking on the local streets. As part of the program to promote public transportation, the following will be implemented:

- Providing on-site secured space for workers' tool storage
- Posting transit schedules and maps at the jobsite
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The Proponent will submit a Boston Residents Construction Employment Plan in accordance with the Boston Jobs Policy. The Plan will provide that the Proponent make good faith efforts to employ local trades people from the City of Boston. In this effort, the Proponent will meet with local agencies prior to the start of construction to establish a community outreach program.

6.12.5 CONSTRUCTION AIR QUALITY

Short-term air quality impacts from fugitive dust may be expected during the removal of soil materials and during the early phases of the Site preparation activities. The construction contract for the Project will require the contractor to reduce potential emissions and minimize air quality impacts. Mitigation measures are expected to include the use of wetting agents where needed on a scheduled basis, covered trucks, minimizing exposed construction debris stored on-site, monitoring construction practices to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized, locating aggregate storage piles away from areas having the greatest pedestrian activity when possible, and periodic cleaning of streets and sidewalks to reduce dust accumulations.

6.12.6 CONSTRUCTION NOISE IMPACTS

Intermittent increases in noise levels will occur in the short term during the construction of the new building. Work will comply with the requirements of the City of Boston Noise Ordinance. Efforts will be made to minimize the noise impact of construction activities, including appropriate mufflers on all equipment such as air compressors and welding generators, maintenance of intake and exhaust mufflers, turning off idling equipment, replacing specific operations and techniques with less noisy ones, and scheduling equipment operations to synchronize the noisiest operations with times of highest ambient noise levels.

6.12.7 SEDIMENT CONTROL MEASURES

During demolition and construction, erosion and sediment control measures will be implemented to minimize the transport of Site soils to off-site areas and BWSC storm drain systems. The existing catch basins will be protected with filter fabric or silt sacks to remove sediment 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.

Other sediment controls, which will be implemented as needed during construction, will include the following:

- Stacked hay bales and/or silt fence barriers will be installed at the base of stockpiled soils and at erosion-prone areas throughout the construction phase of the Project
- Erosion controls will be maintained and replaced as necessary to ensure their effectiveness

- Where necessary, temporary sedimentation basins will be constructed to prevent the transport of sediment off-site

- Measures to control dust will be implemented during renovations— all debris will be properly contained on the Project Site.

Erosion controls will be maintained and replaced as necessary until the installation of pavement and the establishment of stabilized vegetation at the Site.

6.12.8 CONSTRUCTION NOISE IMPACTS

Intermittent increases in noise levels will occur in the short term during the construction of the new building. Work will comply with the requirements of the City of Boston Noise Ordinance. Efforts will be made to minimize the noise impact of construction activities, including appropriate mufflers on all equipment such as air compressors and welding generators, maintenance of intake and exhaust mufflers, turning off idling equipment, replacing specific operations and techniques with less noisy ones, and scheduling equipment operations to synchronize the noisiest operations with times of highest ambient noise levels.

6.12.9 RODENT CONTROL

The contractor will file a rodent extermination certificate with the building permit application to the City. Rodent inspection, monitoring, and treatment will be carried out before, during, and at the completion of all construction work for the Project, in compliance with the City's requirements. Rodent extermination prior to commencing work will treat areas throughout the Site, including building interiors. During the construction process, regular service visits will be made to maintain effective rodent control levels.

6.13 WILDLIFE HABITAT

The Project Site is fully developed with urban landscape and other hardscape materials. The Project will not impact important wildlife habitats. According to current Massachusetts Natural Heritage & Endangered Species Program maps, no Priority or Estimated Habitats are located on or within the vicinity of the Project Site.

6.14 HISTORIC RESOURCES

6.14.1 HISTORIC RESOURCES ON THE PROJECT SITE

Although a number of historic properties and resources are located within ¼ mile of the Project Site, no resources have been identified within the Project Site acreage.

6.14.2 HISTORIC RESOURCES IN THE VICINITY OF THE PROJECT SITE

Saint Francis de Sales Roman Catholic Church

Saint Francis de Sales Roman Catholic Church, located at 175 Ruggles Street, was constructed in 1897 and later in 1934 and 1972. It is presently St. Katherine Drexel Parish and serves Boston's Nigerian Catholic community. In spite of these additions/renovations, the parish appears to be in good condition and retains the characteristic style of Gothic Revival architecture. No information is available about its architect. Project activities will not impact this building or its context. See Figure 6-1, Historic and Archaeological Resources.

The Berger Factory

Located at 37 Williams Street, this industrial building was built by entrepreneurs George Moffette and Henry J. Preston in 1902 as a manufacturing facility for surveying instruments[1]. The sons of the partners were trained in the manufacture of survey instruments in Stuttgart, Germany. The factory remained in use for that purpose until 1947, when the company was acquired by Charles S. Narins of New York. Though added to the National Register of Historic Places in 1980, it does not represent a distinctive architectural style and added to the National and State Register of Historic Places in 1980. The Project will not impact this structure.

John Eliot Square Historic District

The John Eliot Square Historic District is a 95-acre district in Lower Roxbury characterized by its unique mix of architectural styles (Georgian, Federal, 19th Century Revival, and Late Victorian) and uses (civic, residential, religious, and commercial). The district consists of 19 buildings across 95 acres centered on Dudley, Bartlett, Centre, Roxbury, and Dudley Streets. The square developed at the fok of the only road to Boston from the inland towns. Notable landmarks include the First Church of Roxbury, Boston's oldest surviving wooden meeting house built in 1804 in the Federal Style, and the Dillaway-Thomas House, a Georgian-style parsonage for the pastor of the First Church of Roxbury built in 1750. John Eliot Square is named for Roxbury resident John Eliot (c. 1604–1690), a Puritan missionary known as "the apostle to the Indians". The district was added to the National Register of Historic Places in 1973. The heritage of this square is commemorated as the Roxbury Heritage State Park.

[1] http://www.surveyhistory.org/c__l__berger_&_sons_inc_.htm

Lower Roxbury Historic District

This 32-acre district just north of the Project Site consists of 36 buildings surrounding Coventry, Cunard, and Walpole Streets. Built from approximately 1870 to 1925, the contributing buildings include religious structures, commercial structures, warehouses, and residential buildings, and represent several styles, including renaissance, classical revival, and Late Gothic Revival. Construction dates of these buildings range from 1850 to 1949, and are primarily masonry buildings averaging four to five stories.

Frederick Douglass Square Historic District

The Frederick Douglass Square Historic District is roughly bounded by Hammond, Cabot, and Windsor Streets in Lower Roxbury, just north of the Project Site. Centering on Frederick Douglass Square, known in as "The Square", a forum for political rallies, protest meetings, and public celebrations for the abolitionist cause. The oldest building in the district dates from approximately 1860. A number of the buildings served as stations in the underground railroad, and a number of slave "tunnels" are believed to still exist in the area, according to the inventory form. The streets to the southeast of the square are occupied by brick row houses contrasted in 1871 by the Tremont Improvement Company, for whom Madison Park was its most prestigious address. Buildings in the area are modest representations of Queen Anne, Gothic, and Second Empire architectural styles. The 50-acre district is listed in the State and National Registers of Historic Places.

Dudley Station Historic District

The Dudley Station Historic District is a y-shaped 200 acre district located at the intersection of Washington, Warren, and Dudley Streets in Roxbury. The 29 contributing buildings represent a range of architectural styles from the 19th and 20th centuries in masonry commercial forms: Italianate, Second Empire, High Victorian Gothic, Queen Anne, Second Renaissance Revival, Neo-Georgian. These buildings date from approximately the 1870s to 1920s when the area surrounding Dudley Railroad Station was a hub of industry and commerce for all of Roxbury, even prior to its annexation to Boston. Many of the buildings were designed by prominent Boston architects[2]. According to the Inventory-Nomination form, in general the buildings in the district have been underutilized and "have suffered certain inappropriate renovations, especially at the ground floor". The district is presently undergoing renovation and will not be impacted by project activities.

[2] http://www.discoverroxbury.org/roxbury-s-history

Eliot Burying Ground

Located at Washington and Eustis Streets, this area is sited just outside of the defined "vicinity" for the project, but its presence could suggest archaeological/historical resources nearer to the project site.

Table 6-2, Individual Historic Resources in the Vicinity of the Project Site

Name	Address	Listing/Designation
Saint Francis de Sales Roman Catholic Church	159 Ruggles Street	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth
The Berger Factory	37 Williams Street	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth
Dudley Station Historic District	Washington, Warren, and Dudley Streets	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth
John Eliot Square Historic District	Dudley, Bartlett, Centre, Roxbury and Highland Streets	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth
Lower Roxbury Historic District	roughly comprising the area surrounding Coventry, Cunard, and Walpole Streets	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth
Frederick Douglass Square Historic District	Hammond, Cabot, Windsor Streets	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth
Eliot Burying Ground	Washington and Eustis Streets	State and National Register of Historic Places Inventory of Historic and Archeological Assets of the Commonwealth

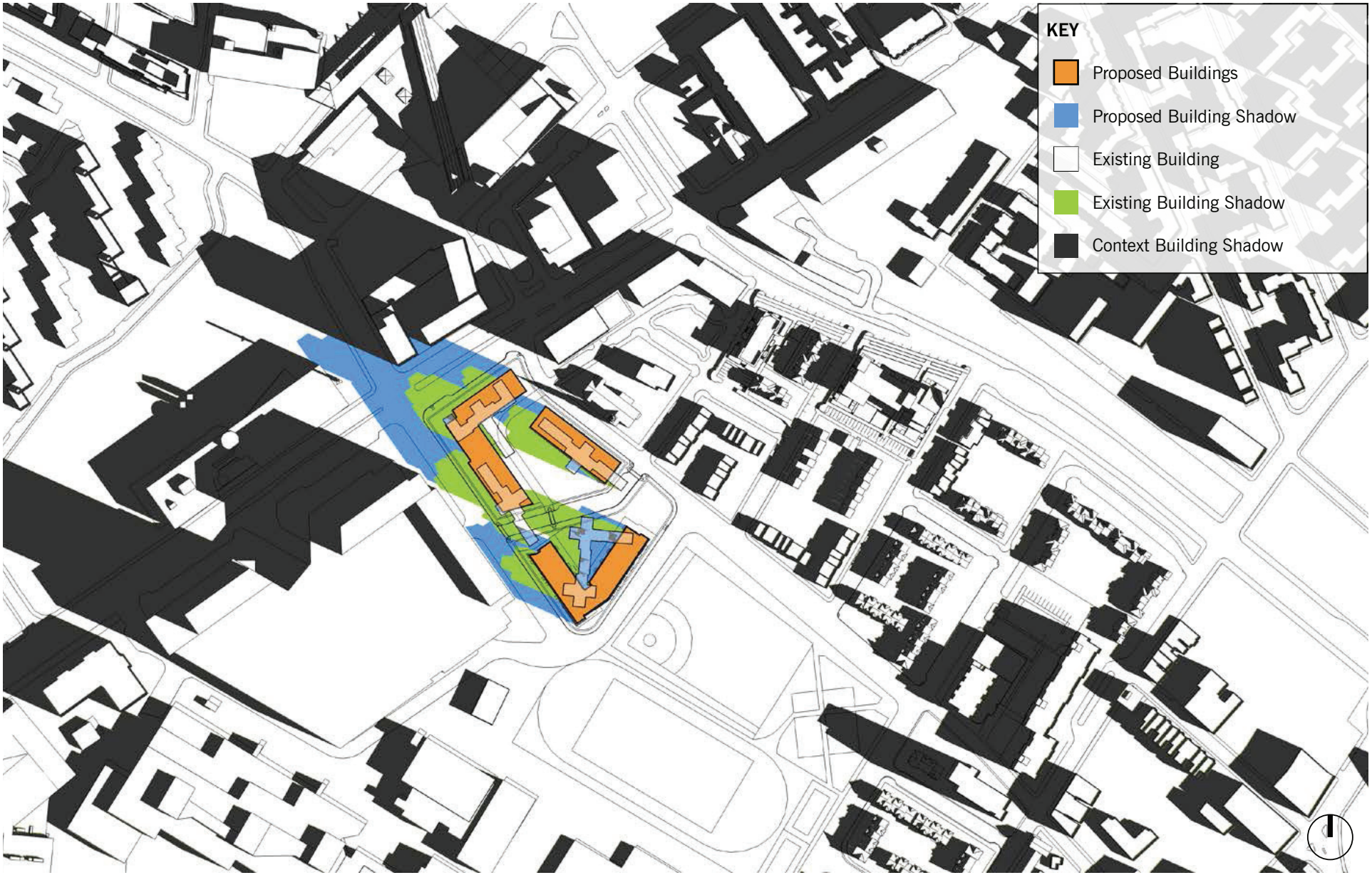


Figure 6-1
Shadow Studies: March 21, 9:00 AM
Source: The Architectural Team, 2015

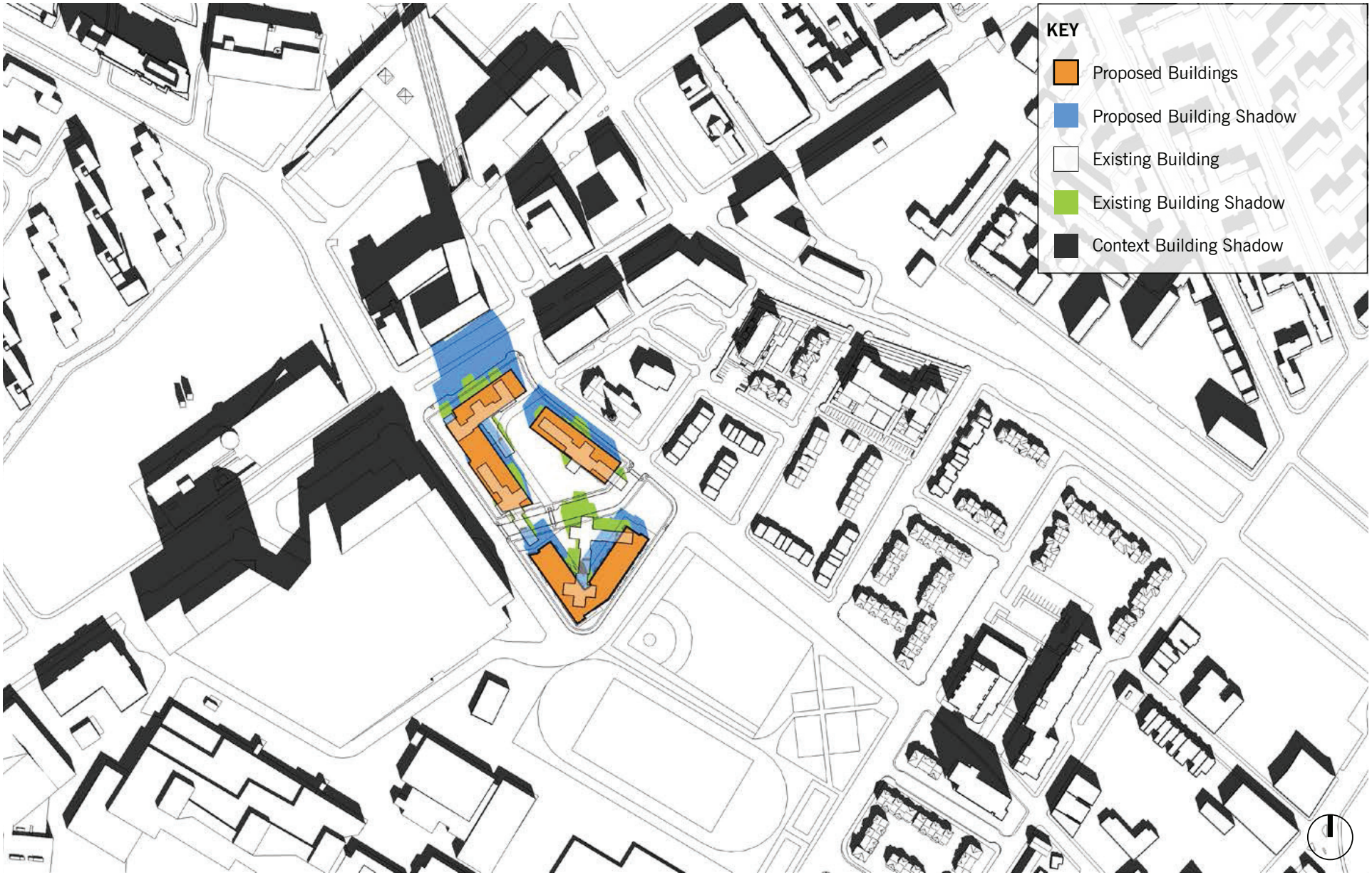


Figure 6-2
Shadow Studies: March 21, 12:00 PM
Source: The Architectural Team, 2015

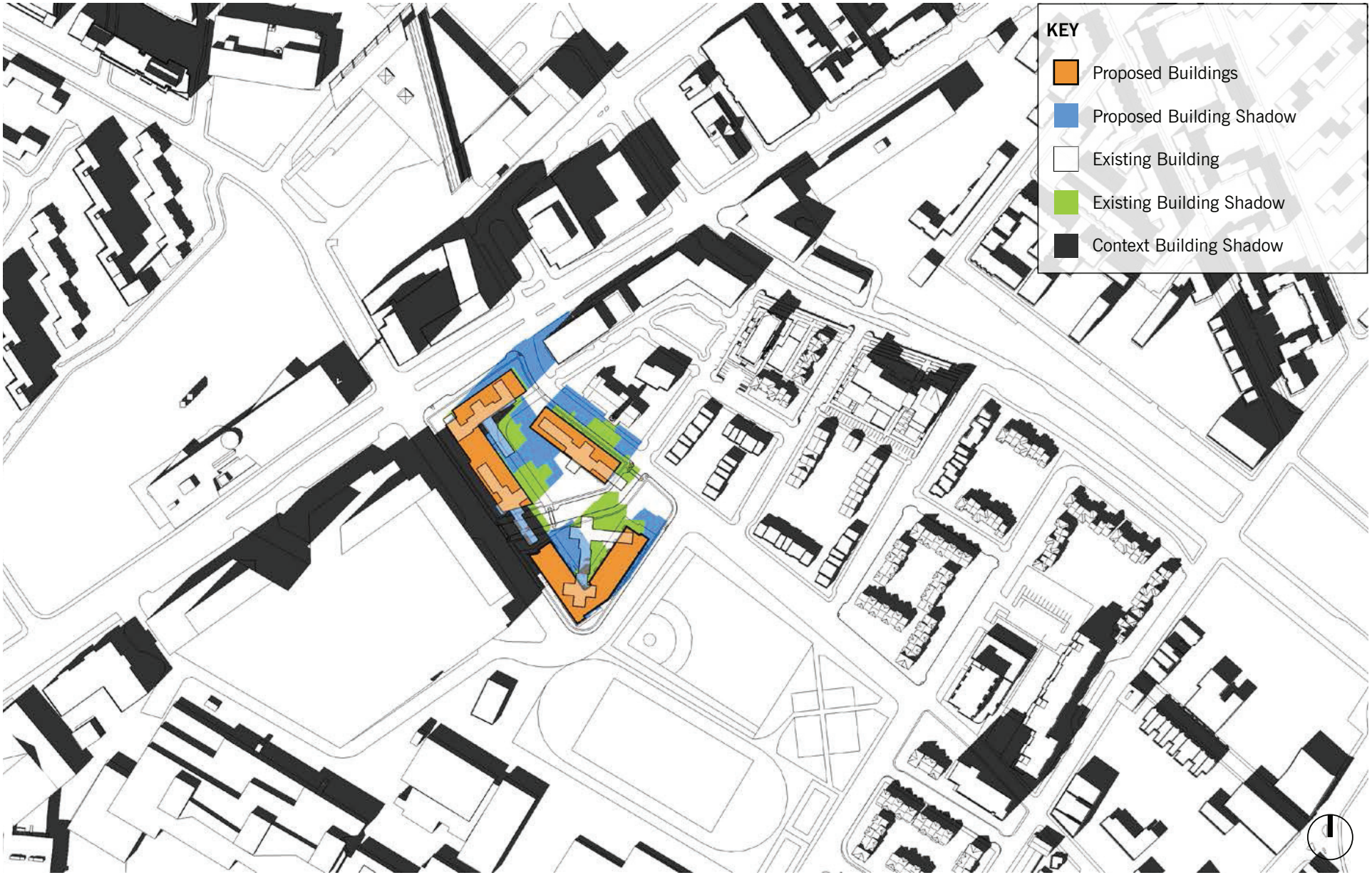


Figure 6-3
Shadow Studies: March 21, 3:00 PM
Source: The Architectural Team, 2015

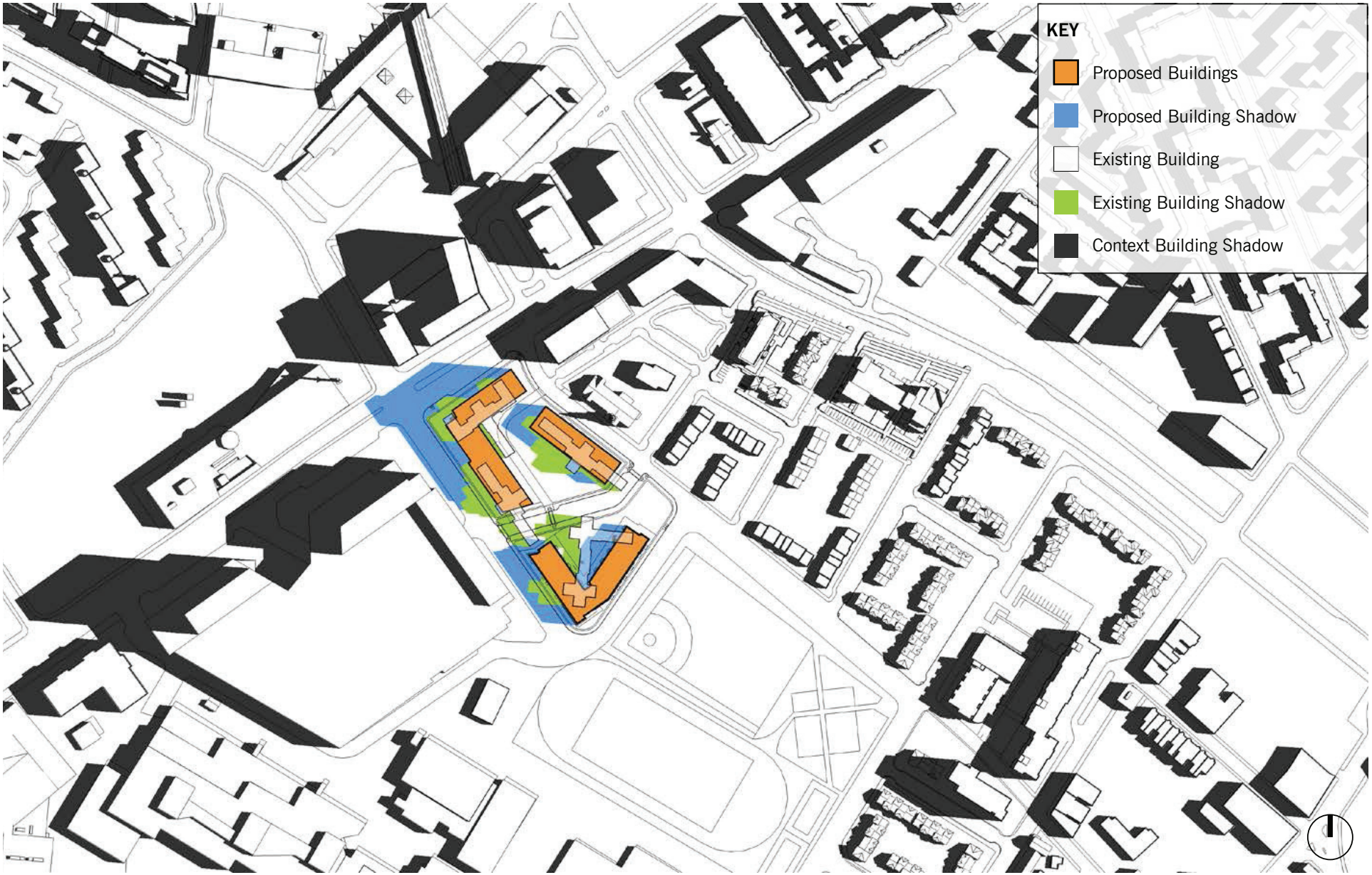
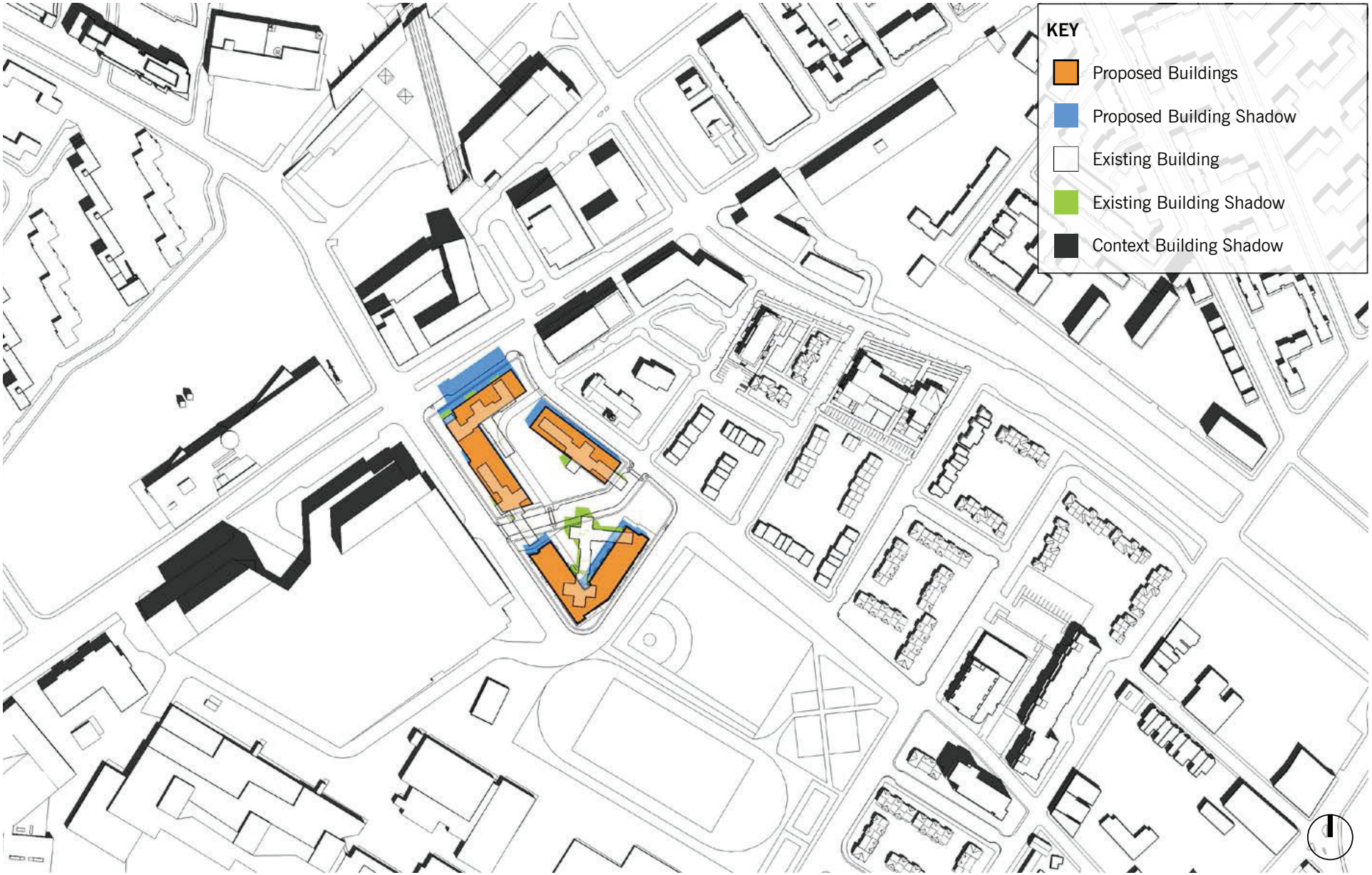


Figure 6-4
Shadow Studies: June 21, 9:00 AM
Source: The Architectural Team, 2015



Roxbury, Massachusetts

Figure 6-5
Shadow Studies: June 21, 12:00 PM
Source: The Architectural Team, 2015

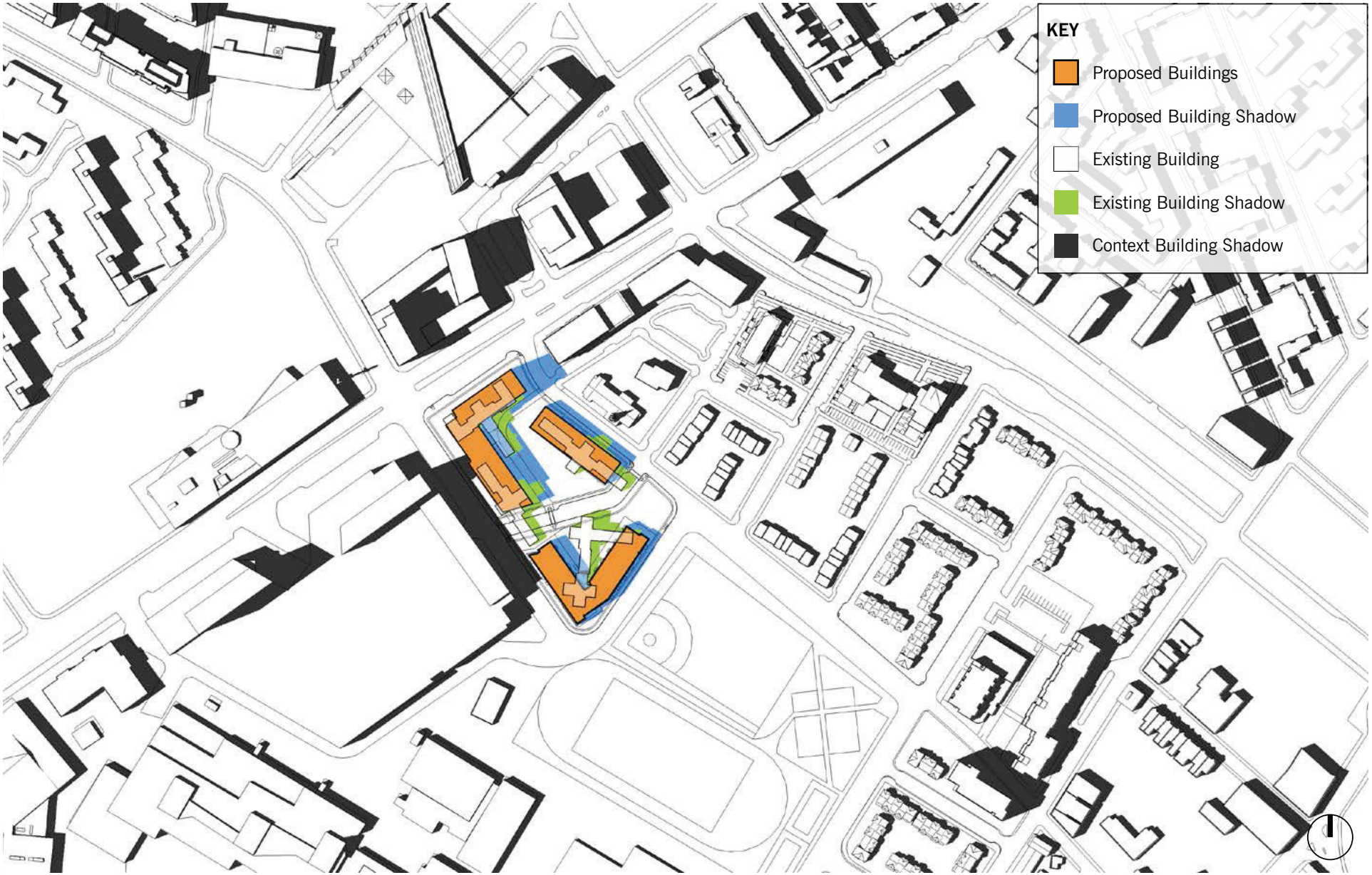


Figure 6-6
Shadow Studies: June 21, 3:00 PM
Source: The Architectural Team, 2015

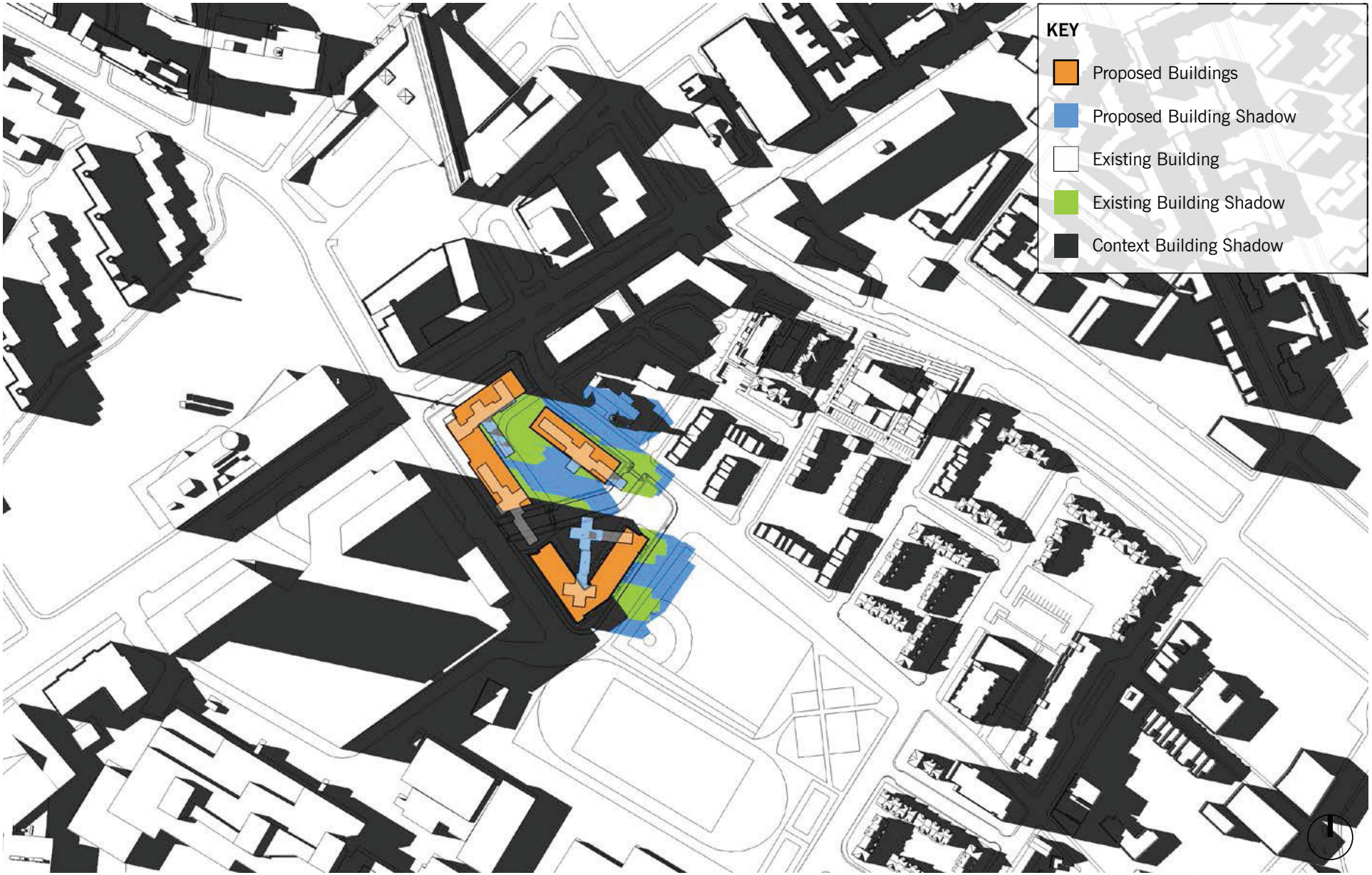


Figure 6-7
Shadow Studies: June 21, 6:00 PM
Source: The Architectural Team, 2015

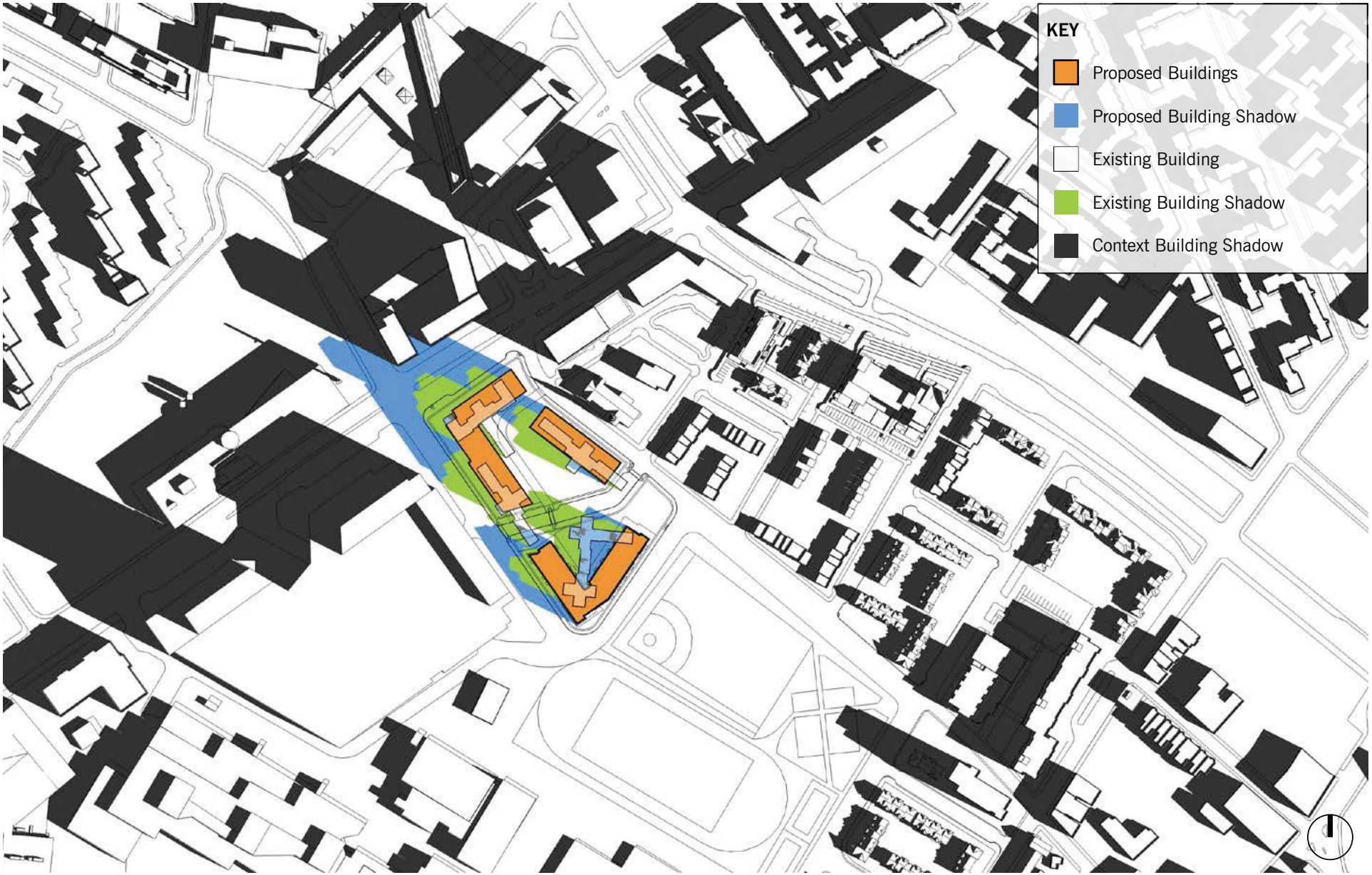


Figure 6-8
Shadow Studies: September 21, 9:00 AM
Source: The Architectural Team, 2015

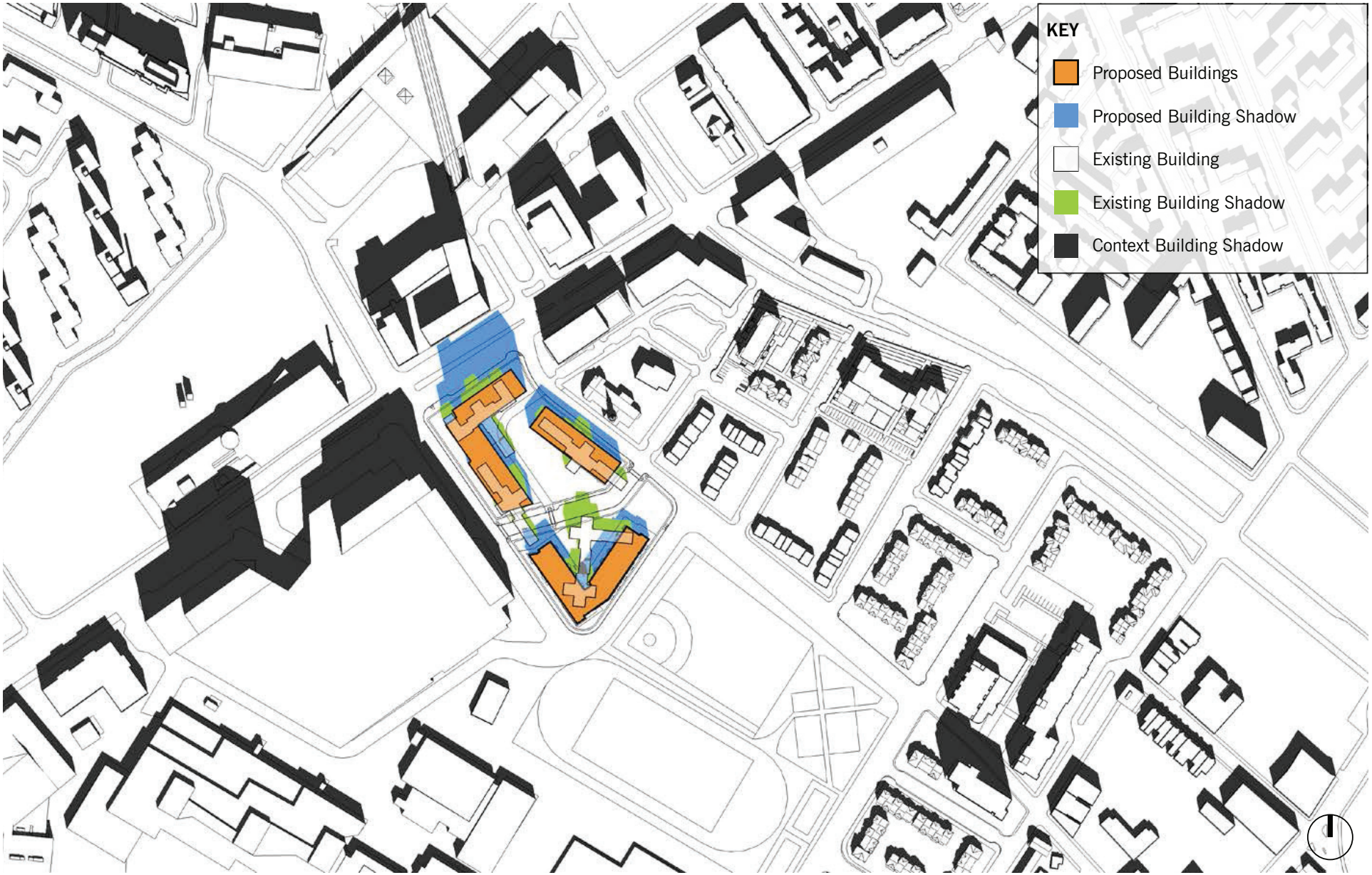


Figure 6-9
Shadow Studies: September 21, 12:00 PM
Source: The Architectural Team, 2015

Figure 6-10
Shadow Studies: September 21, 3:00 PM
Source: The Architectural Team, 2015

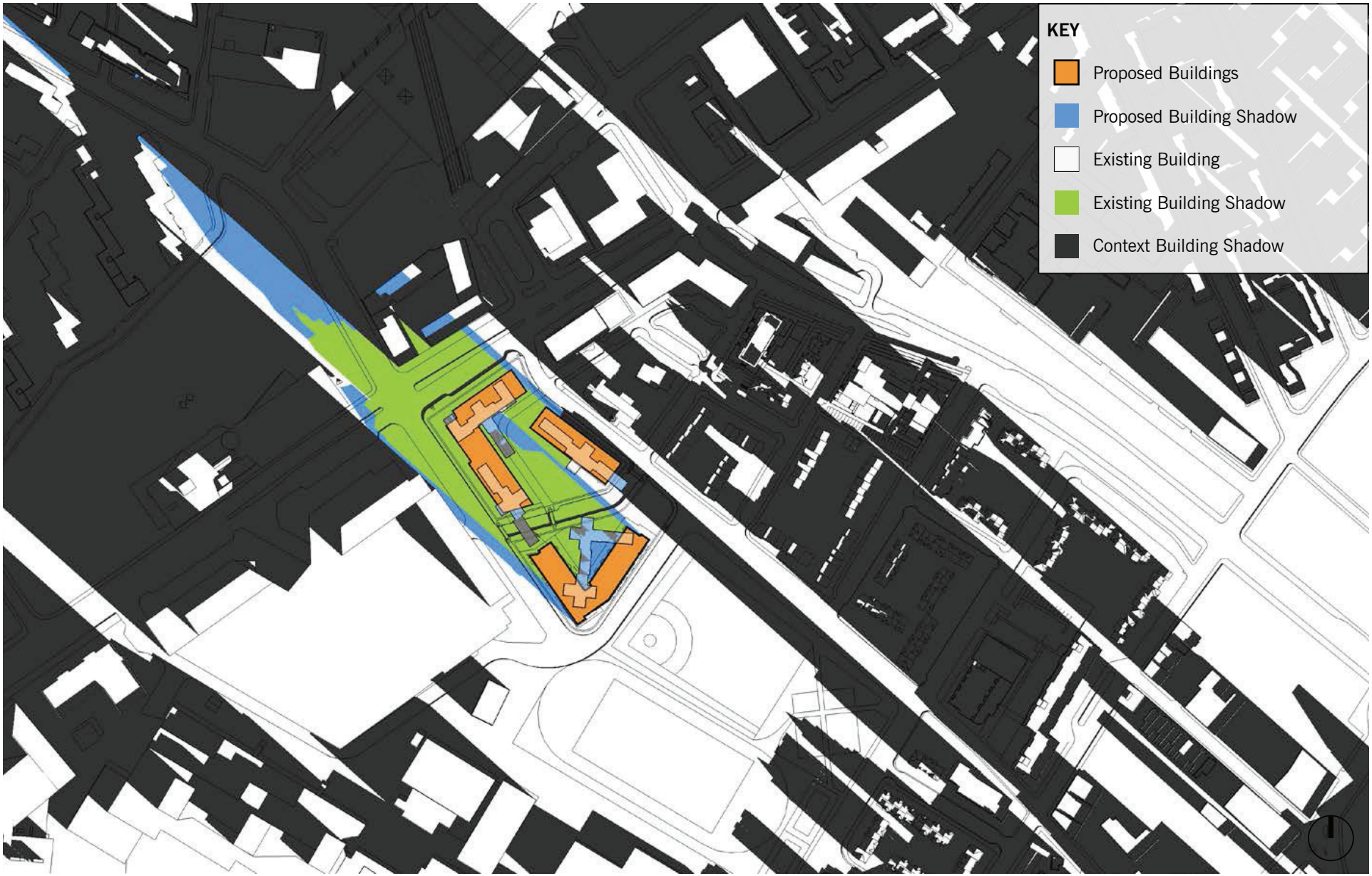


Figure 6-11
Shadow Studies: December 21, 9:00 AM
Source: The Architectural Team, 2015

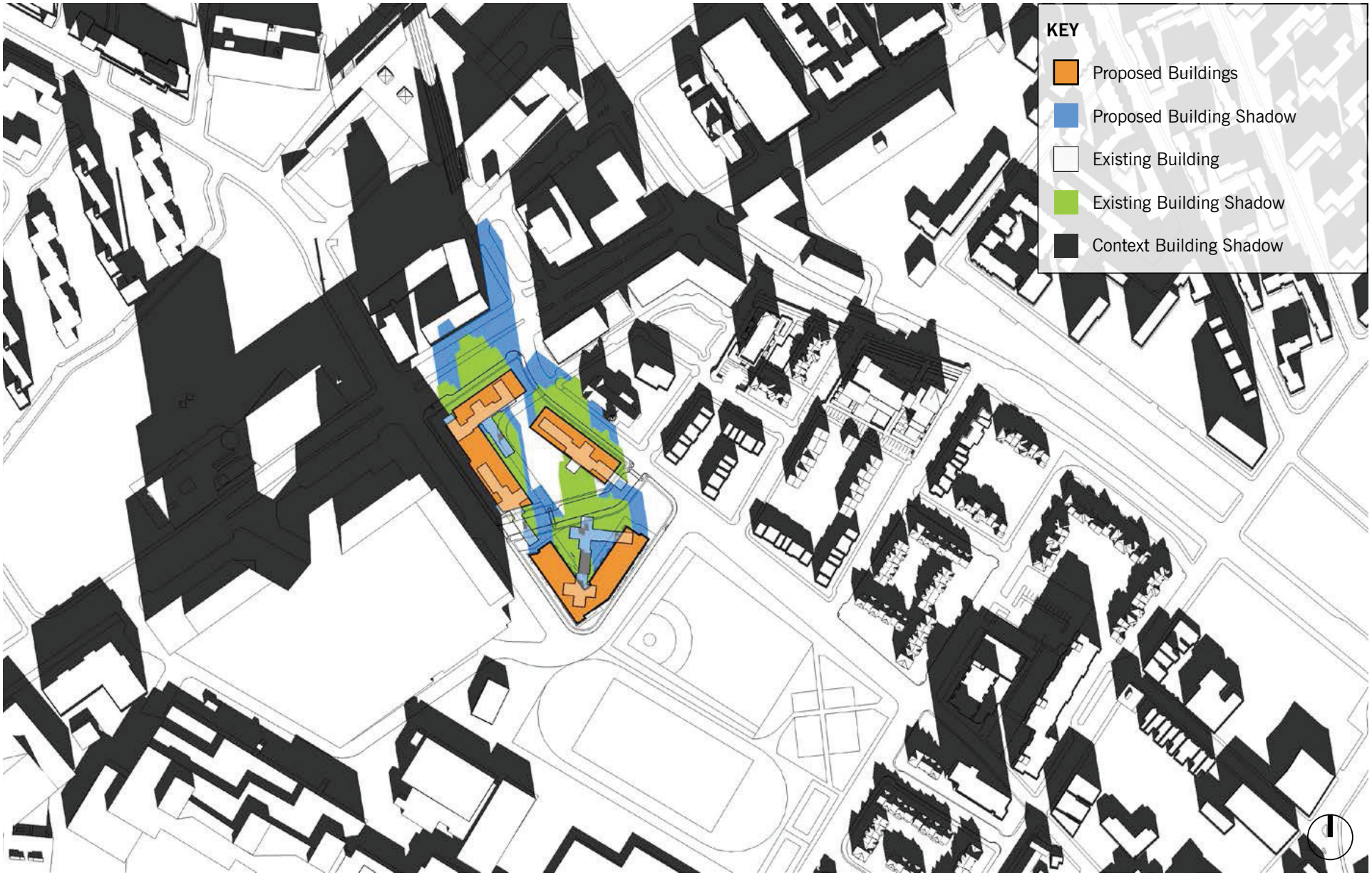


Figure 6-12
Shadow Studies: December 21, 12:00 PM
Source: The Architectural Team, 2015

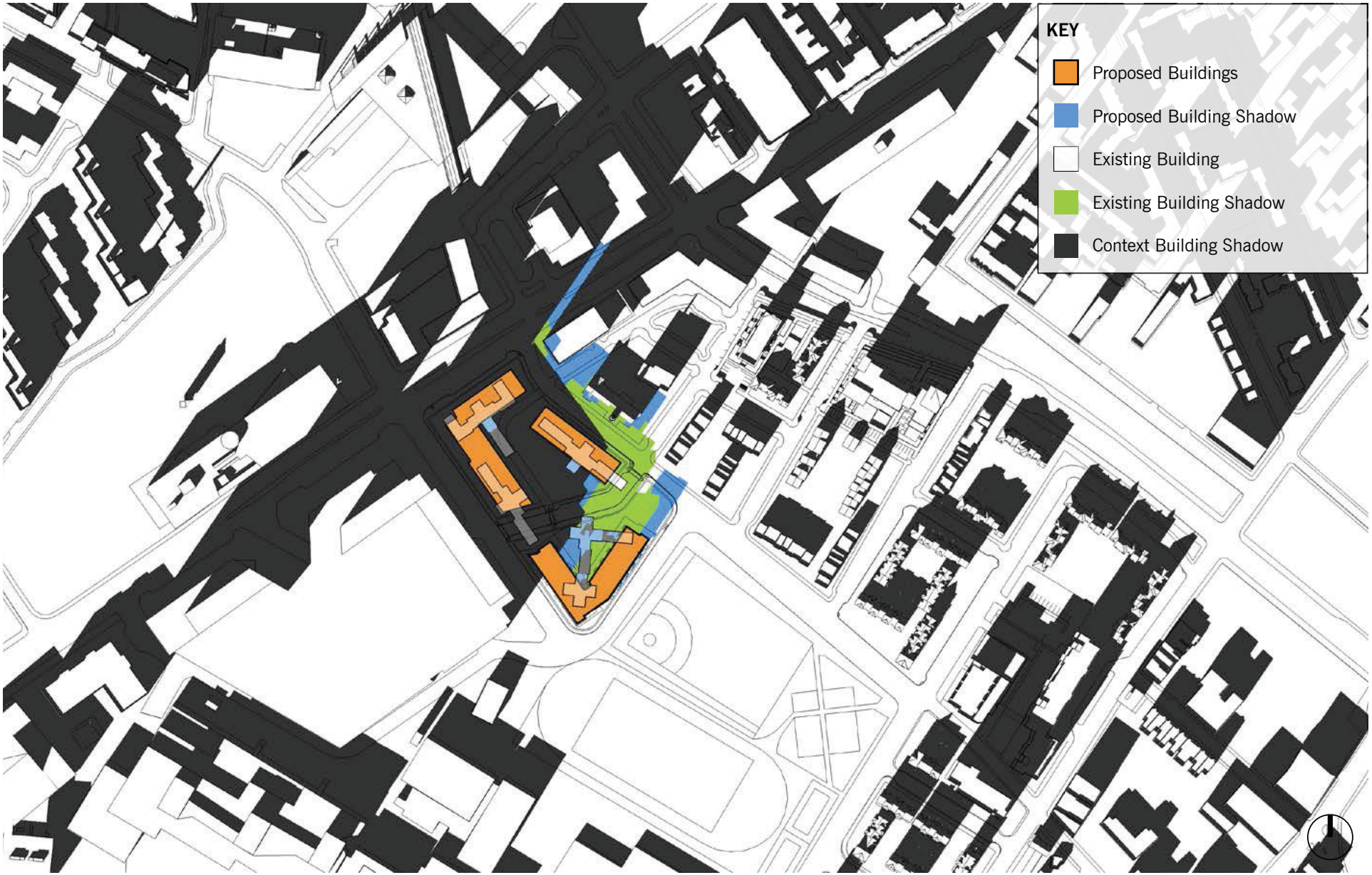


Figure 6-13
Shadow Studies: December 21, 3:00 PM
Source: The Architectural Team, 2015

Roxbury Highlands Historic District
1 Ionic Hall
2 Dillaway-Thomas House
3 Putnam Chapel

Frederick Douglass Square District
4 Robert Treat Paine House

Lower Roxbury Historic District
5 Saint Cyprian's Episcopal Church
6 22-24 Walpole Street
7 United Holiness Church
8 The Burlingame
9 32-38 Cunard Street
10 19 Walpole Street
11 44- 42 Cunard Street
12 Underwriters Salvage Company Warehouse
13 31-41 Cunard Street
14 772-778 Columbus Avenue
15 Northeastern University Apartments, 768 Columbus Ave.
16 748-752 Columbus Avenue
17 1035- 1055 Tremont Street
18 1011-1033 Tremont Street
19 Berger Factory
20 Elliot Burying Ground
21 John Elliot Square

22 Saint Francis de Sales Roman Catholic Church
23 11 Leon St.- United Drug Co.

Figure 6-14
Historic Resources
Source: Fort Point Associates, Inc., 2015

Chapter 7

INFRASTRUCTURE

CHAPTER 7: INFRASTRUCTURE

7.1 INTRODUCTION

The following describes the existing utility systems servicing the Project Site and surrounding area, discusses the Project's potential impacts on these utilities, and identifies mitigation measures to address potential impacts.

To ensure that the Project can be adequately serviced by existing and/or proposed new infrastructure, final engineering and design will be determined once the Project has received necessary approvals. During the design and construction of the Project the engineer and architect will coordinate with the appropriate agencies and utility owners.

7.2 WASTEWATER

7.2.1 EXISTING SEWER SYSTEM

There are existing Boston Water and Sewer Commission (BWSC) sanitary sewer and combined sewer mains located in Tremont Street, Ruggles Street, Cabot Street and Whittier Street adjacent to the Project site, as well as BWSC sewer mains running through the Project site. The existing BWSC sewer system is shown in Figure 7-1.

Whittier Street

In the northern portion of Whittier Street near the Tremont Street side of the Project, there are two (2) 10-inch BWSC sanitary sewer mains and two (2) 99-inch x 114-inch BWSC combined sewer mains. In the southern portion of Whittier Street near the Cabot Street side of the Site, there is a 10-inch BWSC sanitary sewer main, a 12-BWSC sanitary sewer main, a 15-inch BWSC sanitary sewer main, and a 96-inch by 72-inch BWSC combined sewer main (the continuation of a 99-inch x 114-inch BWSC combined sewer main).

Tremont Street

There is a 10-inch BWSC sanitary sewer main and a 24-inch x 36-inch BWSC combined sewer main in Tremont Street.

Ruggles Street

There is a 10-inch BWSC sanitary sewer main and a 24-inch x 36-inch BWSC combined sewer main in Ruggles Street.

Cabot Street

There is a 24-inch x 36-inch BWSC combined sewer main and a 12-inch BWSC sanitary sewer main in Cabot Street.

Project Site

There are three BWSC mains running between Whittier Street and Ruggles Street on the southern side of the Project site. There is a 10-inch BWSC sanitary sewer main, a 54-inch x 57-inch BWSC combined sewer main known as the Stony Brook Interceptor, and a 132-inch x 90-inch combined sewer main within the Project site.

The 10-inch BWSC sanitary sewer main in the northern portion of Whittier Street near the Tremont Street side of the Project flows northerly to the 24-inch x 36-inch BWSC combined sewer main in Tremont Street which flows easterly and connects to the 24-inch x 36-inch BWSC combined sewer main in Ruggles Street which flows southerly. The 10-inch BWSC sanitary sewer main in Ruggles Street flows southerly and connects to the same 24-inch x 36-inch BWSC combined sewer main in Ruggles Street. The 10-inch BWSC sanitary sewer main within the Project site flows also flows easterly to the same 24-inch x 36-inch BWSC combined sewer main in Ruggles Street. The 24-inch x 36-inch BWSC combined sewer main in Ruggles Street flows southerly to the Stony Brook Interceptor, the 54-inch x 56-inch BWSC combined sewer main which flows easterly. The 12-inch BWSC sanitary sewer main in Cabot Street flows easterly and then northerly to the Stony Brook Interceptor.

Additionally, the 12-inch BWSC sanitary sewer main in the southern portion of Ruggles Street near the Cabot Street side of the Project site flows southerly to the 24-inch x 36-inch BWSC combined sewer main in Cabot Street which flows easterly and then northerly and connects to the Stony Brook Interceptor. The 15-inch BWSC sanitary sewer main in the southern portion of Ruggles Street flows northerly to the 54-inch x 57-inch BWSC sanitary sewer main in the Project Site. The 54-inch x 57-inch BWSC sanitary sewer main flows easterly to the Stony Brook Interceptor.

The Stony Brook interceptor ultimately discharges to the Massachusetts Water Resource Authority (MWRA) Deer Island Waste Water Treatment Plant for treatment and disposal.

7.2.2 PROJECTED SANITARY FLOW

The Project's projected sanitary flows were estimated using 310 CMR 15, the Massachusetts Department of Environmental Protection (MassDEP) "The State Environmental Code, Title 5" design criteria for residential, office and commercial uses consistent with the current proposed building programs. 310 CMR 15.203 lists typical sewage generation values by the proposed building use and are conservative

values for estimating the sewage flows from buildings. The 310 CMR 15.203 values are used to evaluate new sewage flows or, in this case, an increase in sewer flows to existing sewer connections.

Table 7-1: Sanitary Flows

Proposed Use	Units/Size	Design Flow Rate (GPD/unit)	Proposed Sanitary Flows (GPD)
Building 1 (Phase 1)			
Residential	170 bedrooms	110/bedroom	18,700
Office	2,750 s.f.	75/1,000 s.f.	206
Phase 1 Total Proposed Sanitary Flow			18,906
Building 4 (Phase 2)			
Residential	398 bedrooms	110/bedroom	43,780
Commercial	7,680 s.f.	50/1,000 s.f.	384
Building 5 (Phase 2)			
Residential	91 bedrooms	110/bedroom	10,010
Phase 2 Total Proposed Sanitary Flow			54,174
Total Complete Project Proposed Sanitary Flow			73,080
Existing Use	**Units/Size**	**Design Flow Rate (GPD/unit)**	**Existing Sanitary Flows (GPD)**
Cabot St. Building (Phase 1)			
Residential	156 bedrooms	110/bedroom	17,160
Phase 1 Total Existing Sanitary Flow			17,160
Whittier St. Building (Phase 2)			
Residential	99 bedrooms	110/bedroom	10,890
Tremont St. Building (Phase 2)			
Residential	107 bedrooms	110/bedroom	11,770
Ruggles St. Building (Phase 2)			
Residential	106 bedrooms	110/bedroom	11,660
Phase 2 Total Existing Sanitary Flow			34,320
Total Overall Existing Sanitary Flow			51,480
Total Phase 1 Increase in Sewer Flows			1,746
Total Phase 2 Increase in Sewer Flows			19,854

Total Complete Project Increase in Sewer Flows	21,600

7.2.3 PROPOSED CONDITIONS

The Proponent will coordinate with the BWSC on the design and capacity of the proposed connections to the BWSC sewer system. In total, the complete Project sewer generation is expected to be approximately 73,080 gallons per day (gpd), or an increase in wastewater flows of approximately 21,600 gpd. The proposed sewage generation for Phase 1 is approximately 18,906 gpd, or an increase of approximately 1,746 gpd. The proposed sewage generation for Phase 2 is approximately 54,174 gpd, or an increase in approximately 19,854 gpd. Approval for the increase in sanitary flow will come from BWSC.

The sewer services for the Project will connect to the existing BWSC sanitary sewer mains or combined sewer mains located in Tremont Street, Ruggles Street, Cabot Street, Whittier Street, and/or within the Project site.

Improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC's Site Plan Review process for the Project. This process will include a comprehensive design review of the proposed service connections, an assessment of Project demands and system capacity, and the establishment of service accounts.

7.2.4 SANITARY SEWER CONNECTIONS

The Project's impact on the existing BWSC systems in Tremont Street, Ruggles Street, Cabot Street, Whittier Street, and within the Project site were analyzed. The existing sewer system capacity calculations are presented in Table 7-2.

Table 7-2: Sewer Hydraulic Capacity Analysis

Sewer Main	Slope (%)	Dia. (inches)	Manning's Number	Flow Capacity (cfs)	Flow Capacity (MGD)
Whittier St. (North)					
92 to 94	0.5%	10	0.013	1.51	0.97
			Minimum Flow Analyzed:	1.51	0.97
Tremont St.					
94 to 133	1.3%	10	0.013	2.45	1.58
133 to 134	1.7%	24 x 36	0.013	49.25	31.83
			Minimum Flow Analyzed:	2.45	1.58
Ruggles St.					
134 to 136	0.2%	24 X 36	0.013	17.06	11.03
285 to 520	2.6%	10	0.013	3.55	2.29
			Minimum Flow Analyzed:	3.55	2.29

Sewer Main	Slope (%)	Dia. (inches)	Manning's Number	Flow Capacity (cfs)	Flow Capacity (MGD)
On-Site					
282 to 284	0.4%	10	0.013	1.40	0.90
			Minimum Flow Analyzed:	1.40	0.90
Whittier St. (South)					
90 to 140	4.8%	15	0.013	14.09	9.10
			Minimum Flow Analyzed:	14.09	9.10
Whittier St. (South)					
82 to 24	0.6%	12	0.013	2.78	1.80
			Minimum Flow Analyzed:	2.78	1.80
Cabot Street					
146 to 147	0.7%	12	0.013	2.87	1.86
			Minimum Flow Analyzed:	2.87	1.86

Table 7-2 indicates the hydraulic capacity of the 10-inch sanitary sewer main in the northern portion of Whittier street, the 10-inch sanitary sewer main and 24-inch by 36-inch combined sewer main in Tremont Street, the 24-inch x 36-inch and 10-inch sanitary sewer mains in Ruggles Street, the 10-inch sanitary sewer main within the Project site, the 15-inch and 12-inch sanitary sewer mains in the southern portion of Whittier Street, and the 12-inch sanitary sewer main in Cabot Street. The minimum hydraulic capacity is 0.97 million gallons per day (MGD) or 1.51 cubic feet per second (cfs) for the 10-inch system in the northern portion of Whittier Street; 1.58 MGD or 2.45 cfs for the 10-inch system in Tremont Street; 2.29 MGD or 3.55 cfs for the 10-inch system in Ruggles Street; 0.90 MGD or 1.40 cfs for the 10-inch system within the Project site; 9.10 MGD or 14.09 cfs for the 15-inch system in the southern portion of Whittier Street; 1.80 GPD or 2.78 cfs for the 12-inch system in the southern portion of Whittier Street; and the 1.86 MGD or 2.87 cfs for the 12-inch system in Cabot Street. Based on an increase in average daily flow of 21,600 GPD or 0.022 MGD; and with a factor of safety of 10 (total estimate = 0.022 MGD x 10 = 0.22 MGD), no capacity problems are expected for the sewer mains in Tremont Street, Ruggles Street, Cabot Street, Whittier Street, and/or within the Project site.

The proposed buildings will require sanitary sewer connections to the BWSC sewage system. Approval from the BWSC will be obtained through their Site Plan Review Process. Coordination with BWSC will include review and approval of the design, capacity, connections, and flow increase resulting from the proposed discharges to the sanitary sewer system.

7.3 WATER SYSTEM

7.3.1 EXISTING WATER SYSTEM

Water serving the Project Site will be provided by the BWSC. There are five water systems within the City, and these provide service to portions of the City based on ground surface elevation. The five systems are southern low (commonly known as low service), southern high (commonly known as high service), southern extra high, northern low, and northern high. There are existing BWSC water mains in Tremont Street, Ruggles Street, Cabot Street, Whittier Street, and running through the Project site. The existing BWSC water systems are illustrated in Figure 7-2.

There is a 12-inch Southern Low Main, and a 48-inch Southern Low Main in Tremont Street. There is a 12-inch Southern Low Main in Ruggles Street. There is an 8-inch Southern Low Main in Cabot Street. There is also an 8-inch Southern Low Main in Whittier Street. There is also a BWSC water main in the southeast portion of the Project site that provides fire protection to the Cabot Street building

BWSC record flow test data containing actual flow and pressure for hydrants within the vicinity of the Site was requested by the Proponent. Hydrant flow data was not available for hydrants near the project site. As the design progress, the Proponent will request hydrant flows be conducted by BWSC adjacent to the project site.

7.3.2 ANTICIPATED WATER CONSUMPTION

The Project's water demand estimate for domestic services is based on the Project's estimated sewage generation, described in the previous section. A conservative factor of 1.1 (10%) is applied to the estimated average daily wastewater flows calculated in Table 7-1 to account for consumption, system losses and other usages to estimate an average daily water demand. The Phase 1 estimated domestic water demand is approximately 20,797 gpd, or an increase of 1,921 gpd. The Phase 2 estimated domestic water demand is approximately 59,591 gpd, or an increase of 21,839 gpd. In total, the Project's estimated domestic water demand is approximately 80,388 gpd, or an estimated increase of 23,760 gpd.

7.3.3 PROPOSED WATER SERVICES

The domestic and fire protection water services for the Project will connect to the existing BWSC water mains in Tremont Street, Ruggles Street, Cabot Street, and/or Whittier Street. The proposed Project's impacts to the existing water system will be reviewed as part of the BWSC's Site Plan Review process.

New domestic and fire protection water service connections required for the Project will meet the applicable BWSC, City and State codes and standards, including cross-

connection backflow prevention. Compliance with the standards for the domestic water system service connections will be reviewed as part of BWSC's Site Plan Review Process. This review will include sizing of domestic water and fire protection services, calculation of meter sizing, backflow prevention design, and location of hydrants and siamese connections that conform to BWSC and Boston Fire Department requirements.

7.3.4 WATER SUPPLY CONSERVATION AND MITIGATION MEASURES

Measures to reduce water consumption will be incorporated into the Project Design. The State Building Code requires the use of water-conserving fixtures. Water conservation measures such as low-flow toilets and restricted flow faucets will help reduce the domestic water demand on the existing distribution system. The installation of sensor-operated sinks with water conserving aerators and sensor-operated toilets in restrooms will be incorporated into the design plans for the Project.

New water services will be installed in accordance with the latest local, state, and federal codes and standards. The Project will comply with the Commonwealth's Stretch Energy Code and as such, will reduce energy use from the baseline energy conservation by approximately 30%. Backflow preventers will be installed at both domestic and fire protection service connections. New meters will be installed with Meter Transmitter Units ("MTU's") as part of the BWSC's Automatic Meter Reading ("AMR") system. If individual occupants of a unit intend to perform operations that will require significantly more water consumption than the average values assumed for the design, they will be required to provide information on their process and associated water conservation measures.

7.4 STORM DRAINAGE

7.4.1 EXISTING STORM DRAINAGE SYSTEM

The existing Project site is approximately 64-percent (64%) impervious cover and is comprised of building roof, paved pedestrian walkways and parking lots, grass, and landscaped areas. Stormwater from the paved walkways and parking lots is collected by catch basins on site or sheets flows off-site to catch basins in the adjacent roadways. There are existing BWSC storm drain mains in Tremont Street, Ruggles Street, and Whittier Street. Additionally, there are existing BWSC combined sewer mains in Tremont Street, Ruggles Street, Cabot Street, Whittier Street, and within the Project site, as described in the previous section. The existing BWSC storm drain system is illustrated in Figure 7-3.

Tremont Street

There is a 62-inch x 57-inch storm drain main with catch to collect stormwater in Tremont Street. There is also a 24-inch x 36-inch BWSC combined sewer main in Tremont Street. The 62-inch x 57-inch BWSC storm drain main in Tremont Street flows westerly to the 99-inch x 114-inch MWRA combined sewer in Ruggles Street.

Ruggles Street

There is a 15-inch BWSC storm drain main with catch basins to collect stormwater in Ruggles Street. Stormwater is collected by catch basins and is directed to the 24-inch x 36-inch BWSC combined sewer main which flows southerly, and then flows to the Stony Brook Interceptor, a 54-inch x 56-inch BWSC combined sewer main which flows easterly. Stormwater directed to the 15-inch BWSC storm drain main in Ruggles Street flows southerly to the 132-inch x 90-inch BWSC combined sewer main within the Project site. The 132-inch x 90-inch BWSC combined sewer main flows westerly to the 99-inch x 114-inch BWSC combined sewer main in Whittier Street which flows northerly. There is also a 24-inch x 36-inch BWSC combined sewer main in Ruggles Street.

Cabot Street

There is a 24-inch x 36-inch BWSC combined sewer main with catch basins to collect stormwater in Cabot Street. Stormwater is directed to the 24-inch x 36-inch BWSC combined sewer main in Cabot Street and flows easterly to the Stony Brook Interceptor.

Whittier Street

In the northern portion of Whittier Street, there are two (2) 99-inch x 114-inch BWSC combined sewer mains. In the southern of Whittier Street, there is a 96-inch x 72-inch BWSC combined sewer main, and a 15-inch BWSC storm drain main. Stormwater is collected in catch basins and is directed to the 15-inch BWSC storm drain main which flows northerly to the 96-inch x 72-inch BWSC combined sewer main in Whittier Street. The 96-inch x 72-inch BWSC combined sewer main flows northerly and to connect to one of the 99-inch x 114-inch BWSC combined sewer mains.

Project Site

There is a 54-inch x 57-inch BWSC combined sewer main known as the Stony Brook Interceptor, which flows easterly, and a 132-inch x 90-inch BWSC combined sewer main which flows westerly through the Project Site.

The storm drain mains that connect to the Stony Brook Interceptor ultimately discharges to the MWRA Deer Island Waste Water Treatment Plant for treatment and disposal, or during times of high flow, discharges to the Boston Harbor. The storm drain mains that connects to the two 99-inch x 114-inch combined sewer mains in Whittier Street continue flowing northerly to the MWRA station and ultimately discharges to the MWRA Deer Island Waste Water Treatment Plan for treatment and disposal, or during times of high flow, discharges to the Charles River.

7.4.2 PROPOSED STORM DRAINAGE SYSTEM

The proposed design will increase the amount of impervious area on the Site by approximately 11-percent (11%) compared to the existing condition, for a total Site imperviousness of approximately 75-percent (75%). The proposed impervious area will consist mostly of building roofs and associated paved parking and pedestrian walkway areas. The project will be designed to promote a reduction of stormwater runoff peak rates and volumes, and to minimize the loss of annual stormwater recharge to groundwater through the use of on-site infiltration measures to the greatest extent practicable.

The Project design will include a closed drainage system that will be adequately sized for the Site's expected stormwater flows, and will direct stormwater to the on-Site infiltration systems for groundwater recharge prior to overflow to the BWSC systems to the maximum extent practicable. Overflow connections to the BWSC storm drain mains will be provided for greater stormwater flows. The on-site infiltration will strive to infiltrate one inch of stormwater runoff from impervious areas to the greatest extent practicable, in order to meet the BWSC stormwater quality and ground water recharge requirements. The Project is not located within the Groundwater Conservation Overlay District.

Improvements to the BWSC infrastructure and/or the existing private storm drain systems will be evaluated as part of the BWSC Site Plan Review Process.

7.4.3 WATER QUALITY IMPACT

The Project will not affect the water quality of nearby water bodies. Erosion and sediment control measures will be implemented during construction to minimize 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, straw bales and/or crushed stone, to provide for sediment removal from runoff. These controls will be inspected and maintained throughout the construction phase until the areas of disturbance have been stabilized through the placement of pavement, structure, or vegetative cover.

Any necessary dewatering will be conducted in accordance with applicable MWRA and BWSC discharge permits. Once construction is complete, the Project will be in compliance with local and state stormwater management policies, as described below.

7.4.4 MITIGATION MEASURES

In March 1997, MassDEP adopted a new Stormwater Management Policy to address non-point source pollution. In 1997, MassDEP published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy, which was revised in February 2008. The Policy prescribes 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 Policy is administered locally pursuant to MGL Ch. 131, s. 40.

A description of the Project's anticipated compliance with the Standards is outlined below:

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. The design does not propose new stormwater conveyances and no new untreated stormwater will be directly discharged to, nor will erosion be caused to wetlands or waters of the Commonwealth as a result of stormwater discharges related to the Project.

Standard #2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Compliance: The proposed design will comply with this Standard. The existing peak discharge rate will be met or will be decreased as a result of the improvements associated with the Project.

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 this standard to the maximum extent practicable.

Standard #4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and

c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

Compliance: The proposed design will comply with this standard. Within the Project's limit of work, there will be mostly roof, landscaping, paved pedestrian areas, and paved roadway. Runoff from paved areas that would contribute unwanted sediments or pollutants to the existing storm drain system will be collected by deep sump, hooded catch basins and conveyed through water quality units before discharging into the BWSC system.

Standard #5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Compliance: The proposed design will comply with this standard. The proposed design will include source control, pollution prevention and pretreatment practices, as necessary.

Standard #6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply

with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

Compliance: Not Applicable. The proposed Project is not within an outstanding resource area.

Standard #7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

Compliance: The Project will comply with this standard to the maximum extent practicable.

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 proposed design will comply with this standard. A plan to control temporary construction-related impacts including erosion, sedimentation, and other pollutant sources during construction and land disturbing activities will be developed and implemented.

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: The Project will comply with this standard. An O&M Plan including long-term Best Management Practices (BMP) operation requirements will be prepared for the Proposed Project and will assure proper maintenance and functioning of the stormwater management system.

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

Compliance: The Project will comply with this standard. There will be no illicit connections associated with the Proposed Project. Temporary construction dewatering will be conducted in accordance with applicable BWSC and Massachusetts Water Resource Authority (MWRA) requirements, as necessary.

7.5 ELECTRICAL SERVICES

Eversource provides electric service to the City of Boston. The Project site is currently served with transformers located on grade. It is anticipated that new electric service to the development will be from new pad mounted transformers located on grade. Electric power design will be further coordinated with Eversource as the Project design progresses and electric consumption is determined.

The Project will result in the reduction in electric consumption due to the proposed energy efficient light fixtures and appliances.

7.6 TELECOMMUNICATIONS SYSTEM

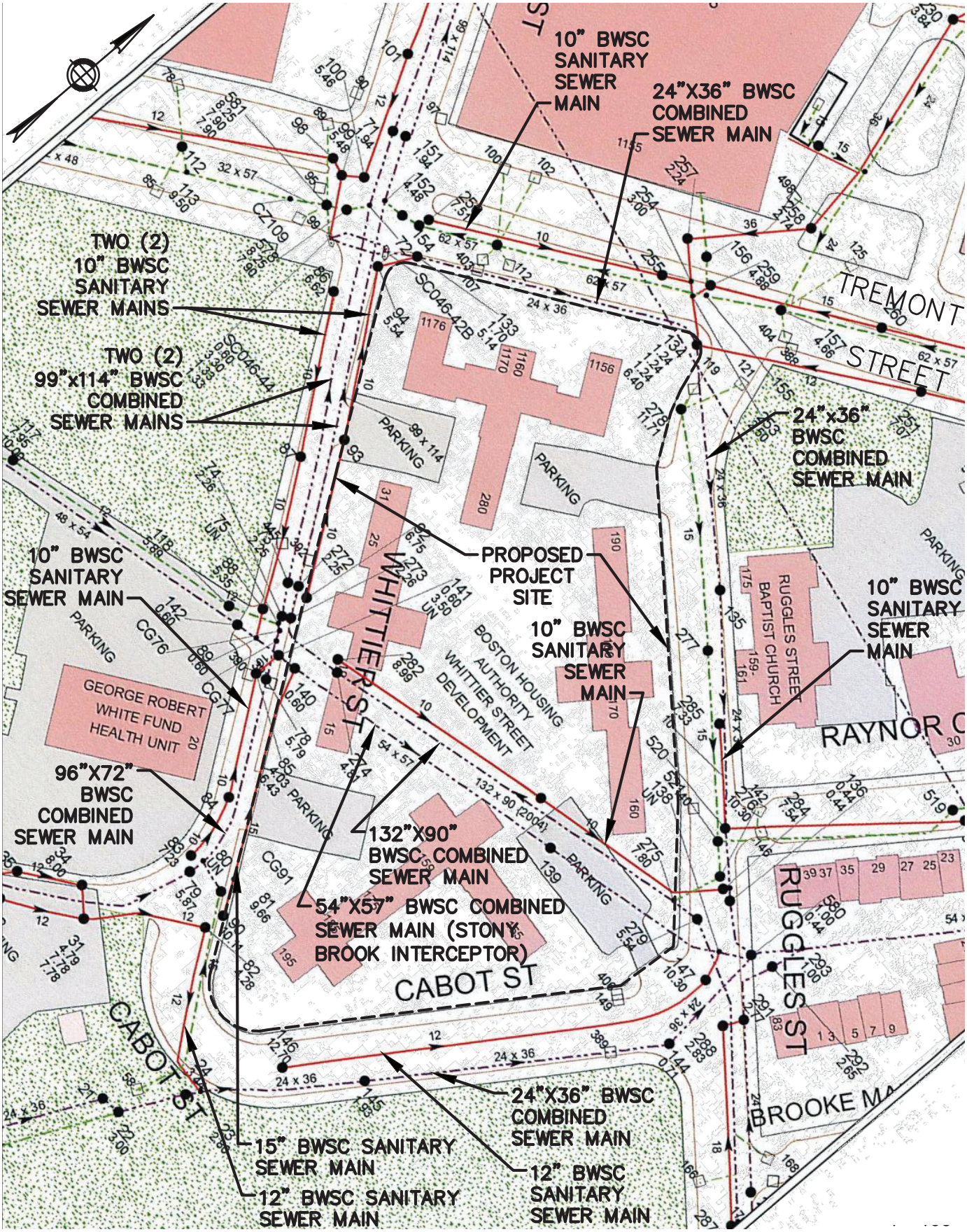
Verizon New England and Comcast provide telephone and cable services in the Project area. There are underground telephone and cable service lines in the adjacent streets.
New telephone and cable lines will be constructed underground to the proposed buildings. The provider of these services will be determined prior to construction.

7.7 NATURAL GAS SYSTEM

National Grid provides natural gas service in the Project area. There are existing gas transmission lines in Tremont Street, Whittier Street, Cabot Street and Ruggles Street. It is anticipated that new gas services will be provided to each of the proposed buildings from the services in the adjacent streets.

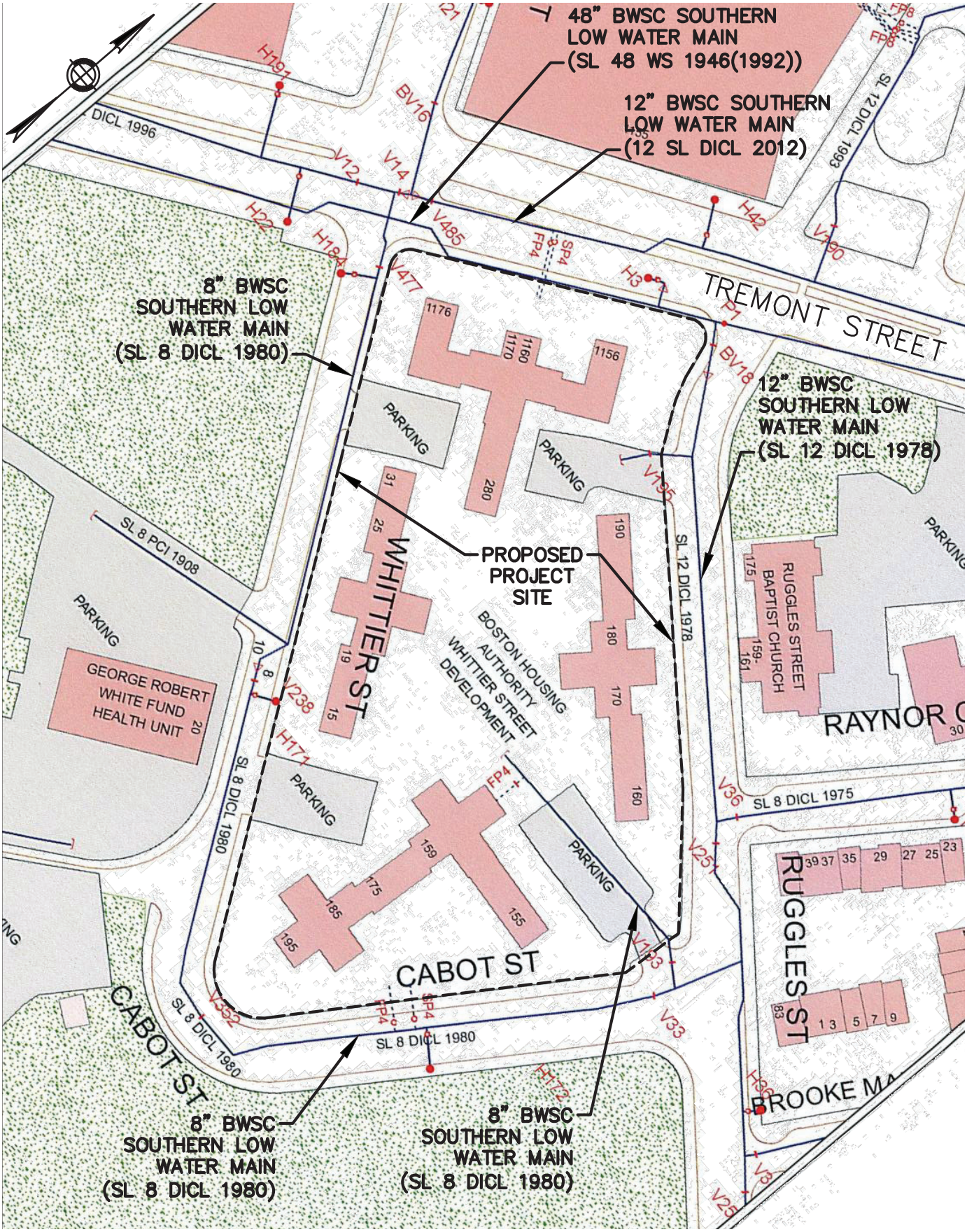
7.8 UTILITY PROTECTION DURING CONSTRUCTION

Existing public and private infrastructure located within any public or private right-of-way shall be protected during construction. The installation of proposed utilities within a public way will be in accordance with BWSC, Boston Public Works Department, the Dig-Safe Program, and applicable utility company requirements. Specific methods for construction of proposed utilities where they are near or within existing water, sewer, and drain facilities will be reviewed by the BWSC as part of the Site Plan Review Process. The necessary permits will be obtained before the commencement of work.



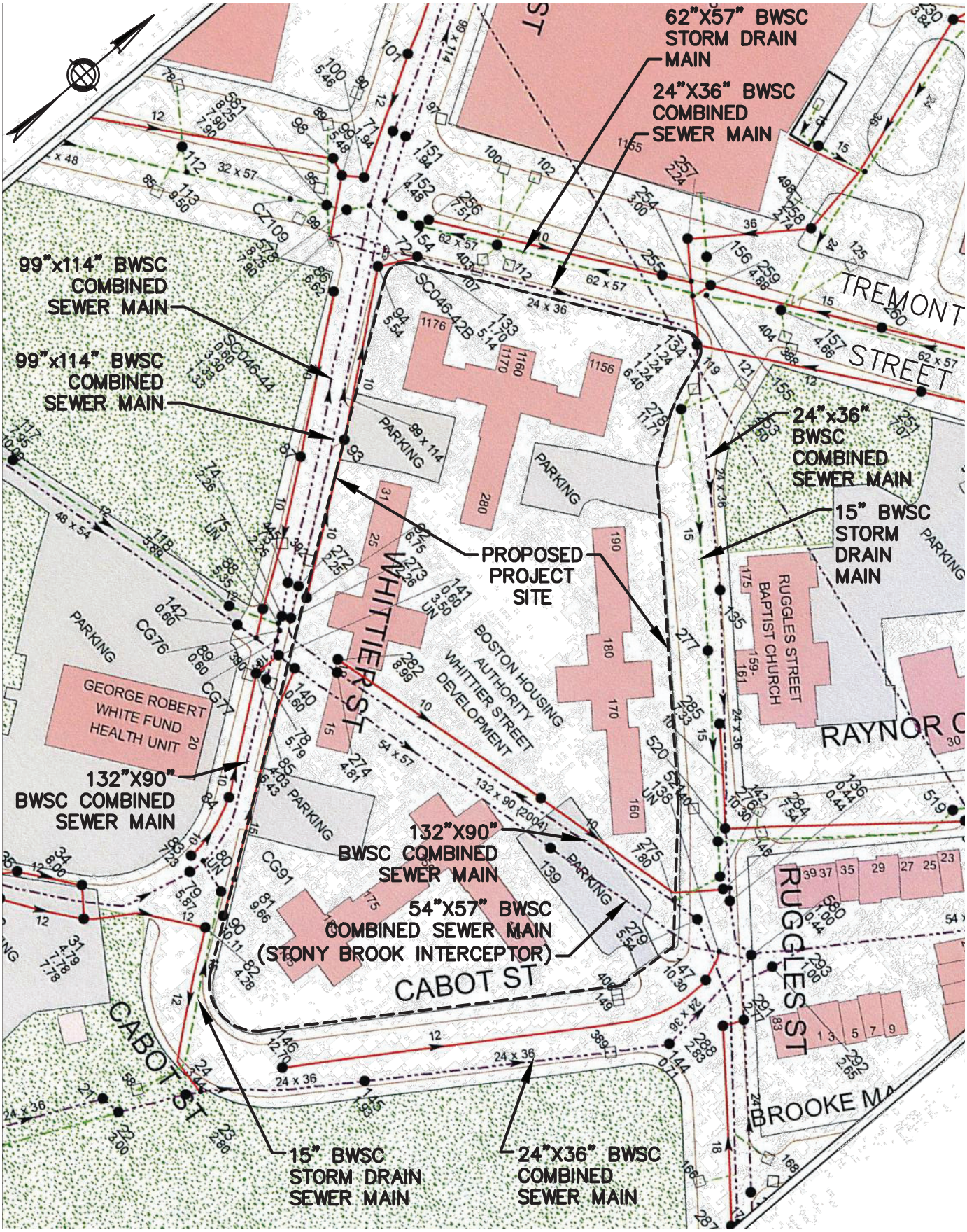
Roxbury, Massachusetts

Figure 7-1
Existing BWSC Sewer Systems
Source: Nitsch Engineering, 2015



Roxbury, Massachusetts

Figure 7-2
Existing BWSC Water Systems
Source: Nitsch Engineering, 2015



Roxbury, Massachusetts

Figure 7-3
Existing BWSC Drain Systems
Source: Nitsch Engineering, 2015

Appendix A

LETTER OF INTENT

Boston Housing Authority

PRESERVATION OF AFFORDABLE HOUSING

Madison Park Development Corporation
184 Dudley Street, Suite 102, Roxbury, MA 02119

March 27, 2015

Mr. Brian Golden
Director
Boston Redevelopment Authority
One City Hall Plaza, 9th Floor
Boston, MA 02201

Re: Letter of Intent
Whittier Choice Neighborhood

Dear Mr. Golden:

Pursuant to the *Executive Order Relative to the Provision of Mitigation by Development Projects in Boston* issued by former Mayor Menino on October 10, 2000 as amended on April 3, 2001, on behalf of the joint venture partnership of Preservation of Affordable Housing ("POAH") and Madison Park Development Corporation ("MPDC") in partnership with property owner Boston Housing Authority ("BHA"), we hereby submit its Letter of Intent to re-develop the existing Whittier Street public housing development in Roxbury, MA.

Location

The Whittier Choice Neighborhood Project (the "Project") site consists of approximately 3.8 acres owned by the BHA which is bounded by Tremont Street, Cabot Street, Ruggles Street and Whittier Street.

Project Description

The Project involves the demolition of 200 units of existing public housing in four buildings, and the phased construction of approximately 386 units of mixed income housing in three new buildings with the addition of ground floor commercial in one building. In total, the proposed Project comprises approximately 472,000 gross square feet (530,000 GSF inclusive of garage floors).

Structured parking will be provided for up to 121 cars at full build a ratio of up to 0.31 spaces/unit. In addition, approximately 26 on-street spaces are proposed to be constructed within internal roadways

which will, in time, become city streets. An additional seven spaces are proposed to be located on Tremont Street as part of the second phase of the Project.

The proposed transit-oriented Project will add a desirable mix of housing types to the Roxbury neighborhood. The proposed high-rise design at Tremont Street will anchor and enliven the streetscape in this highly visible area which encompasses busy Tremont Street, Ruggles Station and future mixed-use development on Parcel 3. The Project will provide momentum to activate future projects at the nearby Madison Park Village and to better connect the community to the Dudley Square business district.

The proposed high-rise residential/mixed-use building (Building 4), located on Tremont and Whittier Streets, will be up to 14 stories with a 10-story wing on Whittier Street. The remaining two buildings will be reduced in scale at 5 stories each to meet the streets of the neighborhood at an appropriate scale and density.

Building 1, which fronts on Whittier Street and Cabot Street, is proposed to be 5 stories and contains 82 units with two-story townhomes and flats above. Building 1, which is the first phase of construction, will utilize existing on-site parking. Three of the four existing buildings will also remain in place until construction on Buildings 4 and 5 is initiated.

Building 4, which turns the corner of Whittier Street, and steps down to ten stories along Tremont Street, is proposed to have 241 units with approximately 7,680 square feet of ground floor commercial space. Building 5 will have 63 units in five stories with, again, two-story townhomes and flats above. Parking for all of the units will be accommodated on an internal street network, and below grade in Building 4. Due to the fact that this is a redevelopment of an existing housing complex, a total of 186 new units and up to 99 new parking spaces will be provided on-street and within a parking garage .

Zoning Compliance

The Project site was the subject of a Map Amendment (Map Amendment No. 597) approved by the Boston Zoning Commission on January 14, 2015. Pursuant to this map amendment, the Project Site is within the "U" Urban Renewal Area overlay district. The applicable use and dimensional controls shall be the use and dimensional controls of the South End and Campus High Urban Renewal Plans and the Land Disposition Agreements relating to the map amendment.

Environmental Documentation

The Project will be submitting a Project Notification Form under Article 80B later this month.

Impact Advisory Group

I understand that, in accordance with the Executive Order referenced above, an Impact Advisory Group (IAG) for this project may be designated. POAH and its project team members will coordinate community outreach with the BRA. The Proponent requests that the BRA encourage participation from Roxbury residents, specifically residents living less than .5 miles from the Proposed Project location, along with members of active neighborhood oversight committees. These individuals can serve to enrich and enhance the IAG membership.

If you have any questions, please call my associate Cory Mian at (617) 449-0867.

Sincerely,

W. Bart Lloyd
Managing Director, Preservation of Affordable Housing

Cc: City Councilor Tito Jackson
State Senator Sonia Chang-Diaz
State Representative Gloria L. Fox
Kaira Fox, Mayor's Office of Neighborhood Services
Erico Lopez, Boston Redevelopment Authority
Dana Whiteside, Boston Redevelopment Authority
Gary Uter, Project Assistant
Sophia Transtamar, Madison Park Development Corporation
James Greene, Esq., Rubin and Rudman
Mitchell L. Fischman, MLF Consulting LLC
Russ Tanner, Madison Park Development Corporation
Kathryn Bennett, Boston Housing Authority
Joseph Bamberg, Boston Housing Authority
Judith Kohn, Fort Point Associates

Appendix B

TRANSPORTATION TECHNICAL APPENDIX

TRANSPORTATION TECHNICAL APPENDIX

- TRAFFIC COUNTS
- INTERSECTION CAPACITY ANALYSIS WORKSHEETS
- EXISTING SITE TRIPS
- TRIP GENERATION CALCULATIONS

TRAFFIC COUNTS

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 123026 E
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	19	0	108	0	134	165	0	1	4	9	6	0	0	267	49	0	762
07:15 AM	43	0	121	0	134	172	0	0	3	10	9	0	0	310	49	0	851
07:30 AM	35	0	157	0	153	201	0	4	4	12	7	0	0	309	39	0	921
07:45 AM	26	0	135	0	119	177	0	0	1	8	14	0	0	334	51	0	865
Total	123	0	521	0	540	715	0	5	12	39	36	0	0	1220	188	0	3399
08:00 AM	21	0	113	0	106	196	0	0	11	2	4	0	0	351	60	0	864
08:15 AM	29	0	87	0	113	158	0	3	5	3	4	0	0	341	33	0	776
08:30 AM	27	0	100	0	99	170	0	3	5	7	8	0	0	339	64	1	823
08:45 AM	23	0	105	0	121	180	0	1	3	4	12	0	0	310	60	0	819
Total	100	0	405	0	439	704	0	7	24	16	28	0	0	1341	217	1	3282
Grand Total	223	0	926	0	979	1419	0	12	36	55	64	0	0	2561	405	1	6681
Apprch %	19.4	0	80.6	0	40.6	58.9	0	0.5	23.2	35.5	41.3	0	0	86.3	13.7	0	
Total %	3.3	0	13.9	0	14.7	21.2	0	0.2	0.5	0.8	1	0	0	38.3	6.1	0	
Cars	123	0	815	0	903	1303	0	11	33	50	59	0	0	2441	302	1	6041
% Cars	55.2	0	88	0	92.2	91.8	0	91.7	91.7	90.9	92.2	0	0	95.3	74.6	100	90.4
Heavy Vehicles	100	0	111	0	76	116	0	1	3	5	5	0	0	120	103	0	640
% Heavy Vehicles	44.8	0	12	0	7.8	8.2	0	8.3	8.3	9.1	7.8	0	0	4.7	25.4	0	9.6

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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 07:15 AM																					
07:15 AM	**43**	**0**	**121**	**0**	**164**	**134**	**172**	**0**	**0**	**306**	**3**	**10**	**9**	**0**	**22**	**0**	**310**	**49**	**0**	**359**	**851**
07:30 AM	**35**	**0**	**157**	**0**	**192**	**153**	**201**	**0**	**4**	**358**	**4**	**12**	7	0	**23**	0	309	39	0	348	**921**
07:45 AM	**26**	**0**	**135**	**0**	**161**	**119**	**177**	**0**	**0**	**296**	**1**	**8**	**14**	**0**	**23**	**0**	**334**	**51**	**0**	**385**	**865**
08:00 AM	**21**	**0**	**113**	**0**	**134**	**106**	**196**	**0**	**0**	**302**	**11**	**2**	**4**	**0**	**17**	**0**	**351**	**60**	0	**411**	**864**
Total Volume	125	0	526	0	651	512	746	0	4	1262	19	32	34	0	85	0	1304	199	0	1503	3501
% App. Total																					
PHF	.727	.000	.838	.000	.848	.837	.928	.000	.250	.881	.432	.667	.607	.000	.924	.000	.929	.829	.000	.914	.950
Cars	75	0	479	0	554	478	687	0	4	1169	17	29	31	0	77	0	1252	146	0	1398	3198
% Cars	60.0	0	91.1	0	85.1	93.4	92.1	0	100	92.6	89.5	90.6	91.2	0	90.6	0	96.0	73.4	0	93.0	91.3
Heavy Vehicles																					
% Heavy Vehicles	40.0	0	8.9	0	14.9	6.6	7.9	0	0	7.4	10.5	9.4	8.8	0	9.4	0	4.0	26.6	0	7.0	8.7

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

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File Name : 123026 E
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Cars

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	8	0	92	0	120	147	0	1	4	8	6	0	0	247	37	0	670
07:15 AM	27	0	111	0	126	157	0	0	3	8	9	0	0	298	33	0	772
07:30 AM	23	0	145	0	142	186	0	4	4	11	5	0	0	293	30	0	843
07:45 AM	14	0	120	0	111	161	0	0	1	8	13	0	0	323	36	0	787
Total	72	0	468	0	499	651	0	5	12	35	33	0	0	1161	136	0	3072
08:00 AM	11	0	103	0	99	183	0	0	9	2	4	0	0	338	47	0	796
08:15 AM	16	0	70	0	97	145	0	3	5	3	4	0	0	325	23	0	691
08:30 AM	13	0	87	0	93	158	0	3	4	7	7	0	0	319	48	1	740
08:45 AM	11	0	87	0	115	166	0	0	3	3	11	0	0	298	48	0	742
Total	51	0	347	0	404	652	0	6	21	15	26	0	0	1280	166	1	2969
Grand Total	123	0	815	0	903	1303	0	11	33	50	59	0	0	2441	302	1	6041
Apprch %	13.1	0	86.9	0	40.7	58.8	0	0.5	23.2	35.2	41.5	0	0	89	11	0	
Total %	2	0	13.5	0	14.9	21.6	0	0.2	0.5	0.8	1	0	0	40.4	5	0	

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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 07:15 AM																					
07:15 AM	**27**	**0**	**111**	**0**	**138**	**126**	**157**	**0**	**0**	**283**	**3**	**8**	**9**	**0**	**20**	**0**	**298**	**33**	**0**	**331**	**772**
07:30 AM	**23**	**0**	**145**	**0**	**168**	**142**	**186**	**0**	**4**	**332**	**4**	**11**	5	0	20	0	293	30	0	323	**843**
07:45 AM	**14**	**0**	**120**	**0**	**134**	**111**	**161**	**0**	**0**	**272**	**1**	**8**	**13**	**0**	**22**	0	323	36	0	359	787
08:00 AM	11	0	103	0	114	99	183	0	0	282	**9**						**338**	**47**	0	**385**	
Total Volume	75	0	479	0	554	478	687	0	4	1169	17	29	31	0	77	0	1252	146	0	1398	3198
% App. Total																					
PHF	.694	.000	.826	.000	.824	.842	.923	.000	.250	.880	.472	.659	.596	.000	.875	.000	.926	.777	.000	.908	.948

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

PRECISION DATA INDUSTRIES, LLC
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File Name : 123026 E
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	11	0	16	0	14	18	0	0	0	1	0	0	0	20	12	0	92
07:15 AM	16	0	10	0	8	15	0	0	0	2	0	0	0	12	16	0	79
07:30 AM	12	0	12	0	11	15	0	0	0	1	2	0	0	16	9	0	78
07:45 AM	12	0	15	0	8	16	0	0	0	0	1	0	0	11	15	0	78
Total	51	0	53	0	41	64	0	0	0	4	3	0	0	59	52	0	327
08:00 AM	10	0	10	0	7	13	0	0	2	0	0	0	0	13	13	0	68
08:15 AM	13	0	17	0	16	13	0	0	0	0	0	0	0	16	10	0	85
08:30 AM	14	0	13	0	6	12	0	0	1	0	1	0	0	20	16	0	83
08:45 AM	12	0	18	0	6	14	0	1	0	1	1	0	0	12	12	0	77
Total	49	0	58	0	35	52	0	1	3	1	2	0	0	61	51	0	313
Grand Total	100	0	111	0	76	116	0	1	3	5	5	0	0	120	103	0	640
Apprch %	47.4	0	52.6	0	39.4	60.1	0	0.5	23.1	38.5	38.5	0	0	53.8	46.2	0	
Total %	15.6	0	17.3	0	11.9	18.1	0	0.2	0.5	0.8	0.8	0	0	18.8	16.1	0	

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	11	0	**16**	**0**	**27**	**14**	**18**	**0**	**0**	**32**	**0**	**1**	**0**	**0**	**1**	**0**	**20**	**12**	**0**	**32**	**92**
07:15 AM	**16**	**0**	**10**	**0**	**26**	**8**	**15**	**0**	**0**	**23**	**0**	**2**	0	0	2	0	12	**16**	0	28	79
07:30 AM	12	0	12	0	24	11	15	0	0	26	0	1	**2**		**3**	0	16	9	0	25	78
07:45 AM	12	0	15	0	27	8	16	0	0	24	0	0	1	0	1	0	11	15	0	26	78
Total Volume	51	0	53	0	104	41	64	0	0	105	0	4	3	0	7	0	59	52	0	111	327
% App. Total	49	0	51	0		39	61	0	0		0	57.1	42.9	0		0	53.2	46.8	0		
PHF	.797	.000	.828	.000	.963	.732	.889	.000	.000	.820	.000	.500	.375	.000	.583	.000	.738	.813	.000	.867	.889

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
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Page No : 1

Groups Printed- Peds and Bikes

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	2	0	1	0	1	0	0	0	10	0	1	0	3	18
07:15 AM	0	0	1	0	1	0	0	4	0	0	0	8	0	2	0	0	16
07:30 AM	0	0	1	3	1	0	0	1	0	0	0	3	0	2	1	1	13
07:45 AM	0	0	2	8	0	0	0	6	0	0	0	10	0	3	0	3	32
Total	0	0	4	13	2	1	0	12	0	0	0	31	0	8	1	7	79
08:00 AM	0	0	2	0	2	0	0	2	0	0	0	3	0	0	0	0	9
08:15 AM	0	0	0	1	0	0	0	6	0	0	0	11	0	3	1	0	22
08:30 AM	0	0	4	0	0	1	0	0	0	1	0	2	0	3	1	0	12
08:45 AM	0	0	3	0	0	0	0	3	0	1	0	11	0	7	0	0	25
Total	0	0	9	1	2	1	0	11	0	2	0	27	0	13	2	0	68
Grand Total	0	0	13	14	4	2	0	23	0	2	0	58	0	21	3	7	147
Apprch %	0	0	48.1	51.9	13.8	6.9	0	79.3	0	3.3	0	96.7	0	67.7	9.7	22.6	
Total %	0	0	8.8	9.5	2.7	1.4	0	15.6	0	1.4	0	39.5	0	14.3	2	4.8	

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	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	2	2	0	**1**	**0**	**1**	**2**	**0**	**0**	**0**	**10**	**10**	0	1	0	**3**	4	18
07:15 AM	0	0	1	0	1	**1**	0	0	4	5	0	0	0	8	8	0	2	0	0	2	16
07:30 AM	0	0	1	3	4	1	0	0	1	2	0	0	0	3	3	0	2	**1**	1	4	13
07:45 AM	0	0	**2**	**8**	**10**	0	0	0	**6**	**6**							**3**			**6**	**32**
Total Volume	0	0	4	13	17	2	1	0	12	15	0	0	0	31	31	0	8	1	7	16	79
% App. Total	0	0	23.5	76.5		13.3	6.7	0	80		0	0	0	100		0	50	6.2	43.8		
PHF	.000	.000	.500	.406	.425	.500	.250	.000	.500	.625	.000	.000	.000	.775	.775	.000	.667	.250	.583	.667	.617

N/S: Ruggles Street/ Whittier Street
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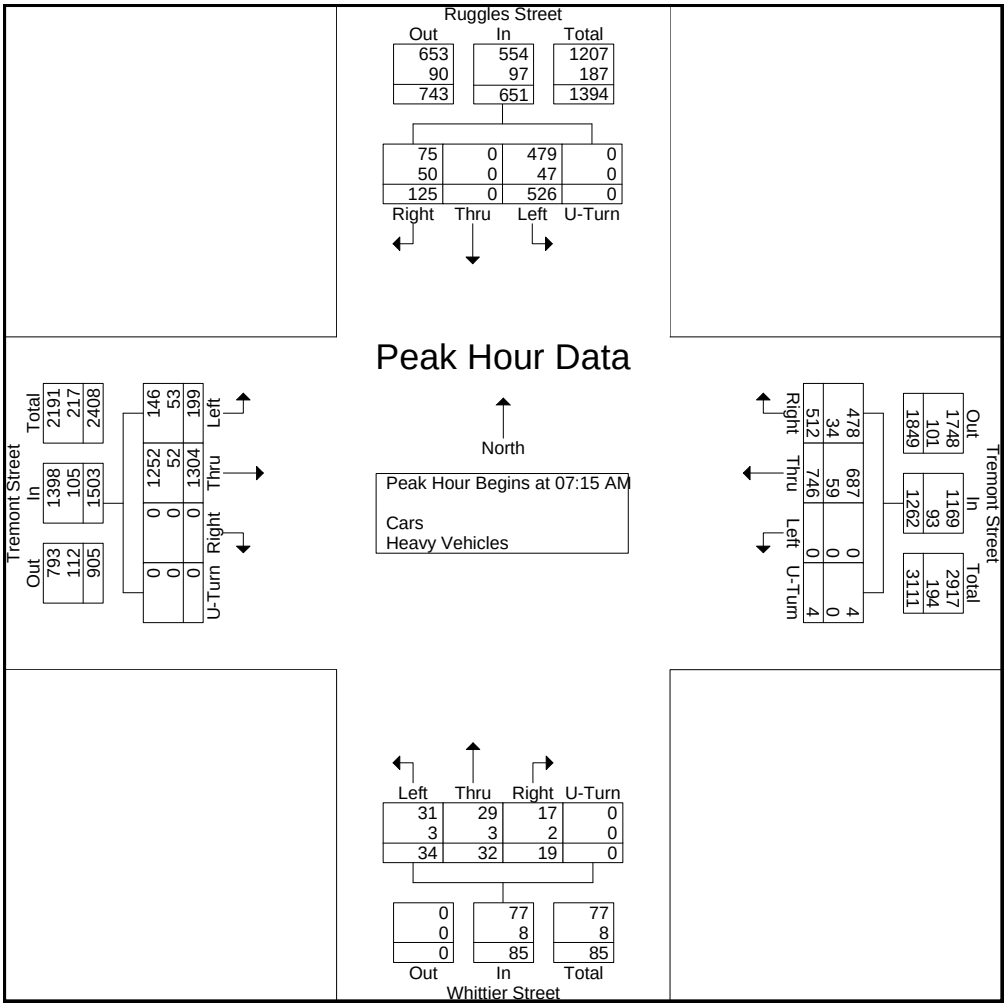
Page No : 1

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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 07:15 AM																					
07:15 AM	**43**	**0**	**121**	**0**	**164**	**134**	**172**	**0**	**0**	**306**	**3**	**10**	**9**	**0**	**22**	**0**	**310**	**49**	**0**	**359**	**851**
07:30 AM	**35**	**0**	**157**	**0**	**192**	**153**	**201**	**0**	**4**	**358**	**4**	**12**	7	0	**23**	0	309	39	0	348	**921**
07:45 AM	**26**	**0**	**135**	**0**	**161**	**119**	**177**	**0**	**0**	**296**	**1**	**8**	**14**	**0**	**23**	**0**	**334**	**51**	**0**	**385**	**865**
08:00 AM	**21**	**0**	**113**	**0**	**134**	**106**	**196**	**0**	**0**	**302**	**11**	**2**	**4**	**0**	**17**	**0**	**351**	**60**	0	**411**	**864**
Total Volume	125	0	526	0	651	512	746	0	4	1262	19	32	34	0	85	0	1304	199	0	1503	3501
% App. Total																					
PHF	.727	.000	.838	.000	.848	.837	.928	.000	.250	.881	.432	.667	.607	.000	.924	.000	.929	.829	.000	.914	.950
Cars	75	0	479	0	554	478	687	0	4	1169	17	29	31	0	77	0	1252	146	0	1398	3198
% Cars	60.0	0	91.1	0	85.1	93.4	92.1	0	100	92.6	89.5	90.6	91.2	0	90.6	0	96.0	73.4	0	93.0	91.3
Heavy Vehicles																					
% Heavy Vehicles	40.0	0	8.9	0	14.9	6.6	7.9	0	0	7.4	10.5	9.4	8.8	0	9.4	0	4.0	26.6	0	7.0	8.7



N/S: Ruggles Street/ Whittier Street
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Groups Printed- Cars - Heavy Vehicles

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	61	0	131	0	141	206	0	2	9	3	7	0	0	307	15	0	882
04:15 PM	23	0	156	0	114	195	0	0	7	1	14	0	0	282	39	0	831
04:30 PM	41	0	129	0	122	168	0	0	13	4	6	0	0	280	42	0	805
04:45 PM	34	0	143	0	147	181	0	1	6	5	10	0	0	264	30	0	821
Total	159	0	559	0	524	750	0	3	35	13	37	0	0	1133	126	0	3339
05:00 PM	33	0	126	0	99	179	0	2	9	3	5	0	0	266	58	0	780
05:15 PM	64	0	125	0	137	222	0	3	9	2	18	0	0	301	39	0	920
05:30 PM	27	0	142	0	158	200	0	1	12	9	24	0	0	262	34	0	869
05:45 PM	47	0	110	0	139	222	0	0	6	5	15	0	0	275	23	0	842
Total	171	0	503	0	533	823	0	6	36	19	62	0	0	1104	154	0	3411
Grand Total	330	0	1062	0	1057	1573	0	9	71	32	99	0	0	2237	280	0	6750
Apprch %	23.7	0	76.3	0	40.1	59.6	0	0.3	35.1	15.8	49	0	0	88.9	11.1	0	
Total %	4.9	0	15.7	0	15.7	23.3	0	0.1	1.1	0.5	1.5	0	0	33.1	4.1	0	
Cars	330	0	978	0	981	1540	0	9	67	32	98	0	0	2132	280	0	6447
% Cars	100	0	92.1	0	92.8	97.9	0	100	94.4	100	99	0	0	95.3	100	0	95.5
Heavy Vehicles	0	0	84	0	76	33	0	0	4	0	1	0	0	105	0	0	303
% Heavy Vehicles	0	0	7.9	0	7.2	2.1	0	0	5.6	0	1	0	0	4.7	0	0	4.5

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	33	0	126	0	159	99	179	0	2	280	9	3	5	0	17	0	266	**58**	0	324	780
05:15 PM	**64**				**189**	137	**222**		**3**	**362**							**301**			**340**	**920**
05:30 PM	**27**	**0**	**142**	**0**	**169**	**158**	200	0	1	359	**12**	**9**	**24**	**0**	**45**	0	262	34	0	296	869
05:45 PM	47	0	110	0	157	139	222	0	0	361	6	5	15	0	26	0	275	23	0	298	842
Total Volume	171	0	503	0	674	533	823	0	6	1362	36	19	62	0	117	0	1104	154	0	1258	3411
% App. Total																					
PHF	.668	.000	.886	.000	.892	.843	.927	.000	.500	.941	.750	.528	.646	.000	.650	.000	.917	.664	.000	.925	.927
Cars	171	0	468	0	639	502	812	0	6	1320	35	19	61	0	115	0	1062	154	0	1216	3290
% Cars	100	0	93.0	0	94.8	94.2	98.7	0	100	96.9	97.2	100	98.4	0	98.3	0	96.2	100	0	96.7	96.5
Heavy Vehicles																					
% Heavy Vehicles	0	0	7.0	0	5.2	5.8	1.3	0	0	3.1	2.8	0	1.6	0	1.7	0	3.8	0	0	3.3	3.5

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Client: HSH/ J. SanClemente

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Groups Printed- Cars

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	61	0	122	0	125	201	0	2	8	3	7	0	0	288	15	0	832
04:15 PM	23	0	141	0	101	188	0	0	7	1	14	0	0	270	39	0	784
04:30 PM	41	0	119	0	111	163	0	0	11	4	6	0	0	266	42	0	763
04:45 PM	34	0	128	0	142	176	0	1	6	5	10	0	0	246	30	0	778
Total	159	0	510	0	479	728	0	3	32	13	37	0	0	1070	126	0	3157
05:00 PM	33	0	115	0	90	173	0	2	9	3	5	0	0	257	58	0	745
05:15 PM	64	0	119	0	129	218	0	3	9	2	18	0	0	291	39	0	892
05:30 PM	27	0	132	0	152	199	0	1	11	9	23	0	0	248	34	0	836
05:45 PM	47	0	102	0	131	222	0	0	6	5	15	0	0	266	23	0	817
Total	171	0	468	0	502	812	0	6	35	19	61	0	0	1062	154	0	3290
Grand Total	330	0	978	0	981	1540	0	9	67	32	98	0	0	2132	280	0	6447
Apprch %	25.2	0	74.8	0	38.8	60.9	0	0.4	34	16.2	49.7	0	0	88.4	11.6	0	
Total %	5.1	0	15.2	0	15.2	23.9	0	0.1	1	0.5	1.5	0	0	33.1	4.3	0	

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	33	0	115	0	148	90	173	0	2	265	9	3	5	0	17	0	257	**58**	0	315	745
05:15 PM	**64**				**183**	129	218	0	**3**	350	9	2	18	0	29	0	**291**			**330**	**892**
05:30 PM	**27**	**0**	**132**	**0**	**159**	**152**	199	0	1	352	**11**	**9**	**23**	**0**	**43**	0	248	34	0	282	836
05:45 PM	47	0	102	0	149	131	**222**			**353**											
Total Volume	171	0	468	0	639	502	812	0	6	1320	35	19	61	0	115	0	1062	154	0	1216	3290
% App. Total																					
PHF	.668	.000	.886	.000	.873	.826	.914	.000	.500	.935	.795	.528	.663	.000	.669	.000	.912	.664	.000	.921	.922

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

PRECISION DATA INDUSTRIES, LLC
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File Name : 123026 EE
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Heavy Vehicles

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	0	0	9	0	16	5	0	0	1	0	0	0	0	19	0	0	50
04:15 PM	0	0	15	0	13	7	0	0	0	0	0	0	0	12	0	0	47
04:30 PM	0	0	10	0	11	5	0	0	2	0	0	0	0	14	0	0	42
04:45 PM	0	0	15	0	5	5	0	0	0	0	0	0	0	18	0	0	43
Total	0	0	49	0	45	22	0	0	3	0	0	0	0	63	0	0	182
05:00 PM	0	0	11	0	9	6	0	0	0	0	0	0	0	9	0	0	35
05:15 PM	0	0	6	0	8	4	0	0	0	0	0	0	0	10	0	0	28
05:30 PM	0	0	10	0	6	1	0	0	1	0	1	0	0	14	0	0	33
05:45 PM	0	0	8	0	8	0	0	0	0	0	0	0	0	9	0	0	25
Total	0	0	35	0	31	11	0	0	1	0	1	0	0	42	0	0	121
Grand Total	0	0	84	0	76	33	0	0	4	0	1	0	0	105	0	0	303
Apprch %	0	0	100	0	69.7	30.3	0	0	80	0	20	0	0	100	0	0	
Total %	0	0	27.7	0	25.1	10.9	0	0	1.3	0	0.3	0	0	34.7	0	0	

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	9	0	9	**16**	5	0	0	**21**	**1**	**0**	**0**	**0**	**1**	**0**	**19**	**0**	**0**	**19**	**50**
04:15 PM	**0**	**0**	**15**	**0**	**15**	13	**7**	**0**	**0**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**12**	**47**
04:30 PM	**0**	**0**	**10**	**0**	**10**	**11**	**5**	**0**	**0**	**16**	**2**	**0**	**0**	**0**	**2**	0	14	0	0	14	42
04:45 PM	0	0	15	0	15	5	5	0	0	10	0	0	0	0	0	0	18	0	0	18	43
Total Volume	0	0	49	0	49	45	22	0	0	67	3	0	0	0	3	0	63	0	0	63	182
% App. Total	0	0	100	0		67.2	32.8	0	0		100	0	0	0		0	100	0	0		
PHF	.000	.000	.817	.000	.817	.703	.786	.000	.000	.798	.375	.000	.000	.000	.375	.000	.829	.000	.000	.829	.910

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

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File Name : 123026 EE
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Peds and Bikes

	Ruggles Street From North				Tremont Street From East				Whittier Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	4	0	2	0	8	0	0	1	21	0	2	0	2	40
04:15 PM	1	0	0	0	0	0	0	1	0	0	0	12	0	1	0	4	19
04:30 PM	1	0	1	0	0	0	0	2	0	0	1	16	0	2	0	6	29
04:45 PM	1	0	3	0	0	0	0	4	0	0	0	16	0	0	0	11	35
Total	3	0	4	4	0	2	0	15	0	0	2	65	0	5	0	23	123
05:00 PM	1	0	2	0	0	1	0	8	2	0	0	11	0	2	0	4	31
05:15 PM	0	0	3	1	0	3	0	5	0	1	0	14	0	2	0	9	38
05:30 PM	1	0	3	0	0	0	0	15	0	0	0	19	0	2	0	3	43
05:45 PM	0	0	0	0	1	5	0	37	0	0	0	14	0	2	0	4	63
Total	2	0	8	1	1	9	0	65	2	1	0	58	0	8	0	20	175
Grand Total	5	0	12	5	1	11	0	80	2	1	2	123	0	13	0	43	298
Apprch %	22.7	0	54.5	22.7	1.1	12	0	87	1.6	0.8	1.6	96.1	0	23.2	0	76.8	
Total %	1.7	0	4	1.7	0.3	3.7	0	26.8	0.7	0.3	0.7	41.3	0	4.4	0	14.4	

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	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**	**0**	**2**	**0**	**3**	**0**	**1**	**0**	**8**	**9**	**2**	**0**	**0**	**11**	**13**	**0**	**2**	**0**	**4**	**6**	**31**
05:15 PM	**0**	**0**	**3**	**1**	**4**	0	3	0	5	8	0	**1**	0	14	15	0	2	0	**9**	**11**	**38**
05:30 PM	**1**	**0**	**3**	**0**	**4**	**0**	**0**	**0**	**15**	**15**	**0**	**0**	**0**	**19**	**19**	0	2	0	3	5	43
05:45 PM	0	0	0	0	0	**1**	**5**		**37**	**43**											**63**
Total Volume	2	0	8	1	11	1	9	0	65	75	2	1	0	58	61	0	8	0	20	28	175
% App. Total	18.2	0	72.7	9.1		1.3	12	0	86.7		3.3	1.6	0	95.1		0	28.6	0	71.4		
PHF	.500	.000	.667	.250	.688	.250	.450	.000	.439	.436	.250	.250	.000	.763	.803	.000	1.00	.000	.556	.636	.694

N/S: Ruggles Street/ Whittier Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

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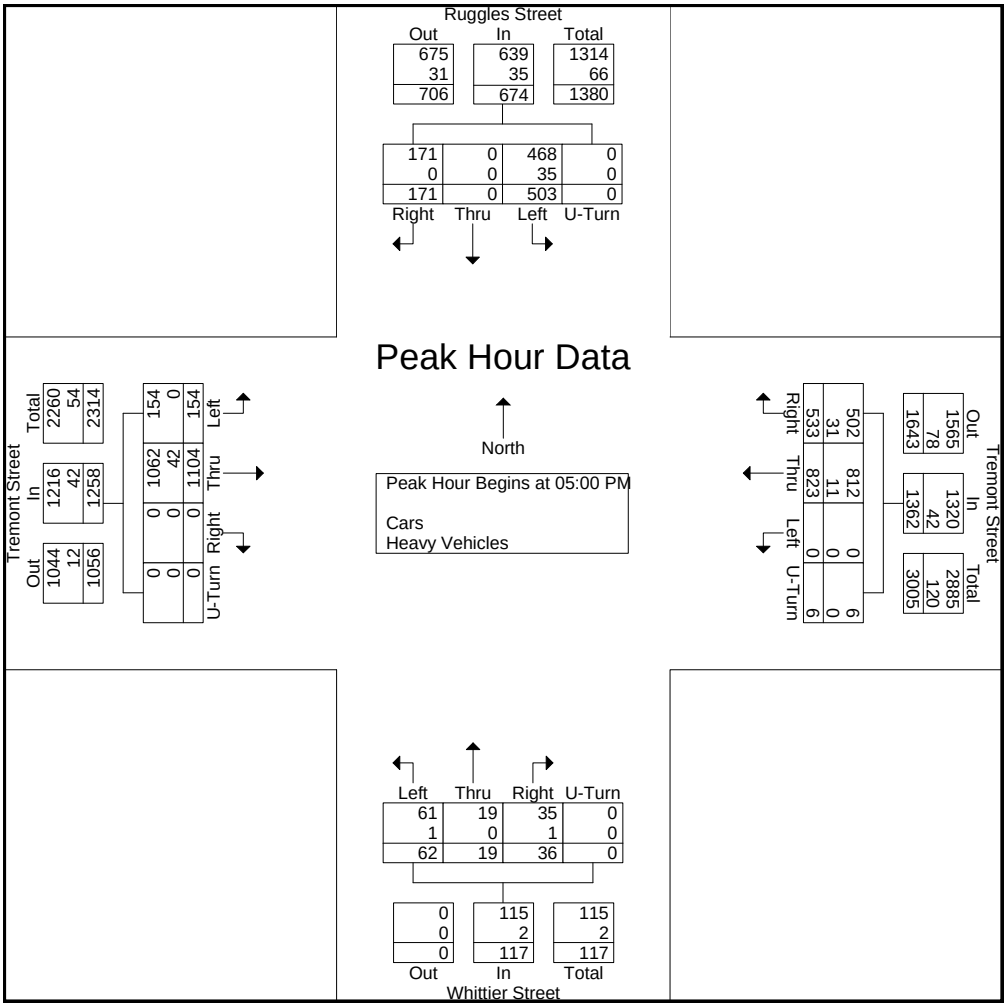
File Name : 123026 EE
Site Code : 2011046_
Start Date : 9/25/2012

	Ruggles Street From North					Tremont Street From East					Whittier Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	33	0	126	0	159	99	179	0	2	280	9	3	5	0	17	0	266	**58**	0	324	780
05:15 PM	**64**				**189**	137	**222**		**3**	**362**							**301**			**340**	**920**
05:30 PM	**27**	**0**	**142**	**0**	**169**	**158**	200	0	1	359	**12**	**9**	**24**	**0**	**45**	0	262	34	0	296	869
05:45 PM	47	0	110	0	157	139	222	0	0	361	6	5	15	0	26	0	275	23	0	298	842
Total Volume	171	0	503	0	674	533	823	0	6	1362	36	19	62	0	117	0	1104	154	0	1258	3411
% App. Total																					
PHF	.668	.000	.886	.000	.892	.843	.927	.000	.500	.941	.750	.528	.646	.000	.650	.000	.917	.664	.000	.925	.927
Cars	171	0	468	0	639	502	812	0	6	1320	35	19	61	0	115	0	1062	154	0	1216	3290
% Cars	100	0	93.0	0	94.8	94.2	98.7	0	100	96.9	97.2	100	98.4	0	98.3	0	96.2	100	0	96.7	96.5
Heavy Vehicles																					
% Heavy Vehicles	0	0	7.0	0	5.2	5.8	1.3	0	0	3.1	2.8	0	1.6	0	1.7	0	3.8	0	0	3.3	3.5



N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

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File Name : 123026 F
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	7	0	0	0	0	308	0	0	0	0	0	0	30	355	0	0	700
07:15 AM	11	0	0	0	0	303	0	0	0	0	0	0	35	377	0	0	726
07:30 AM	10	0	0	0	0	344	0	0	0	0	0	0	30	455	0	0	839
07:45 AM	9	0	0	0	0	292	0	0	0	0	0	0	28	446	0	0	775
Total	37	0	0	0	0	1247	0	0	0	0	0	0	123	1633	0	0	3040
08:00 AM	13	0	0	0	0	265	0	0	0	0	0	0	33	463	0	0	774
08:15 AM	8	0	0	0	0	275	0	0	0	0	0	0	30	411	0	0	724
08:30 AM	9	0	0	0	0	279	0	0	0	0	0	0	33	386	0	0	707
08:45 AM	11	0	0	0	0	316	0	0	0	0	0	0	24	417	0	0	768
Total	41	0	0	0	0	1135	0	0	0	0	0	0	120	1677	0	0	2973
Grand Total	78	0	0	0	0	2382	0	0	0	0	0	0	243	3310	0	0	6013
Apprch %	100	0	0	0	0	100	0	0	0	0	0	0	6.8	93.2	0	0	
Total %	1.3	0	0	0	0	39.6	0	0	0	0	0	0	4	55	0	0	
Cars	56	0	0	0	0	2212	0	0	0	0	0	0	204	3122	0	0	5594
% Cars	71.8	0	0	0	0	92.9	0	0	0	0	0	0	84	94.3	0	0	93
Heavy Vehicles	22	0	0	0	0	170	0	0	0	0	0	0	39	188	0	0	419
% Heavy Vehicles	28.2	0	0	0	0	7.1	0	0	0	0	0	0	16	5.7	0	0	7

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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 07:15 AM																					
07:15 AM	11	0	0	0	11	0	303	0	0	303	0	0	0	0	0	**35**	377	0	0	412	726
07:30 AM	10	0	0	0	10	0	**344**			**344**											**839**
07:45 AM	**9**	**0**	**0**	**0**	**9**	**0**	**292**	**0**	**0**	**292**	**0**	**0**	**0**	**0**	**0**	**28**	**446**	**0**	**0**	**474**	**775**
08:00 AM	**13**	**0**	**0**	**0**	**13**	0	265	0	0	265	0	0	0	0	0	33	**463**	**0**	**0**	**496**	**774**
Total Volume	43	0	0	0	43	0	1204	0	0	1204	0	0	0	0	0	126	1741	0	0	1867	3114
% App. Total																					
PHF	.827	.000	.000	.000	.827	.000	.875	.000	.000	.875	.000	.000	.000	.000	.000	.900	.940	.000	.000	.941	.928
Cars	35	0	0	0	35	0	1123	0	0	1123	0	0	0	0	0	109	1661	0	0	1770	2928
% Cars	81.4	0	0	0	81.4	0	93.3	0	0	93.3	0	0	0	0	0	86.5	95.4	0	0	94.8	94.0
Heavy Vehicles																					
% Heavy Vehicles	18.6	0	0	0	18.6	0	6.7	0	0	6.7	0	0	0	0	0	13.5	4.6	0	0	5.2	6.0

N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
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Site Code : 2011046_
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Page No : 1

Groups Printed- Cars

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	4	0	0	0	0	282	0	0	0	0	0	0	23	325	0	0	634
07:15 AM	9	0	0	0	0	287	0	0	0	0	0	0	31	360	0	0	687
07:30 AM	7	0	0	0	0	321	0	0	0	0	0	0	26	431	0	0	785
07:45 AM	7	0	0	0	0	267	0	0	0	0	0	0	24	427	0	0	725
Total	27	0	0	0	0	1157	0	0	0	0	0	0	104	1543	0	0	2831
08:00 AM	12	0	0	0	0	248	0	0	0	0	0	0	28	443	0	0	731
08:15 AM	5	0	0	0	0	252	0	0	0	0	0	0	27	382	0	0	666
08:30 AM	5	0	0	0	0	264	0	0	0	0	0	0	28	364	0	0	661
08:45 AM	7	0	0	0	0	291	0	0	0	0	0	0	17	390	0	0	705
Total	29	0	0	0	0	1055	0	0	0	0	0	0	100	1579	0	0	2763
Grand Total	56	0	0	0	0	2212	0	0	0	0	0	0	204	3122	0	0	5594
Apprch %	100	0	0	0	0	100	0	0	0	0	0	0	6.1	93.9	0	0	
Total %	1	0	0	0	0	39.5	0	0	0	0	0	0	3.6	55.8	0	0	

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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 07:15 AM																					
07:15 AM	9	0	0	0	9	0	287	0	0	287	0	0	0	0	0	**31**	360	0	0	391	687
07:30 AM	7	0	0	0	7	0	**321**			**321**											**785**
07:45 AM	**7**	**0**	**0**	**0**	**7**	**0**	**267**	**0**	**0**	**267**	**0**	**0**	**0**	**0**	**0**	**24**	**427**	**0**	**0**	**451**	**725**
08:00 AM	**12**	**0**	**0**	**0**	**12**	0	248	0	0	248	0	0	0	0	0	28	**443**	**0**	**0**	**471**	**731**
Total Volume	35	0	0	0	35	0	1123	0	0	1123	0	0	0	0	0	109	1661	0	0	1770	2928
% App. Total																					
PHF	.729	.000	.000	.000	.729	.000	.875	.000	.000	.875	.000	.000	.000	.000	.000	.879	.937	.000	.000	.939	.932

N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
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Groups Printed- Heavy Vehicles

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
07:00 AM	3	0	0	0	0	26	0	0	0	0	0	0	7	30	0	0	66
07:15 AM	2	0	0	0	0	16	0	0	0	0	0	0	4	17	0	0	39
07:30 AM	3	0	0	0	0	23	0	0	0	0	0	0	4	24	0	0	54
07:45 AM	2	0	0	0	0	25	0	0	0	0	0	0	4	19	0	0	50
Total	10	0	0	0	0	90	0	0	0	0	0	0	19	90	0	0	209
08:00 AM	1	0	0	0	0	17	0	0	0	0	0	0	5	20	0	0	43
08:15 AM	3	0	0	0	0	23	0	0	0	0	0	0	3	29	0	0	58
08:30 AM	4	0	0	0	0	15	0	0	0	0	0	0	5	22	0	0	46
08:45 AM	4	0	0	0	0	25	0	0	0	0	0	0	7	27	0	0	63
Total	12	0	0	0	0	80	0	0	0	0	0	0	20	98	0	0	210
Grand Total	22	0	0	0	0	170	0	0	0	0	0	0	39	188	0	0	419
Apprch %	100	0	0	0	0	100	0	0	0	0	0	0	17.2	82.8	0	0	
Total %	5.3	0	0	0	0	40.6	0	0	0	0	0	0	9.3	44.9	0	0	

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	1	0	0	0	1	0	17	0	0	17	0	0	0	0	0	5	20	0	0	25	43
08:15 AM	3	0	0	0	3	0	23	0	0	23	0	0	0	0	0	3	**29**	**0**	**0**	**32**	**58**
08:30 AM	**4**	**0**	**0**	**0**	**4**	0	15	0	0	15	0	0	0	0	0	5	22	0	0	27	46
08:45 AM	4	0	0	0	4	0	**25**			**25**						**7**	27	0	0	**34**	**63**
Total Volume	12	0	0	0	12	0	80	0	0	80	0	0	0	0	0	20	98	0	0	118	210
% App. Total	100	0	0	0		0	100	0	0		0	0	0	0		16.9	83.1	0	0		
PHF	.750	.000	.000	.000	.750	.000	.800	.000	.000	.800	.000	.000	.000	.000	.000	.714	.845	.000	.000	.868	.833

N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

PRECISION DATA INDUSTRIES, LLC
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File Name : 123026 F
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Peds and Bikes

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	7	0	2	0	36	0	0	0	7	0	1	0	3	56
07:15 AM	0	0	0	5	0	2	0	28	0	0	0	6	0	3	0	5	49
07:30 AM	0	0	0	3	0	1	0	13	0	0	0	3	1	2	0	3	26
07:45 AM	1	0	0	8	0	0	0	22	0	0	0	8	0	6	0	4	49
Total	1	0	0	23	0	5	0	99	0	0	0	24	1	12	0	15	180
08:00 AM	0	0	0	9	0	1	0	38	0	0	0	0	0	3	0	5	56
08:15 AM	0	0	0	5	0	1	0	31	0	0	0	5	0	3	0	0	45
08:30 AM	0	0	0	7	0	0	0	24	0	0	0	0	1	6	0	0	38
08:45 AM	0	0	0	12	0	0	0	18	0	0	0	0	0	12	0	0	42
Total	0	0	0	33	0	2	0	111	0	0	0	5	1	24	0	5	181
Grand Total	1	0	0	56	0	7	0	210	0	0	0	29	2	36	0	20	361
Apprch %	1.8	0	0	98.2	0	3.2	0	96.8	0	0	0	100	3.4	62.1	0	34.5	
Total %	0.3	0	0	15.5	0	1.9	0	58.2	0	0	0	8	0.6	10	0	5.5	

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	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	**1**	**0**	**0**	**8**	**9**	0	0	0	22	22	0	0	0	**8**	**8**	0	**6**	**0**	**4**	**10**	**49**
08:00 AM	**0**	**0**	**0**	**9**	**9**	**0**	**1**	**0**	**38**	**39**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**5**	8	**56**
08:15 AM	**0**	**0**	**0**	**5**	**5**	**0**	**1**	**0**	**31**	**32**	**0**	**0**	**0**	**5**	**5**	**0**	**3**	**0**	**0**	**3**	**45**
08:30 AM	**0**	**0**	**0**	**7**	**7**	**0**	**0**	**0**	**24**	**24**	**0**	**0**	**0**	**0**	**0**	**1**	6	0	0	7	38
Total Volume	1	0	0	29	30	0	2	0	115	117	0	0	0	13	13	1	18	0	9	28	188
% App. Total	3.3	0	0	96.7		0	1.7	0	98.3		0	0	0	100		3.6	64.3	0	32.1		
PHF	.250	.000	.000	.806	.833	.000	.500	.000	.757	.750	.000	.000	.000	.406	.406	.250	.750	.000	.450	.700	.839

N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
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Client: HSH/ J. SanClemente

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File Name : 123026 F
Site Code : 2011046_
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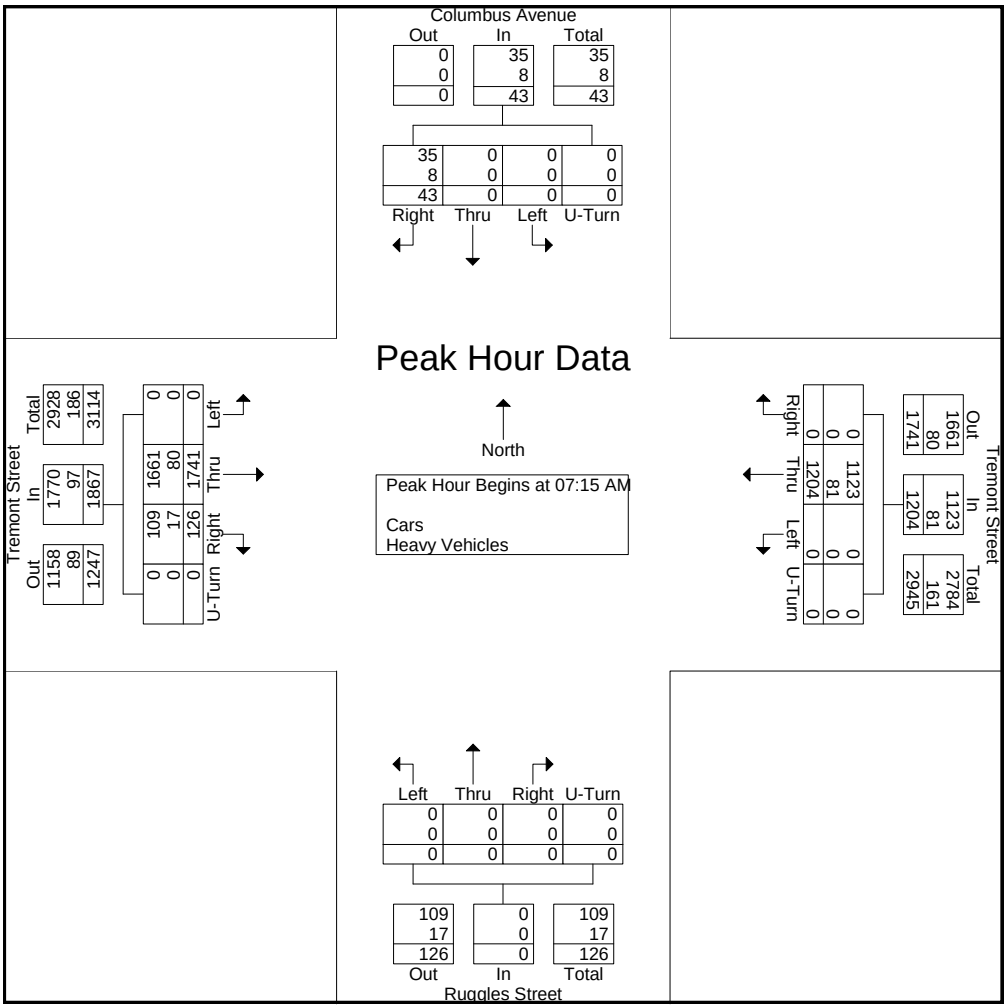
Page No : 1

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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 07:15 AM																					
07:15 AM	11	0	0	0	11	0	303	0	0	303	0	0	0	0	0	**35**	377	0	0	412	726
07:30 AM	10	0	0	0	10	0	**344**			**344**											**839**
07:45 AM	**9**	**0**	**0**	**0**	**9**	**0**	**292**	**0**	**0**	**292**	**0**	**0**	**0**	**0**	**0**	**28**	**446**	**0**	**0**	**474**	**775**
08:00 AM	**13**	**0**	**0**	**0**	**13**	0	265	0	0	265	0	0	0	0	0	33	**463**	**0**	**0**	**496**	**774**
Total Volume	43	0	0	0	43	0	1204	0	0	1204	0	0	0	0	0	126	1741	0	0	1867	3114
% App. Total																					
PHF	.827	.000	.000	.000	.827	.000	.875	.000	.000	.875	.000	.000	.000	.000	.000	.900	.940	.000	.000	.941	.928
Cars	35	0	0	0	35	0	1123	0	0	1123	0	0	0	0	0	109	1661	0	0	1770	2928
% Cars	81.4	0	0	0	81.4	0	93.3	0	0	93.3	0	0	0	0	0	86.5	95.4	0	0	94.8	94.0
Heavy Vehicles																					
% Heavy Vehicles	18.6	0	0	0	18.6	0	6.7	0	0	6.7	0	0	0	0	0	13.5	4.6	0	0	5.2	6.0



N/S: Columbus Avenue/ Ruggles Street
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File Name : 123026 FF
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	20	0	0	0	0	272	0	0	0	0	0	0	66	383	0	0	741
04:15 PM	19	0	0	0	0	272	0	0	0	0	0	0	51	407	0	0	749
04:30 PM	27	0	0	0	0	261	0	0	0	0	0	0	44	374	0	0	706
04:45 PM	24	0	0	0	0	300	0	0	0	0	0	0	46	381	0	0	751
Total	90	0	0	0	0	1105	0	0	0	0	0	0	207	1545	0	0	2947
05:00 PM	25	0	0	0	0	272	0	0	0	0	0	0	52	359	0	0	708
05:15 PM	35	0	0	0	0	295	0	0	0	0	0	0	70	392	0	0	792
05:30 PM	32	0	0	0	0	318	0	0	0	0	0	0	62	355	0	0	767
05:45 PM	30	0	0	0	0	271	0	0	0	0	0	0	38	353	0	0	692
Total	122	0	0	0	0	1156	0	0	0	0	0	0	222	1459	0	0	2959
Grand Total	212	0	0	0	0	2261	0	0	0	0	0	0	429	3004	0	0	5906
Apprch %	100	0	0	0	0	100	0	0	0	0	0	0	12.5	87.5	0	0	
Total %	3.6	0	0	0	0	38.3	0	0	0	0	0	0	7.3	50.9	0	0	
Cars	183	0	0	0	0	2178	0	0	0	0	0	0	405	2839	0	0	5605
% Cars	86.3	0	0	0	0	96.3	0	0	0	0	0	0	94.4	94.5	0	0	94.9
Heavy Vehicles	29	0	0	0	0	83	0	0	0	0	0	0	24	165	0	0	301
% Heavy Vehicles	13.7	0	0	0	0	3.7	0	0	0	0	0	0	5.6	5.5	0	0	5.1

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	24	0	0	0	24	0	300	0	0	300	0	0	0	0	0	46	381	0	0	427	751
05:00 PM	25	0	0	0	25	0	272	0	0	272	0	0	0	0	0	52	359	0	0	411	708
05:15 PM	**35**	**0**	**0**	**0**	**35**	0	295	0	0	295	0	0	0	0	0	**70**	**392**	**0**	**0**	**462**	**792**
05:30 PM	**32**	**0**	**0**	**0**	**32**	**0**	**318**	**0**	**0**	**318**	**0**	**0**	**0**	**0**	**0**	**62**	**355**	**0**	**0**	**417**	**767**
Total Volume	116	0	0	0	116	0	1185	0	0	1185	0	0	0	0	0	230	1487	0	0	1717	3018
% App. Total																					
PHF	.829	.000	.000	.000	.829	.000	.932	.000	.000	.932	.000	.000	.000	.000	.000	.821	.948	.000	.000	.929	.953
Cars	101	0	0	0	101	0	1154	0	0	1154	0	0	0	0	0	218	1405	0	0	1623	2878
% Cars	87.1	0	0	0	87.1	0	97.4	0	0	97.4	0	0	0	0	0	94.8	94.5	0	0	94.5	95.4
Heavy Vehicles																					
% Heavy Vehicles	12.9	0	0	0	12.9	0	2.6	0	0	2.6	0	0	0	0	0	5.2	5.5	0	0	5.5	4.6

N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

PRECISION DATA INDUSTRIES, LLC
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File Name : 123026 FF
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

Groups Printed- Cars

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	17	0	0	0	0	255	0	0	0	0	0	0	62	359	0	0	693
04:15 PM	14	0	0	0	0	256	0	0	0	0	0	0	48	387	0	0	705
04:30 PM	24	0	0	0	0	247	0	0	0	0	0	0	39	351	0	0	661
04:45 PM	22	0	0	0	0	291	0	0	0	0	0	0	43	352	0	0	708
Total	77	0	0	0	0	1049	0	0	0	0	0	0	192	1449	0	0	2767
05:00 PM	21	0	0	0	0	262	0	0	0	0	0	0	51	340	0	0	674
05:15 PM	30	0	0	0	0	287	0	0	0	0	0	0	65	380	0	0	762
05:30 PM	28	0	0	0	0	314	0	0	0	0	0	0	59	333	0	0	734
05:45 PM	27	0	0	0	0	266	0	0	0	0	0	0	38	337	0	0	668
Total	106	0	0	0	0	1129	0	0	0	0	0	0	213	1390	0	0	2838
Grand Total	183	0	0	0	0	2178	0	0	0	0	0	0	405	2839	0	0	5605
Apprch %	100	0	0	0	0	100	0	0	0	0	0	0	12.5	87.5	0	0	
Total %	3.3	0	0	0	0	38.9	0	0	0	0	0	0	7.2	50.7	0	0	

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	22	0	0	0	22	0	291	0	0	291	0	0	0	0	0	43	352	0	0	395	708
05:00 PM	21	0	0	0	21	0	262	0	0	262	0	0	0	0	0	51	340	0	0	391	674
05:15 PM	**30**	**0**	**0**	**0**	**30**	0	287	0	0	287	0	0	0	0	0	**65**	**380**	**0**	**0**	**445**	**762**
05:30 PM	**28**	**0**	**0**	**0**	**28**	**0**	**314**	**0**	**0**	**314**	**0**	**0**	**0**	**0**	**0**	**59**	**333**	**0**	**0**	**392**	**734**
Total Volume	101	0	0	0	101	0	1154	0	0	1154	0	0	0	0	0	218	1405	0	0	1623	2878
% App. Total																					
PHF	.842	.000	.000	.000	.842	.000	.919	.000	.000	.919	.000	.000	.000	.000	.000	.838	.924	.000	.000	.912	.944

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Groups Printed- Heavy Vehicles

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Int. Total
04:00 PM	3	0	0	0	0	17	0	0	0	0	0	0	4	24	0	0	48
04:15 PM	5	0	0	0	0	16	0	0	0	0	0	0	3	20	0	0	44
04:30 PM	3	0	0	0	0	14	0	0	0	0	0	0	5	23	0	0	45
04:45 PM	2	0	0	0	0	9	0	0	0	0	0	0	3	29	0	0	43
Total	13	0	0	0	0	56	0	0	0	0	0	0	15	96	0	0	180
05:00 PM	4	0	0	0	0	10	0	0	0	0	0	0	1	19	0	0	34
05:15 PM	5	0	0	0	0	8	0	0	0	0	0	0	5	12	0	0	30
05:30 PM	4	0	0	0	0	4	0	0	0	0	0	0	3	22	0	0	33
05:45 PM	3	0	0	0	0	5	0	0	0	0	0	0	0	16	0	0	24
Total	16	0	0	0	0	27	0	0	0	0	0	0	9	69	0	0	121
Grand Total	29	0	0	0	0	83	0	0	0	0	0	0	24	165	0	0	301
Apprch %	100	0	0	0	0	100	0	0	0	0	0	0	12.7	87.3	0	0	
Total %	9.6	0	0	0	0	27.6	0	0	0	0	0	0	8	54.8	0	0	

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	3	0	0	0	3	0	**17**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**0**	**4**	**24**	**0**	**0**	**28**	**48**
04:15 PM	**5**	**0**	**0**	**0**	**5**	0	16	0	0	16	0	0	0	0	0	3	20	0	0	23	44
04:30 PM	3	0	0	0	3	0	14	0	0	14	0	0	0	0	0	**5**	23	0	0	28	45
04:45 PM	2	0	0	0	2	0	9	0	0	9	0	0	0	0	0	3	**29**			**32**	
Total Volume	13	0	0	0	13	0	56	0	0	56	0	0	0	0	0	15	96	0	0	111	180
% App. Total	100	0	0	0		0	100	0	0		0	0	0	0		13.5	86.5	0	0		
PHF	.650	.000	.000	.000	.650	.000	.824	.000	.000	.824	.000	.000	.000	.000	.000	.750	.828	.000	.000	.867	.938

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Groups Printed- Peds and Bikes

	Columbus Avenue From North				Tremont Street From East				Ruggles Street From South				Tremont Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	3	0	32	0	0	0	10	0	0	0	3	48
04:15 PM	1	0	0	0	0	0	0	66	0	0	0	14	0	2	0	4	87
04:30 PM	0	0	0	0	0	0	0	37	0	0	0	5	0	2	0	2	46
04:45 PM	0	0	0	0	0	0	0	44	0	0	0	6	0	2	0	0	52
Total	1	0	0	0	0	3	0	179	0	0	0	35	0	6	0	9	233
05:00 PM	0	0	0	0	0	1	0	39	0	0	0	16	0	2	0	4	62
05:15 PM	2	0	0	0	0	4	0	44	0	0	0	17	0	4	0	9	80
05:30 PM	0	0	0	0	0	0	0	34	0	0	0	11	2	3	0	12	62
05:45 PM	0	0	0	2	0	2	0	29	0	0	0	16	0	2	0	8	59
Total	2	0	0	2	0	7	0	146	0	0	0	60	2	11	0	33	263
Grand Total	3	0	0	2	0	10	0	325	0	0	0	95	2	17	0	42	496
Apprch %	60	0	0	40	0	3	0	97	0	0	0	100	3.3	27.9	0	68.9	
Total %	0.6	0	0	0.4	0	2	0	65.5	0	0	0	19.2	0.4	3.4	0	8.5	

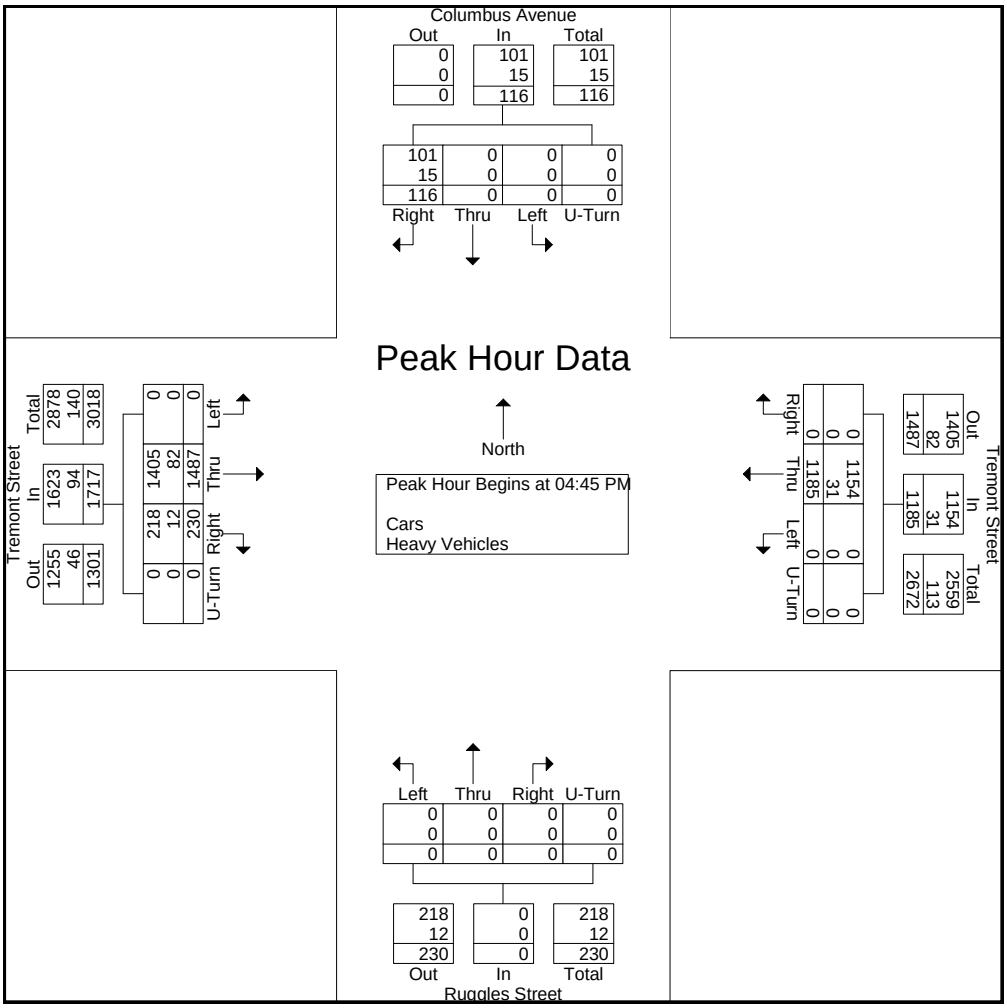
	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM 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	39	40	0	0	0	16	16	0	2	0	4	6	62
05:15 PM	**2**	**0**	**0**	**0**	**2**	0	**4**	**0**	**44**	**48**	**0**	**0**	**0**	**17**	**17**	0	**4**	**0**	**9**	**13**	**80**
05:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**34**	**34**	**0**	**0**	**0**	**11**	**11**	**2**	3	0	**12**	**17**	**62**
05:45 PM	**0**	**0**	**0**	**2**	**2**	**0**	**2**	**0**	**29**	**31**	**0**	**0**	**0**	**16**	**16**	**0**	**2**	**0**	**8**	**10**	**59**
Total Volume	2	0	0	2	4	0	7	0	146	153	0	0	0	60	60	2	11	0	33	46	263
% App. Total	50	0	0	50		0	4.6	0	95.4		0	0	0	100		4.3	23.9	0	71.7		
PHF	.250	.000	.000	.250	.500	.000	.438	.000	.830	.797	.000	.000	.000	.882	.882	.250	.688	.000	.688	.676	.822

N/S: Columbus Avenue/ Ruggles Street
E/W: Tremont Street
City, State: Boston, MA
Client: HSH/ J. SanClemente

PRECISION D A T A INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 123026 FF
Site Code : 2011046_
Start Date : 9/25/2012
Page No : 1

	Columbus Avenue From North					Tremont Street From East					Ruggles Street From South					Tremont Street From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	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	24	0	0	0	24	0	300	0	0	300	0	0	0	0	0	46	381	0	0	427	751
05:00 PM	25	0	0	0	25	0	272	0	0	272	0	0	0	0	0	52	359	0	0	411	708
05:15 PM	**35**	**0**	**0**	**0**	**35**	0	295	0	0	295	0	0	0	0	0	**70**	**392**	**0**	**0**	**462**	**792**
05:30 PM	**32**	**0**	**0**	**0**	**32**	**0**	**318**	**0**	**0**	**318**	**0**	**0**	**0**	**0**	**0**	**62**	**355**	**0**	**0**	**417**	**767**
Total Volume	116	0	0	0	116	0	1185	0	0	1185	0	0	0	0	0	230	1487	0	0	1717	3018
% App. Total																					
PHF	.829	.000	.000	.000	.829	.000	.932	.000	.000	.932	.000	.000	.000	.000	.000	.821	.948	.000	.000	.929	.953
Cars	101	0	0	0	101	0	1154	0	0	1154	0	0	0	0	0	218	1405	0	0	1623	2878
% Cars	87.1	0	0	0	87.1	0	97.4	0	0	97.4	0	0	0	0	0	94.8	94.5	0	0	94.5	95.4
Heavy Vehicles																					
% Heavy Vehicles	12.9	0	0	0	12.9	0	2.6	0	0	2.6	0	0	0	0	0	5.2	5.5	0	0	5.5	4.6



Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 1

Groups Printed- Cars - Trucks

	Shawmut Ave From North			Ruggles St From East			Shawmut Ave From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	93	0	9	0	0	0	0	0	0	13	12	129
07:15 AM	6	91	0	22	0	0	0	0	0	0	5	12	136
07:30 AM	8	88	0	25	0	0	0	0	0	0	13	15	149
07:45 AM	11	89	0	29	0	0	0	0	0	0	6	8	143
Total	27	361	0	85	0	0	0	0	0	0	37	47	557
08:00 AM	18	96	0	23	0	0	0	0	0	0	17	5	159
08:15 AM	11	109	0	19	0	0	0	0	0	0	11	6	156
08:30 AM	13	89	0	20	0	0	0	0	0	0	12	7	141
08:45 AM	7	81	0	27	0	0	0	0	0	0	17	5	137
Total	49	375	0	89	0	0	0	0	0	0	57	23	593
Grand Total	76	736	0	174	0	0	0	0	0	0	94	70	1150
Apprch %	9.4	90.6	0	100	0	0	0	0	0	0	57.3	42.7	
Total %	6.6	64	0	15.1	0	0	0	0	0	0	8.2	6.1	
Cars	68	693	0	172	0	0	0	0	0	0	88	49	1070
% Cars	89.5	94.2	0	98.9	0	0	0	0	0	0	93.6	70	93
Trucks	8	43	0	2	0	0	0	0	0	0	6	21	80
% Trucks	10.5	5.8	0	1.1	0	0	0	0	0	0	6.4	30	7

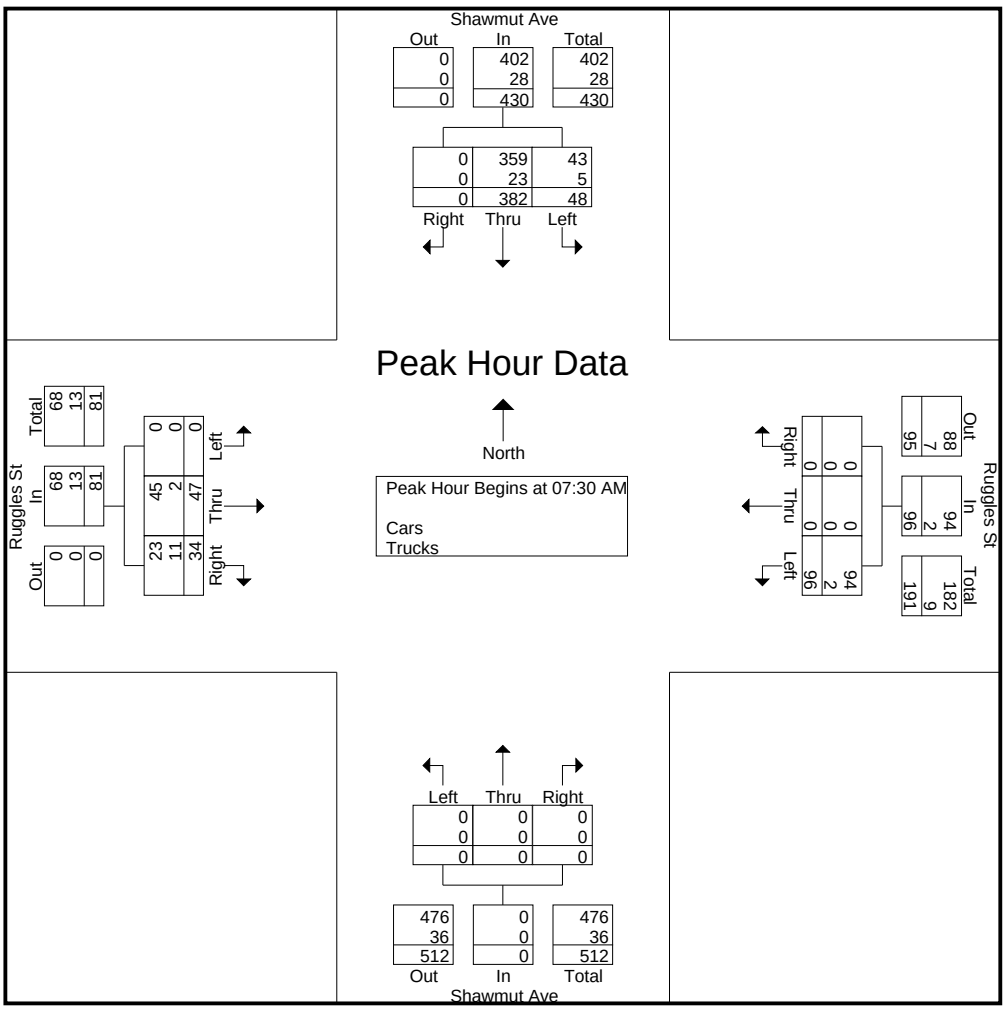
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 2

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 07:30 AM																	
07:30 AM	8	88	0	96	25	0	0	25	0	0	0	0	0	13	**15**	**28**	149
07:45 AM	11	89	0	100	**29**	0	0	**29**	0	0	0	0	0	6	8	14	143
08:00 AM	**18**	96	0	114	23	0	0	23	0	0	0	0	0	**17**	5	22	**159**
08:15 AM	11	**109**	0	**120**	19	0	0	19	0	0	0	0	0	11	6	17	156
Total Volume	48	382	0	430	96	0	0	96	0	0	0	0	0	47	34	81	607
% App. Total	11.2	88.8	0		100	0	0		0	0	0		0	58	42		
PHF	.667	.876	.000	.896	.828	.000	.000	.828	.000	.000	.000	.000	.000	.691	.567	.723	.954
Cars	43	359	0	402	94	0	0	94	0	0	0	0	0	45	23	68	564
% Cars	89.6	94.0	0	93.5	97.9	0	0	97.9	0	0	0	0	0	95.7	67.6	84.0	92.9
Trucks	5	23	0	28	2	0	0	2	0	0	0	0	0	2	11	13	43
% Trucks	10.4	6.0	0	6.5	2.1	0	0	2.1	0	0	0	0	0	4.3	32.4	16.0	7.1

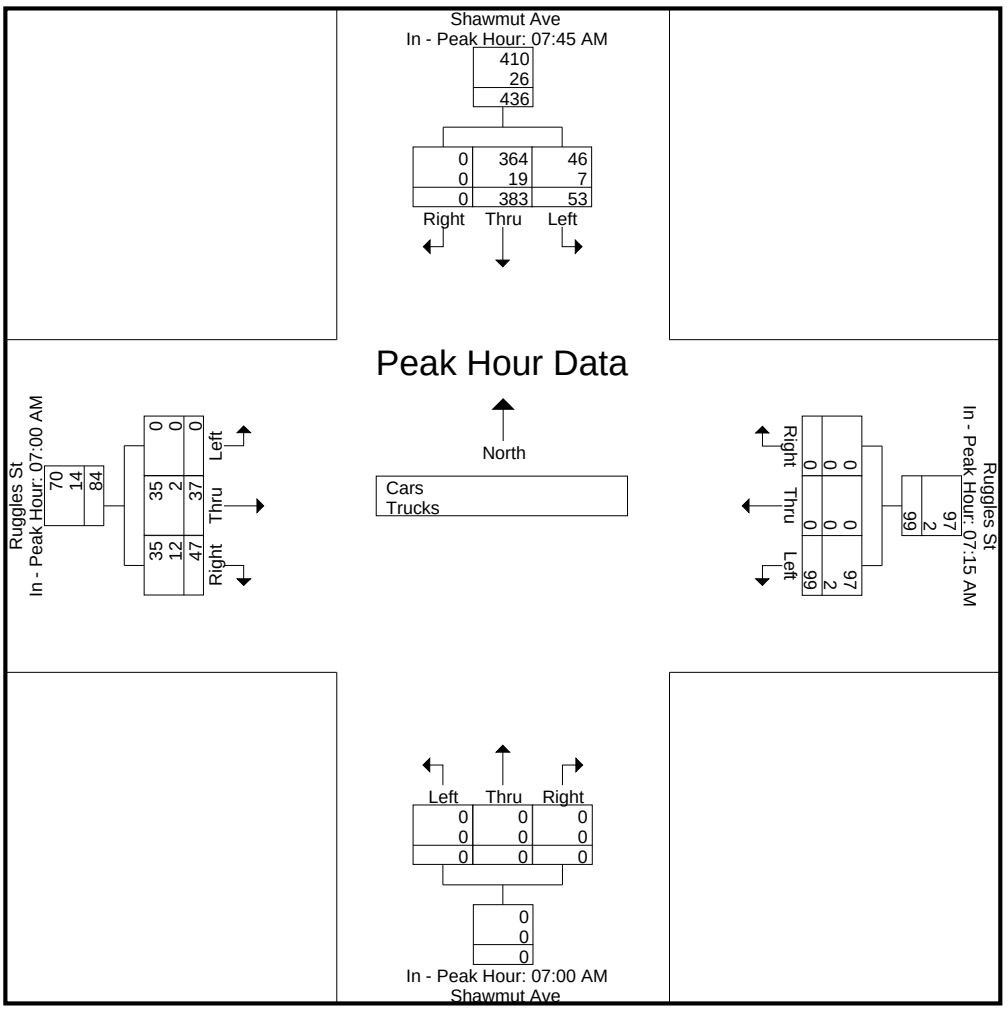


Accurate Counts
978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 3

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	07:45 AM				07:15 AM				07:00 AM				07:00 AM				
+0 mins.	11	89	0	100	22	0	0	22	0	0	0	0	0	**13**	12	25	
+15 mins.	**18**	96	0	114	25	0	0	25	0	0	0	0	0	5	12	17	
+30 mins.	11	**109**	0	**120**	**29**	0	0	**29**	0	0	0	0	0	13	**15**	**28**	
+45 mins.	13	89	0	102	23	0	0	23	0	0	0	0	0	6	8	14	
Total Volume	53	383	0	436	99	0	0	99	0	0	0	0	0	37	47	84	
% App. Total	12.2	87.8	0		100	0	0		0	0	0		0	44	56		
PHF	.736	.878	.000	.908	.853	.000	.000	.853	.000	.000	.000	.000	.000	.712	.783	.750	
Cars	46	364	0	410	97	0	0	97	0	0	0	0	0	35	35	70	
% Cars	86.8	95	0	94	98	0	0	98	0	0	0	0	0	94.6	74.5	83.3	
Trucks	7	19	0	26	2	0	0	2	0	0	0	0	0	2	12	14	
% Trucks	13.2	5	0	6	2	0	0	2	0	0	0	0	0	5.4	25.5	16.7	



Accurate Counts
978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014

Groups Printed- Cars

	Shawmut Ave From North			Ruggles St From East			Shawmut Ave From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	1	86	0	9	0	0	0	0	0	0	12	9	117
07:15 AM	6	87	0	22	0	0	0	0	0	0	5	11	131
07:30 AM	8	82	0	25	0	0	0	0	0	0	12	10	137
07:45 AM	10	82	0	28	0	0	0	0	0	0	6	5	131
Total	25	337	0	84	0	0	0	0	0	0	35	35	516
08:00 AM	16	90	0	22	0	0	0	0	0	0	17	4	149
08:15 AM	9	105	0	19	0	0	0	0	0	0	10	4	147
08:30 AM	11	87	0	20	0	0	0	0	0	0	10	3	131
08:45 AM	7	74	0	27	0	0	0	0	0	0	16	3	127
Total	43	356	0	88	0	0	0	0	0	0	53	14	554
Grand Total	68	693	0	172	0	0	0	0	0	0	88	49	1070
Apprch %	8.9	91.1	0	100	0	0	0	0	0	0	64.2	35.8	
Total %	6.4	64.8	0	16.1	0	0	0	0	0	0	8.2	4.6	

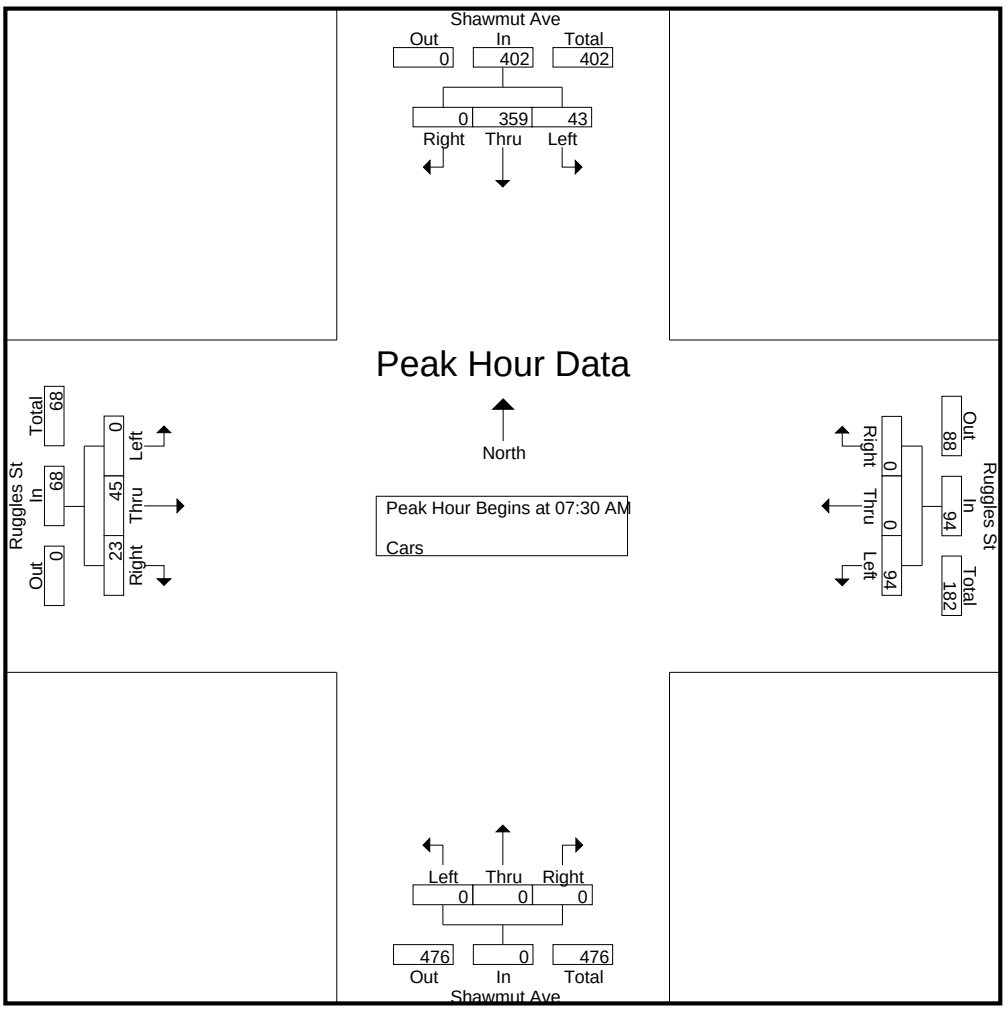
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 5

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 07:30 AM																	
07:30 AM	8	82	0	90	25	0	0	25	0	0	0	0	0	12	**10**	**22**	137
07:45 AM	10	82	0	92	**28**	0	0	**28**	0	0	0	0	0	6	5	11	131
08:00 AM	**16**	90	0	106	22	0	0	22	0	0	0	0	0	**17**	4	21	**149**
08:15 AM	9	**105**	0	**114**	19	0	0	19	0	0	0	0	0	10	4	14	147
Total Volume	43	359	0	402	94	0	0	94	0	0	0	0	0	45	23	68	564
% App. Total	10.7	89.3	0		100	0	0		0	0	0		0	66.2	33.8		
PHF	.672	.855	.000	.882	.839	.000	.000	.839	.000	.000	.000	.000	.000	.662	.575	.773	.946



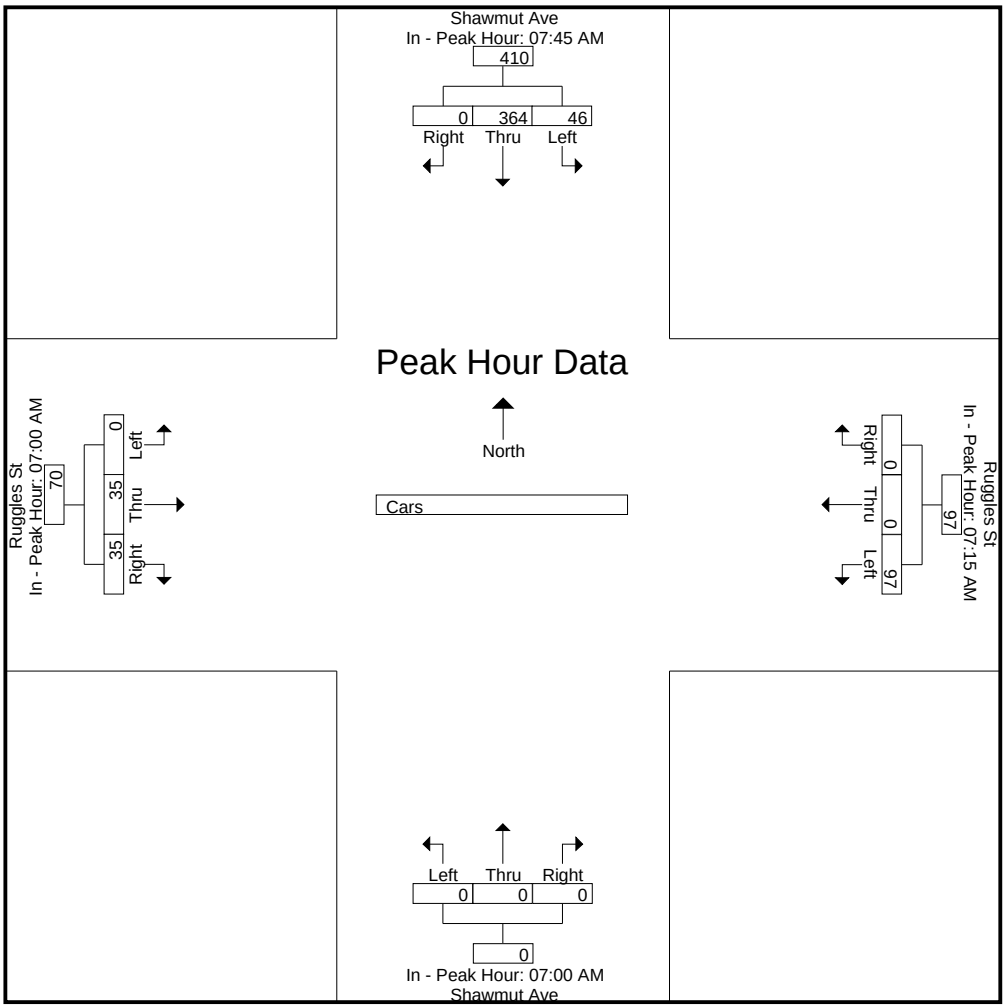
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 6

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	07:45 AM				07:15 AM				07:00 AM				07:00 AM				
+0 mins.	10	82	0	92	22	0	0	22	0	0	0	0	0	**12**	9	21	
+15 mins.	**16**	90	0	106	25	0	0	25	0	0	0	0	0	5	**11**	16	
+30 mins.	9	**105**	0	**114**	**28**	0	0	**28**	0	0	0	0	0	12	10	**22**	
+45 mins.	11	87	0	98	22	0	0	22	0	0	0	0	0	6	5	11	
Total Volume	46	364	0	410	97	0	0	97	0	0	0	0	0	35	35	70	
% App. Total	11.2	88.8	0		100	0	0		0	0	0		0	50	50		
PHF	.719	.867	.000	.899	.866	.000	.000	.866	.000	.000	.000	.000	.000	.729	.795	.795	



Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014

Groups Printed- Trucks

	Shawmut Ave From North			Ruggles St From East			Shawmut Ave From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	1	7	0	0	0	0	0	0	0	0	1	3	12
07:15 AM	0	4	0	0	0	0	0	0	0	0	0	1	5
07:30 AM	0	6	0	0	0	0	0	0	0	0	1	5	12
07:45 AM	1	7	0	1	0	0	0	0	0	0	0	3	12
Total	2	24	0	1	0	0	0	0	0	0	2	12	41
08:00 AM	2	6	0	1	0	0	0	0	0	0	0	1	10
08:15 AM	2	4	0	0	0	0	0	0	0	0	1	2	9
08:30 AM	2	2	0	0	0	0	0	0	0	0	2	4	10
08:45 AM	0	7	0	0	0	0	0	0	0	0	1	2	10
Total	6	19	0	1	0	0	0	0	0	0	4	9	39
Grand Total	8	43	0	2	0	0	0	0	0	0	6	21	80
Apprch %	15.7	84.3	0	100	0	0	0	0	0	0	22.2	77.8	
Total %	10	53.8	0	2.5	0	0	0	0	0	0	7.5	26.2	

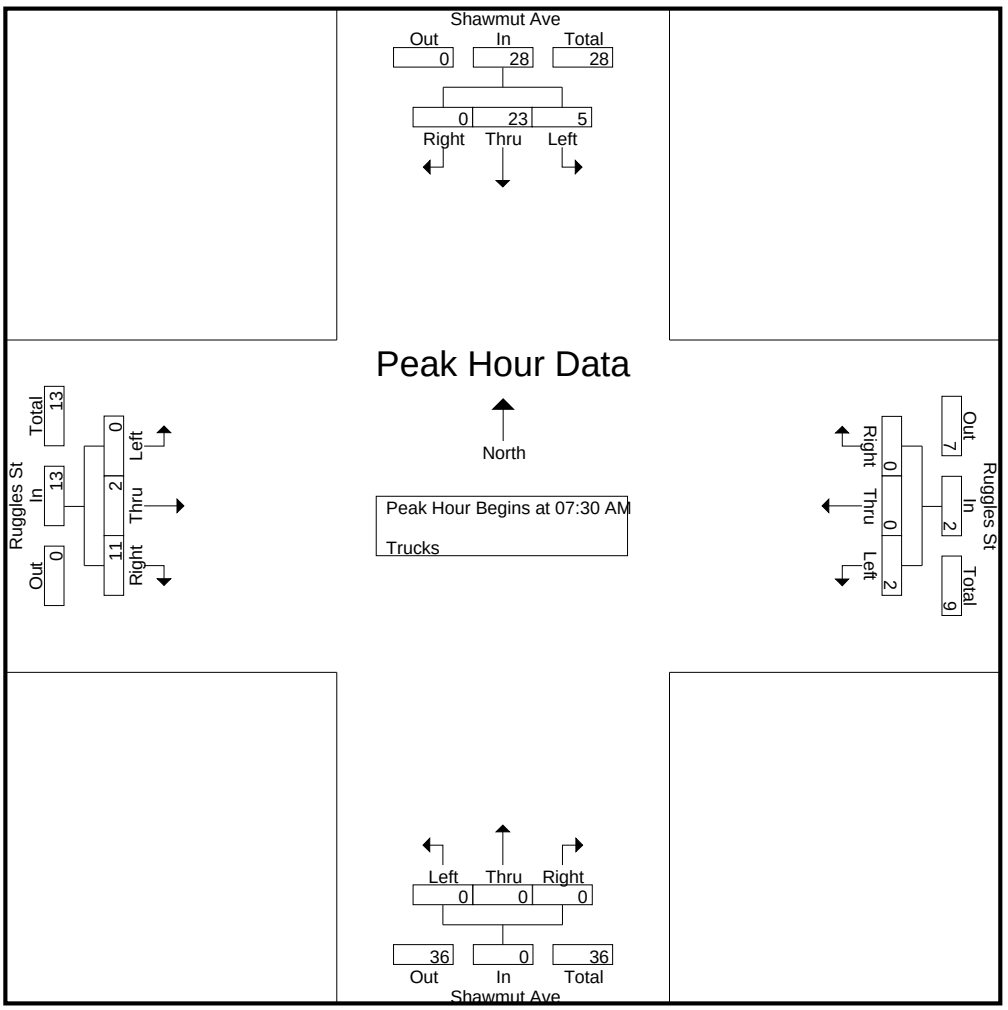
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 8

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 07:30 AM																	
07:30 AM	0	6	0	6	0	0	0	0	0	0	0	0	0	**1**	**5**	**6**	**12**
07:45 AM	1	**7**	0	**8**	**1**	0	0	**1**	0	0	0	0	0	0	3	3	12
08:00 AM	**2**	6	0	8	1	0	0	1	0	0	0	0	0	0	1	1	10
08:15 AM	2	4	0	6	0	0	0	0	0	0	0	0	0	1	2	3	9
Total Volume	5	23	0	28	2	0	0	2	0	0	0	0	0	2	11	13	43
% App. Total	17.9	82.1	0		100	0	0		0	0	0		0	15.4	84.6		
PHF	.625	.821	.000	.875	.500	.000	.000	.500	.000	.000	.000	.000	.000	.500	.550	.542	.896

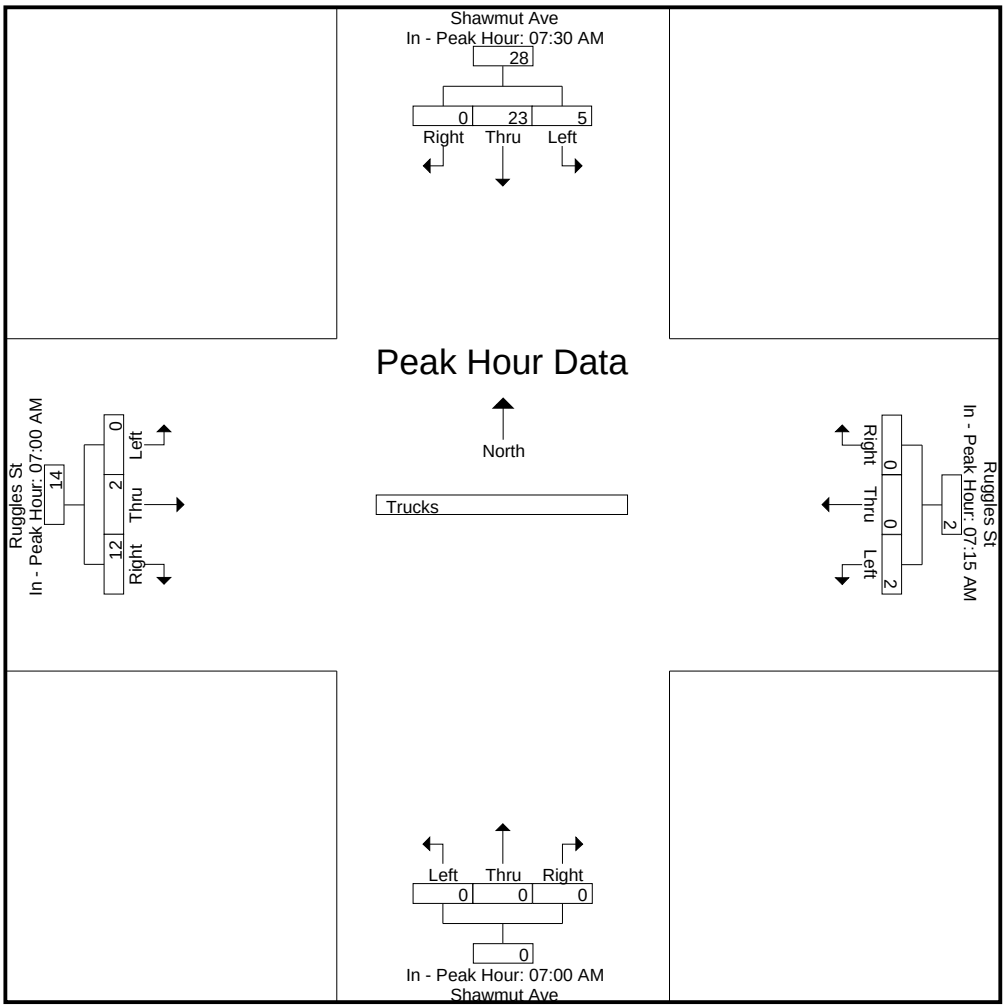


Accurate Counts
978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 9

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	07:30 AM				07:15 AM				07:00 AM				07:00 AM				
+0 mins.	0	6	0	6	0	0	0	0	0	0	0	0	0	**1**	3	4	
+15 mins.	1	**7**	0	**8**	0	0	0	0	0	0	0	0	0	0	1	1	
+30 mins.	**2**	6	0	8	**1**	0	0	**1**	0	0	0	0	0	1	**5**	**6**	
+45 mins.	2	4	0	6	1	0	0	1	0	0	0	0	0	0	3	3	
Total Volume	5	23	0	28	2	0	0	2	0	0	0	0	0	2	12	14	
% App. Total	17.9	82.1	0		100	0	0		0	0	0		0	14.3	85.7		
PHF	.625	.821	.000	.875	.500	.000	.000	.500	.000	.000	.000	.000	.000	.500	.600	.583	



Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014

Groups Printed- Bikes Peds

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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	5	0	1	0	5	0	0	0	2	0	0	0	8	20	1	21
07:15 AM	0	1	0	1	0	0	0	1	1	1	0	6	0	1	0	5	13	4	17
07:30 AM	0	0	0	7	0	1	0	3	0	1	0	7	0	2	0	7	24	4	28
07:45 AM	0	0	0	7	0	0	0	2	0	0	0	2	0	2	0	8	19	2	21
Total	0	1	0	20	0	2	0	11	1	2	0	17	0	5	0	28	76	11	87
08:00 AM	0	0	0	8	0	0	0	5	0	1	1	10	0	1	0	2	25	3	28
08:15 AM	1	0	0	6	0	0	0	6	0	0	0	3	0	0	0	5	20	1	21
08:30 AM	1	0	0	13	0	1	2	3	0	0	0	8	0	0	0	12	36	4	40
08:45 AM	0	1	1	12	0	0	0	5	0	0	0	5	1	3	0	5	27	6	33
Total	2	1	1	39	0	1	2	19	0	1	1	26	1	4	0	24	108	14	122
Grand Total	2	2	1	59	0	3	2	30	1	3	1	43	1	9	0	52	184	25	209
Apprch %	40	40	20		0	60	40		20	60	20		10	90	0				
Total %	8	8	4		0	12	8		4	12	4		4	36	0		88	12	

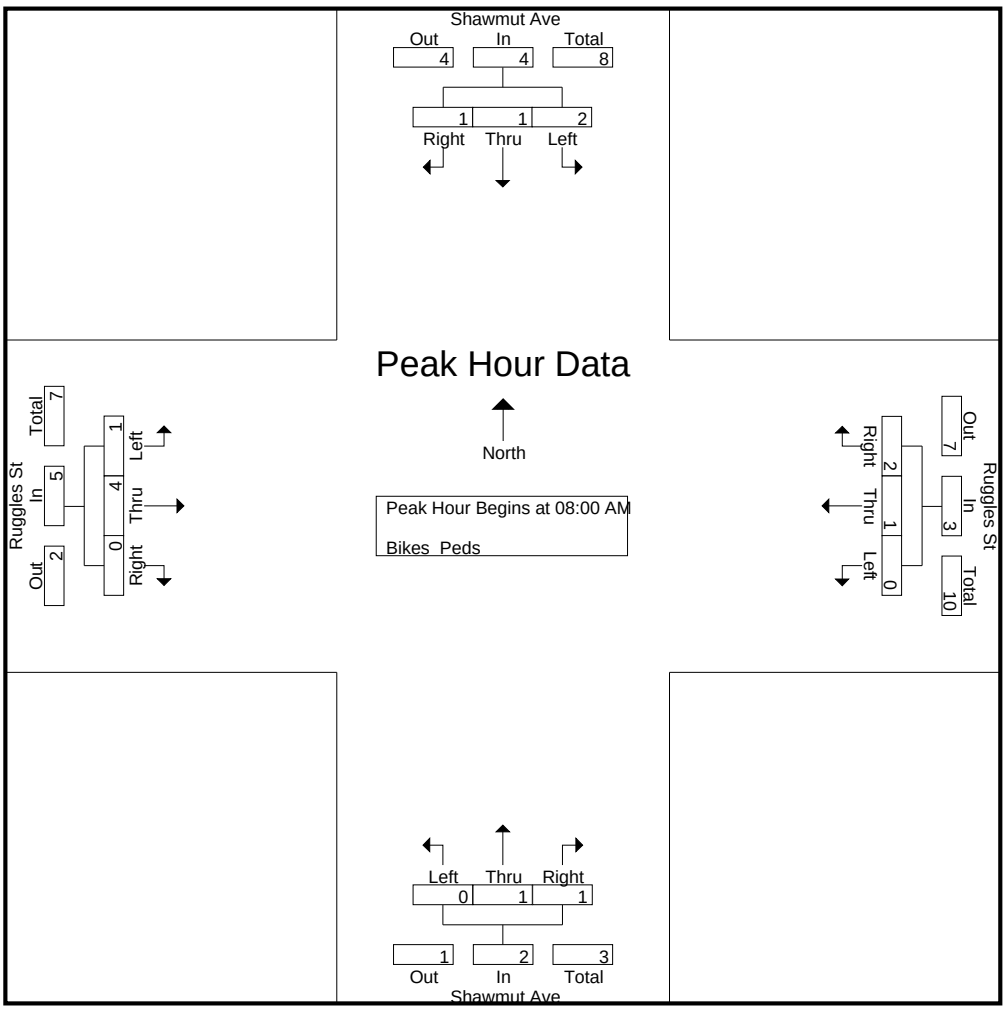
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 11

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 08:00 AM																	
08:00 AM	0	0	0	0	0	0	0	0	0	**1**	**1**	**2**	0	1	0	1	3
08:15 AM	**1**	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	1	0	0	1	0	**1**	**2**	**3**	0	0	0	0	0	0	0	0	4
08:45 AM	0	**1**	**1**	**2**	0	0	0	0	0	0	0	0	**1**	**3**	0	**4**	**6**
Total Volume	2	1	1	4	0	1	2	3	0	1	1	2	1	4	0	5	14
% App. Total	50	25	25		0	33.3	66.7		0	50	50		20	80	0		
PHF	.500	.250	.250	.500	.000	.250	.250	.250	.000	.250	.250	.250	.250	.333	.000	.313	.583



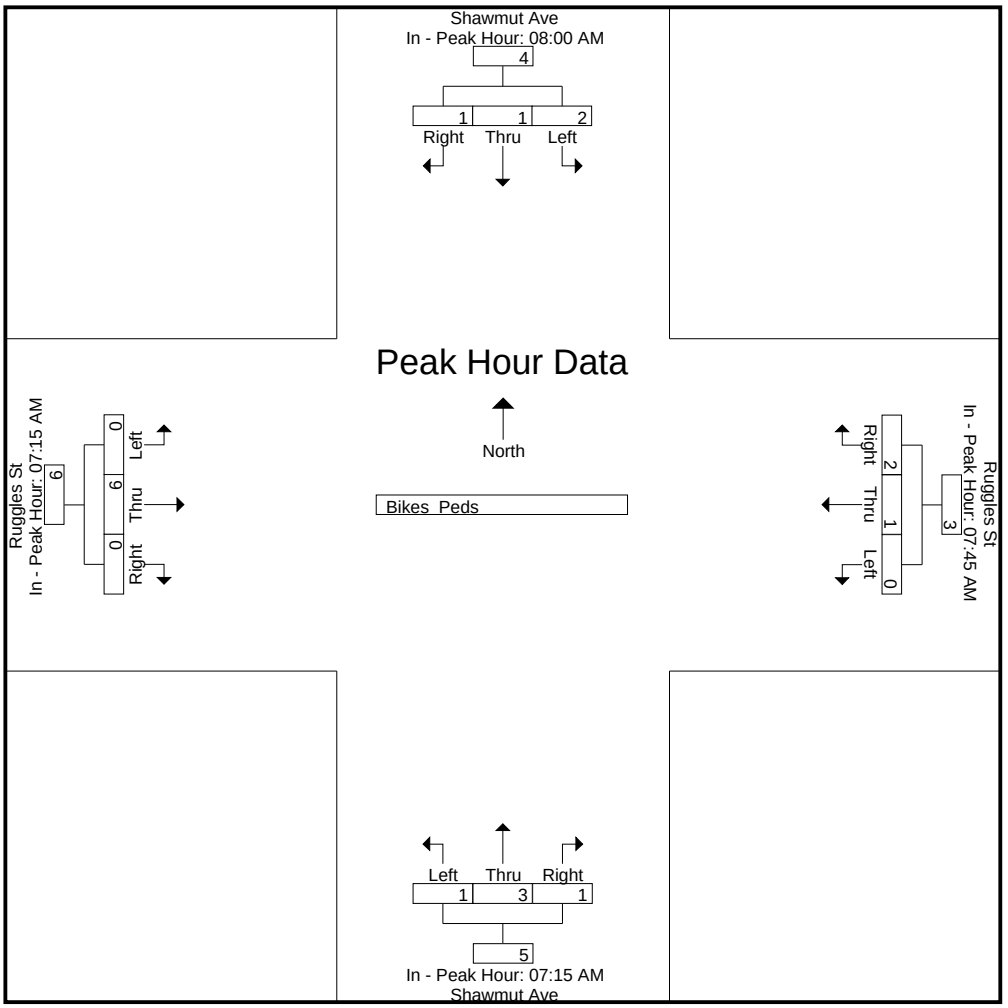
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 12

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	08:00 AM				07:45 AM				07:15 AM				07:15 AM				
+0 mins.	0	0	0	0	0	0	0	0	**1**	**1**	0	**2**	0	1	0	1	
+15 mins.	**1**	0	0	1	0	0	0	0	0	1	0	1	0	**2**	0	**2**	
+30 mins.	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0	2	
+45 mins.	0	**1**	**1**	**2**	0	**1**	**2**	**3**	0	1	**1**	2	0	1	0	1	
Total Volume	2	1	1	4	0	1	2	3	1	3	1	5	0	6	0	6	
% App. Total	50	25	25		0	33.3	66.7		20	60	20		0	100	0		
PHF	.500	.250	.250	.500	.000	.250	.250	.250	.250	.750	.250	.625	.000	.750	.000	.750	



Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 1

Groups Printed- Cars - Trucks

	Shawmut Ave From North			Ruggles St From East			Shawmut Ave From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	11	186	0	13	0	0	0	0	0	0	24	13	247
04:15 PM	10	147	0	15	0	0	0	0	0	0	21	21	214
04:30 PM	12	144	0	8	0	0	0	0	0	0	28	13	205
04:45 PM	9	168	0	17	0	0	0	0	0	0	21	6	221
Total	42	645	0	53	0	0	0	0	0	0	94	53	887
05:00 PM	9	178	0	28	0	0	0	0	0	0	23	17	255
05:15 PM	7	179	0	11	0	0	0	0	0	0	25	14	236
05:30 PM	4	149	0	14	0	0	0	0	0	0	14	15	196
05:45 PM	14	143	0	14	0	0	0	0	0	0	20	16	207
Total	34	649	0	67	0	0	0	0	0	0	82	62	894
Grand Total	76	1294	0	120	0	0	0	0	0	0	176	115	1781
Apprch %	5.5	94.5	0	100	0	0	0	0	0	0	60.5	39.5	
Total %	4.3	72.7	0	6.7	0	0	0	0	0	0	9.9	6.5	
Cars	72	1279	0	119	0	0	0	0	0	0	171	97	1738
% Cars	94.7	98.8	0	99.2	0	0	0	0	0	0	97.2	84.3	97.6
Trucks	4	15	0	1	0	0	0	0	0	0	5	18	43
% Trucks	5.3	1.2	0	0.8	0	0	0	0	0	0	2.8	15.7	2.4

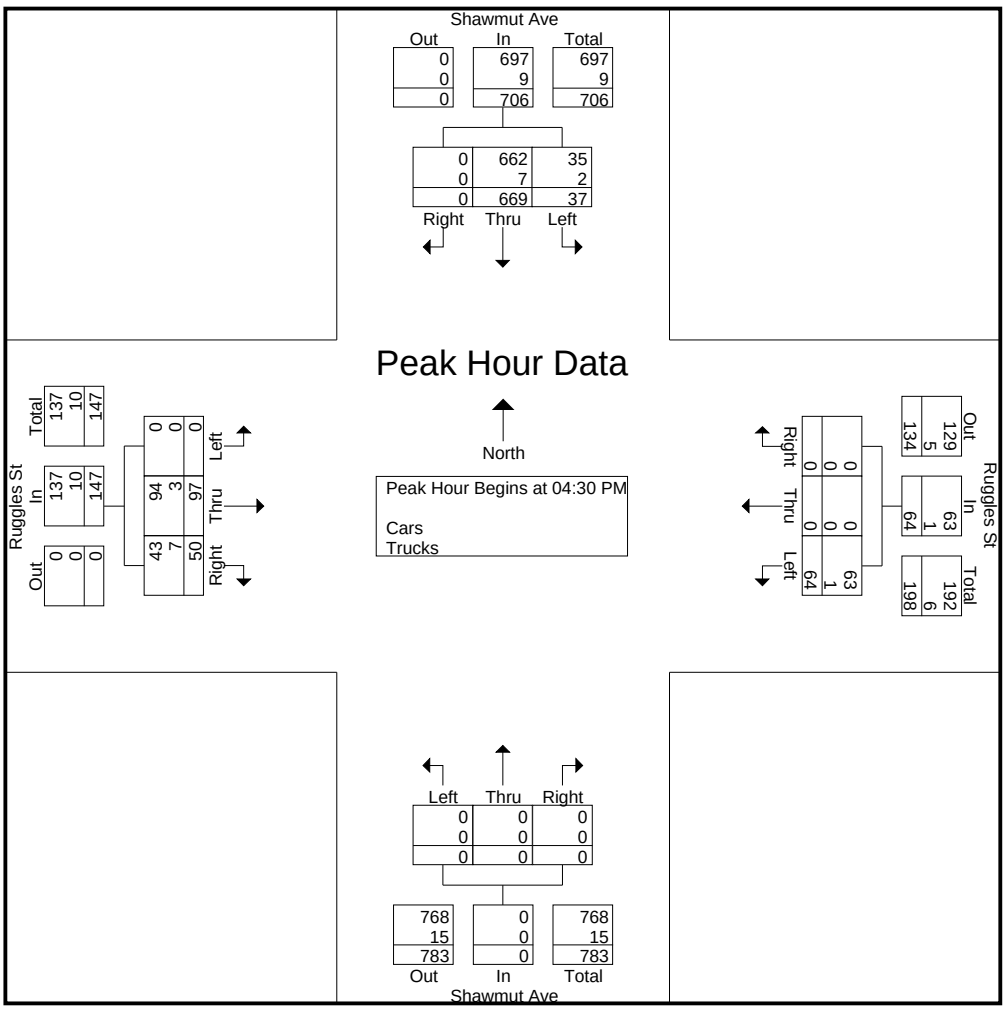
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 2

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 04:30 PM																	
04:30 PM	**12**	144	0	156	8	0	0	8	0	0	0	0	0	**28**	13	**41**	205
04:45 PM	9	168	0	177	17	0	0	17	0	0	0	0	0	21	6	27	221
05:00 PM	9	178	0	**187**	**28**	0	0	**28**	0	0	0	0	0	23	**17**	40	**255**
05:15 PM	7	**179**	0	186	11	0	0	11	0	0	0	0	0	25	14	39	236
Total Volume	37	669	0	706	64	0	0	64	0	0	0	0	0	97	50	147	917
% App. Total	5.2	94.8	0		100	0	0		0	0	0		0	66	34		
PHF	.771	.934	.000	.944	.571	.000	.000	.571	.000	.000	.000	.000	.000	.866	.735	.896	.899
Cars	35	662	0	697	63	0	0	63	0	0	0	0	0	94	43	137	897
% Cars	94.6	99.0	0	98.7	98.4	0	0	98.4	0	0	0	0	0	96.9	86.0	93.2	97.8
Trucks	2	7	0	9	1	0	0	1	0	0	0	0	0	3	7	10	20
% Trucks	5.4	1.0	0	1.3	1.6	0	0	1.6	0	0	0	0	0	3.1	14.0	6.8	2.2

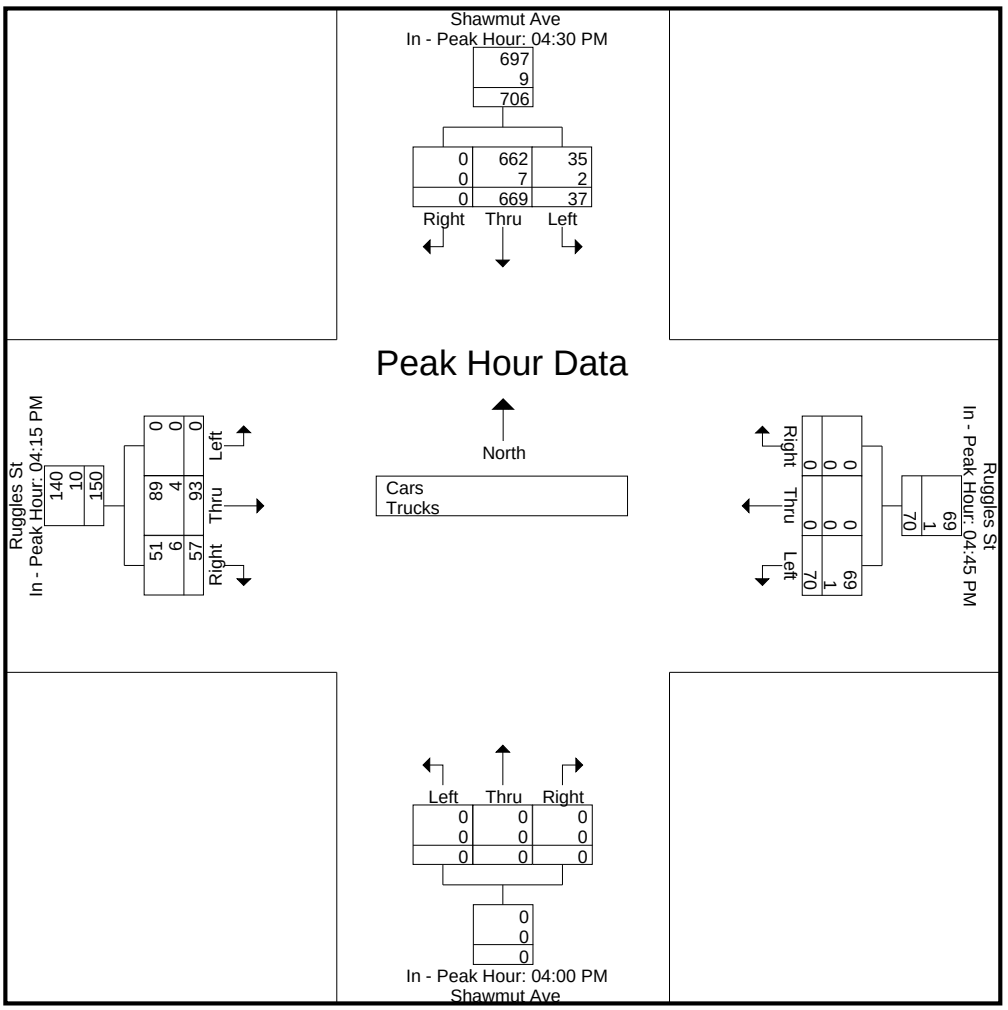


Accurate Counts
978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 3

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	04:30 PM				04:45 PM				04:00 PM				04:15 PM				
+0 mins.	**12**	144	0	156	17	0	0	17	0	0	0	0	0	21	**21**	**42**	
+15 mins.	9	168	0	177	**28**	0	0	**28**	0	0	0	0	0	**28**	13	41	
+30 mins.	9	178	0	**187**	11	0	0	11	0	0	0	0	0	21	6	27	
+45 mins.	7	**179**	0	186	14	0	0	14	0	0	0	0	0	23	17	40	
Total Volume	37	669	0	706	70	0	0	70	0	0	0	0	0	93	57	150	
% App. Total	5.2	94.8	0		100	0	0		0	0	0		0	62	38		
PHF	.771	.934	.000	.944	.625	.000	.000	.625	.000	.000	.000	.000	.000	.830	.679	.893	
Cars	35	662	0	697	69	0	0	69	0	0	0	0	0	89	51	140	
% Cars	94.6	99	0	98.7	98.6	0	0	98.6	0	0	0	0	0	95.7	89.5	93.3	
Trucks	2	7	0	9	1	0	0	1	0	0	0	0	0	4	6	10	
% Trucks	5.4	1	0	1.3	1.4	0	0	1.4	0	0	0	0	0	4.3	10.5	6.7	



Accurate Counts
978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014

Groups Printed- Cars

	Shawmut Ave From North			Ruggles St From East			Shawmut Ave From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	9	181	0	13	0	0	0	0	0	0	23	10	236
04:15 PM	10	147	0	15	0	0	0	0	0	0	20	20	212
04:30 PM	11	143	0	8	0	0	0	0	0	0	26	11	199
04:45 PM	9	164	0	17	0	0	0	0	0	0	20	4	214
Total	39	635	0	53	0	0	0	0	0	0	89	45	861
05:00 PM	9	177	0	28	0	0	0	0	0	0	23	16	253
05:15 PM	6	178	0	10	0	0	0	0	0	0	25	12	231
05:30 PM	4	147	0	14	0	0	0	0	0	0	14	13	192
05:45 PM	14	142	0	14	0	0	0	0	0	0	20	11	201
Total	33	644	0	66	0	0	0	0	0	0	82	52	877
Grand Total	72	1279	0	119	0	0	0	0	0	0	171	97	1738
Apprch %	5.3	94.7	0	100	0	0	0	0	0	0	63.8	36.2	
Total %	4.1	73.6	0	6.8	0	0	0	0	0	0	9.8	5.6	

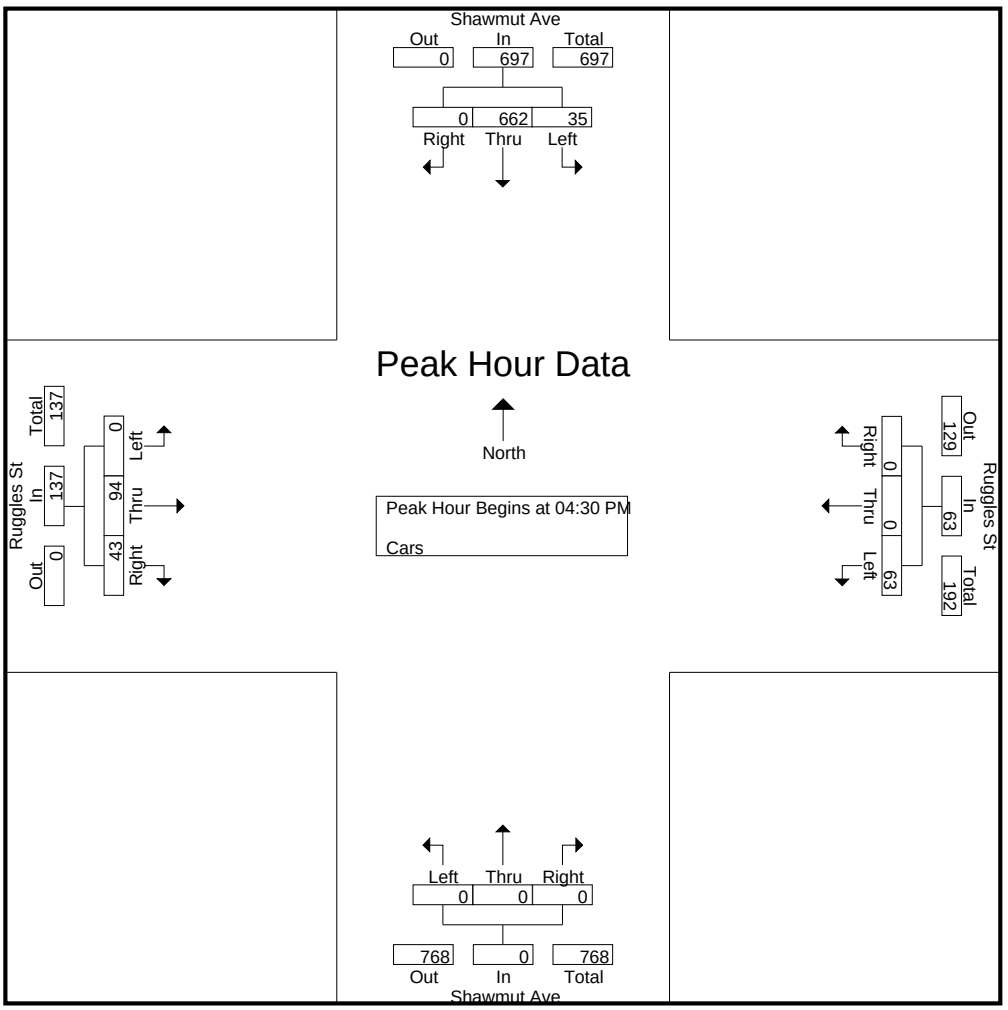
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 5

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 04:30 PM																	
04:30 PM	**11**	143	0	154	8	0	0	8	0	0	0	0	0	**26**	11	37	199
04:45 PM	9	164	0	173	17	0	0	17	0	0	0	0	0	20	4	24	214
05:00 PM	9	177	0	**186**	**28**	0	0	**28**	0	0	0	0	0	23	**16**	**39**	**253**
05:15 PM	6	**178**	0	184	10	0	0	10	0	0	0	0	0	25	12	37	231
Total Volume	35	662	0	697	63	0	0	63	0	0	0	0	0	94	43	137	897
% App. Total	5	95	0		100	0	0		0	0	0		0	68.6	31.4		
PHF	.795	.930	.000	.937	.563	.000	.000	.563	.000	.000	.000	.000	.000	.904	.672	.878	.886



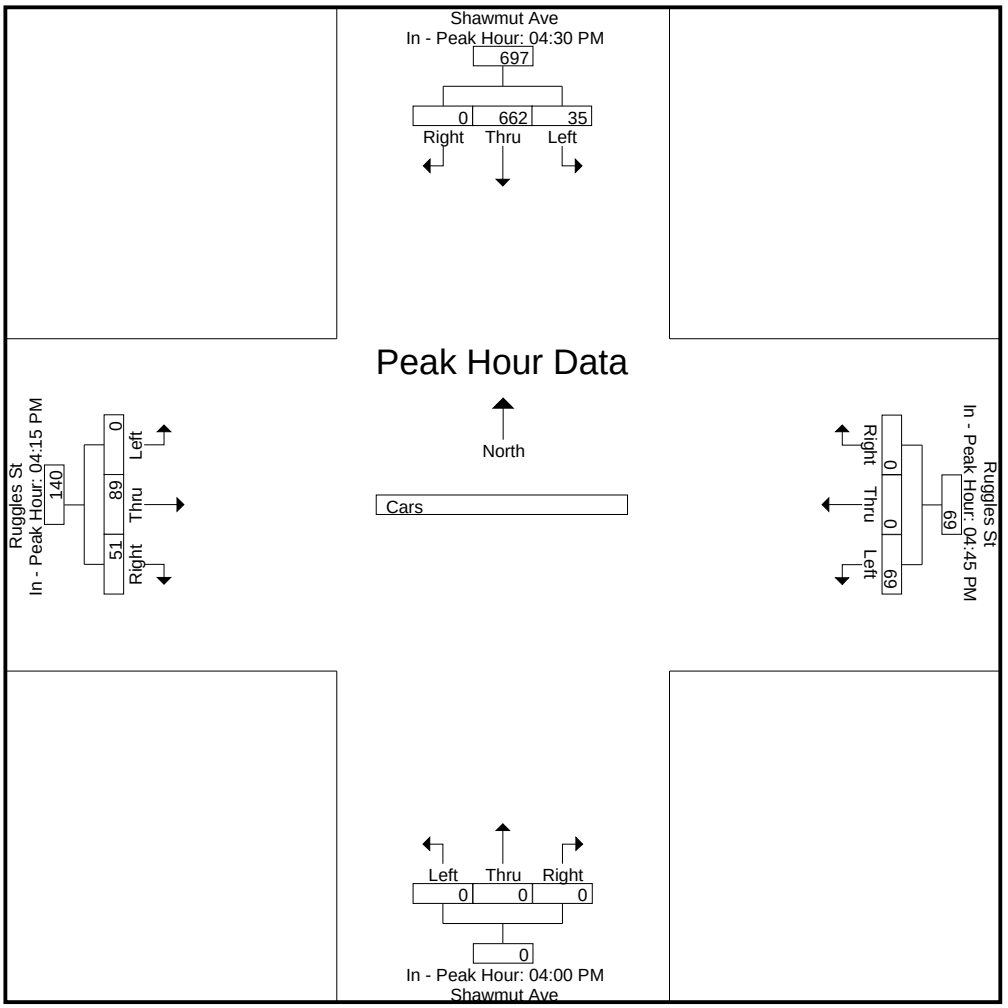
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 6

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	04:30 PM				04:45 PM				04:00 PM				04:15 PM				
+0 mins.	**11**	143	0	154	17	0	0	17	0	0	0	0	0	20	**20**	**40**	
+15 mins.	9	164	0	173	**28**	0	0	**28**	0	0	0	0	0	**26**	11	37	
+30 mins.	9	177	0	**186**	10	0	0	10	0	0	0	0	0	20	4	24	
+45 mins.	6	**178**	0	184	14	0	0	14	0	0	0	0	0	23	16	39	
Total Volume	35	662	0	697	69	0	0	69	0	0	0	0	0	89	51	140	
% App. Total	5	95	0		100	0	0		0	0	0		0	63.6	36.4		
PHF	.795	.930	.000	.937	.616	.000	.000	.616	.000	.000	.000	.000	.000	.856	.638	.875	



Accurate Counts
978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014

Groups Printed- Trucks

	Shawmut Ave From North			Ruggles St From East			Shawmut Ave From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	2	5	0	0	0	0	0	0	0	0	1	3	11
04:15 PM	0	0	0	0	0	0	0	0	0	0	1	1	2
04:30 PM	1	1	0	0	0	0	0	0	0	0	2	2	6
04:45 PM	0	4	0	0	0	0	0	0	0	0	1	2	7
Total	3	10	0	0	0	0	0	0	0	0	5	8	26
05:00 PM	0	1	0	0	0	0	0	0	0	0	0	1	2
05:15 PM	1	1	0	1	0	0	0	0	0	0	0	2	5
05:30 PM	0	2	0	0	0	0	0	0	0	0	0	2	4
05:45 PM	0	1	0	0	0	0	0	0	0	0	0	5	6
Total	1	5	0	1	0	0	0	0	0	0	0	10	17
Grand Total	4	15	0	1	0	0	0	0	0	0	5	18	43
Apprch %	21.1	78.9	0	100	0	0	0	0	0	0	21.7	78.3	
Total %	9.3	34.9	0	2.3	0	0	0	0	0	0	11.6	41.9	

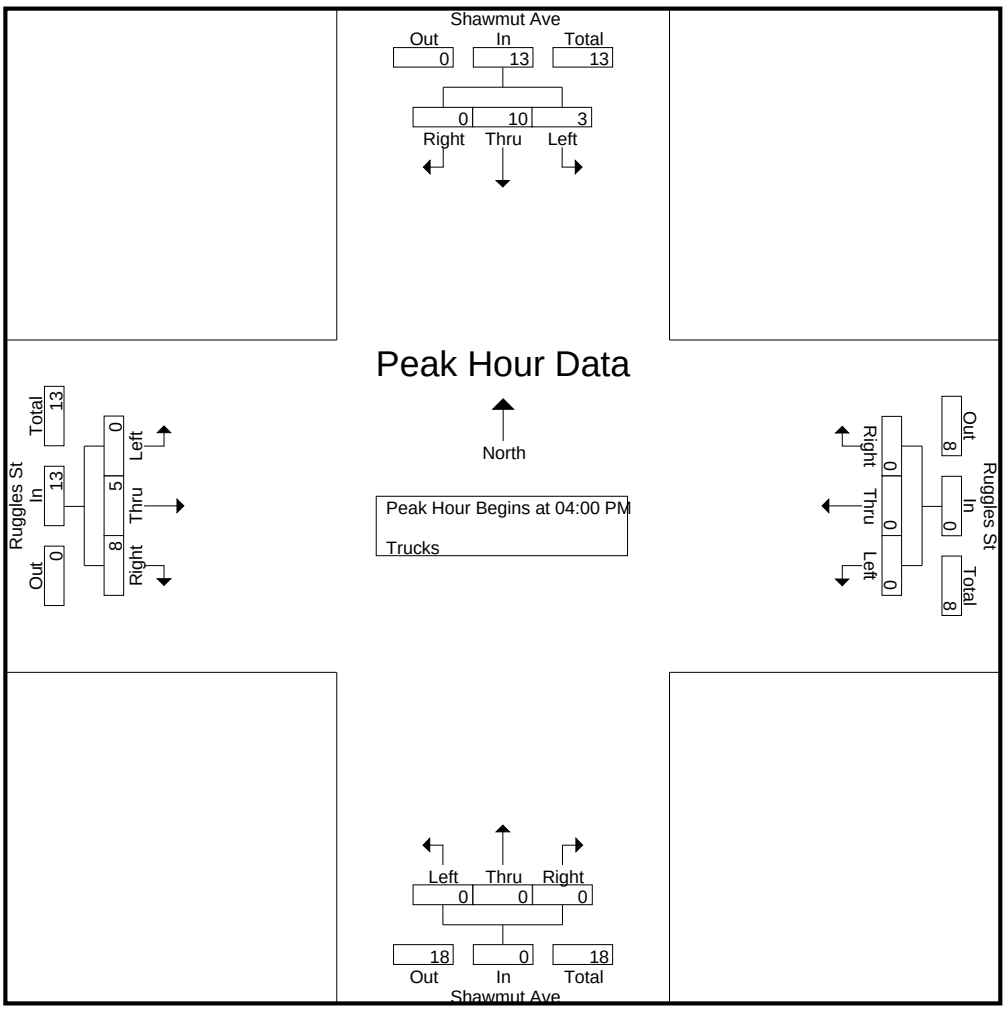
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 8

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 04:00 PM																	
04:00 PM	**2**	**5**	0	**7**	0	0	0	0	0	0	0	0	0	1	**3**	**4**	**11**
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2
04:30 PM	1	1	0	2	0	0	0	0	0	0	0	0	0	**2**	2	4	6
04:45 PM	0	4	0	4	0	0	0	0	0	0	0	0	0	1	2	3	7
Total Volume	3	10	0	13	0	0	0	0	0	0	0	0	0	5	8	13	26
% App. Total	23.1	76.9	0		0	0	0		0	0	0		0	38.5	61.5		
PHF	.375	.500	.000	.464	.000	.000	.000	.000	.000	.000	.000	.000	.000	.625	.667	.813	.591



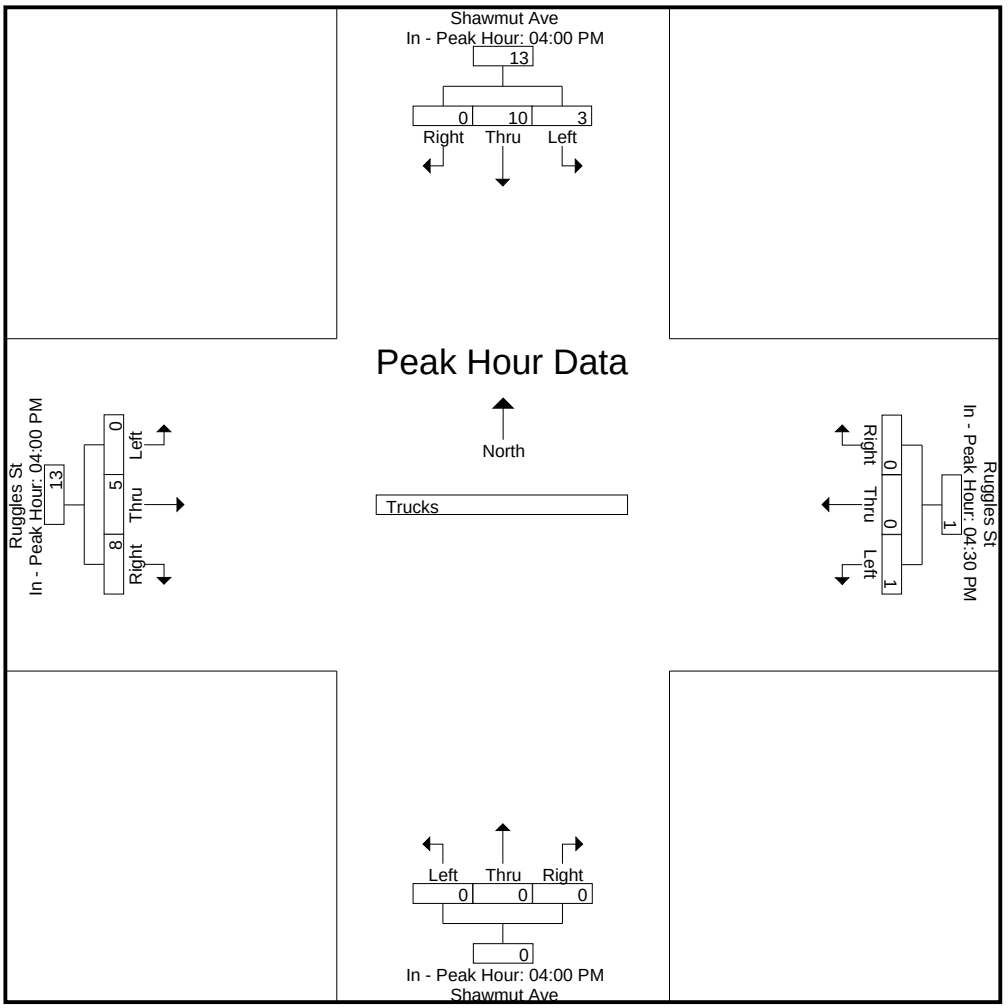
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 9

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	04:00 PM				04:30 PM				04:00 PM				04:00 PM				
+0 mins.	**2**	**5**	0	**7**	0	0	0	0	0	0	0	0	0	1	**3**	**4**	
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	
+30 mins.	1	1	0	2	0	0	0	0	0	0	0	0	0	**2**	2	4	
+45 mins.	0	4	0	4	**1**	0	0	**1**	0	0	0	0	0	1	2	3	
Total Volume	3	10	0	13	1	0	0	1	0	0	0	0	0	5	8	13	
% App. Total	23.1	76.9	0		100	0	0		0	0	0		0	38.5	61.5		
PHF	.375	.500	.000	.464	.250	.000	.000	.250	.000	.000	.000	.000	.000	.625	.667	.813	



Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014

Groups Printed- Bikes Peds

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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	13	0	0	0	11	0	0	0	8	0	2	0	8	40	3	43
04:15 PM	0	3	0	11	0	0	0	7	0	0	1	21	0	1	1	3	42	6	48
04:30 PM	0	2	0	19	0	2	0	5	0	2	0	3	0	1	0	9	36	7	43
04:45 PM	0	0	0	10	0	2	0	12	0	1	0	17	0	1	0	20	59	4	63
Total	0	6	0	53	0	4	0	35	0	3	1	49	0	5	1	40	177	20	197
05:00 PM	0	1	0	6	0	1	0	2	0	1	0	21	0	2	0	10	39	5	44
05:15 PM	0	0	0	20	0	1	0	3	0	0	0	10	0	3	0	5	38	4	42
05:30 PM	0	0	0	13	0	2	0	4	0	0	3	9	0	0	0	7	33	5	38
05:45 PM	0	0	0	9	0	0	0	6	0	1	0	19	0	1	0	4	38	2	40
Total	0	1	0	48	0	4	0	15	0	2	3	59	0	6	0	26	148	16	164
Grand Total	0	7	0	101	0	8	0	50	0	5	4	108	0	11	1	66	325	36	361
Apprch %	0	100	0		0	100	0		0	55.6	44.4		0	91.7	8.3				
Total %	0	19.4	0		0	22.2	0		0	13.9	11.1		0	30.6	2.8		90	10	

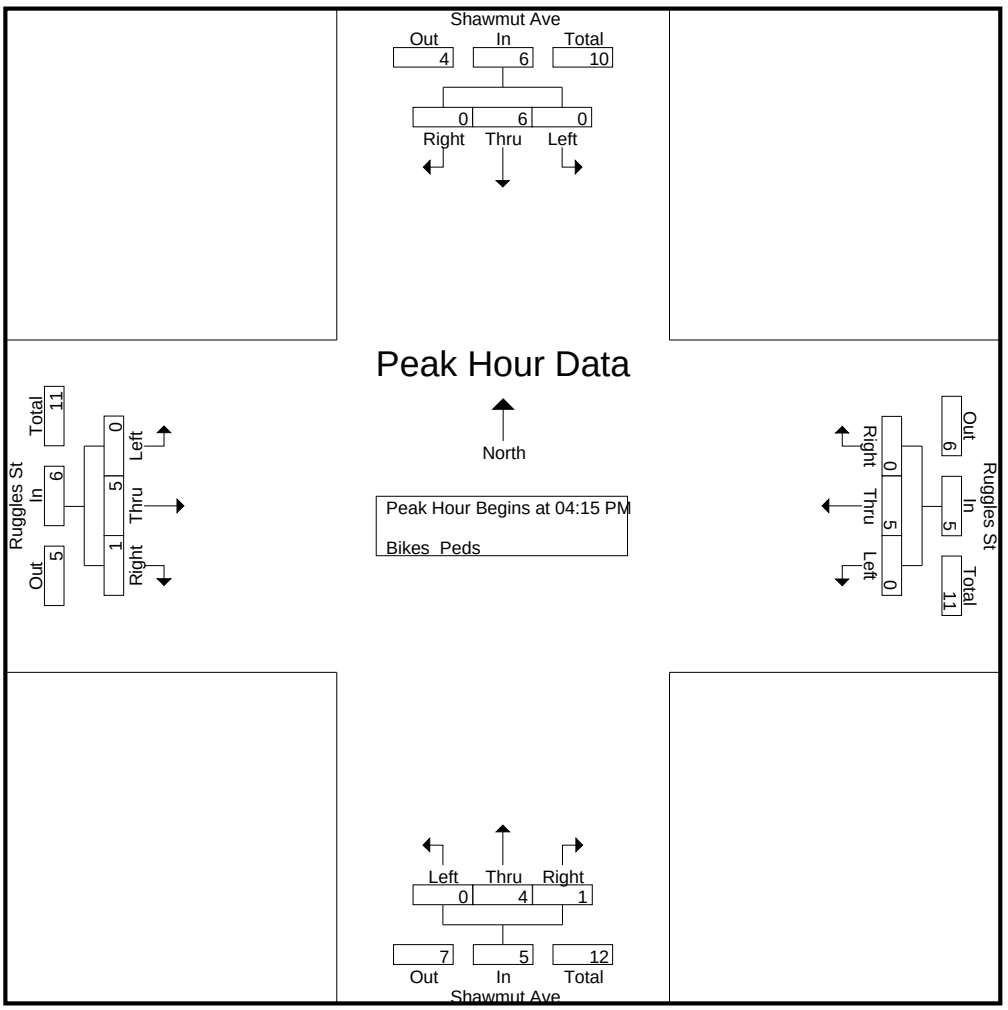
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 11

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 04:15 PM																	
04:15 PM	0	**3**	0	**3**	0	0	0	0	0	0	**1**	1	0	1	**1**	**2**	6
04:30 PM	0	2	0	2	0	**2**	0	**2**	0	**2**	0	**2**	0	1	0	1	**7**
04:45 PM	0	0	0	0	0	2	0	2	0	1	0	1	0	1	0	1	4
05:00 PM	0	1	0	1	0	1	0	1	0	1	0	1	0	**2**	0	2	5
Total Volume	0	6	0	6	0	5	0	5	0	4	1	5	0	5	1	6	22
% App. Total	0	100	0		0	100	0		0	80	20		0	83.3	16.7		
PHF	.000	.500	.000	.500	.000	.625	.000	.625	.000	.500	.250	.625	.000	.625	.250	.750	.786



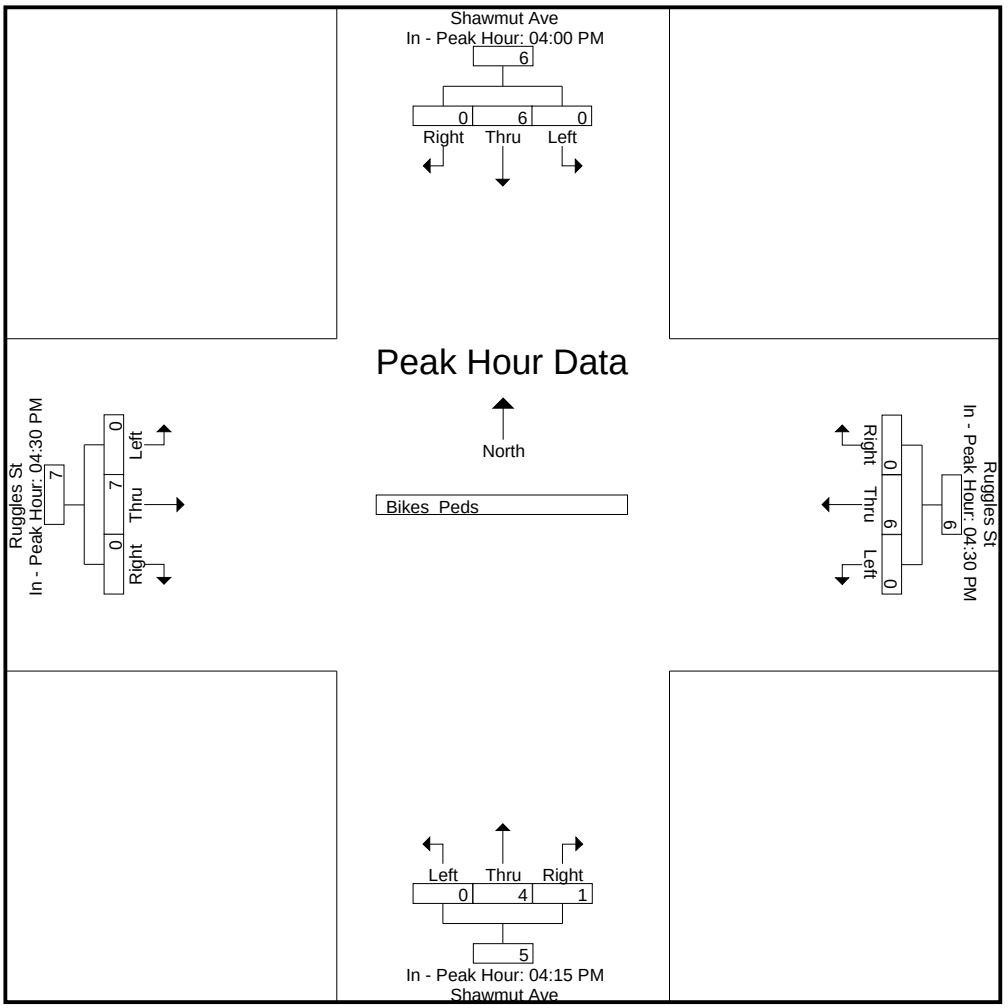
Accurate Counts

978-664-2565

N/S Street : Shawmut Avenue
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006004
Site Code : 14006004
Start Date : 10/15/2014
Page No : 12

	Shawmut Ave From North				Ruggles St From East				Shawmut Ave From South				Ruggles 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 Each Approach Begins at:																	
	04:00 PM				04:30 PM				04:15 PM				04:30 PM				
+0 mins.	0	1	0	1	0	**2**	0	**2**	0	0	**1**	1	0	1	0	1	
+15 mins.	0	**3**	0	**3**	0	2	0	2	0	**2**	0	**2**	0	1	0	1	
+30 mins.	0	2	0	2	0	1	0	1	0	1	0	1	0	2	0	2	
+45 mins.	0	0	0	0	0	1	0	1	0	1	0	1	0	**3**	0	**3**	
Total Volume	0	6	0	6	0	6	0	6	0	4	1	5	0	7	0	7	
% App. Total	0	100	0		0	100	0		0	80	20		0	100	0		
PHF	.000	.500	.000	.500	.000	.750	.000	.750	.000	.500	.250	.625	.000	.583	.000	.583	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Cars - Trucks

	Ruggles St From East			Cabot St From South			Private Dr From Southwest			Ruggles St From West			
Start Time	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Thru	Right	HdRt	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	27	20	0	47
07:15 AM	0	0	0	0	0	1	0	0	2	13	17	0	33
07:30 AM	0	0	0	0	0	0	0	0	0	32	23	0	55
07:45 AM	0	0	0	0	0	0	0	0	0	22	21	3	46
Total	0	0	0	0	0	1	0	0	2	94	81	3	181
08:00 AM	0	0	0	0	0	0	0	1	2	30	21	3	57
08:15 AM	0	0	0	0	0	0	0	0	3	24	21	2	50
08:30 AM	0	0	0	0	0	0	0	1	2	30	23	0	56
08:45 AM	0	0	0	0	0	1	0	0	2	32	17	0	52
Total	0	0	0	0	0	1	0	2	9	116	82	5	215
Grand Total	0	0	0	0	0	2	0	2	11	210	163	8	396
Apprch %	0	0	0	0	0	100	0	15.4	84.6	55.1	42.8	2.1	
Total %	0	0	0	0	0	0.5	0	0.5	2.8	53	41.2	2	
Cars	0	0	0	0	0	2	0	2	11	184	156	8	363
% Cars	0	0	0	0	0	100	0	100	100	87.6	95.7	100	91.7
Trucks	0	0	0	0	0	0	0	0	0	26	7	0	33
% Trucks	0	0	0	0	0	0	0	0	0	12.4	4.3	0	8.3

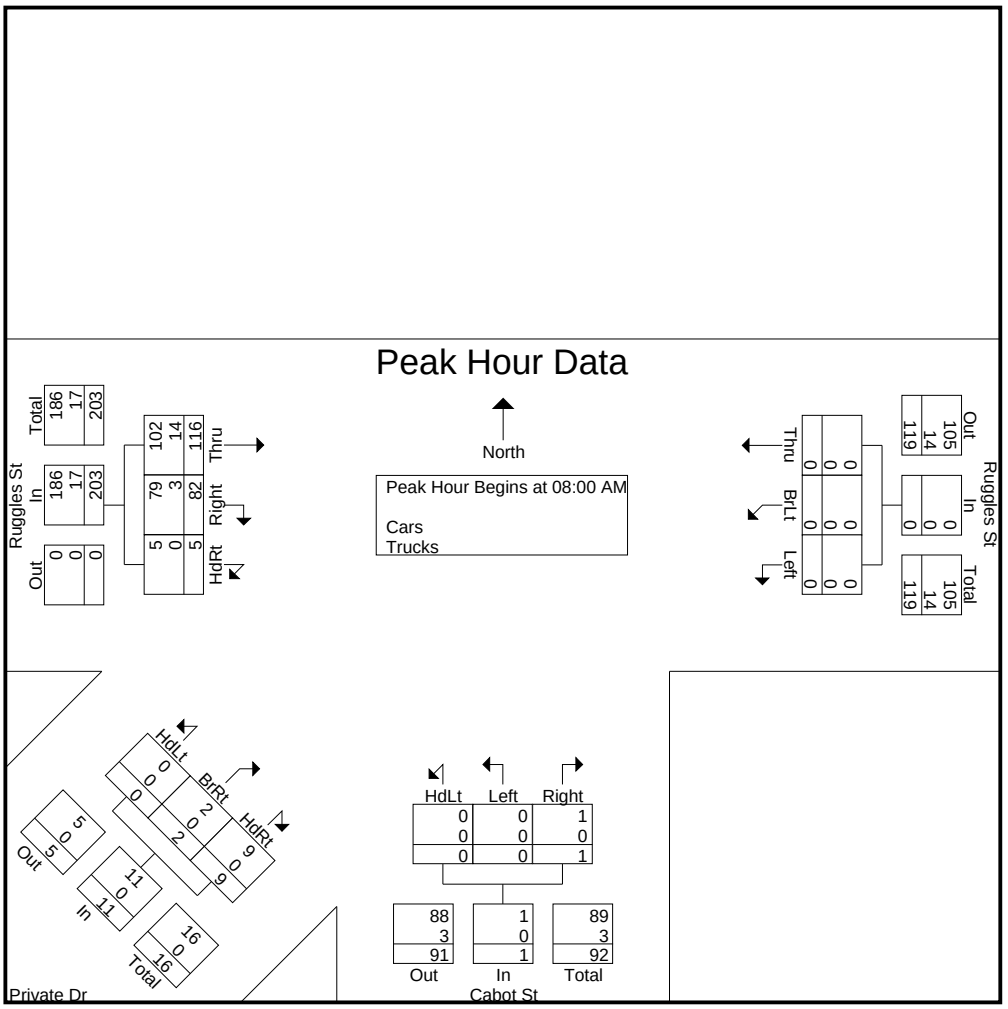
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 2

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	0	0	0	0	**1**	2	**3**	30	21	**3**	**54**	**57**
08:15 AM	0	0	0	0	0	0	0	0	0	0	**3**	3	24	21	2	47	50
08:30 AM	0	0	0	0	0	0	0	0	0	1	2	3	30	**23**	0	53	56
08:45 AM	0	0	0	0	0	0	**1**	**1**	0	0	2	2	**32**	17	0	49	52
Total Volume	0	0	0	0	0	0	1	1	0	2	9	11	116	82	5	203	215
% App. Total	0	0	0		0	0	100		0	18.2	81.8		57.1	40.4	2.5		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.000	.500	.750	.917	.906	.891	.417	.940	.943
Cars	0	0	0	0	0	0	1	1	0	2	9	11	102	79	5	186	198
% Cars	0	0	0	0	0	0	100	100	0	100	100	100	87.9	96.3	100	91.6	92.1
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	14	3	0	17	17
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	12.1	3.7	0	8.4	7.9



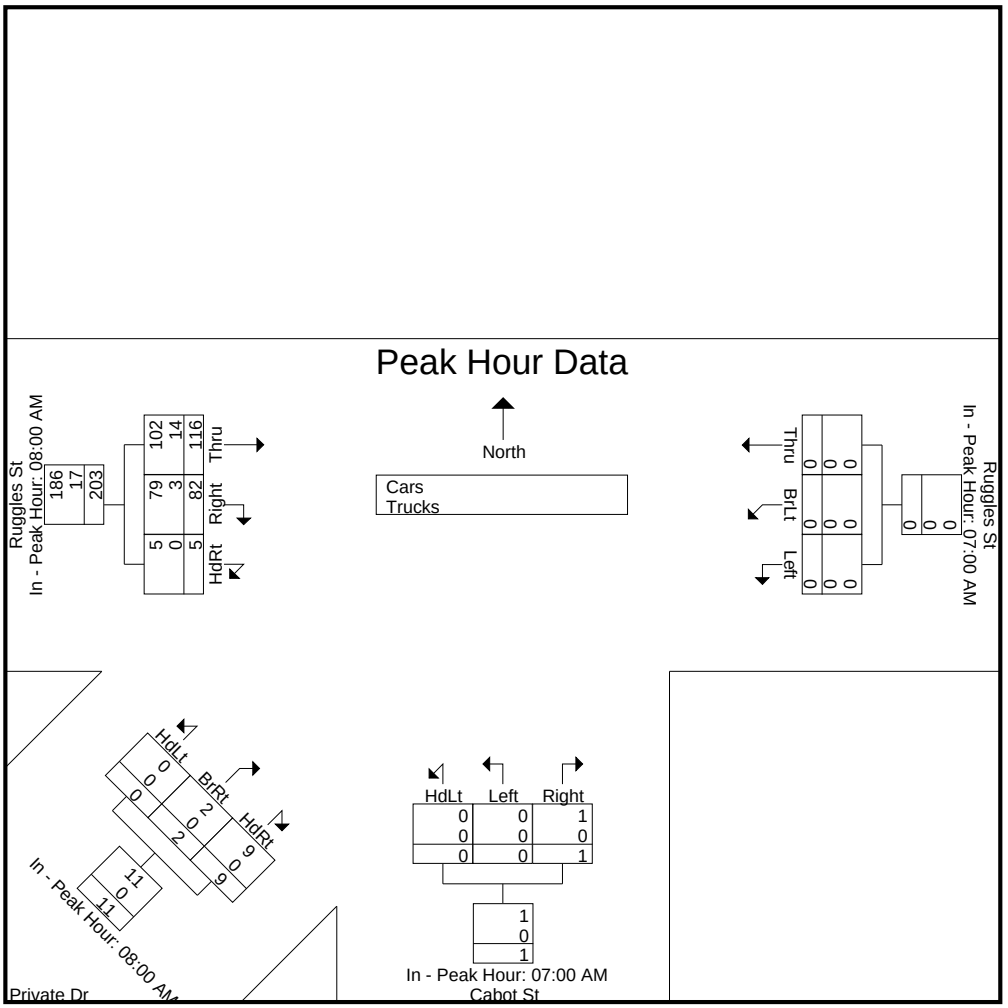
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 3

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				07:00 AM				08:00 AM				08:00 AM				
+0 mins.	0	0	0	0	0	0	0	0	0	**1**	2	**3**	30	21	**3**	**54**	
+15 mins.	0	0	0	0	0	0	**1**	**1**	0	0	**3**	3	24	21	2	47	
+30 mins.	0	0	0	0	0	0	0	0	0	1	2	3	30	**23**	0	53	
+45 mins.	0	0	0	0	0	0	0	0	0	0	2	2	**32**	17	0	49	
Total Volume	0	0	0	0	0	0	1	1	0	2	9	11	116	82	5	203	
% App. Total	0	0	0		0	0	100		0	18.2	81.8		57.1	40.4	2.5		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.000	.500	.750	.917	.906	.891	.417	.940	
Cars	0	0	0	0	0	0	1	1	0	2	9	11	102	79	5	186	
% Cars	0	0	0	0	0	0	100	100	0	100	100	100	87.9	96.3	100	91.6	
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	14	3	0	17	
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	12.1	3.7	0	8.4	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Cars

	Ruggles St From East			Cabot St From South			Private Dr From Southwest			Ruggles St From West			
Start Time	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Thru	Right	HdRt	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	24	18	0	42
07:15 AM	0	0	0	0	0	1	0	0	2	12	16	0	31
07:30 AM	0	0	0	0	0	0	0	0	0	27	23	0	50
07:45 AM	0	0	0	0	0	0	0	0	0	19	20	3	42
Total	0	0	0	0	0	1	0	0	2	82	77	3	165
08:00 AM	0	0	0	0	0	0	0	1	2	28	21	3	55
08:15 AM	0	0	0	0	0	0	0	0	3	21	20	2	46
08:30 AM	0	0	0	0	0	0	0	1	2	23	21	0	47
08:45 AM	0	0	0	0	0	1	0	0	2	30	17	0	50
Total	0	0	0	0	0	1	0	2	9	102	79	5	198
Grand Total	0	0	0	0	0	2	0	2	11	184	156	8	363
Apprch %	0	0	0	0	0	100	0	15.4	84.6	52.9	44.8	2.3	
Total %	0	0	0	0	0	0.6	0	0.6	3	50.7	43	2.2	

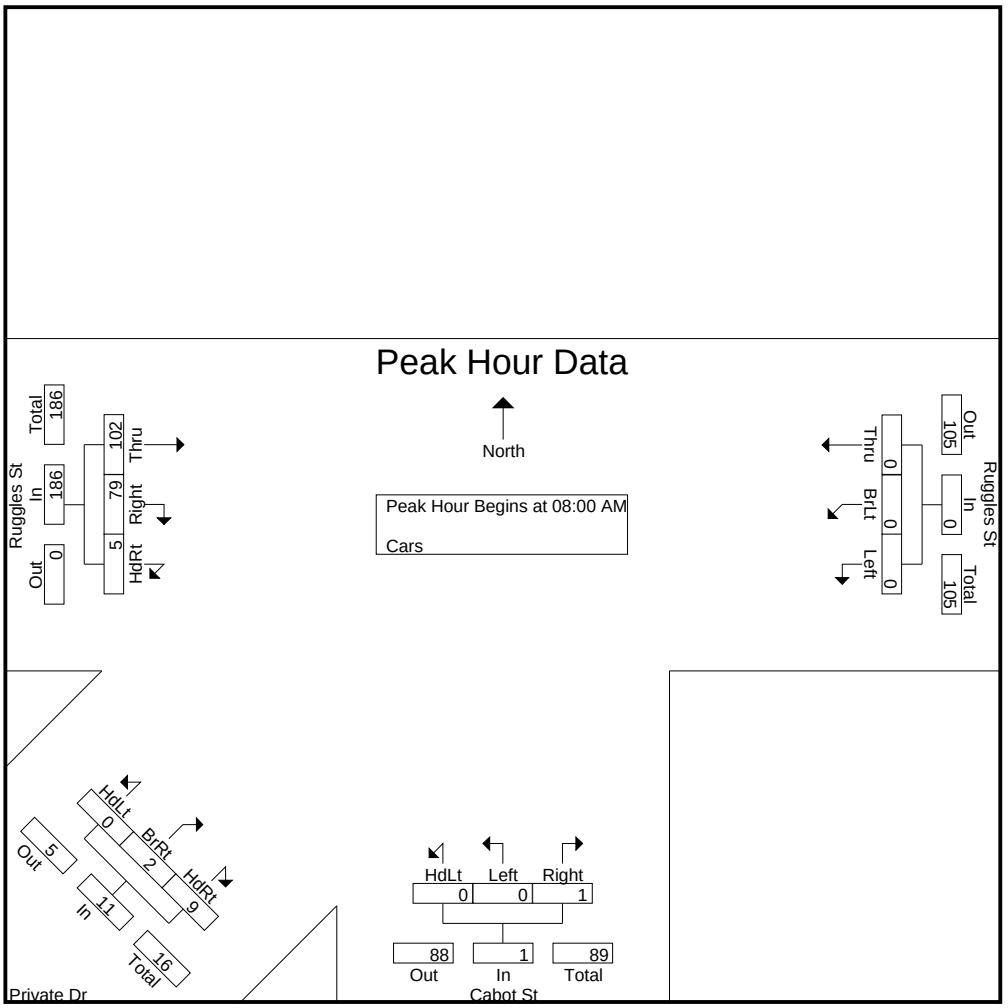
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 5

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	0	0	0	0	**1**	2	**3**	28	**21**	**3**	**52**	**55**
08:15 AM	0	0	0	0	0	0	0	0	0	0	**3**	3	21	20	2	43	46
08:30 AM	0	0	0	0	0	0	0	0	0	1	2	3	23	21	0	44	47
08:45 AM	0	0	0	0	0	0	**1**	**1**	0	0	2	2	**30**	17	0	47	50
Total Volume	0	0	0	0	0	0	1	1	0	2	9	11	102	79	5	186	198
% App. Total	0	0	0		0	0	100		0	18.2	81.8		54.8	42.5	2.7		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.000	.500	.750	.917	.850	.940	.417	.894	.900



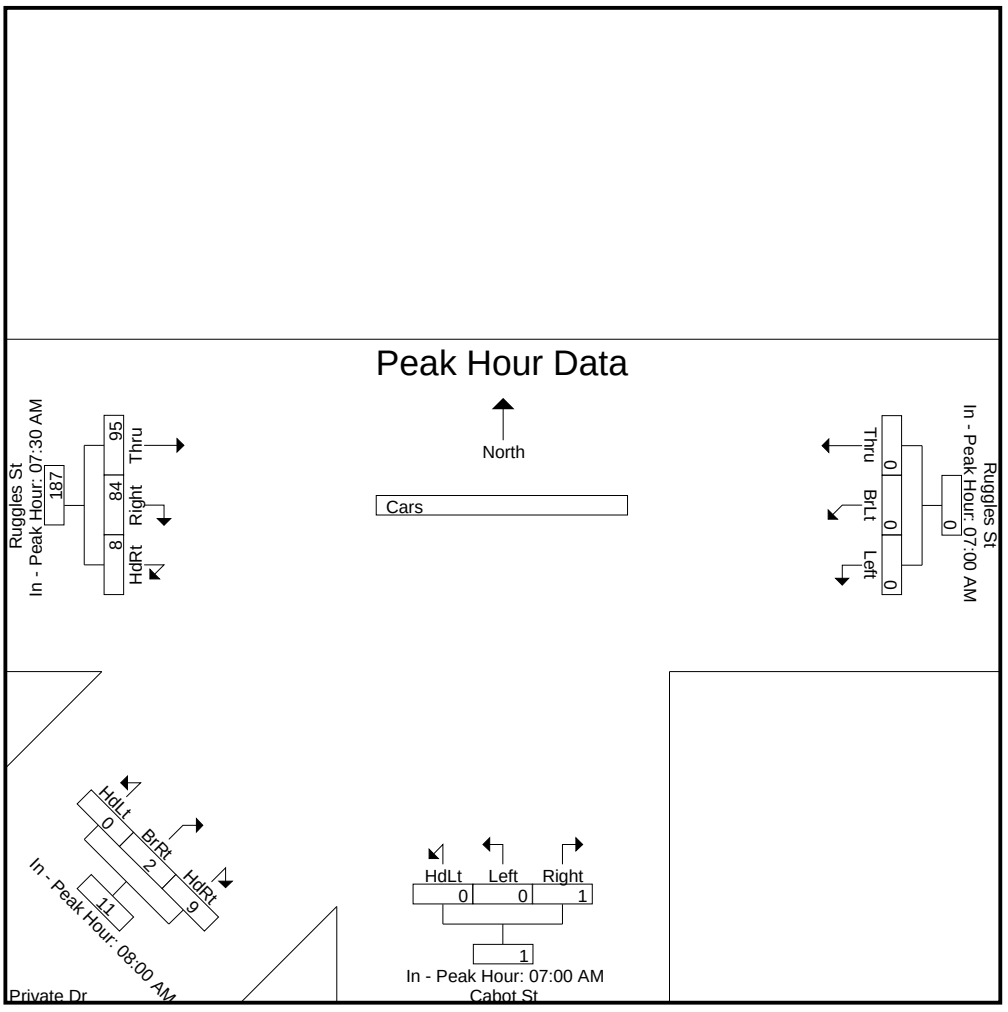
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 6

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				07:00 AM				08:00 AM				07:30 AM				
+0 mins.	0	0	0	0	0	0	0	0	0	**1**	2	**3**	27	**23**	0	50	
+15 mins.	0	0	0	0	0	0	**1**	**1**	0	0	**3**	3	19	20	**3**	42	
+30 mins.	0	0	0	0	0	0	0	0	0	1	2	3	**28**	21	3	**52**	
+45 mins.	0	0	0	0	0	0	0	0	0	0	2	2	21	20	2	43	
Total Volume	0	0	0	0	0	0	1	1	0	2	9	11	95	84	8	187	
% App. Total	0	0	0		0	0	100		0	18.2	81.8		50.8	44.9	4.3		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.000	.500	.750	.917	.848	.913	.667	.899	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Trucks

	Ruggles St From East			Cabot St From South			Private Dr From Southwest			Ruggles St From West			
Start Time	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Thru	Right	HdRt	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	3	2	0	5
07:15 AM	0	0	0	0	0	0	0	0	0	1	1	0	2
07:30 AM	0	0	0	0	0	0	0	0	0	5	0	0	5
07:45 AM	0	0	0	0	0	0	0	0	0	3	1	0	4
Total	0	0	0	0	0	0	0	0	0	12	4	0	16
08:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	2
08:15 AM	0	0	0	0	0	0	0	0	0	3	1	0	4
08:30 AM	0	0	0	0	0	0	0	0	0	7	2	0	9
08:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	2
Total	0	0	0	0	0	0	0	0	0	14	3	0	17
Grand Total	0	0	0	0	0	0	0	0	0	26	7	0	33
Apprch %	0	0	0	0	0	0	0	0	0	78.8	21.2	0	
Total %	0	0	0	0	0	0	0	0	0	78.8	21.2	0	

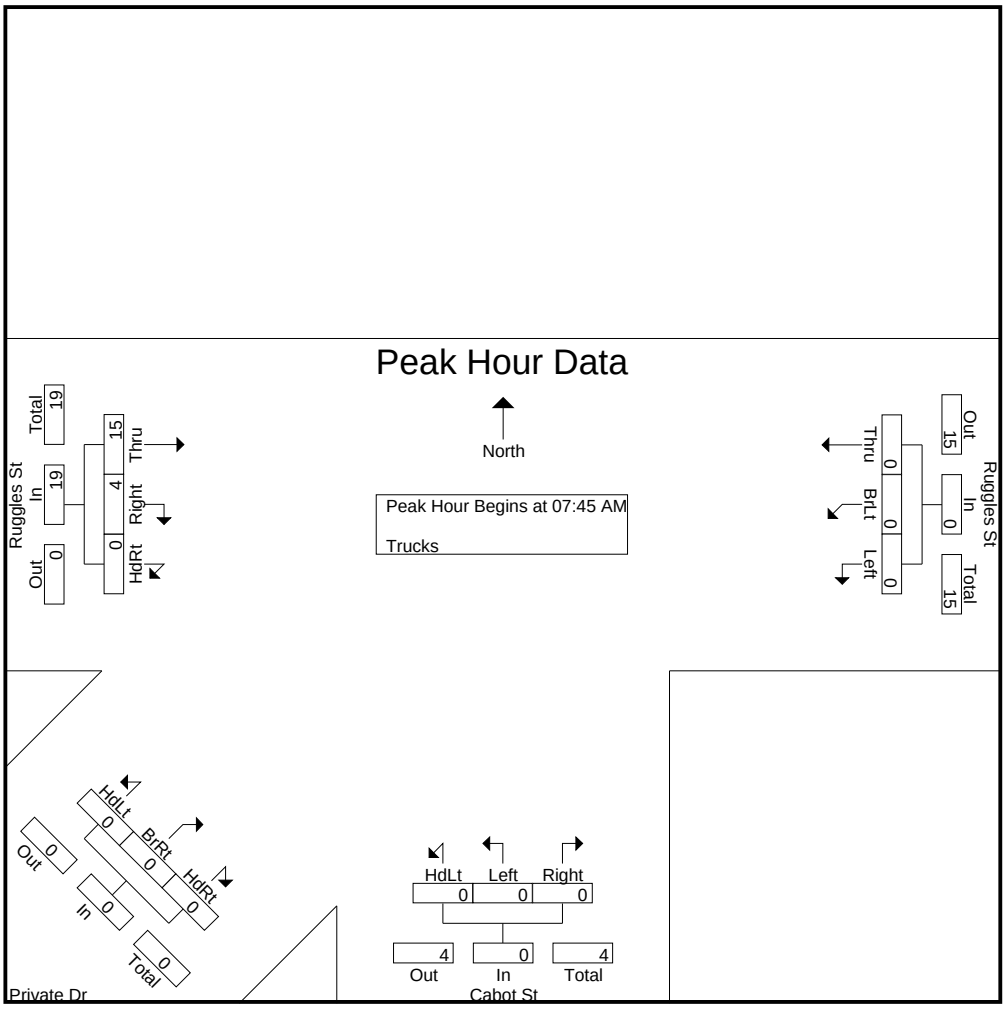
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 8

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	0	0	0	0	0	0	0	3	1	0	4	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	4
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	**7**	**2**	0	**9**	**9**
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0	19	19
% App. Total	0	0	0		0	0	0		0	0	0		78.9	21.1	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.536	.500	.000	.528	.528



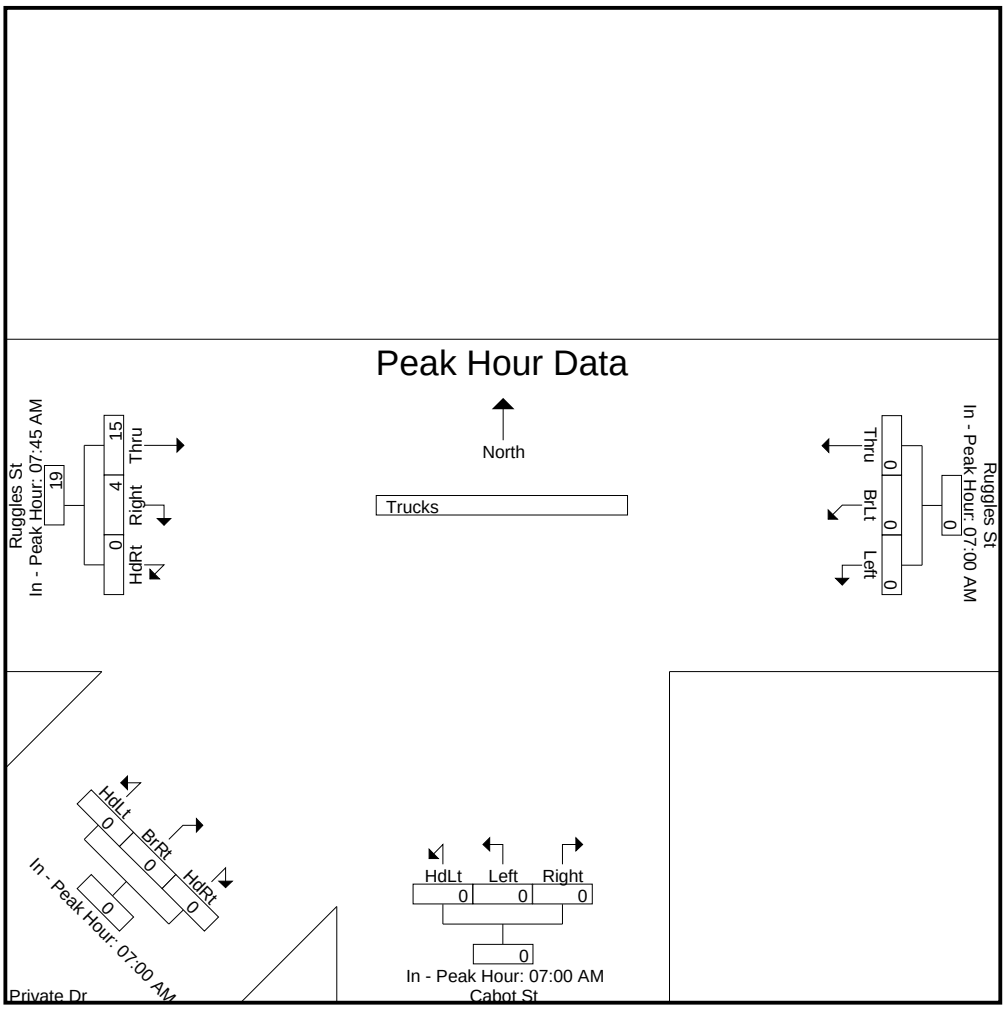
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 9

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				07:00 AM				07:00 AM				07:45 AM				
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	**7**	**2**	0	**9**	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0	19	
% App. Total	0	0	0		0	0	0		0	0	0		78.9	21.1	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.536	.500	.000	.528	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Bikes Peds

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West						
Start Time	Left	BrLt	Thru	Peds	HdLt	Left	Right	Peds	HdLt	BrRt	HdRt	Peds	Thru	Right	HdRt	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	1	2	0	0	0	5	0	0	0	0	0	0	0	0	7	1	8
07:15 AM	0	0	1	0	0	0	0	9	0	0	0	0	1	0	0	4	13	2	15
07:30 AM	1	0	1	0	0	0	0	2	0	0	0	0	2	0	0	1	3	4	7
07:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	2	3	2	5
Total	1	0	3	2	0	0	0	17	0	0	0	0	5	0	0	7	26	9	35
08:00 AM	0	0	0	2	0	0	0	9	0	0	0	0	1	0	0	0	11	1	12
08:15 AM	1	0	0	1	0	0	0	3	0	0	0	0	0	0	0	1	5	1	6
08:30 AM	0	0	2	1	0	0	0	3	0	0	0	0	0	0	0	0	4	2	6
08:45 AM	1	0	0	1	0	0	0	4	0	0	0	0	4	0	0	0	5	5	10
Total	2	0	2	5	0	0	0	19	0	0	0	0	5	0	0	1	25	9	34
Grand Total	3	0	5	7	0	0	0	36	0	0	0	0	10	0	0	8	51	18	69
Apprch %	37.5	0	62.5		0	0	0		0	0	0		100	0	0				
Total %	16.7	0	27.8		0	0	0		0	0	0		55.6	0	0		73.9	26.1	

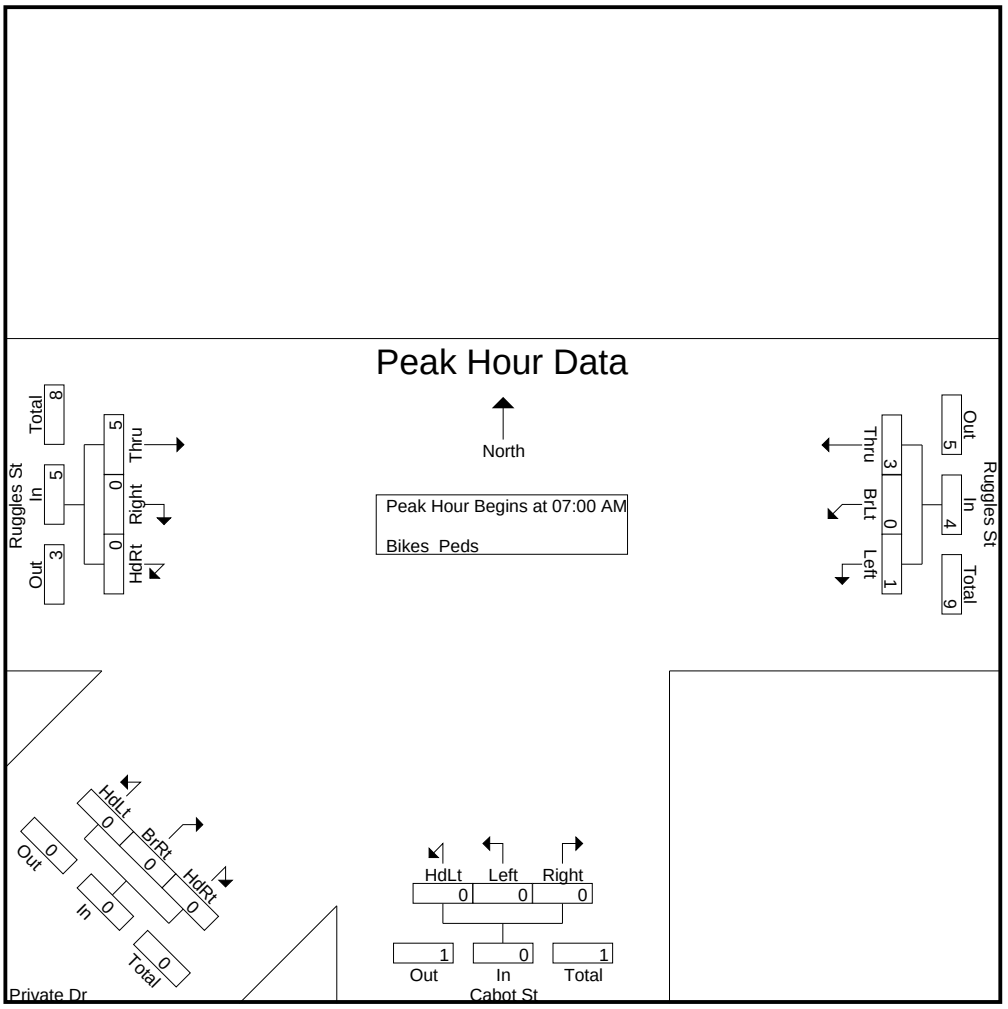
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 11

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	**1**	1	0	0	0	0	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	2
07:30 AM	**1**	0	1	**2**	0	0	0	0	0	0	0	0	**2**	0	0	**2**	**4**
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Total Volume	1	0	3	4	0	0	0	0	0	0	0	0	5	0	0	5	9
% App. Total	25	0	75		0	0	0		0	0	0		100	0	0		
PHF	.250	.000	.750	.500	.000	.000	.000	.000	.000	.000	.000	.000	.625	.000	.000	.625	.563



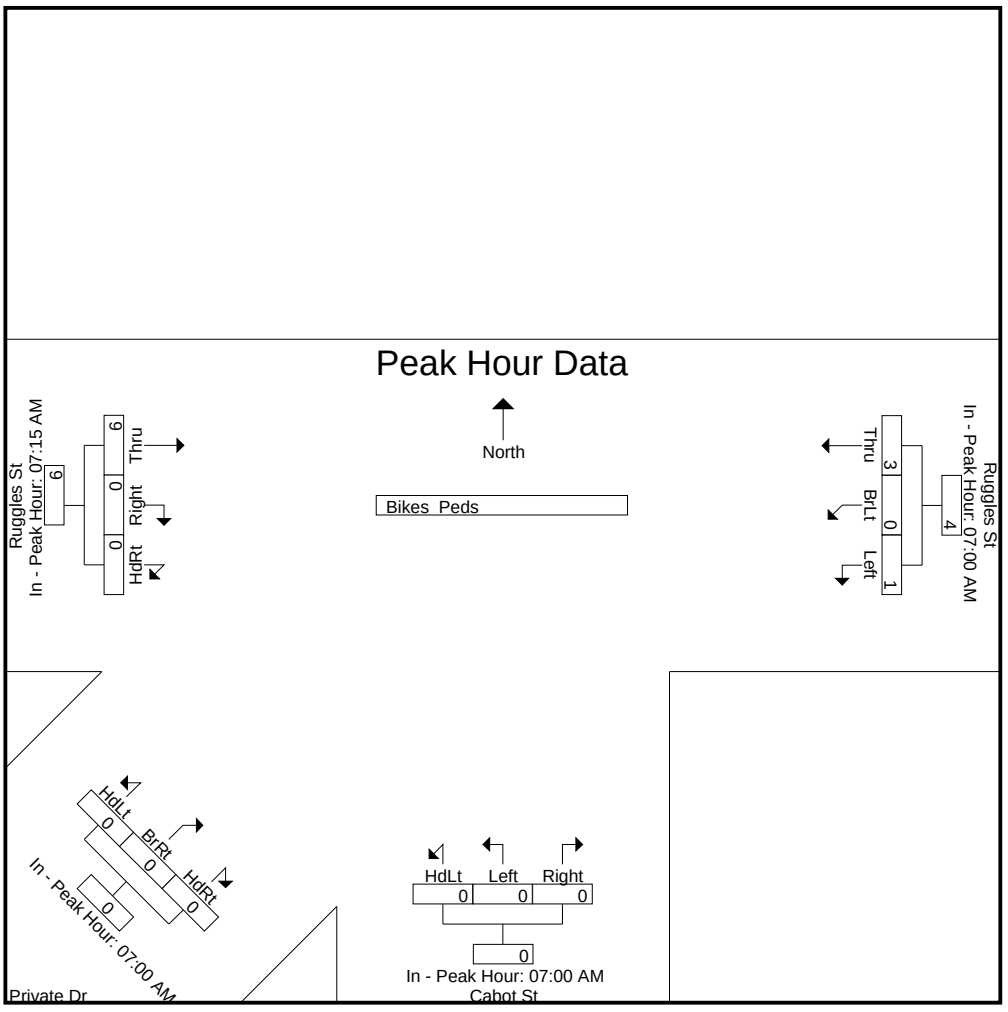
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 12

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				07:00 AM				07:00 AM				07:15 AM				
+0 mins.	0	0	**1**	1	0	0	0	0	0	0	0	0	1	0	0	1	
+15 mins.	0	0	1	1	0	0	0	0	0	0	0	0	**2**	0	0	**2**	
+30 mins.	**1**	0	1	**2**	0	0	0	0	0	0	0	0	2	0	0	2	
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	
Total Volume	1	0	3	4	0	0	0	0	0	0	0	0	6	0	0	6	
% App. Total	25	0	75		0	0	0		0	0	0		100	0	0		
PHF	.250	.000	.750	.500	.000	.000	.000	.000	.000	.000	.000	.000	.750	.000	.000	.750	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Cars - Trucks

	Ruggles St From East			Cabot St From South			Private Dr From Southwest			Ruggles St From West			
Start Time	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Thru	Right	HdRt	Int. Total
04:00 PM	0	0	0	0	0	2	0	2	1	65	16	1	87
04:15 PM	0	0	0	0	0	0	0	1	1	41	17	0	60
04:30 PM	0	0	0	0	0	1	0	1	2	52	21	1	78
04:45 PM	0	0	0	0	0	0	0	1	1	46	21	3	72
Total	0	0	0	0	0	3	0	5	5	204	75	5	297
05:00 PM	0	0	0	0	0	1	0	0	0	44	27	0	72
05:15 PM	0	0	0	0	0	0	0	1	1	55	12	0	69
05:30 PM	0	0	0	0	0	0	0	1	0	43	26	1	71
05:45 PM	0	0	0	0	0	0	0	0	1	45	18	1	65
Total	0	0	0	0	0	1	0	2	2	187	83	2	277
Grand Total	0	0	0	0	0	4	0	7	7	391	158	7	574
Apprch %	0	0	0	0	0	100	0	50	50	70.3	28.4	1.3	
Total %	0	0	0	0	0	0.7	0	1.2	1.2	68.1	27.5	1.2	
Cars	0	0	0	0	0	4	0	7	7	375	158	7	558
% Cars	0	0	0	0	0	100	0	100	100	95.9	100	100	97.2
Trucks	0	0	0	0	0	0	0	0	0	16	0	0	16
% Trucks	0	0	0	0	0	0	0	0	0	4.1	0	0	2.8

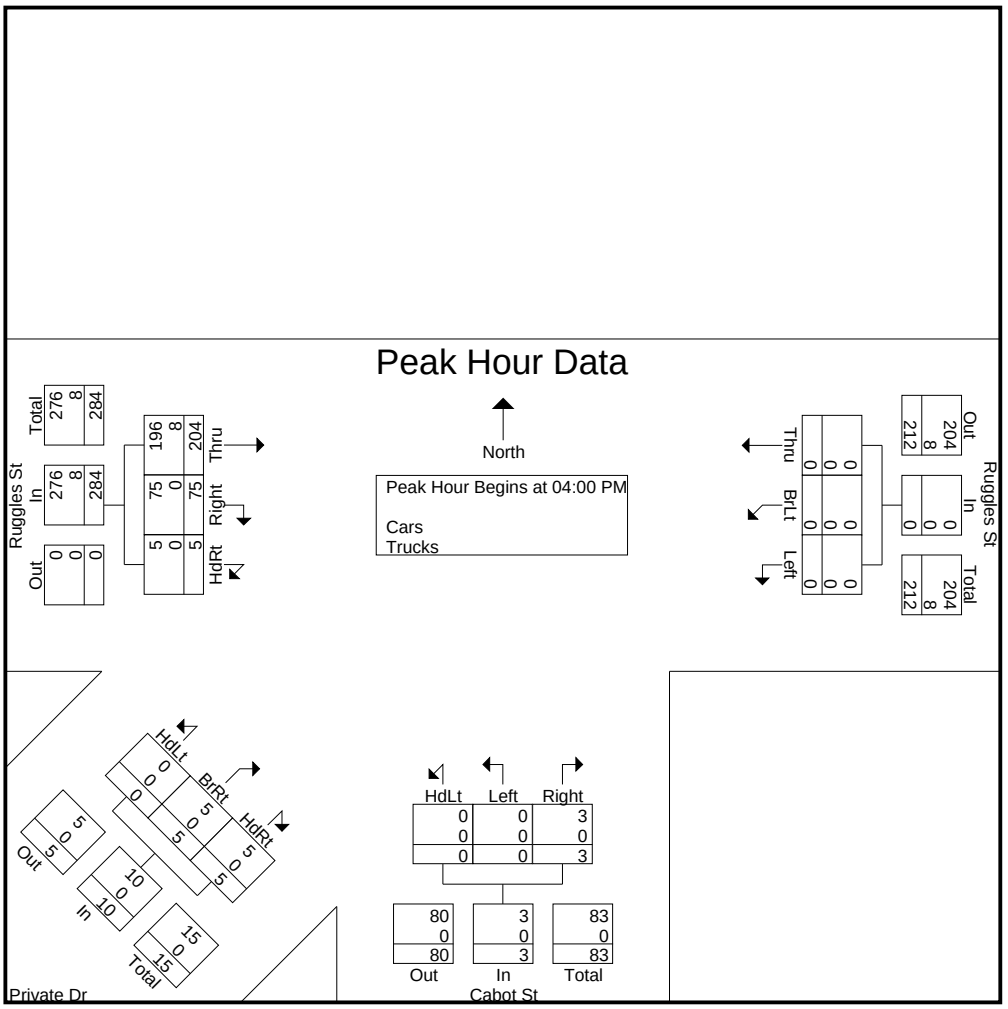
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 2

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	**2**	**2**	0	**2**	1	**3**	**65**	16	1	**82**	**87**
04:15 PM	0	0	0	0	0	0	0	0	0	1	1	2	41	17	0	58	60
04:30 PM	0	0	0	0	0	0	1	1	0	1	**2**	3	52	**21**	1	74	78
04:45 PM	0	0	0	0	0	0	0	0	0	1	1	2	46	21	**3**	70	72
Total Volume	0	0	0	0	0	0	3	3	0	5	5	10	204	75	5	284	297
% App. Total	0	0	0		0	0	100		0	50	50		71.8	26.4	1.8		
PHF	.000	.000	.000	.000	.000	.000	.375	.375	.000	.625	.625	.833	.785	.893	.417	.866	.853
Cars	0	0	0	0	0	0	3	3	0	5	5	10	196	75	5	276	289
% Cars	0	0	0	0	0	0	100	100	0	100	100	100	96.1	100	100	97.2	97.3
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	8
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	3.9	0	0	2.8	2.7



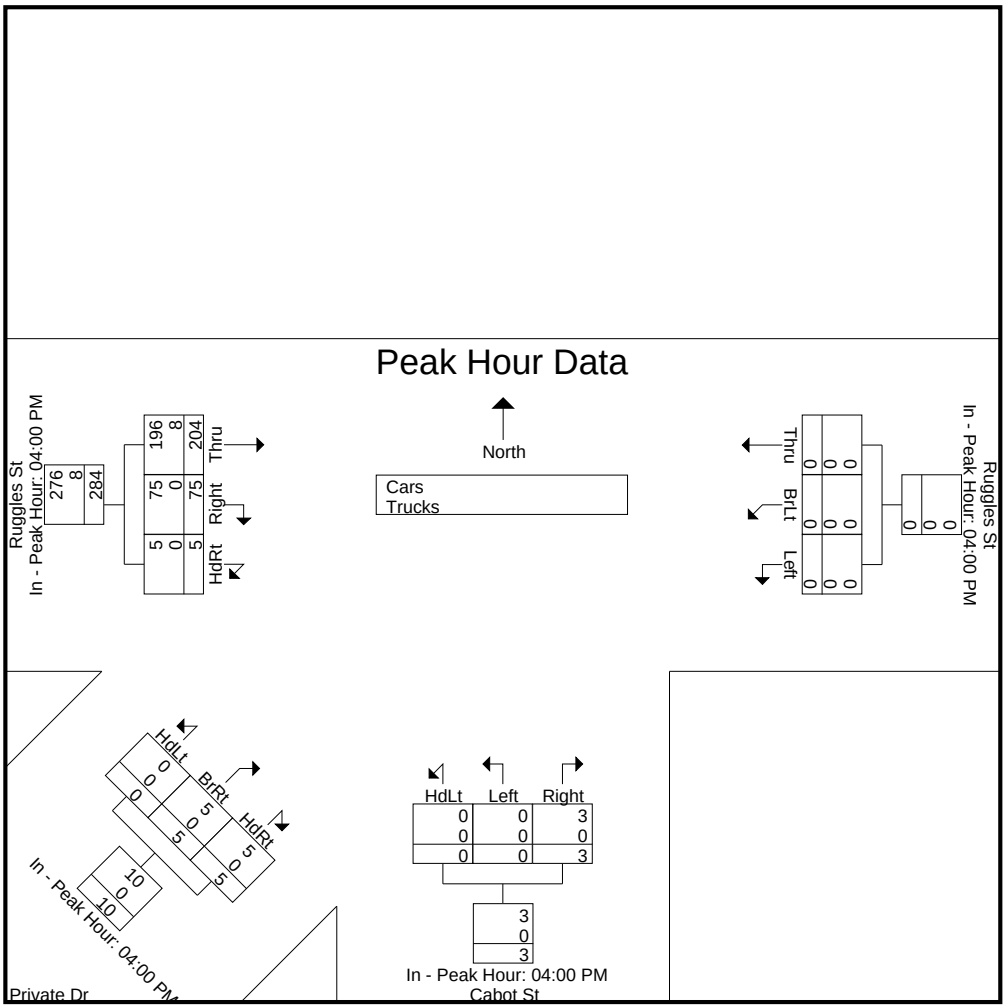
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 3

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				04:00 PM				04:00 PM				04:00 PM				
+0 mins.	0	0	0	0	0	0	**2**	**2**	0	**2**	1	**3**	**65**	16	1	**82**	
+15 mins.	0	0	0	0	0	0	0	0	0	1	1	2	41	17	0	58	
+30 mins.	0	0	0	0	0	0	1	1	0	1	**2**	3	52	**21**	1	74	
+45 mins.	0	0	0	0	0	0	0	0	0	1	1	2	46	21	**3**	70	
Total Volume	0	0	0	0	0	0	3	3	0	5	5	10	204	75	5	284	
% App. Total	0	0	0		0	0	100		0	50	50		71.8	26.4	1.8		
PHF	.000	.000	.000	.000	.000	.000	.375	.375	.000	.625	.625	.833	.785	.893	.417	.866	
Cars	0	0	0	0	0	0	3	3	0	5	5	10	196	75	5	276	
% Cars	0	0	0	0	0	0	100	100	0	100	100	100	96.1	100	100	97.2	
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	3.9	0	0	2.8	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Cars

	Ruggles St From East			Cabot St From South			Private Dr From Southwest			Ruggles St From West			
Start Time	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Thru	Right	HdRt	Int. Total
04:00 PM	0	0	0	0	0	2	0	2	1	63	16	1	85
04:15 PM	0	0	0	0	0	0	0	1	1	39	17	0	58
04:30 PM	0	0	0	0	0	1	0	1	2	50	21	1	76
04:45 PM	0	0	0	0	0	0	0	1	1	44	21	3	70
Total	0	0	0	0	0	3	0	5	5	196	75	5	289
05:00 PM	0	0	0	0	0	1	0	0	0	44	27	0	72
05:15 PM	0	0	0	0	0	0	0	1	1	54	12	0	68
05:30 PM	0	0	0	0	0	0	0	1	0	40	26	1	68
05:45 PM	0	0	0	0	0	0	0	0	1	41	18	1	61
Total	0	0	0	0	0	1	0	2	2	179	83	2	269
Grand Total	0	0	0	0	0	4	0	7	7	375	158	7	558
Apprch %	0	0	0	0	0	100	0	50	50	69.4	29.3	1.3	
Total %	0	0	0	0	0	0.7	0	1.3	1.3	67.2	28.3	1.3	

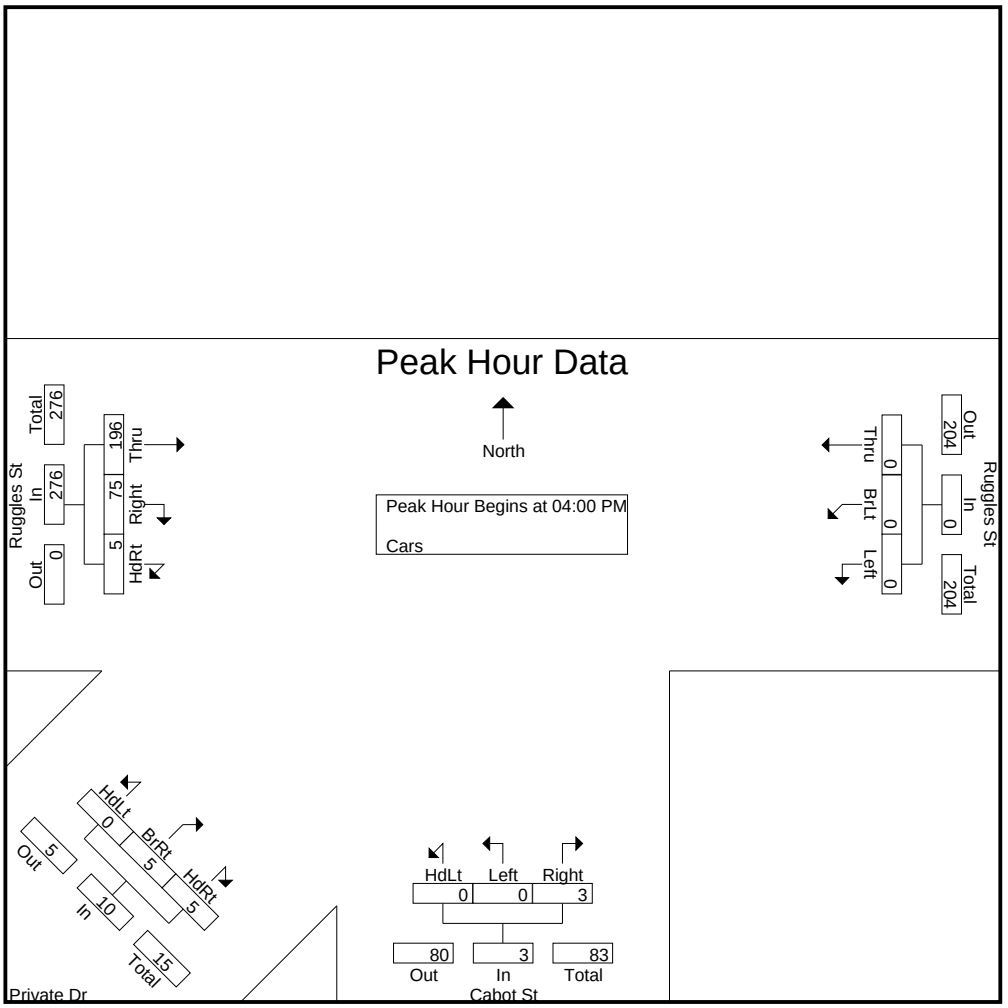
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 5

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	**2**	**2**	0	**2**	1	**3**	**63**	16	1	**80**	**85**
04:15 PM	0	0	0	0	0	0	0	0	0	1	1	2	39	17	0	56	58
04:30 PM	0	0	0	0	0	0	1	1	0	1	**2**	3	50	**21**	1	72	76
04:45 PM	0	0	0	0	0	0	0	0	0	1	1	2	44	21	**3**	68	70
Total Volume	0	0	0	0	0	0	3	3	0	5	5	10	196	75	5	276	289
% App. Total	0	0	0		0	0	100		0	50	50		71	27.2	1.8		
PHF	.000	.000	.000	.000	.000	.000	.375	.375	.000	.625	.625	.833	.778	.893	.417	.863	.850



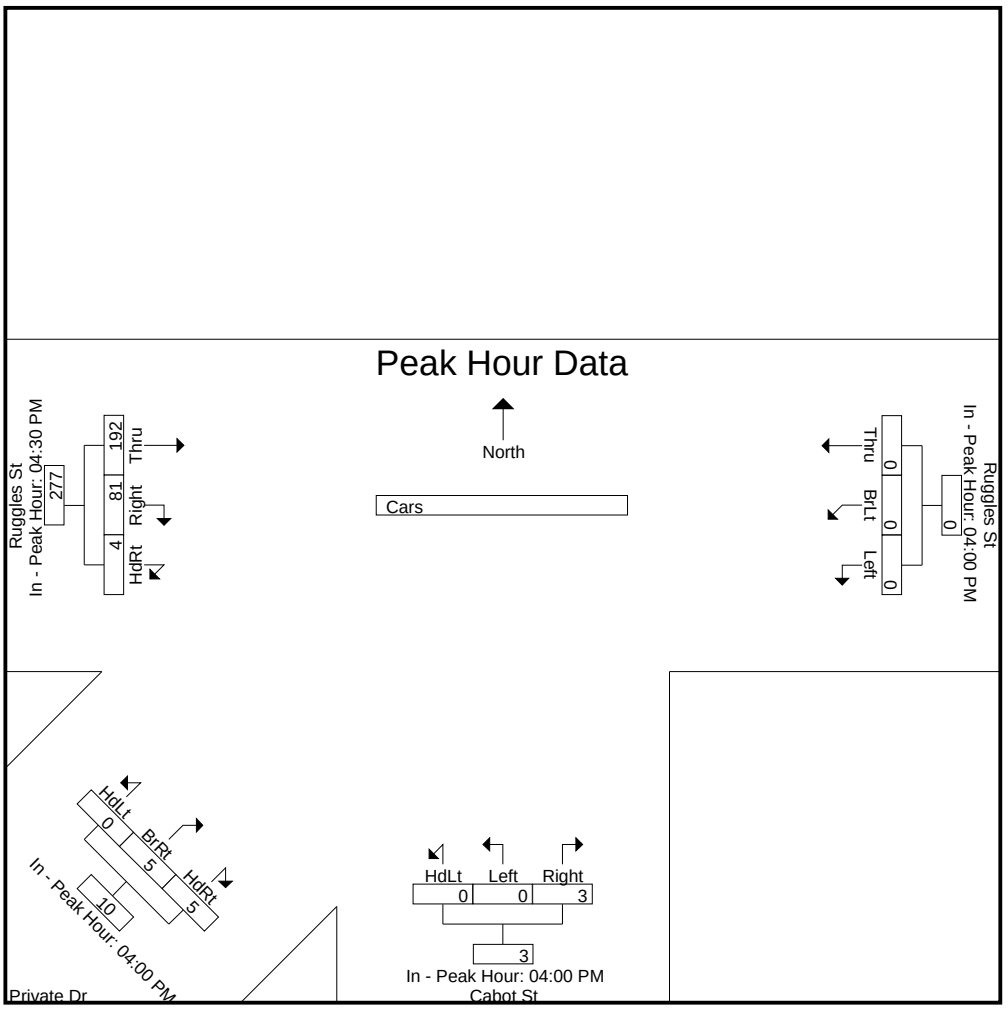
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 6

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				04:00 PM				04:00 PM				04:30 PM				
+0 mins.	0	0	0	0	0	0	**2**	**2**	0	**2**	1	**3**	50	21	1	**72**	
+15 mins.	0	0	0	0	0	0	0	0	0	1	1	2	44	21	**3**	68	
+30 mins.	0	0	0	0	0	0	1	1	0	1	**2**	3	44	**27**	0	71	
+45 mins.	0	0	0	0	0	0	0	0	0	1	1	2	**54**	12	0	66	
Total Volume	0	0	0	0	0	0	3	3	0	5	5	10	192	81	4	277	
% App. Total	0	0	0		0	0	100		0	50	50		69.3	29.2	1.4		
PHF	.000	.000	.000	.000	.000	.000	.375	.375	.000	.625	.625	.833	.889	.750	.333	.962	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Trucks

	Ruggles St From East			Cabot St From South			Private Dr From Southwest			Ruggles St From West			
Start Time	Left	BrLt	Thru	HdLt	Left	Right	HdLt	BrRt	HdRt	Thru	Right	HdRt	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	2
04:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	2
Total	0	0	0	0	0	0	0	0	0	8	0	0	8
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	3	0	0	3
05:45 PM	0	0	0	0	0	0	0	0	0	4	0	0	4
Total	0	0	0	0	0	0	0	0	0	8	0	0	8
Grand Total	0	0	0	0	0	0	0	0	0	16	0	0	16
Apprch %	0	0	0	0	0	0	0	0	0	100	0	0	
Total %	0	0	0	0	0	0	0	0	0	100	0	0	

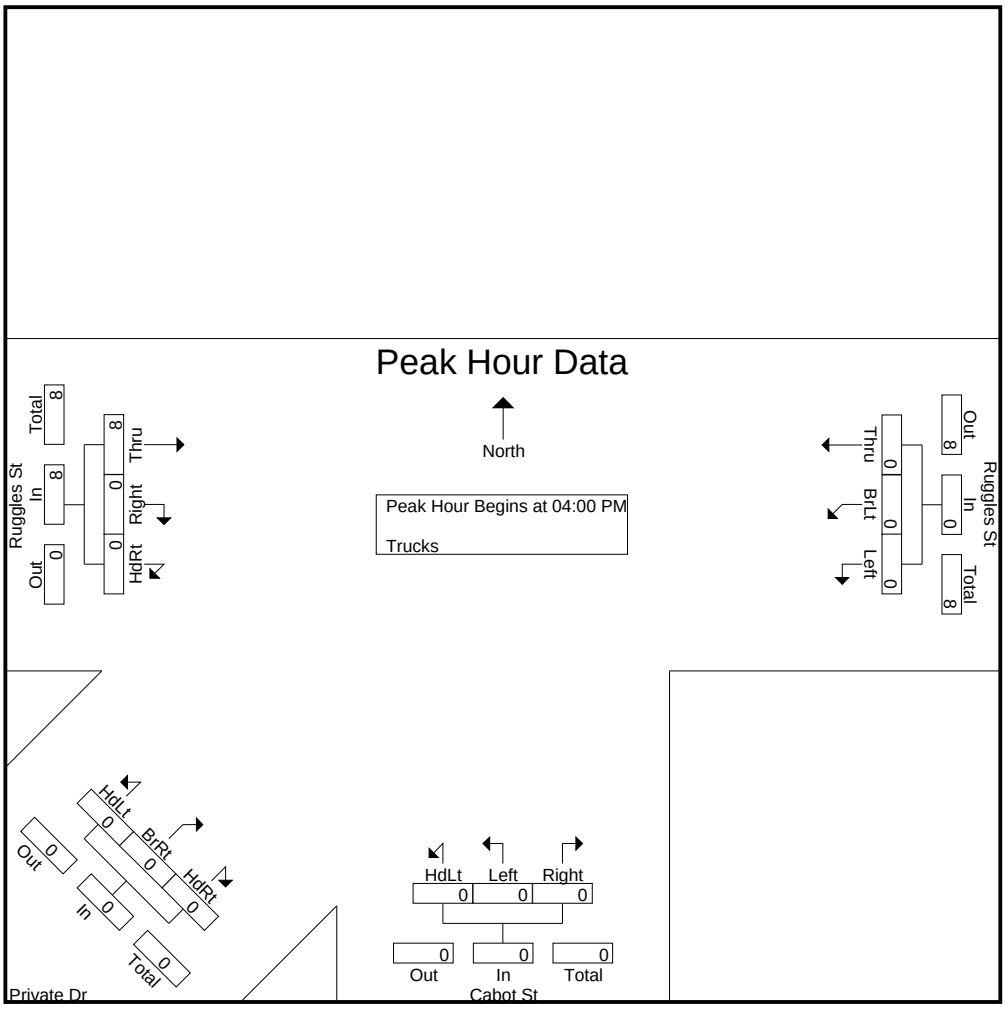
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 8

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	0	0	0	0	0	0	**2**	0	0	**2**	**2**
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	8
% App. Total	0	0	0		0	0	0		0	0	0		100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	1.00	.000	.000	1.00	1.00



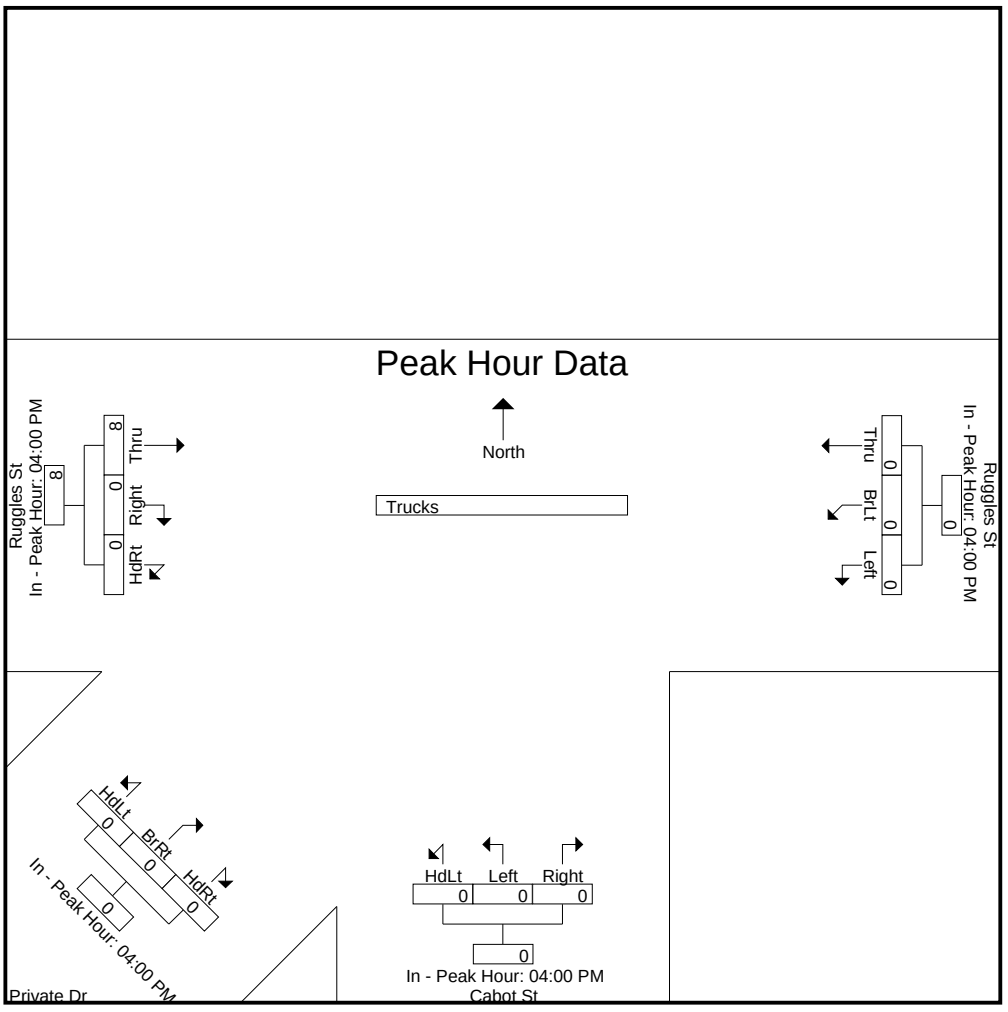
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 9

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				04:00 PM				04:00 PM				04:00 PM				
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0	0	**2**	
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8	
% App. Total	0	0	0		0	0	0		0	0	0		100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	1.000	.000	.000	1.000	



Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014

Groups Printed- Bikes Peds

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West						
Start Time	Left	BrLt	Thru	Peds	HdLt	Left	Right	Peds	HdLt	BrRt	HdRt	Peds	Thru	Right	HdRt	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	1	0	0	0	0	0	0	6	0	0	0	0	1	0	0	0	6	2	8
04:15 PM	0	0	1	1	0	0	0	13	0	0	0	0	2	0	0	0	14	3	17
04:30 PM	1	0	1	0	0	0	0	11	0	0	0	0	1	0	0	0	11	3	14
04:45 PM	2	0	1	5	0	0	0	5	0	0	0	0	1	0	0	0	10	4	14
Total	4	0	3	6	0	0	0	35	0	0	0	0	5	0	0	0	41	12	53
05:00 PM	2	0	0	3	0	0	0	13	0	0	0	0	1	0	0	0	16	3	19
05:15 PM	0	0	1	1	0	0	1	14	0	0	0	0	4	0	0	0	15	6	21
05:30 PM	0	0	3	2	0	0	0	12	0	0	0	0	0	0	0	0	14	3	17
05:45 PM	0	0	2	1	0	0	0	14	0	0	0	0	1	0	0	0	15	3	18
Total	2	0	6	7	0	0	1	53	0	0	0	0	6	0	0	0	60	15	75
Grand Total	6	0	9	13	0	0	1	88	0	0	0	0	11	0	0	0	101	27	128
Apprch %	40	0	60		0	0	100		0	0	0		100	0	0				
Total %	22.2	0	33.3		0	0	3.7		0	0	0		40.7	0	0		78.9	21.1	

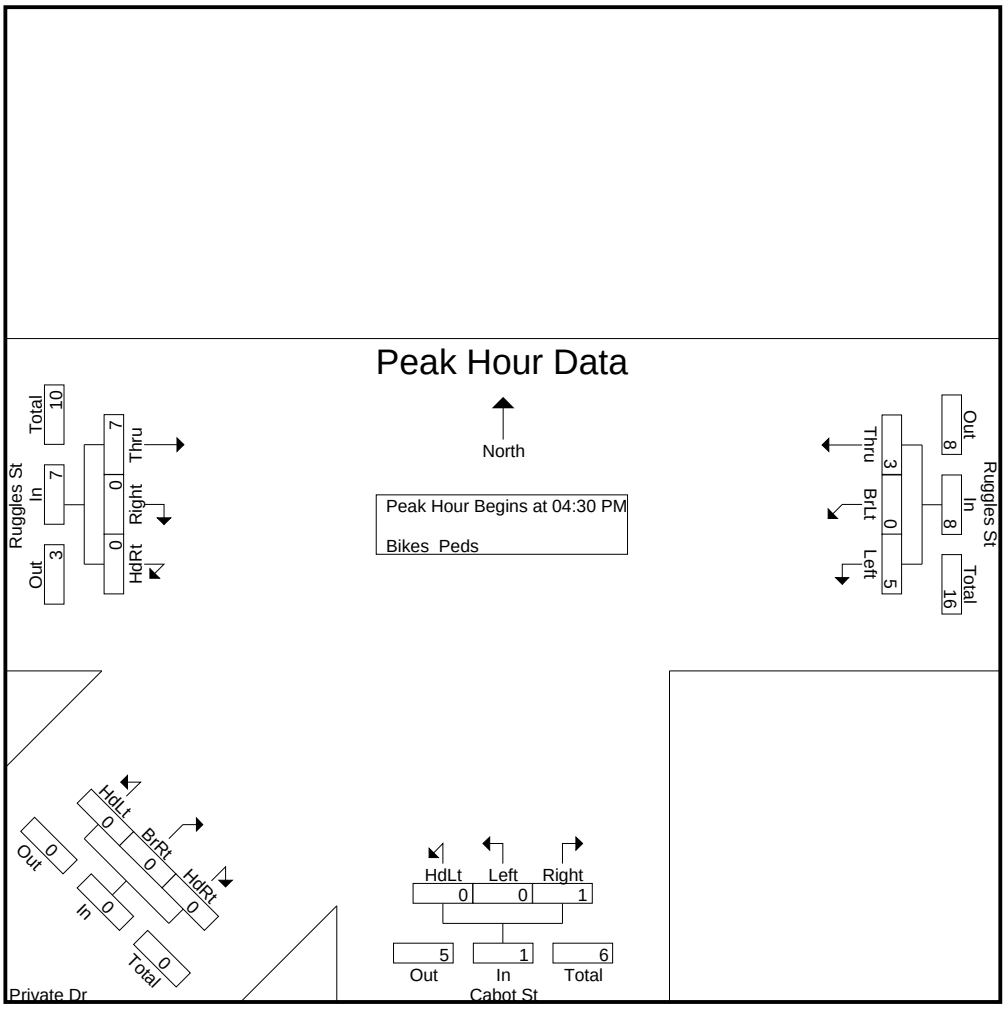
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 11

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	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	**1**	2	0	0	0	0	0	0	0	0	1	0	0	1	3
04:45 PM	**2**	0	1	**3**	0	0	0	0	0	0	0	0	1	0	0	1	4
05:00 PM	2	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	3
05:15 PM	0	0	1	1	0	0	**1**	**1**	0	0	0	0	**4**	0	0	**4**	**6**
Total Volume	5	0	3	8	0	0	1	1	0	0	0	0	7	0	0	7	16
% App. Total	62.5	0	37.5		0	0	100		0	0	0		100	0	0		
PHF	.625	.000	.750	.667	.000	.000	.250	.250	.000	.000	.000	.000	.438	.000	.000	.438	.667



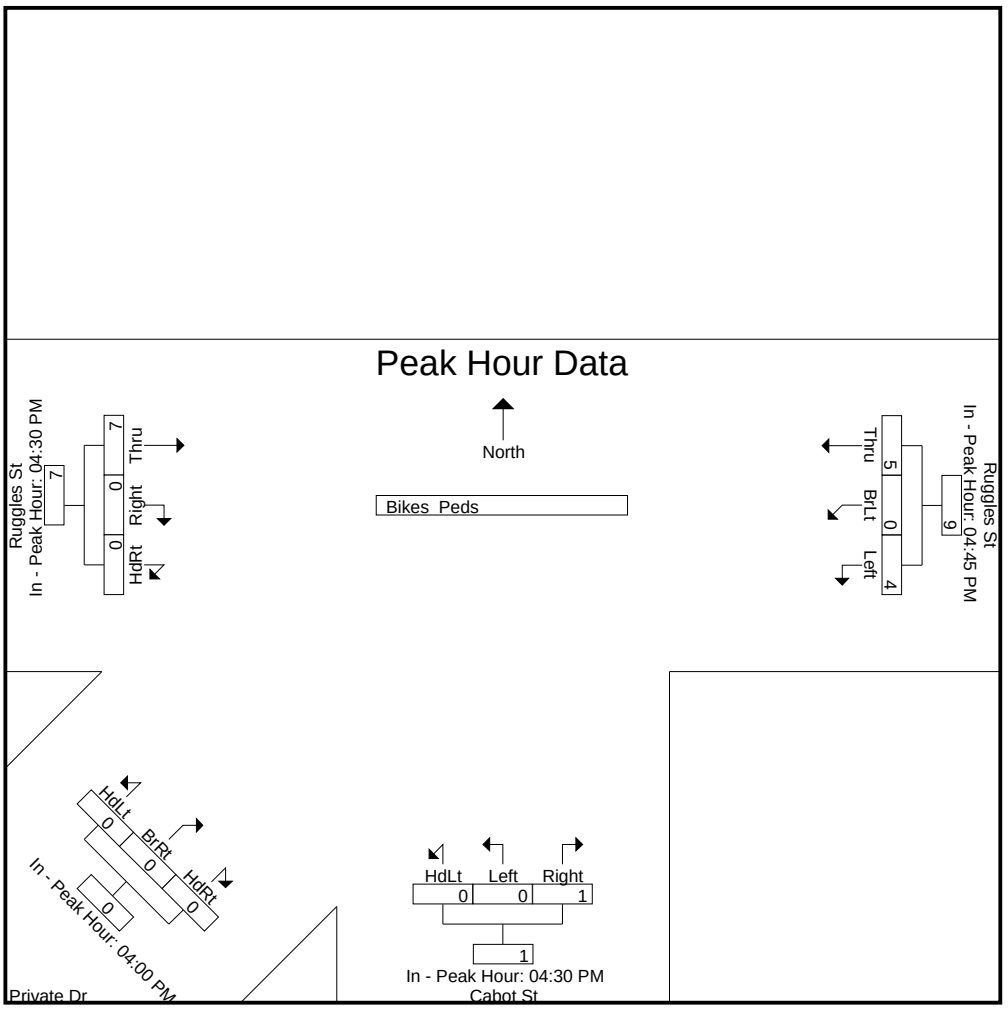
Accurate Counts

978-664-2565

N/S Street : Cabot St / Private Dr
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006006
Site Code : 14006006
Start Date : 10/15/2014
Page No : 12

	Ruggles St From East				Cabot St From South				Private Dr From Southwest				Ruggles St From West				
Start Time	Left	BrLt	Thru	App. Total	HdLt	Left	Right	App. Total	HdLt	BrRt	HdRt	App. Total	Thru	Right	HdRt	App. Total	Int. Total
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				04:30 PM				
+0 mins.	**2**	0	1	**3**	0	0	0	0	0	0	0	0	1	0	0	1	
+15 mins.	2	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	
+30 mins.	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	
+45 mins.	0	0	**3**	3	0	0	**1**	**1**	0	0	0	0	**4**	0	0	**4**	
Total Volume	4	0	5	9	0	0	1	1	0	0	0	0	7	0	0	7	
% App. Total	44.4	0	55.6		0	0	100		0	0	0		100	0	0		
PHF	.500	.000	.417	.750	.000	.000	.250	.250	.000	.000	.000	.000	.438	.000	.000	.438	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Cars - Trucks

	Dewitt Dr From North			Ruggles St From East			Dewitt Dr From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	3	0	0	0	0	0	5	5	1	12	19	47
07:15 AM	2	3	0	0	0	0	0	20	12	1	7	8	53
07:30 AM	1	1	0	0	0	0	0	14	10	5	16	15	62
07:45 AM	1	5	0	0	0	0	0	31	4	0	10	15	66
Total	6	12	0	0	0	0	0	70	31	7	45	57	228
08:00 AM	1	2	0	0	0	0	0	36	3	3	17	10	72
08:15 AM	0	3	0	0	0	0	0	20	6	2	11	12	54
08:30 AM	0	3	0	0	0	0	0	19	2	4	15	16	59
08:45 AM	0	2	0	0	0	0	0	27	7	6	18	16	76
Total	1	10	0	0	0	0	0	102	18	15	61	54	261
Grand Total	7	22	0	0	0	0	0	172	49	22	106	111	489
Apprch %	24.1	75.9	0	0	0	0	0	77.8	22.2	9.2	44.4	46.4	
Total %	1.4	4.5	0	0	0	0	0	35.2	10	4.5	21.7	22.7	
Cars	7	20	0	0	0	0	0	167	49	21	83	108	455
% Cars	100	90.9	0	0	0	0	0	97.1	100	95.5	78.3	97.3	93
Trucks	0	2	0	0	0	0	0	5	0	1	23	3	34
% Trucks	0	9.1	0	0	0	0	0	2.9	0	4.5	21.7	2.7	7

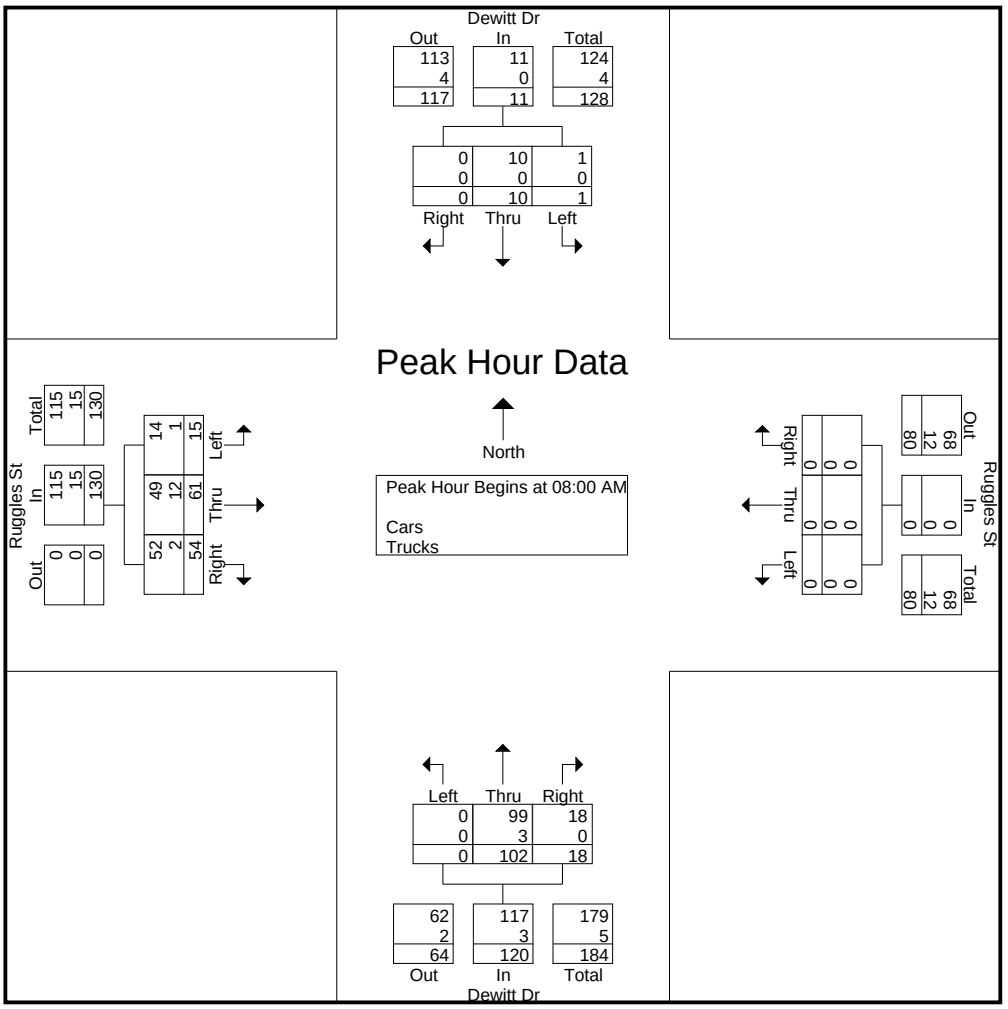
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 2

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 08:00 AM																	
08:00 AM	**1**	2	0	**3**	0	0	0	0	0	**36**	3	**39**	3	17	10	30	72
08:15 AM	0	**3**	0	3	0	0	0	0	0	20	6	26	2	11	12	25	54
08:30 AM	0	3	0	3	0	0	0	0	0	19	2	21	4	15	**16**	35	59
08:45 AM	0	2	0	2	0	0	0	0	0	27	**7**	34	**6**	**18**	16	**40**	**76**
Total Volume	1	10	0	11	0	0	0	0	0	102	18	120	15	61	54	130	261
% App. Total	9.1	90.9	0		0	0	0		0	85	15		11.5	46.9	41.5		
PHF	.250	.833	.000	.917	.000	.000	.000	.000	.000	.708	.643	.769	.625	.847	.844	.813	.859
Cars	1	10	0	11	0	0	0	0	0	99	18	117	14	49	52	115	243
% Cars	100	100	0	100	0	0	0	0	0	97.1	100	97.5	93.3	80.3	96.3	88.5	93.1
Trucks	0	0	0	0	0	0	0	0	0	3	0	3	1	12	2	15	18
% Trucks	0	0	0	0	0	0	0	0	0	2.9	0	2.5	6.7	19.7	3.7	11.5	6.9

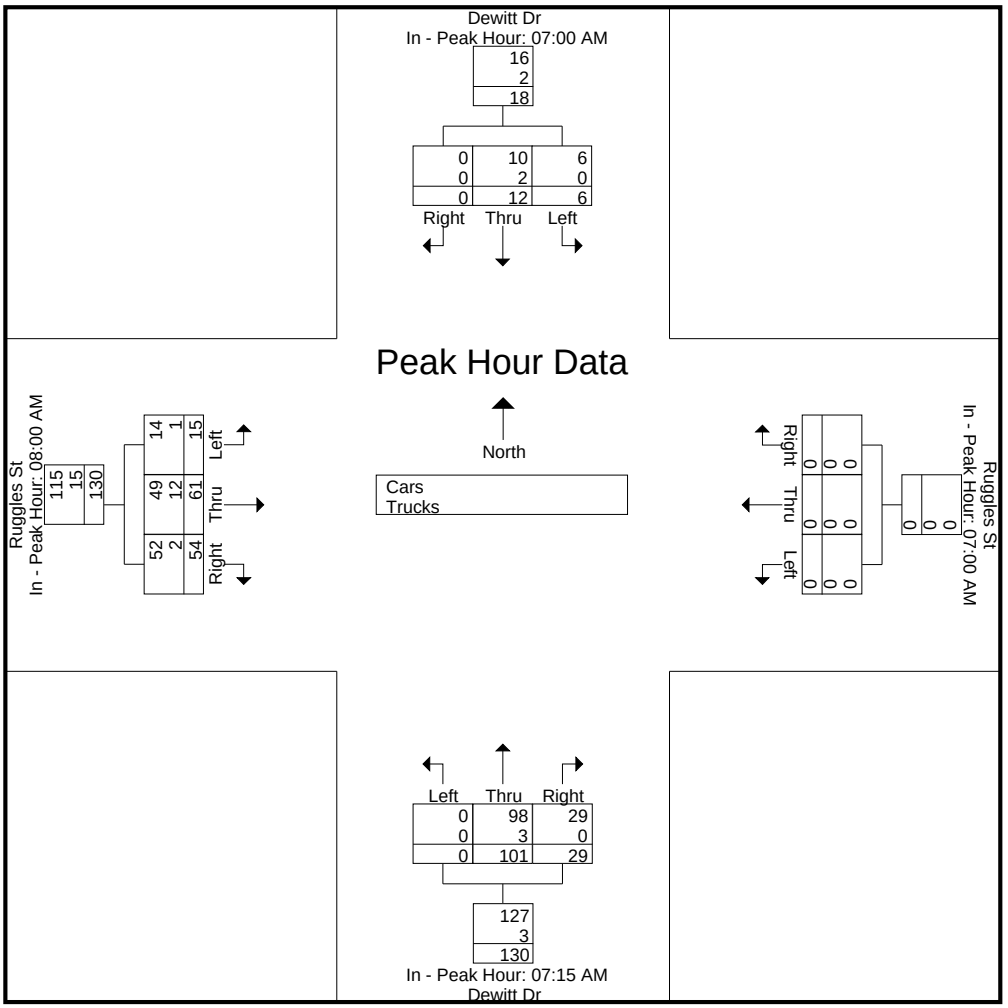


Accurate Counts
978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	07:00 AM				07:00 AM				07:15 AM				08:00 AM				
+0 mins.	**2**	3	0	5	0	0	0	0	0	20	**12**	32	3	17	10	30	
+15 mins.	2	3	0	5	0	0	0	0	0	14	10	24	2	11	12	25	
+30 mins.	1	1	0	2	0	0	0	0	0	31	4	35	4	15	**16**	35	
+45 mins.	1	**5**	0	**6**	0	0	0	0	0	**36**	3	**39**	**6**	**18**	16	**40**	
Total Volume	6	12	0	18	0	0	0	0	0	101	29	130	15	61	54	130	
% App. Total	33.3	66.7	0		0	0	0		0	77.7	22.3		11.5	46.9	41.5		
PHF	.750	.600	.000	.750	.000	.000	.000	.000	.000	.701	.604	.833	.625	.847	.844	.813	
Cars	6	10	0	16	0	0	0	0	0	98	29	127	14	49	52	115	
% Cars	100	83.3	0	88.9	0	0	0	0	0	97	100	97.7	93.3	80.3	96.3	88.5	
Trucks	0	2	0	2	0	0	0	0	0	3	0	3	1	12	2	15	
% Trucks	0	16.7	0	11.1	0	0	0	0	0	3	0	2.3	6.7	19.7	3.7	11.5	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Cars

	Dewitt Dr From North			Ruggles St From East			Dewitt Dr From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	3	0	0	0	0	0	5	5	1	10	19	45
07:15 AM	2	3	0	0	0	0	0	20	12	1	6	8	52
07:30 AM	1	1	0	0	0	0	0	14	10	5	10	14	55
07:45 AM	1	3	0	0	0	0	0	29	4	0	8	15	60
Total	6	10	0	0	0	0	0	68	31	7	34	56	212
08:00 AM	1	2	0	0	0	0	0	35	3	3	15	8	67
08:15 AM	0	3	0	0	0	0	0	19	6	2	8	12	50
08:30 AM	0	3	0	0	0	0	0	18	2	4	11	16	54
08:45 AM	0	2	0	0	0	0	0	27	7	5	15	16	72
Total	1	10	0	0	0	0	0	99	18	14	49	52	243
Grand Total	7	20	0	0	0	0	0	167	49	21	83	108	455
Apprch %	25.9	74.1	0	0	0	0	0	77.3	22.7	9.9	39.2	50.9	
Total %	1.5	4.4	0	0	0	0	0	36.7	10.8	4.6	18.2	23.7	

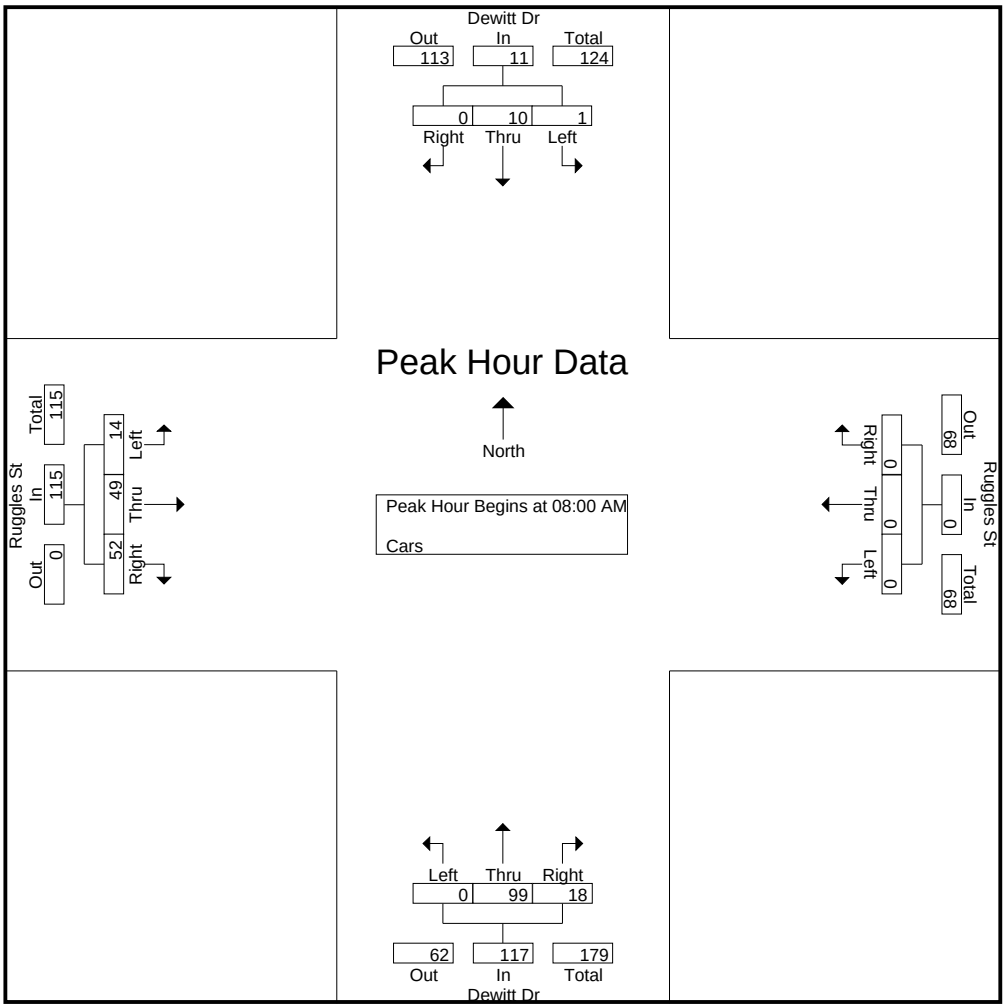
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 5

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 08:00 AM																	
08:00 AM	**1**	2	0	**3**	0	0	0	0	0	**35**	3	**38**	3	**15**	8	26	67
08:15 AM	0	**3**	0	3	0	0	0	0	0	19	6	25	2	8	12	22	50
08:30 AM	0	3	0	3	0	0	0	0	0	18	2	20	4	11	**16**	31	54
08:45 AM	0	2	0	2	0	0	0	0	0	27	**7**	34	**5**	15	16	**36**	**72**
Total Volume	1	10	0	11	0	0	0	0	0	99	18	117	14	49	52	115	243
% App. Total	9.1	90.9	0		0	0	0		0	84.6	15.4		12.2	42.6	45.2		
PHF	.250	.833	.000	.917	.000	.000	.000	.000	.000	.707	.643	.770	.700	.817	.813	.799	.844



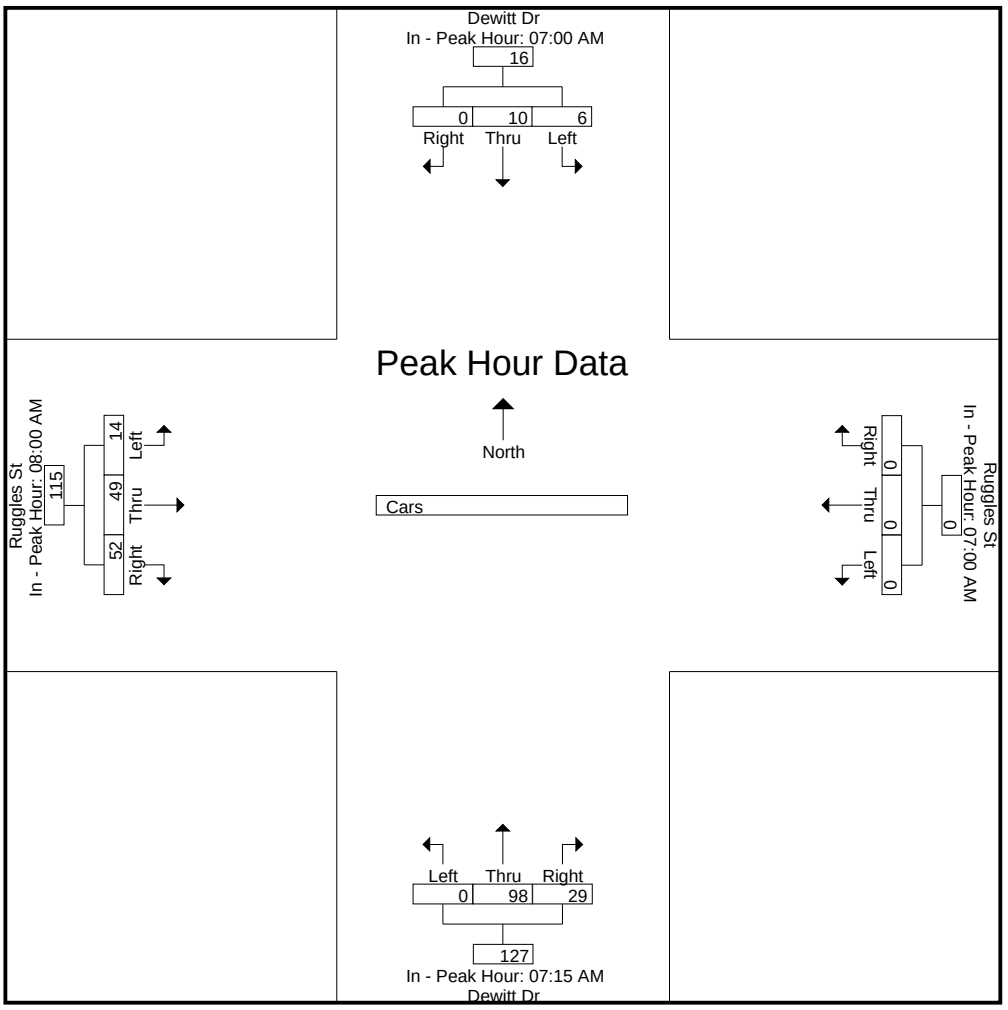
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 6

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	07:00 AM				07:00 AM				07:15 AM				08:00 AM				
+0 mins.	**2**	**3**	0	**5**	0	0	0	0	0	20	**12**	32	3	**15**	8	26	
+15 mins.	2	3	0	5	0	0	0	0	0	14	10	24	2	8	12	22	
+30 mins.	1	1	0	2	0	0	0	0	0	29	4	33	4	11	**16**	31	
+45 mins.	1	3	0	4	0	0	0	0	0	**35**	3	**38**	**5**	15	16	**36**	
Total Volume	6	10	0	16	0	0	0	0	0	98	29	127	14	49	52	115	
% App. Total	37.5	62.5	0		0	0	0		0	77.2	22.8		12.2	42.6	45.2		
PHF	.750	.833	.000	.800	.000	.000	.000	.000	.000	.700	.604	.836	.700	.817	.813	.799	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Trucks

	Dewitt Dr From North			Ruggles St From East			Dewitt Dr From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	2	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	6	1	7
07:45 AM	0	2	0	0	0	0	0	2	0	0	2	0	6
Total	0	2	0	0	0	0	0	2	0	0	11	1	16
08:00 AM	0	0	0	0	0	0	0	1	0	0	2	2	5
08:15 AM	0	0	0	0	0	0	0	1	0	0	3	0	4
08:30 AM	0	0	0	0	0	0	0	1	0	0	4	0	5
08:45 AM	0	0	0	0	0	0	0	0	0	1	3	0	4
Total	0	0	0	0	0	0	0	3	0	1	12	2	18
Grand Total	0	2	0	0	0	0	0	5	0	1	23	3	34
Apprch %	0	100	0	0	0	0	0	100	0	3.7	85.2	11.1	
Total %	0	5.9	0	0	0	0	0	14.7	0	2.9	67.6	8.8	

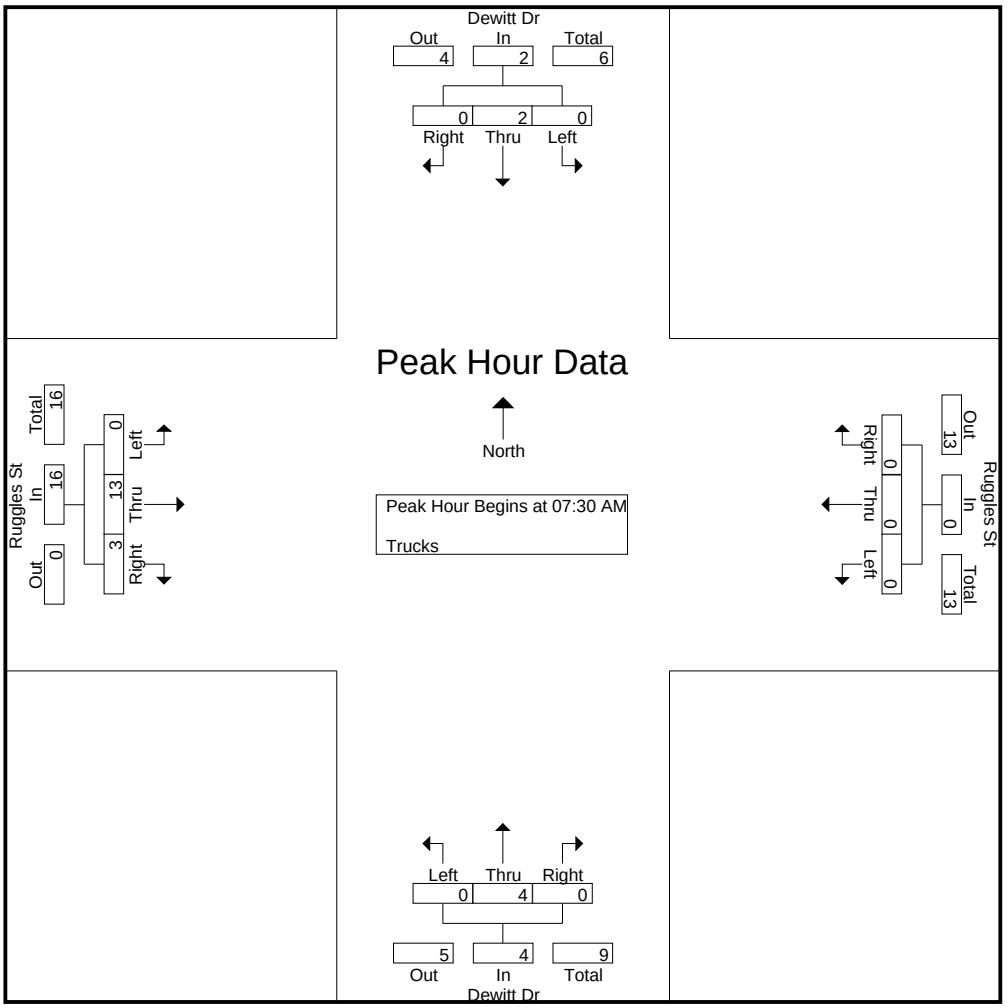
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 8

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 07:30 AM																	
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**6**	1	**7**	**7**
07:45 AM	0	**2**	0	**2**	0	0	0	0	0	**2**	0	**2**	0	2	0	2	6
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	2	**2**	4	5
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	3	0	3	4
Total Volume	0	2	0	2	0	0	0	0	0	4	0	4	0	13	3	16	22
% App. Total	0	100	0		0	0	0		0	100	0		0	81.2	18.8		
PHF	.000	.250	.000	.250	.000	.000	.000	.000	.000	.500	.000	.500	.000	.542	.375	.571	.786



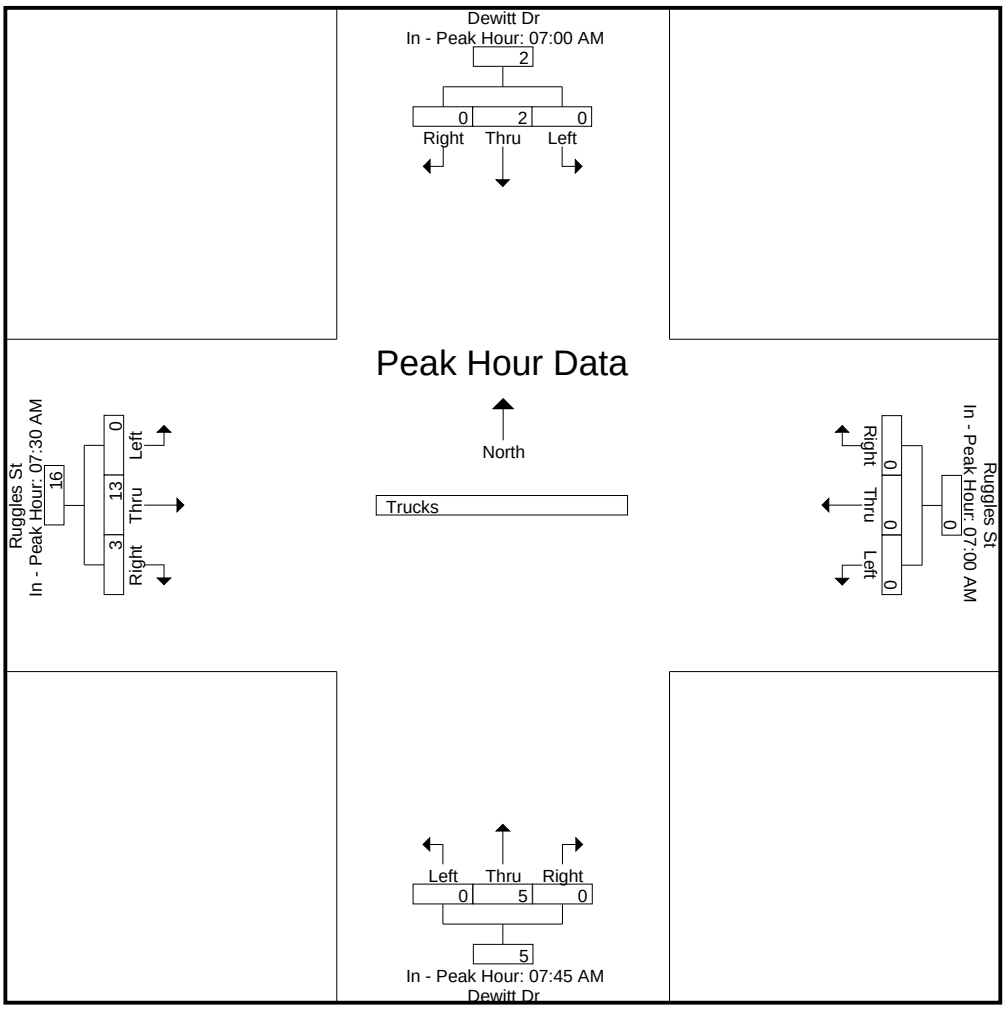
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 9

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	07:00 AM				07:00 AM				07:45 AM				07:30 AM				
+0 mins.	0	0	0	0	0	0	0	0	0	**2**	0	**2**	0	**6**	1	**7**	
+15 mins.	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	2	
+30 mins.	0	0	0	0	0	0	0	0	0	1	0	1	0	2	**2**	4	
+45 mins.	0	**2**	0	**2**	0	0	0	0	0	1	0	1	0	3	0	3	
Total Volume	0	2	0	2	0	0	0	0	0	5	0	5	0	13	3	16	
% App. Total	0	100	0		0	0	0		0	100	0		0	81.2	18.8		
PHF	.000	.250	.000	.250	.000	.000	.000	.000	.000	.625	.000	.625	.000	.542	.375	.571	



Accurate Counts
978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Bikes Peds

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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	1	0	7	0	1	0	0	0	0	0	2	0	0	0	5	14	2	16
07:15 AM	0	0	0	11	0	0	0	1	0	0	1	12	0	2	0	5	29	3	32
07:30 AM	0	0	0	13	0	1	0	2	0	0	0	7	0	2	0	5	27	3	30
07:45 AM	0	0	0	14	0	1	0	9	0	0	0	12	0	3	0	5	40	4	44
Total	0	1	0	45	0	3	0	12	0	0	1	33	0	7	0	20	110	12	122
08:00 AM	0	0	0	20	0	0	0	8	0	0	0	12	0	1	0	4	44	1	45
08:15 AM	0	0	0	10	0	1	0	3	0	0	0	3	0	1	0	3	19	2	21
08:30 AM	0	0	0	10	0	3	0	2	0	1	0	6	0	0	0	4	22	4	26
08:45 AM	0	0	0	5	0	1	0	7	0	0	0	16	0	3	0	1	29	4	33
Total	0	0	0	45	0	5	0	20	0	1	0	37	0	5	0	12	114	11	125
Grand Total	0	1	0	90	0	8	0	32	0	1	1	70	0	12	0	32	224	23	247
Apprch %	0	100	0		0	100	0		0	50	50		0	100	0				
Total %	0	4.3	0		0	34.8	0		0	4.3	4.3		0	52.2	0		90.7	9.3	

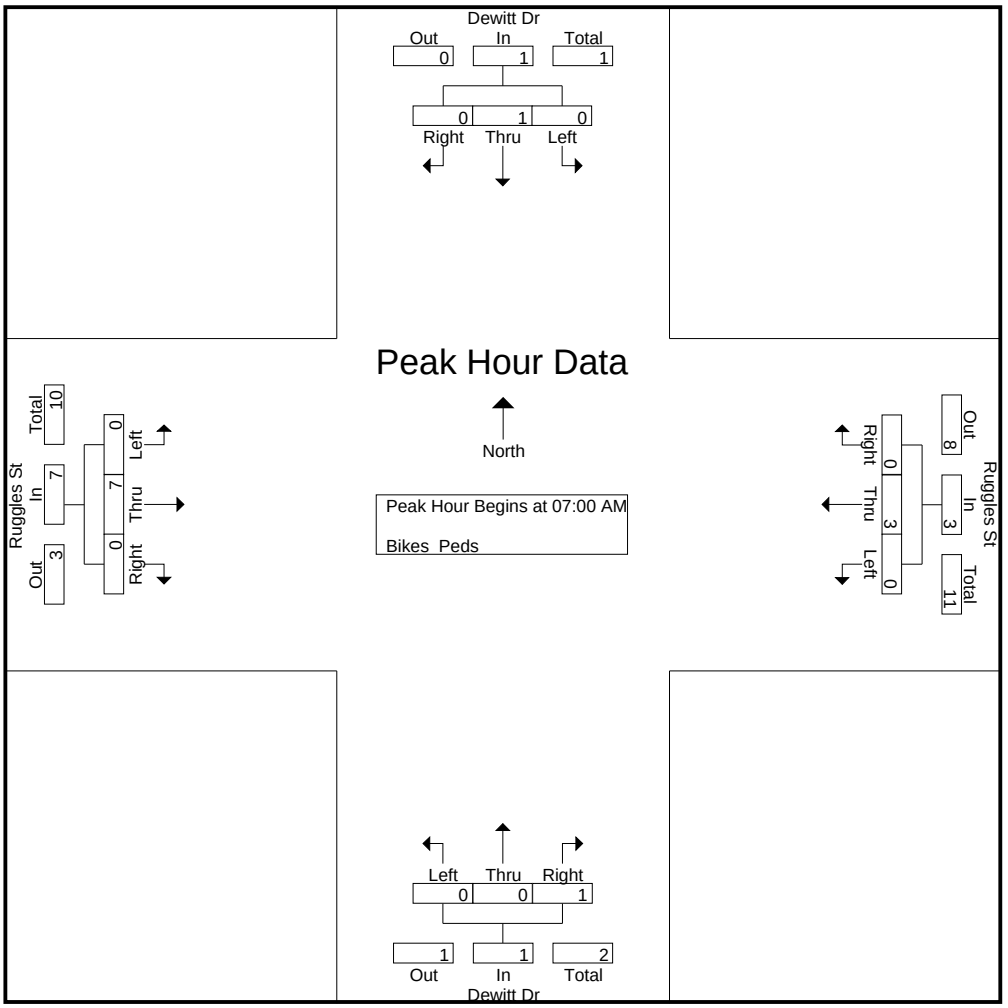
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 11

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 07:00 AM																	
07:00 AM	0	**1**	0	**1**	0	**1**	0	**1**	0	0	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	2	0	2	3
07:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0	2	3
07:45 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	**3**	0	**3**	**4**
Total Volume	0	1	0	1	0	3	0	3	0	0	1	1	0	7	0	7	12
% App. Total	0	100	0		0	100	0		0	0	100		0	100	0		
PHF	.000	.250	.000	.250	.000	.750	.000	.750	.000	.000	.250	.250	.000	.583	.000	.583	.750



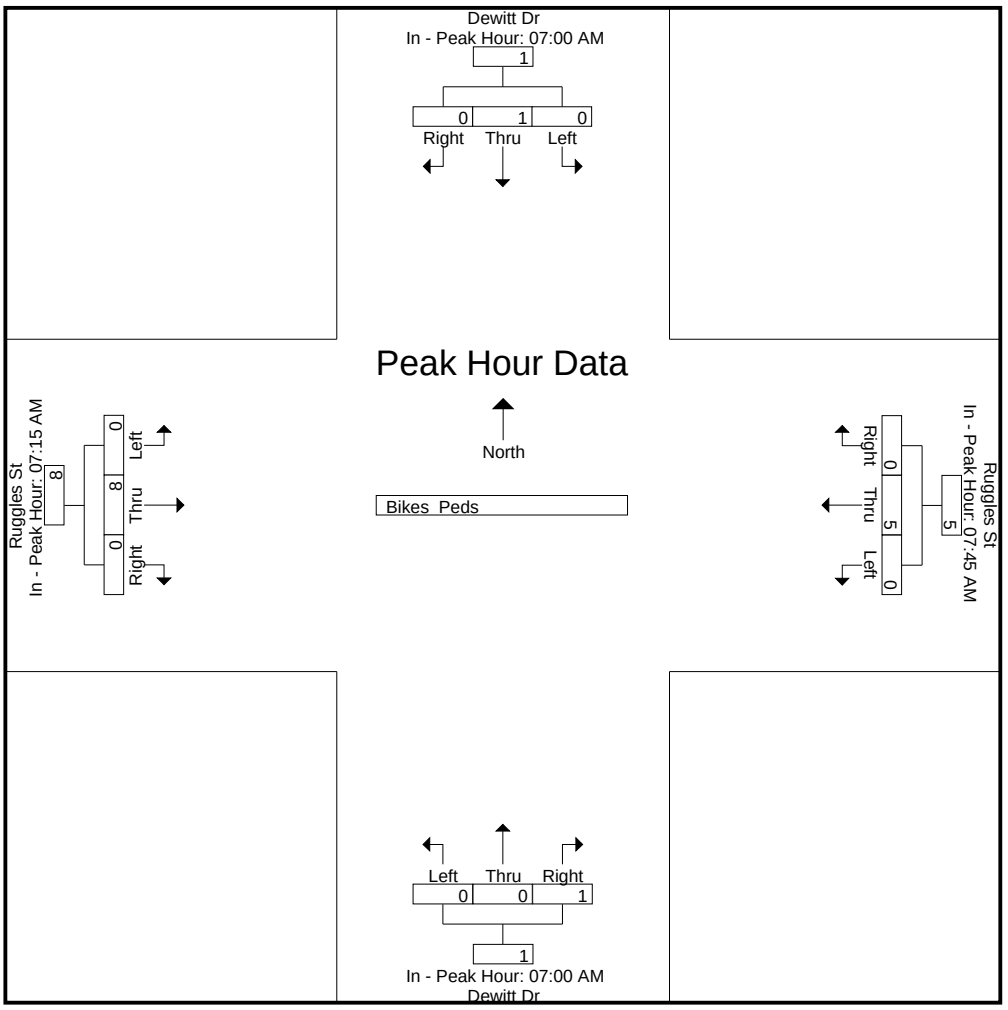
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 12

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	07:00 AM				07:45 AM				07:00 AM				07:15 AM				
+0 mins.	0	**1**	0	**1**	0	1	0	1	0	0	0	0	0	2	0	2	
+15 mins.	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	2	0	2	
+30 mins.	0	0	0	0	0	1	0	1	0	0	0	0	0	**3**	0	**3**	
+45 mins.	0	0	0	0	0	**3**	0	**3**	0	0	0	0	0	1	0	1	
Total Volume	0	1	0	1	0	5	0	5	0	0	1	1	0	8	0	8	
% App. Total	0	100	0		0	100	0		0	0	100		0	100	0		
PHF	.000	.250	.000	.250	.000	.417	.000	.417	.000	.000	.250	.250	.000	.667	.000	.667	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Cars - Trucks

	Dewitt Dr From North			Ruggles St From East			Dewitt Dr From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	3	0	0	0	0	0	13	5	4	35	33	93
04:15 PM	0	5	0	0	0	0	0	10	5	3	32	18	73
04:30 PM	1	3	0	0	0	0	0	14	3	1	36	23	81
04:45 PM	0	5	0	0	0	0	0	17	0	2	27	14	65
Total	1	16	0	0	0	0	0	54	13	10	130	88	312
05:00 PM	3	4	0	0	0	0	0	22	3	4	31	27	94
05:15 PM	1	5	0	0	0	0	0	11	2	7	31	27	84
05:30 PM	2	3	0	0	0	0	1	11	0	4	26	21	68
05:45 PM	1	2	0	0	0	0	0	8	3	1	30	22	67
Total	7	14	0	0	0	0	1	52	8	16	118	97	313
Grand Total	8	30	0	0	0	0	1	106	21	26	248	185	625
Apprch %	21.1	78.9	0	0	0	0	0.8	82.8	16.4	5.7	54	40.3	
Total %	1.3	4.8	0	0	0	0	0.2	17	3.4	4.2	39.7	29.6	
Cars	8	30	0	0	0	0	1	106	21	26	231	184	607
% Cars	100	100	0	0	0	0	100	100	100	100	93.1	99.5	97.1
Trucks	0	0	0	0	0	0	0	0	0	0	17	1	18
% Trucks	0	0	0	0	0	0	0	0	0	0	6.9	0.5	2.9

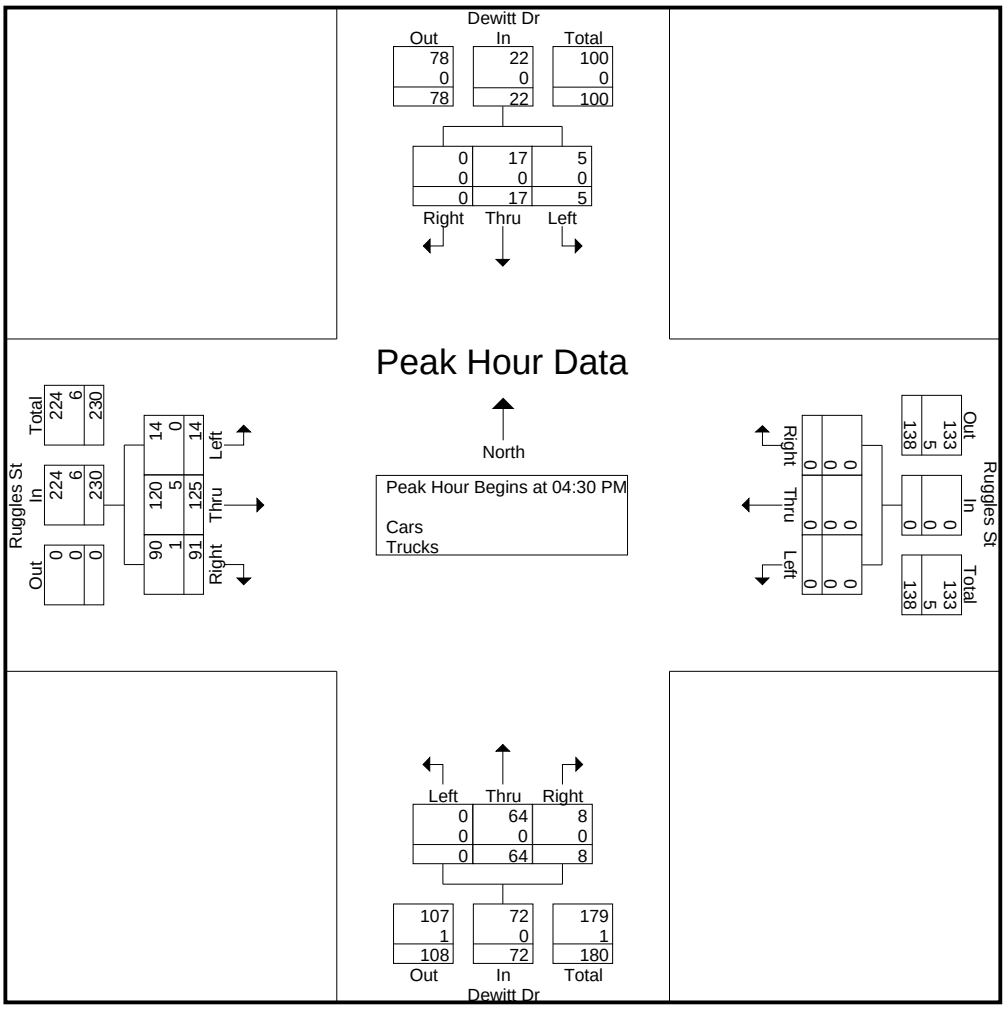
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 2

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 04:30 PM																	
04:30 PM	1	3	0	4	0	0	0	0	0	14	**3**	17	1	**36**	23	60	81
04:45 PM	0	**5**	0	5	0	0	0	0	0	17	0	17	2	27	14	43	65
05:00 PM	**3**	4	0	**7**	0	0	0	0	0	**22**	3	**25**	4	31	**27**	62	**94**
05:15 PM	1	5	0	6	0	0	0	0	0	11	2	13	**7**	31	27	**65**	84
Total Volume	5	17	0	22	0	0	0	0	0	64	8	72	14	125	91	230	324
% App. Total	22.7	77.3	0		0	0	0		0	88.9	11.1		6.1	54.3	39.6		
PHF	.417	.850	.000	.786	.000	.000	.000	.000	.000	.727	.667	.720	.500	.868	.843	.885	.862
Cars	5	17	0	22	0	0	0	0	0	64	8	72	14	120	90	224	318
% Cars	100	100	0	100	0	0	0	0	0	100	100	100	100	96.0	98.9	97.4	98.1
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	6	6
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	4.0	1.1	2.6	1.9



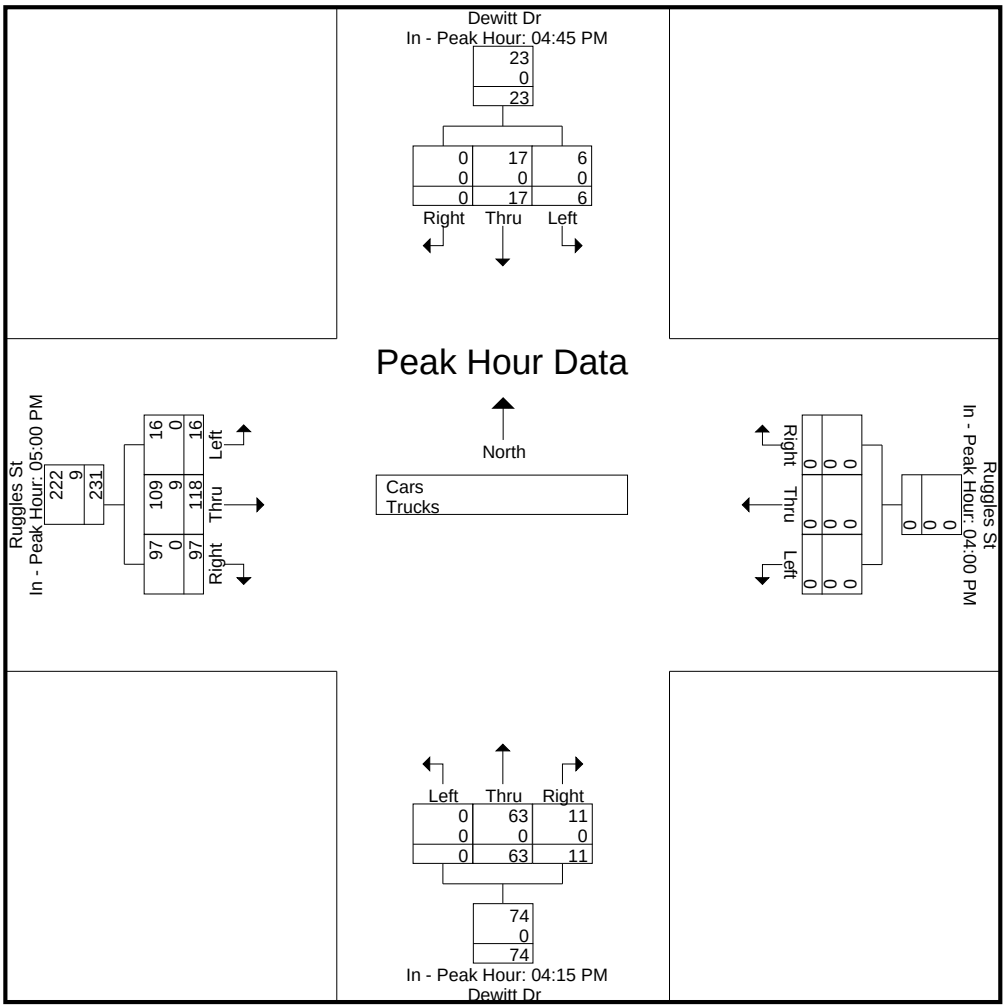
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 3

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	04:45 PM				04:00 PM				04:15 PM				05:00 PM				
+0 mins.	0	**5**	0	5	0	0	0	0	0	10	**5**	15	4	**31**	**27**	62	
+15 mins.	**3**	4	0	**7**	0	0	0	0	0	14	3	17	**7**	31	27	**65**	
+30 mins.	1	5	0	6	0	0	0	0	0	17	0	17	4	26	21	51	
+45 mins.	2	3	0	5	0	0	0	0	0	**22**	3	**25**	1	30	22	53	
Total Volume	6	17	0	23	0	0	0	0	0	63	11	74	16	118	97	231	
% App. Total	26.1	73.9	0		0	0	0		0	85.1	14.9		6.9	51.1	42		
PHF	.500	.850	.000	.821	.000	.000	.000	.000	.000	.716	.550	.740	.571	.952	.898	.888	
Cars	6	17	0	23	0	0	0	0	0	63	11	74	16	109	97	222	
% Cars	100	100	0	100	0	0	0	0	0	100	100	100	100	92.4	100	96.1	
Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9	
% Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	7.6	0	3.9	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Cars

	Dewitt Dr From North			Ruggles St From East			Dewitt Dr From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	3	0	0	0	0	0	13	5	4	33	33	91
04:15 PM	0	5	0	0	0	0	0	10	5	3	29	18	70
04:30 PM	1	3	0	0	0	0	0	14	3	1	34	23	79
04:45 PM	0	5	0	0	0	0	0	17	0	2	26	13	63
Total	1	16	0	0	0	0	0	54	13	10	122	87	303
05:00 PM	3	4	0	0	0	0	0	22	3	4	30	27	93
05:15 PM	1	5	0	0	0	0	0	11	2	7	30	27	83
05:30 PM	2	3	0	0	0	0	1	11	0	4	23	21	65
05:45 PM	1	2	0	0	0	0	0	8	3	1	26	22	63
Total	7	14	0	0	0	0	1	52	8	16	109	97	304
Grand Total	8	30	0	0	0	0	1	106	21	26	231	184	607
Apprch %	21.1	78.9	0	0	0	0	0.8	82.8	16.4	5.9	52.4	41.7	
Total %	1.3	4.9	0	0	0	0	0.2	17.5	3.5	4.3	38.1	30.3	

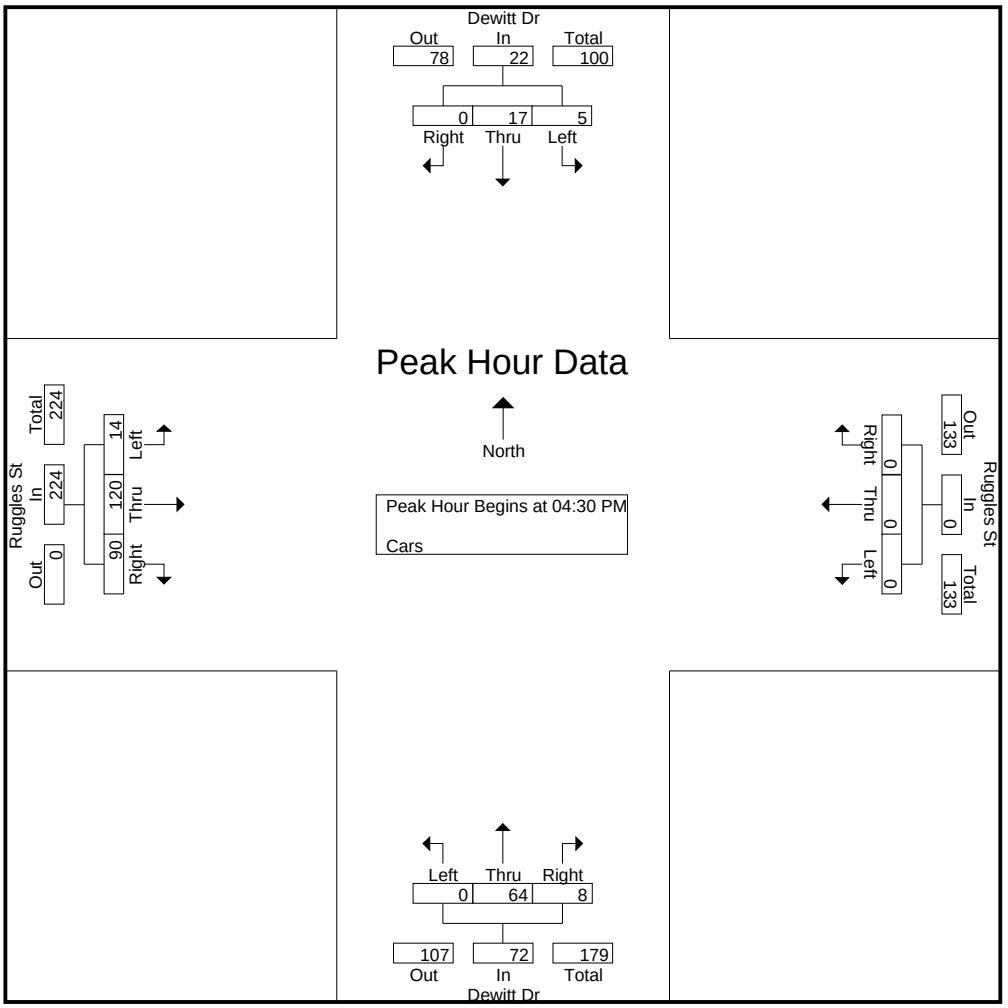
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 5

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 04:30 PM																	
04:30 PM	1	3	0	4	0	0	0	0	0	14	**3**	17	1	**34**	23	58	79
04:45 PM	0	**5**	0	5	0	0	0	0	0	17	0	17	2	26	13	41	63
05:00 PM	**3**	4	0	**7**	0	0	0	0	0	**22**	3	**25**	4	30	**27**	61	**93**
05:15 PM	1	5	0	6	0	0	0	0	0	11	2	13	**7**	30	27	**64**	83
Total Volume	5	17	0	22	0	0	0	0	0	64	8	72	14	120	90	224	318
% App. Total	22.7	77.3	0		0	0	0		0	88.9	11.1		6.2	53.6	40.2		
PHF	.417	.850	.000	.786	.000	.000	.000	.000	.000	.727	.667	.720	.500	.882	.833	.875	.855



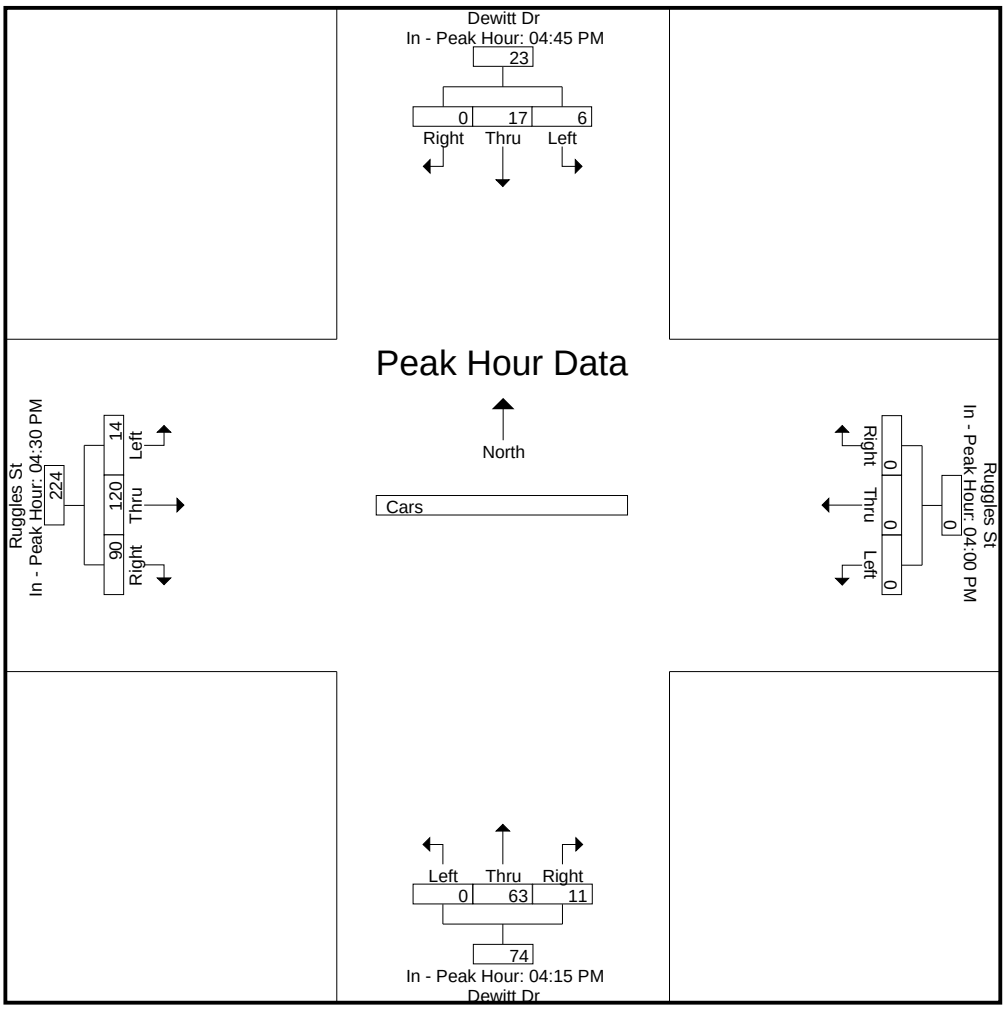
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 6

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	04:45 PM				04:00 PM				04:15 PM				04:30 PM				
+0 mins.	0	**5**	0	5	0	0	0	0	0	10	**5**	15	1	**34**	23	58	
+15 mins.	**3**	4	0	**7**	0	0	0	0	0	14	3	17	2	26	13	41	
+30 mins.	1	5	0	6	0	0	0	0	0	17	0	17	4	30	**27**	61	
+45 mins.	2	3	0	5	0	0	0	0	0	**22**	3	**25**	**7**	30	27	**64**	
Total Volume	6	17	0	23	0	0	0	0	0	63	11	74	14	120	90	224	
% App. Total	26.1	73.9	0		0	0	0		0	85.1	14.9		6.2	53.6	40.2		
PHF	.500	.850	.000	.821	.000	.000	.000	.000	.000	.716	.550	.740	.500	.882	.833	.875	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Trucks

	Dewitt Dr From North			Ruggles St From East			Dewitt Dr From South			Ruggles St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	3	0	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	2
Total	0	0	0	0	0	0	0	0	0	0	8	1	9
05:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0	3	0	3
05:45 PM	0	0	0	0	0	0	0	0	0	0	4	0	4
Total	0	0	0	0	0	0	0	0	0	0	9	0	9
Grand Total	0	0	0	0	0	0	0	0	0	0	17	1	18
Apprch %	0	0	0	0	0	0	0	0	0	0	94.4	5.6	
Total %	0	0	0	0	0	0	0	0	0	0	94.4	5.6	

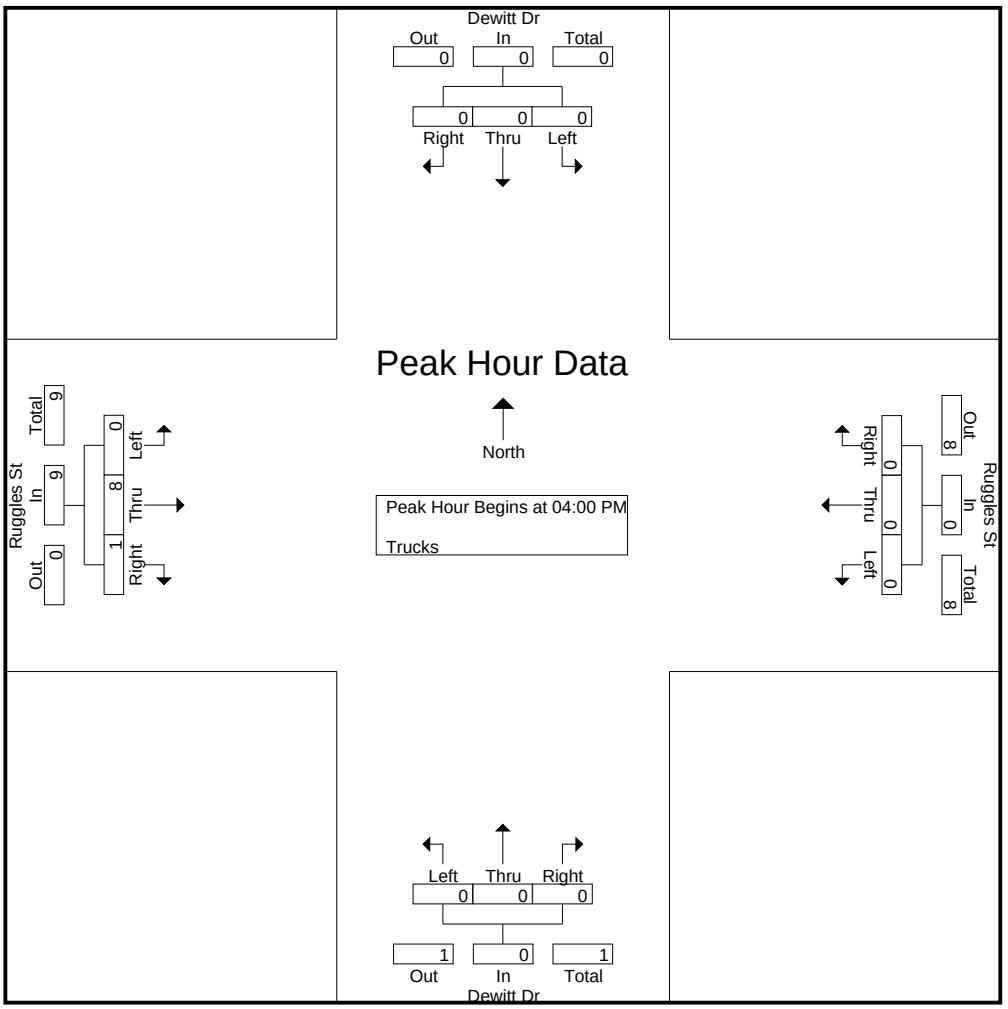
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 8

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 04:00 PM																	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	**3**	**3**
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	2	2
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	9	9
% App. Total	0	0	0		0	0	0		0	0	0		0	88.9	11.1		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.667	.250	.750	.750



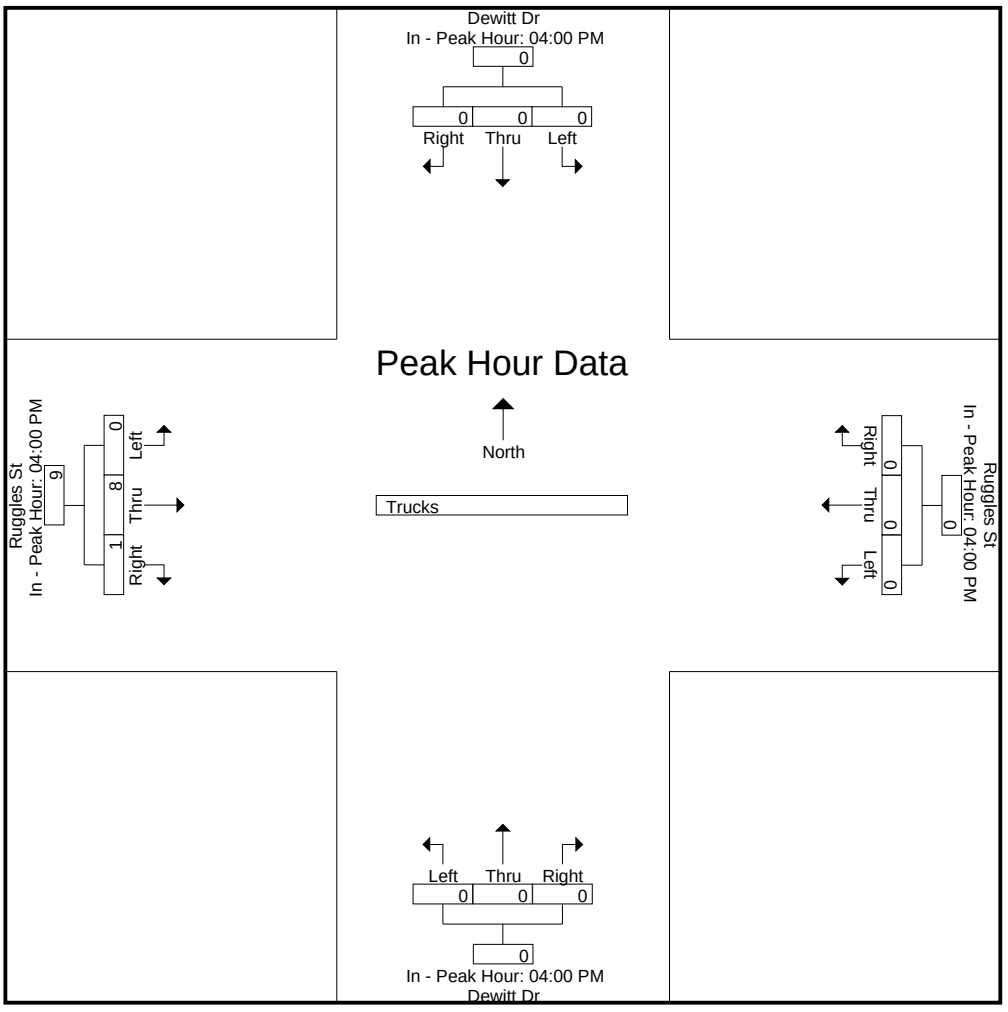
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 9

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	04:00 PM				04:00 PM				04:00 PM				04:00 PM				
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	**3**	
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	2	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	9	
% App. Total	0	0	0		0	0	0		0	0	0		0	88.9	11.1		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.667	.250	.750	



Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014

Groups Printed- Bikes Peds

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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	1	0	0	16	0	1	0	5	0	0	0	18	0	4	0	3	42	6	48
04:15 PM	0	1	0	19	0	0	0	5	0	0	1	31	0	1	0	5	60	3	63
04:30 PM	0	0	0	15	1	1	0	9	1	1	0	17	0	1	0	8	49	5	54
04:45 PM	0	0	0	23	0	2	0	8	2	0	0	17	2	2	0	4	52	8	60
Total	1	1	0	73	1	4	0	27	3	1	1	83	2	8	0	20	203	22	225
05:00 PM	0	0	0	10	0	2	0	7	1	0	0	15	0	1	1	6	38	5	43
05:15 PM	1	0	0	20	0	0	0	4	0	0	0	14	0	1	2	2	40	4	44
05:30 PM	0	0	0	14	0	2	0	5	0	0	0	9	0	0	0	0	28	2	30
05:45 PM	0	0	0	9	0	2	0	1	0	0	0	9	0	2	0	4	23	4	27
Total	1	0	0	53	0	6	0	17	1	0	0	47	0	4	3	12	129	15	144
Grand Total	2	1	0	126	1	10	0	44	4	1	1	130	2	12	3	32	332	37	369
Apprch %	66.7	33.3	0		9.1	90.9	0		66.7	16.7	16.7		11.8	70.6	17.6				
Total %	5.4	2.7	0		2.7	27	0		10.8	2.7	2.7		5.4	32.4	8.1		90	10	

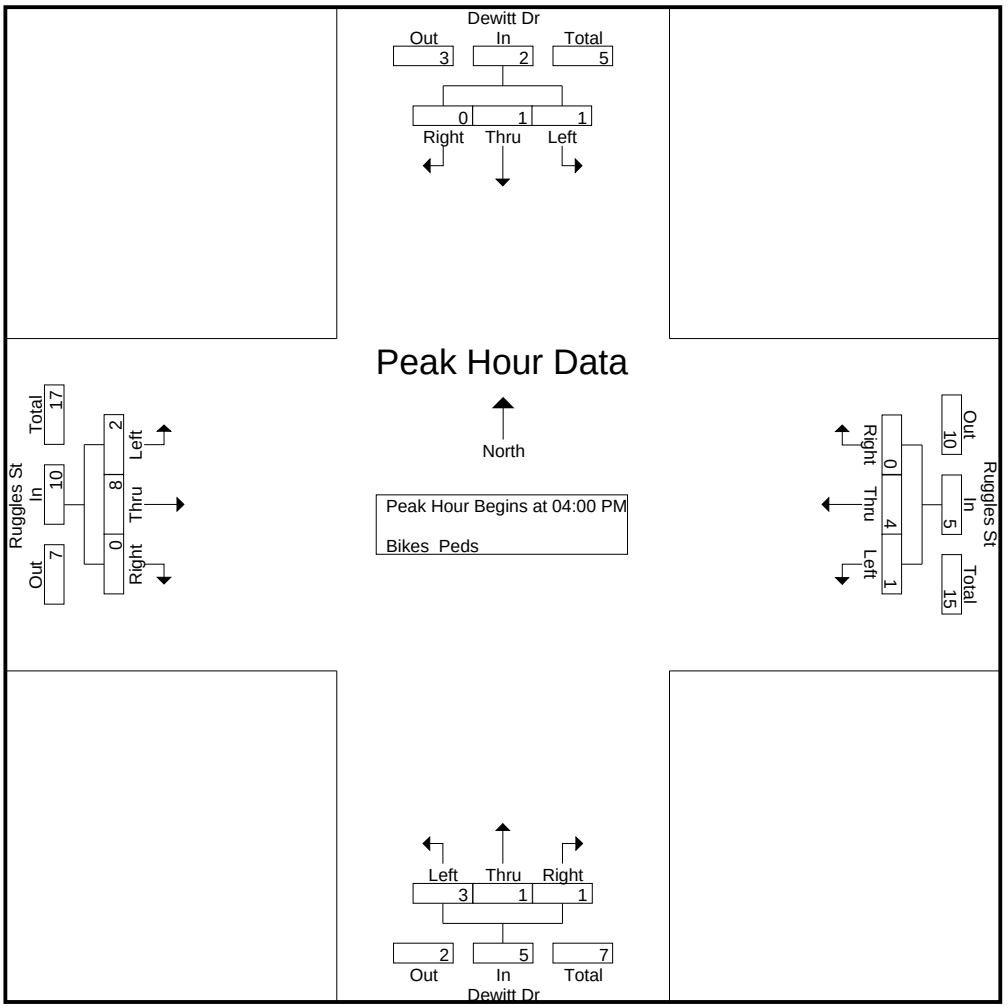
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 11

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 04:00 PM																	
04:00 PM	**1**	0	0	**1**	0	1	0	1	0	0	0	0	0	**4**	0	**4**	6
04:15 PM	0	**1**	0	1	0	0	0	0	0	0	**1**	1	0	1	0	1	3
04:30 PM	0	0	0	0	**1**	1	0	**2**	1	**1**	0	**2**	0	1	0	1	5
04:45 PM	0	0	0	0	0	**2**	0	2	**2**	0	0	2	**2**	2	0	4	**8**
Total Volume	1	1	0	2	1	4	0	5	3	1	1	5	2	8	0	10	22
% App. Total	50	50	0		20	80	0		60	20	20		20	80	0		
PHF	.250	.250	.000	.500	.250	.500	.000	.625	.375	.250	.250	.625	.250	.500	.000	.625	.688



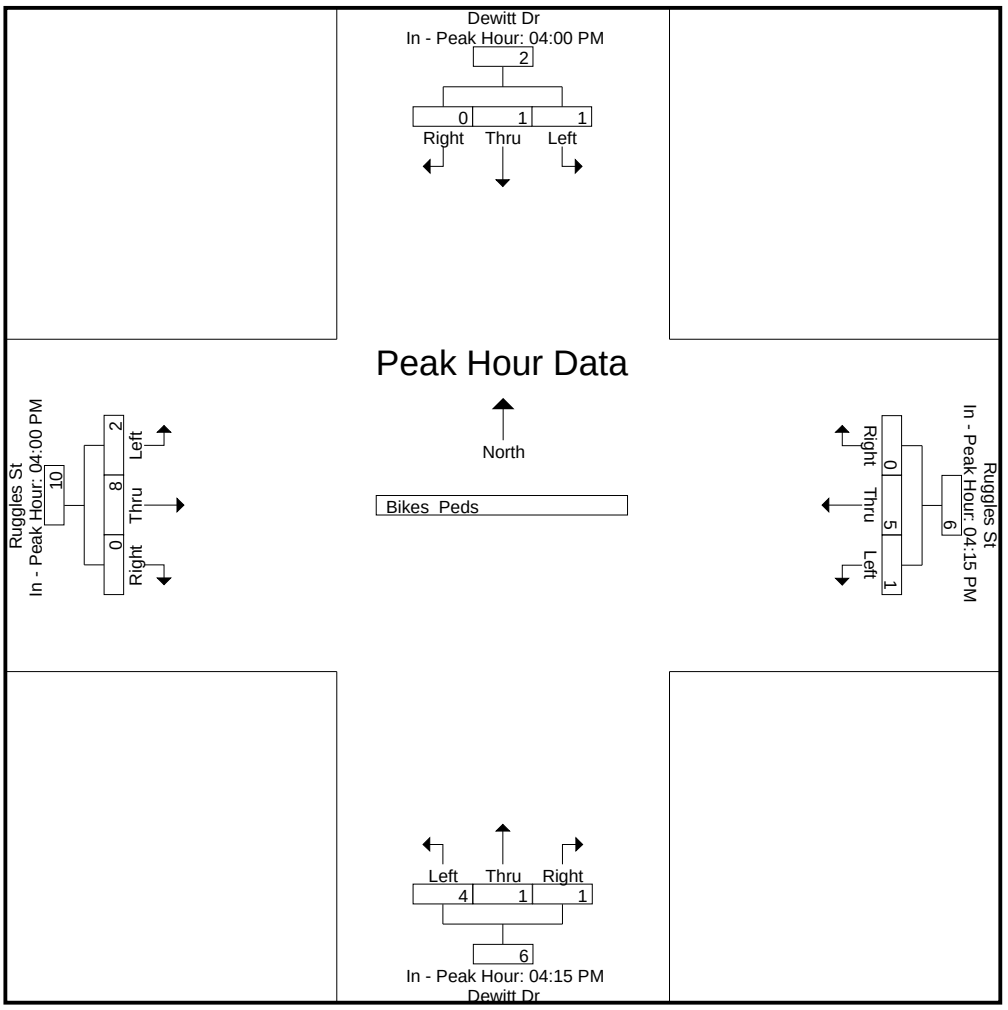
Accurate Counts

978-664-2565

N/S Street : Dewitt Drive
E/W Street : Ruggles Street
City/State : Boston, MA
Weather : Clear

File Name : 14006005
Site Code : 14006005
Start Date : 10/15/2014
Page No : 12

	Dewitt Dr From North				Ruggles St From East				Dewitt Dr From South				Ruggles 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 Each Approach Begins at:																	
	04:00 PM				04:15 PM				04:15 PM				04:00 PM				
+0 mins.	**1**	0	0	**1**	0	0	0	0	0	0	**1**	1	0	**4**	0	**4**	
+15 mins.	0	**1**	0	1	**1**	1	0	**2**	1	**1**	0	**2**	0	1	0	1	
+30 mins.	0	0	0	0	0	**2**	0	2	**2**	0	0	2	0	1	0	1	
+45 mins.	0	0	0	0	0	2	0	2	1	0	0	1	**2**	2	0	4	
Total Volume	1	1	0	2	1	5	0	6	4	1	1	6	2	8	0	10	
% App. Total	50	50	0		16.7	83.3	0		66.7	16.7	16.7		20	80	0		
PHF	.250	.250	.000	.500	.250	.625	.000	.750	.500	.250	.250	.750	.250	.500	.000	.625	



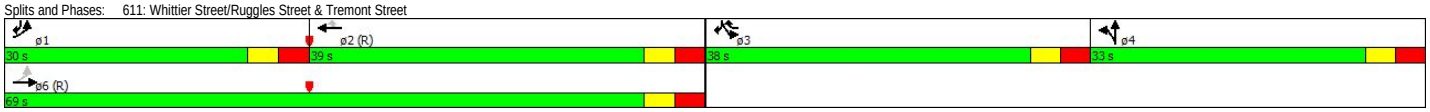
INTERSECTION CAPACITY ANALYSIS WORKSHEETS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	1330	0	0	753	517	34	32	19	536	0	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	12	12
Storage Length (ft)	300		0	0		0	50		0	0		300
Storage Lanes	1		0	0		1	0		0	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor						0.94		0.99				
Frt						0.850		0.970				0.850
Flt Protected	0.950							0.980		0.950		
Satd. Flow (prot)	1279	4489	0	0	3008	1358	0	1671	0	2891	0	1038
Flt Permitted	0.152							0.980		0.950		
Satd. Flow (perm)	205	4489	0	0	3008	1279	0	1666	0	2891	0	1038
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)								9				148
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			315			702			458	
Travel Time (s)		12.5			7.2			16.0			10.4	
Confl. Peds. (#/hr)						11	4		13			
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92	0.92	0.85	0.85	0.85
Heavy Vehicles (%)	27%	4%	0%	0%	8%	7%	9%	9%	11%	9%	0%	40%
Adj. Flow (vph)	221	1462	0	0	856	588	37	35	21	631	0	148
Shared Lane Traffic (%)												
Lane Group Flow (vph)	221	1462	0	0	856	588	0	93	0	631	0	148
Turn Type	pm+pt	NA			NA	pm+ov	Split	NA		Prot		custom
Protected Phases	1	6			2	3	4	4		3		1 3
Permitted Phases	6					2						
Detector Phase	1	6			2	3	4	4		3		1 3
Switch Phase												
Minimum Initial (s)	8.0	8.0			8.0	8.0	7.0	7.0		8.0		
Minimum Split (s)	14.0	26.0			26.0	14.0	32.0	32.0		14.0		
Total Split (s)	30.0	69.0			39.0	38.0	33.0	33.0		38.0		
Total Split (%)	21.4%	49.3%			27.9%	27.1%	23.6%	23.6%		27.1%		
Maximum Green (s)	24.0	63.0			33.0	32.0	27.0	27.0		32.0		
Yellow Time (s)	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		
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0		
Total Lost Time (s)	6.0	6.0			6.0	6.0		6.0		6.0		
Lead/Lag	Lead				Lag	Lead	Lag	Lag		Lead		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0			2.0	2.0	2.0	2.0		2.0		
Recall Mode	None	C-Max			C-Max	None	None	None		None		
Walk Time (s)		8.0			8.0		7.0	7.0				
Flash Dont Walk (s)		12.0			12.0		19.0	19.0				
Pedestrian Calls (#/hr)		12			14		5	5				
Act Effct Green (s)	76.8	76.8			49.8	81.5		13.5		31.7		52.7
Actuated g/C Ratio	0.55	0.55			0.36	0.58		0.10		0.23		0.38
v/c Ratio	0.81	0.59			0.80	0.77		0.55		0.97		0.31
Control Delay	47.2	23.5			29.8	30.1		65.2		81.2		3.8
Queue Delay	0.0	0.0			6.3	0.0		0.0		0.0		0.0
Total Delay	47.2	23.5			36.1	30.1		65.2		81.2		3.8
LOS	D	C			D	C		E		F		A
Approach Delay		26.6			33.7			65.2				
Approach LOS		C			C			E				
90th %ile Green (s)	24.0	64.0			34.0	32.0	26.0	26.0		32.0		
90th %ile Term Code	Max	Coord			Coord	Max	Ped	Ped		Max		
70th %ile Green (s)	24.0	76.3			46.3	32.0	13.7	13.7		32.0		
70th %ile Term Code	Max	Coord			Coord	Max	Gap	Gap		Max		
50th %ile Green (s)	24.0	78.5			48.5	32.0	11.5	11.5		32.0		
50th %ile Term Code	Max	Coord			Coord	Max	Gap	Gap		Max		
30th %ile Green (s)	19.6	80.7			55.1	32.0	9.3	9.3		32.0		
30th %ile Term Code	Gap	Coord			Coord	Max	Gap	Gap		Max		
10th %ile Green (s)	13.4	84.7			65.3	30.3	7.0	7.0		30.3		
10th %ile Term Code	Gap	Coord			Coord	Gap	Min	Min		Gap		
Stops (vph)	117	873			540	455		71		488		12
Fuel Used(gal)	3	17			9	7		2		13		1
CO Emissions (g/hr)	240	1180			657	486		160		942		43
NOx Emissions (g/hr)	47	230			128	95		31		183		8
VOC Emissions (g/hr)	56	273			152	113		37		218		10
Dilemma Vehicles (#)	0	0			0	0		0		0		0
Queue Length 50th (ft)	110	306			384	500		78		294		0
Queue Length 95th (ft)	#269	444			#584	#747		121		#374		19
Internal Link Dist (ft)		470			235			622			378	
Turn Bay Length (ft)	300											300
Base Capacity (vph)	296	2463			1070	765		329		660		504
Starvation Cap Reductn	0	0			169	1		0		0		0
Spillback Cap Reductn	0	0			0	0		0		0		0
Storage Cap Reductn	0	0			0	0		0		0		0
Reduced v/c Ratio	0.75	0.59			0.95	0.77		0.28		0.96		0.29

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 96 (69%), Referenced to phase 2:WBT and 6:EBTL, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 37.8 Intersection LOS: D
Intersection Capacity Utilization 75.5% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 611: Whittier Street/Ruggles Street & Tremont Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1758	127	0	1227	0	0	0	0	0	0	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99										
Frt		0.990										0.865
Flt Protected												
Satd. Flow (prot)	0	4343	0	0	4363	0	0	0	0	0	0	1243
Flt Permitted												
Satd. Flow (perm)	0	4343	0	0	4363	0	0	0	0	0	0	1243
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21										86
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		315			473			580			203	
Travel Time (s)		7.2			10.8			13.2			4.6	
Confl. Peds. (#/hr)			17									
Confl. Bikes (#/hr)			18									
Peak Hour Factor	0.94	0.94	0.94	0.88	0.88	0.88	0.92	0.92	0.92	0.83	0.83	0.83
Heavy Vehicles (%)	0%	5%	14%	0%	7%	0%	2%	2%	2%	0%	0%	19%
Adj. Flow (vph)	0	1870	135	0	1394	0	0	0	0	0	0	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2005	0	0	1394	0	0	0	0	0	0	52
Turn Type		NA			NA							custom
Protected Phases		1			1							5
Permitted Phases												
Detector Phase		1			1							5
Switch Phase												
Minimum Initial (s)		8.0			8.0							8.0
Minimum Split (s)		19.0			19.0							30.0
Total Split (s)		107.0			107.0							33.0
Total Split (%)		76.4%			76.4%							23.6%
Maximum Green (s)		102.0			102.0							28.0
Yellow Time (s)		3.0			3.0							3.0
All-Red Time (s)		2.0			2.0							2.0
Lost Time Adjust (s)		0.0			0.0							0.0
Total Lost Time (s)		5.0			5.0							5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0							2.0
Recall Mode		C-Max			C-Max							None
Walk Time (s)		8.0			8.0							8.0
Flash Dont Walk (s)		6.0			6.0							17.0
Pedestrian Calls (#/hr)		0			0							0
Act Effct Green (s)		125.6			125.6							8.0
Actuated g/C Ratio		0.90			0.90							0.06
v/c Ratio		0.51			0.36							0.34
Control Delay		0.4			0.8							9.2
Queue Delay		0.1			0.4							0.0
Total Delay		0.5			1.2							9.2
LOS		A			A							A
Approach Delay		0.5			1.2							
Approach LOS		A			A							
90th %ile Green (s)		122.0			122.0							8.0
90th %ile Term Code		Coord			Coord							Min
70th %ile Green (s)		122.0			122.0							8.0
70th %ile Term Code		Coord			Coord							Min
50th %ile Green (s)		122.0			122.0							8.0
50th %ile Term Code		Coord			Coord							Min
30th %ile Green (s)		122.0			122.0							8.0
30th %ile Term Code		Coord			Coord							Min
10th %ile Green (s)		135.0			135.0							0.0
10th %ile Term Code		Coord			Coord							Skip
Stops (vph)		1			76							2
Fuel Used(gal)		5			5							0
CO Emissions (g/hr)		334			360							11
NOx Emissions (g/hr)		65			70							2
VOC Emissions (g/hr)		77			84							3
Dilemma Vehicles (#)		0			0							0
Queue Length 50th (ft)		0			15							0
Queue Length 95th (ft)		m0			m74							6
Internal Link Dist (ft)		235			393			500			123	
Turn Bay Length (ft)												
Base Capacity (vph)		3898			3914							317
Starvation Cap Reductn		631			1763							0
Spillback Cap Reductn		49			361							7
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.61			0.65							0.17

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 73 (52%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 0.9 Intersection LOS: A
Intersection Capacity Utilization 45.2% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

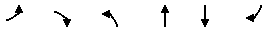
Splits and Phases: 3082: Ruggles Street & Tremont Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	48	382	0	96	0	0	0	47	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	16	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.99						0.96	
Frt											0.943	
Flt Protected					0.994		0.950					
Satd. Flow (prot)	0	0	0	0	1810	0	1593	0	0	0	1522	0
Flt Permitted					0.994		0.950					
Satd. Flow (perm)	0	0	0	0	1799	0	1593	0	0	0	1522	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											42	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			726			519			367	
Travel Time (s)		13.9			16.5			11.8			8.3	
Confl. Peds. (#/hr)				19								26
Confl. Bikes (#/hr)												4
Peak Hour Factor	0.92	0.92	0.92	0.90	0.90	0.90	0.83	0.83	0.83	0.72	0.72	0.72
Heavy Vehicles (%)	2%	2%	2%	10%	6%	0%	2%	0%	0%	0%	4%	32%
Adj. Flow (vph)	0	0	0	53	424	0	116	0	0	0	65	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	477	0	116	0	0	0	112	0
Turn Type				Perm	NA		Prot				NA	
Protected Phases					2		6				5	
Permitted Phases				2								
Detector Phase				2	2		6				5	
Switch Phase												
Minimum Initial (s)				4.0	4.0		4.0				4.0	
Minimum Split (s)				18.0	18.0		8.0				21.0	
Total Split (s)				34.0	34.0		24.0				22.0	
Total Split (%)				42.5%	42.5%		30.0%				27.5%	
Maximum Green (s)				30.0	30.0		20.0				18.0	
Yellow Time (s)				3.0	3.0		3.0				3.0	
All-Red Time (s)				1.0	1.0		1.0				1.0	
Lost Time Adjust (s)					0.0		0.0				0.0	
Total Lost Time (s)					4.0		4.0				4.0	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				2.0	2.0		2.0				2.0	
Recall Mode				C-Max	C-Max		None				None	
Walk Time (s)				7.0	7.0						7.0	
Flash Dont Walk (s)				7.0	7.0						10.0	
Pedestrian Calls (#/hr)				10	10						10	
Act Effct Green (s)					53.0		10.2				9.2	
Actuated g/C Ratio					0.66		0.13				0.12	
v/c Ratio					0.40		0.57				0.53	
Control Delay					11.3		43.2				29.7	
Queue Delay					0.0		0.0				0.0	
Total Delay					11.3		43.2				29.7	
LOS					B		D				C	
Approach Delay					11.3						29.7	
Approach LOS					B						C	
90th %ile Green (s)				36.2	36.2		14.8				17.0	
90th %ile Term Code				Coord	Coord		Gap				Ped	
70th %ile Green (s)				45.8	45.8		12.1				10.1	
70th %ile Term Code				Coord	Coord		Gap				Gap	
50th %ile Green (s)				49.6	49.6		10.2				8.2	
50th %ile Term Code				Coord	Coord		Gap				Gap	
30th %ile Green (s)				53.5	53.5		8.3				6.2	
30th %ile Term Code				Coord	Coord		Gap				Gap	
10th %ile Green (s)				76.0	76.0		0.0				0.0	
10th %ile Term Code				Coord	Coord		Skip				Skip	
Stops (vph)					221		87				49	
Fuel Used(gal)					5		2				1	
CO Emissions (g/hr)					324		120				69	
NOx Emissions (g/hr)					63		23				13	
VOC Emissions (g/hr)					75		28				16	
Dilemma Vehicles (#)					0		0				0	
Queue Length 50th (ft)					110		55				34	
Queue Length 95th (ft)					265		91				53	
Internal Link Dist (ft)		531			646			439			287	
Turn Bay Length (ft)												
Base Capacity (vph)					1192		398				375	
Starvation Cap Reductn					0		0				0	
Spillback Cap Reductn					0		0				0	
Storage Cap Reductn					0		0				0	
Reduced v/c Ratio					0.40		0.29				0.30	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 19.5 Intersection LOS: B
Intersection Capacity Utilization 44.5% ICU Level of Service A
Analysis Period (min) 15

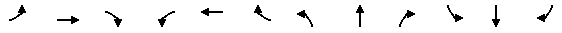
Splits and Phases: 10: Ruggles Street & Shawmut Avenue



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	9	0	0	116	87
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.94	0.94
Hourly flow rate (vph)	0	10	0	0	123	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1056	580	
pX, platoon unblocked						
vC, conflicting volume	170	170	216			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	170	170	216			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	821	874	1354			

Direction, Lane #	EB 1	SB 1
Volume Total	10	216
Volume Left	0	0
Volume Right	10	93
cSH	874	1700
Volume to Capacity	0.01	0.13
Queue Length 95th (ft)	1	0
Control Delay (s)	9.2	0.0
Lane LOS	A	
Approach Delay (s)	9.2	0.0
Approach LOS	A	

Intersection Summary				
Average Delay		0.4		
Intersection Capacity Utilization		22.7%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	102	18	1	10	0	0	0	0	15	62	54
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.92	0.92	0.92	0.25	0.25	0.25	0.81	0.81	0.81
Hourly flow rate (vph)	0	132	23	1	11	0	0	0	0	19	77	67
Pedestrians		43			58			20				
Lane Width (ft)		16.0			16.0			0.0				
Walking Speed (ft/s)		4.0			4.0			4.0				
Percent Blockage		5			6			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								367			1269	
pX, platoon unblocked												
vC, conflicting volume	195	248	173	315	281	58	186			58		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	195	248	173	315	281	58	186			58		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	77	97	100	98	100	100			99		
cM capacity (veh/h)	654	574	834	437	554	948	1333			1417		

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	156	12	162
Volume Left	0	1	19
Volume Right	23	0	67
cSH	602	541	1417
Volume to Capacity	0.26	0.02	0.01
Queue Length 95th (ft)	26	2	1
Control Delay (s)	13.1	11.8	1.0
Lane LOS	B	B	A
Approach Delay (s)	13.1	11.8	1.0
Approach LOS	B	B	

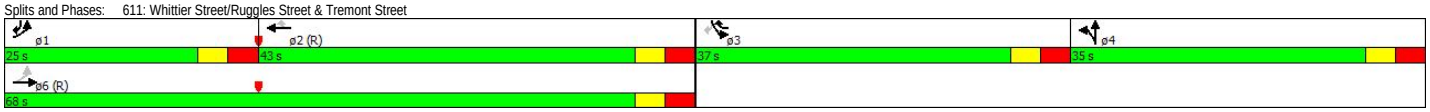
Intersection Summary					
Average Delay	7.1				
Intersection Capacity Utilization	29.5%	ICU Level of Service		A	
Analysis Period (min)	15				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	156	1165	0	0	831	538	63	19	38	531	0	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	12	12
Storage Length (ft)	300		0	0		0	50		0	0		300
Storage Lanes	1		0	0		1	0		0	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor						0.97		0.95				
Frt						0.850		0.957				0.850
Flt Protected	0.950							0.974		0.950		
Satd. Flow (prot)	1624	4489	0	0	3217	1371	0	1706	0	2945	0	1454
Flt Permitted	0.157							0.974		0.950		
Satd. Flow (perm)	268	4489	0	0	3217	1330	0	1677	0	2945	0	1454
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)								15				194
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			315			702			458	
Travel Time (s)		12.5			7.2			16.0			10.4	
Confl. Peds. (#/hr)						1	20		65			
Confl. Bikes (#/hr)						9			1			
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.65	0.65	0.65	0.89	0.89	0.89
Heavy Vehicles (%)	0%	4%	0%	0%	1%	6%	2%	0%	3%	7%	0%	0%
Adj. Flow (vph)	168	1253	0	0	884	572	97	29	58	597	0	194
Shared Lane Traffic (%)												
Lane Group Flow (vph)	168	1253	0	0	884	572	0	184	0	597	0	194
Turn Type	pm+pt	NA			NA	pm+ov	Split	NA		Prot		custom
Protected Phases	1	6			2	3	4	4		3		1
Permitted Phases	6					2						3
Detector Phase	1	6			2	3	4	4		3		1
Switch Phase												
Minimum Initial (s)	8.0	8.0			8.0	8.0	7.0	7.0		8.0		8.0
Minimum Split (s)	14.0	26.0			26.0	14.0	32.0	32.0		14.0		14.0
Total Split (s)	25.0	68.0			43.0	37.0	35.0	35.0		37.0		25.0
Total Split (%)	17.9%	48.6%			30.7%	26.4%	25.0%	25.0%		26.4%		17.9%
Maximum Green (s)	19.0	62.0			37.0	31.0	29.0	29.0		31.0		19.0
Yellow Time (s)	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
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)	6.0	6.0			6.0	6.0		6.0		6.0		6.0
Lead/Lag	Lead				Lag	Lead	Lag	Lag		Lead		Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0			2.0	2.0	2.0	2.0		2.0		2.0
Recall Mode	None	C-Max			C-Max	None	None	None		None		None
Walk Time (s)		8.0			8.0		7.0	7.0				
Flash Dont Walk (s)		12.0			12.0		19.0	19.0				
Pedestrian Calls (#/hr)		4			4		17	17				
Act Effct Green (s)	72.4	72.4			53.1	83.3		19.4		30.2		43.5
Actuated g/C Ratio	0.52	0.52			0.38	0.60		0.14		0.22		0.31
v/c Ratio	0.63	0.54			0.72	0.71		0.74		0.94		0.33
Control Delay	30.7	24.7			39.8	20.7		69.0		77.6		3.6
Queue Delay	0.0	0.1			2.5	0.0		0.0		0.0		0.0
Total Delay	30.7	24.8			42.2	20.7		69.0		77.6		3.6
LOS	C	C			D	C		E		E		A
Approach Delay		25.5			33.8			69.0				
Approach LOS		C			C			E				
90th %ile Green (s)	19.0	65.0			40.0	31.0	26.0	26.0		31.0		19.0
90th %ile Term Code	Max	Coord			Coord	Max	Ped	Ped		Max		Max
70th %ile Green (s)	16.7	65.0			42.3	31.0	26.0	26.0		31.0		16.7
70th %ile Term Code	Gap	Coord			Coord	Max	Ped	Ped		Max		Gap
50th %ile Green (s)	12.7	72.6			53.9	31.0	18.4	18.4		31.0		12.7
50th %ile Term Code	Gap	Coord			Coord	Max	Gap	Gap		Max		Gap
30th %ile Green (s)	10.2	75.6			59.4	31.0	15.4	15.4		31.0		10.2
30th %ile Term Code	Gap	Coord			Coord	Max	Gap	Gap		Max		Gap
10th %ile Green (s)	8.0	84.0			70.0	26.9	11.1	11.1		26.9		8.0
10th %ile Term Code	Min	Coord			Coord	Gap	Gap	Gap		Gap		Min
Stops (vph)	86	765			715	382		103		490		15
Fuel Used(gal)	2	15			13	6		3		13		1
CO Emissions (g/hr)	148	1055			889	398		231		908		58
NOx Emissions (g/hr)	29	205			173	78		45		177		11
VOC Emissions (g/hr)	34	244			206	92		54		211		13
Dilemma Vehicles (#)	0	0			0	0		0		0		0
Queue Length 50th (ft)	80	271			423	372		150		276		0
Queue Length 95th (ft)	140	354			#571	#562		147		#376		28
Internal Link Dist (ft)		470			235			622			378	
Turn Bay Length (ft)	300											300
Base Capacity (vph)	322	2322			1220	808		365		652		637
Starvation Cap Reductn	0	0			213	0		0		0		0
Spillback Cap Reductn	0	128			0	0		0		0		0
Storage Cap Reductn	0	0			0	0		0		0		0
Reduced v/c Ratio	0.52	0.57			0.88	0.71		0.50		0.92		0.30

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 56 (40%), Referenced to phase 2:WBT and 6:EBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 37.7 Intersection LOS: D
Intersection Capacity Utilization 81.9% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 611: Whittier Street/Ruggles Street & Tremont Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1502	232	0	1227	0	0	0	0	0	0	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.96										
Frt		0.980										0.865
Flt Protected												
Satd. Flow (prot)	0	4166	0	0	4668	0	0	0	0	0	0	1309
Flt Permitted												
Satd. Flow (perm)	0	4166	0	0	4668	0	0	0	0	0	0	1309
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		57										104
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		315			473			580			203	
Travel Time (s)		7.2			10.8			13.2			4.6	
Confl. Peds. (#/hr)			50									
Confl. Bikes (#/hr)			11									
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.83	0.83	0.83
Heavy Vehicles (%)	0%	6%	5%	0%	0%	0%	0%	0%	0%	0%	0%	13%
Adj. Flow (vph)	0	1615	249	0	1319	0	0	0	0	0	0	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1864	0	0	1319	0	0	0	0	0	0	145
Turn Type		NA			NA							custom
Protected Phases		1			1							5
Permitted Phases												
Detector Phase		1			1							5
Switch Phase												
Minimum Initial (s)		8.0			8.0							8.0
Minimum Split (s)		19.0			19.0							30.0
Total Split (s)		109.0			109.0							31.0
Total Split (%)		77.9%			77.9%							22.1%
Maximum Green (s)		104.0			104.0							26.0
Yellow Time (s)		3.0			3.0							3.0
All-Red Time (s)		2.0			2.0							2.0
Lost Time Adjust (s)		0.0			0.0							0.0
Total Lost Time (s)		5.0			5.0							5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0							2.0
Recall Mode		C-Max			C-Max							None
Walk Time (s)		8.0			8.0							8.0
Flash Dont Walk (s)		6.0			6.0							17.0
Pedestrian Calls (#/hr)		0			0							37
Act Effct Green (s)		108.4			108.4							21.6
Actuated g/C Ratio		0.77			0.77							0.15
v/c Ratio		0.58			0.36							0.50
Control Delay		2.6			3.2							23.1
Queue Delay		0.2			0.5							0.1
Total Delay		2.8			3.7							23.2
LOS		A			A							C
Approach Delay		2.8			3.7							
Approach LOS		A			A							
90th %ile Green (s)		105.0			105.0							25.0
90th %ile Term Code		Coord			Coord							Ped
70th %ile Green (s)		105.0			105.0							25.0
70th %ile Term Code		Coord			Coord							Ped
50th %ile Green (s)		105.0			105.0							25.0
50th %ile Term Code		Coord			Coord							Ped
30th %ile Green (s)		105.0			105.0							25.0
30th %ile Term Code		Coord			Coord							Ped
10th %ile Green (s)		122.0			122.0							8.0
10th %ile Term Code		Coord			Coord							Min
Stops (vph)		366			331							36
Fuel Used(gal)		7			7							1
CO Emissions (g/hr)		503			501							67
NOx Emissions (g/hr)		98			97							13
VOC Emissions (g/hr)		117			116							15
Dilemma Vehicles (#)		0			0							0
Queue Length 50th (ft)		308			69							32
Queue Length 95th (ft)		23			m82							84
Internal Link Dist (ft)		235			393			500			123	
Turn Bay Length (ft)												
Base Capacity (vph)		3238			3614							327
Starvation Cap Reductn		474			1676							0
Spillback Cap Reductn		3			462							10
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.67			0.68							0.46

Intersection Summary			
Area Type:	CBD		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 32 (23%), Referenced to phase 1:EBWB, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 4.0		Intersection LOS: A	
Intersection Capacity Utilization 42.9%		ICU Level of Service A	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

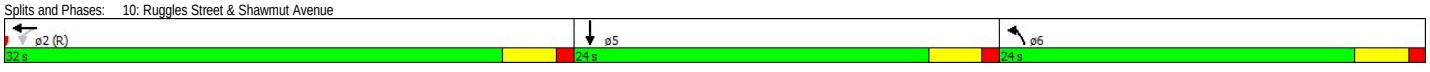
Splits and Phases: 3082: Ruggles Street & Tremont Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	37	669	0	64	0	0	0	97	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	16	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.99						0.95	
Frt											0.954	
Flt Protected					0.997		0.950					
Satd. Flow (prot)	0	0	0	0	1909	0	1593	0	0	0	1649	0
Flt Permitted					0.997		0.950					
Satd. Flow (perm)	0	0	0	0	1899	0	1593	0	0	0	1649	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											31	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			726			519			367	
Travel Time (s)		13.9			16.5			11.8			8.3	
Confl. Peds. (#/hr)				35								49
Confl. Bikes (#/hr)						6			5			6
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.57	0.57	0.57	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%	2%	0%	0%	0%	3%	14%
Adj. Flow (vph)	0	0	0	39	712	0	112	0	0	0	108	56
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	751	0	112	0	0	0	164	0
Turn Type				Perm	NA		Prot				NA	
Protected Phases					2		6				5	
Permitted Phases				2								
Detector Phase				2	2		6				5	
Switch Phase												
Minimum Initial (s)				4.0	4.0		4.0				4.0	
Minimum Split (s)				18.0	18.0		8.0				21.0	
Total Split (s)				32.0	32.0		24.0				24.0	
Total Split (%)				40.0%	40.0%		30.0%				30.0%	
Maximum Green (s)				28.0	28.0		20.0				20.0	
Yellow Time (s)				3.0	3.0		3.0				3.0	
All-Red Time (s)				1.0	1.0		1.0				1.0	
Lost Time Adjust (s)					0.0		0.0				0.0	
Total Lost Time (s)					4.0		4.0				4.0	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				2.0	2.0		2.0				2.0	
Recall Mode				C-Max	C-Max		None				None	
Walk Time (s)				7.0	7.0						7.0	
Flash Dont Walk (s)				7.0	7.0						10.0	
Pedestrian Calls (#/hr)				10	10						10	
Act Effct Green (s)					48.8		10.0				11.1	
Actuated g/C Ratio					0.61		0.12				0.14	
v/c Ratio					0.65		0.56				0.65	
Control Delay					17.1		43.2				37.3	
Queue Delay					0.0		0.0				0.0	
Total Delay					17.1		43.2				37.3	
LOS					B		D				D	
Approach Delay					17.1						37.3	
Approach LOS					B						D	
90th %ile Green (s)				36.5	36.5		14.5				17.0	
90th %ile Term Code				Coord	Coord		Gap				Ped	
70th %ile Green (s)				43.1	43.1		11.8				13.1	
70th %ile Term Code				Coord	Coord		Gap				Gap	
50th %ile Green (s)				47.1	47.1		10.0				10.9	
50th %ile Term Code				Coord	Coord		Gap				Gap	
30th %ile Green (s)				51.1	51.1		8.2				8.7	
30th %ile Term Code				Coord	Coord		Gap				Gap	
10th %ile Green (s)				66.4	66.4		0.0				5.6	
10th %ile Term Code				Coord	Coord		Skip				Gap	
Stops (vph)					442		58				109	
Fuel Used(gal)					9		1				2	
CO Emissions (g/hr)					621		80				150	
NOx Emissions (g/hr)					121		16				29	
VOC Emissions (g/hr)					144		19				35	
Dilemma Vehicles (#)					0		0				0	
Queue Length 50th (ft)					232		54				63	
Queue Length 95th (ft)					#544		59				114	
Internal Link Dist (ft)		531			646			439			287	
Turn Bay Length (ft)												
Base Capacity (vph)					1159		398				435	
Starvation Cap Reductn					0		0				0	
Spillback Cap Reductn					0		0				0	
Storage Cap Reductn					0		0				0	
Reduced v/c Ratio					0.65		0.28				0.38	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 23.1 Intersection LOS: C
Intersection Capacity Utilization 68.8% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

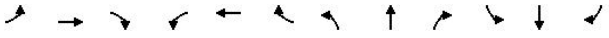
Splits and Phases: 10: Ruggles Street & Shawmut Avenue



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	5	0	0	204	80
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.87	0.87
Hourly flow rate (vph)	0	5	0	0	234	92
Pedestrians	4					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1056	580	
pX, platoon unblocked						
vC, conflicting volume	284	284	330			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	284	284	330			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	707	756	1235			

Direction, Lane #	EB 1	SB 1
Volume Total	5	326
Volume Left	0	0
Volume Right	5	92
cSH	756	1700
Volume to Capacity	0.01	0.19
Queue Length 95th (ft)	1	0
Control Delay (s)	9.8	0.0
Lane LOS	A	
Approach Delay (s)	9.8	0.0
Approach LOS	A	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	64	9	5	17	0	0	0	0	14	133	91
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.79	0.79	0.79	0.25	0.25	0.25	0.89	0.89	0.89
Hourly flow rate (vph)	0	89	12	6	22	0	0	0	0	16	149	102
Pedestrians		83			73			27				
Lane Width (ft)		16.0			16.0			0.0				
Walking Speed (ft/s)		4.0			4.0			4.0				
Percent Blockage		9			8			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								367			1269	
pX, platoon unblocked												
vC, conflicting volume	326	388	311	389	439	73	335			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	326	388	311	389	439	73	335			73		
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 %	100	80	98	98	95	100	100			99		
cM capacity (veh/h)	477	454	667	382	425	914	1122			1415		

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	101	28	267
Volume Left	0	6	16
Volume Right	12	0	102
cSH	472	414	1415
Volume to Capacity	0.21	0.07	0.01
Queue Length 95th (ft)	20	5	1
Control Delay (s)	14.7	14.3	0.5
Lane LOS	B	B	A
Approach Delay (s)	14.7	14.3	0.5
Approach LOS	B	B	

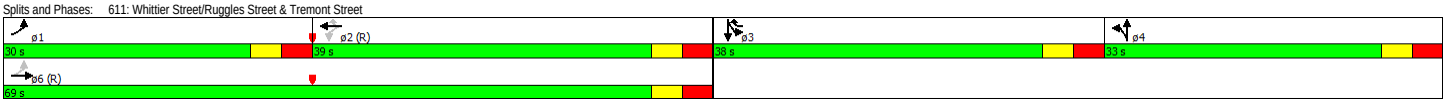
Intersection Summary					
Average Delay			5.1		
Intersection Capacity Utilization			33.4%	ICU Level of Service	A
Analysis Period (min)			15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	1424	1	12	848	534	35	37	20	551	11	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	12	12
Storage Length (ft)	300		0	0		0	50		0	0		300
Storage Lanes	1		0	1		1	0		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor						0.94		0.99				
Frt						0.850		0.970			0.860	
Flt Protected	0.950			0.950				0.981		0.950		
Satd. Flow (prot)	1279	4489	0	1624	3008	1358	0	1673	0	2891	1071	0
Flt Permitted	0.095			0.151				0.981		0.950		
Satd. Flow (perm)	128	4489	0	258	3008	1279	0	1670	0	2891	1071	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)								9			179	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			315			702			458	
Travel Time (s)		12.5			7.2			16.0			10.4	
Confl. Peds. (#/hr)						11	4		13			
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92	0.92	0.85	0.85	0.85
Heavy Vehicles (%)	27%	4%	0%	0%	8%	7%	9%	9%	11%	9%	0%	40%
Adj. Flow (vph)	241	1565	1	14	964	607	38	40	22	648	13	179
Shared Lane Traffic (%)												
Lane Group Flow (vph)	241	1566	0	14	964	607	0	100	0	648	192	0
Turn Type	pm+pt	NA		Perm	NA	pm+ov	Split	NA		Split	NA	
Protected Phases	1	6			2	3	4	4		3	3	
Permitted Phases	6			2		2						
Detector Phase	1	6		2	2	3	4	4		3	3	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	7.0	7.0		8.0	8.0	
Minimum Split (s)	14.0	26.0		26.0	26.0	14.0	32.0	32.0		14.0	14.0	
Total Split (s)	30.0	69.0		39.0	39.0	38.0	33.0	33.0		38.0	38.0	
Total Split (%)	21.4%	49.3%		27.9%	27.9%	27.1%	23.6%	23.6%		27.1%	27.1%	
Maximum Green (s)	24.0	63.0		33.0	33.0	32.0	27.0	27.0		32.0	32.0	
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	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0		6.0	6.0	
Lead/Lag	Lead			Lag	Lag	Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	C-Max		C-Max	C-Max	None	None	None		None	None	
Walk Time (s)		8.0		8.0	8.0		7.0	7.0				
Flash Dont Walk (s)		12.0		12.0	12.0		19.0	19.0				
Pedestrian Calls (#/hr)		12		14	14		5	5				
Act Effct Green (s)	76.2	76.2		47.4	47.4	79.4		13.8		32.0	32.0	
Actuated g/C Ratio	0.54	0.54		0.34	0.34	0.57		0.10		0.23	0.23	
v/c Ratio	0.94	0.64		0.16	0.95	0.82		0.58		0.98	0.50	
Control Delay	79.6	24.9		21.4	44.7	35.3		66.0		84.2	12.6	
Queue Delay	0.0	0.0		0.0	37.3	0.0		0.0		0.0	0.0	
Total Delay	79.6	24.9		21.4	81.9	35.3		66.0		84.2	12.6	
LOS	E	C		C	F	D		E		F	B	
Approach Delay		32.2			63.6			66.0			67.9	
Approach LOS		C			E			E			E	
Queue Length 50th (ft)	168	343		4	490	525		84		305	9	
Queue Length 95th (ft)	#354	490		m18	#693	#786		129		#390	68	
Internal Link Dist (ft)		470			235			622			378	
Turn Bay Length (ft)	300											
Base Capacity (vph)	266	2442		87	1017	743		329		660	382	
Starvation Cap Reductn	0	0		0	128	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.91	0.64		0.16	1.08	0.82		0.30		0.98	0.50	

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 96 (69%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 51.4 Intersection LOS: D
Intersection Capacity Utilization 88.5% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

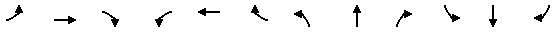
Splits and Phases: 611: Whittier Street/Ruggles Street & Tremont Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1869	127	0	1350	0	0	0	0	0	0	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99										
Frt		0.990										0.865
Flt Protected												
Satd. Flow (prot)	0	4347	0	0	4363	0	0	0	0	0	0	1243
Flt Permitted												
Satd. Flow (perm)	0	4347	0	0	4363	0	0	0	0	0	0	1243
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20										66
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		315			473			580			203	
Travel Time (s)		7.2			10.8			13.2			4.6	
Confl. Peds. (#/hr)			17									
Confl. Bikes (#/hr)			18									
Peak Hour Factor	0.94	0.94	0.94	0.88	0.88	0.88	0.92	0.92	0.92	0.83	0.83	0.83
Heavy Vehicles (%)	0%	5%	14%	0%	7%	0%	2%	2%	2%	0%	0%	19%
Adj. Flow (vph)	0	1988	135	0	1534	0	0	0	0	0	0	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2123	0	0	1534	0	0	0	0	0	0	53
Turn Type		NA			NA							Prot
Protected Phases		1			1							5
Permitted Phases												
Detector Phase		1			1							5
Switch Phase												
Minimum Initial (s)		8.0			8.0							8.0
Minimum Split (s)		19.0			19.0							30.0
Total Split (s)		107.0			107.0							33.0
Total Split (%)		76.4%			76.4%							23.6%
Maximum Green (s)		102.0			102.0							28.0
Yellow Time (s)		3.0			3.0							3.0
All-Red Time (s)		2.0			2.0							2.0
Lost Time Adjust (s)		0.0			0.0							0.0
Total Lost Time (s)		5.0			5.0							5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0							2.0
Recall Mode		C-Max			C-Max							None
Walk Time (s)		8.0			8.0							8.0
Flash Dont Walk (s)		6.0			6.0							17.0
Pedestrian Calls (#/hr)		0			0							0
Act Effct Green (s)		125.5			125.5							8.1
Actuated g/C Ratio		0.90			0.90							0.06
v/c Ratio		0.54			0.39							0.40
Control Delay		0.4			1.1							18.1
Queue Delay		0.1			0.5							0.0
Total Delay		0.5			1.6							18.2
LOS		A			A							B
Approach Delay		0.5			1.6							
Approach LOS		A			A							
Queue Length 50th (ft)		0			19							0
Queue Length 95th (ft)		m0			m89							26
Internal Link Dist (ft)		235			393			500			123	
Turn Bay Length (ft)												
Base Capacity (vph)		3898			3911							301
Starvation Cap Reductn		629			1759							0
Spillback Cap Reductn		113			296							7
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.65			0.71							0.18

Intersection Summary			
Area Type:	CBD		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 73 (52%), Referenced to phase 1:EBWB, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.54			
Intersection Signal Delay: 1.2		Intersection LOS: A	
Intersection Capacity Utilization 47.5%		ICU Level of Service A	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3082: Ruggles Street & Tremont Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	49	398	0	99	0	0	0	49	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	16	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.99						0.96	
Frt											0.942	
Flt Protected					0.995		0.950					
Satd. Flow (prot)	0	0	0	0	1812	0	1593	0	0	0	1516	0
Flt Permitted					0.995		0.950					
Satd. Flow (perm)	0	0	0	0	1801	0	1593	0	0	0	1516	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											44	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			726			519			367	
Travel Time (s)		13.9			16.5			11.8			8.3	
Confl. Peds. (#/hr)				19								26
Confl. Bikes (#/hr)												4
Peak Hour Factor	0.92	0.92	0.92	0.90	0.90	0.90	0.83	0.83	0.83	0.72	0.72	0.72
Heavy Vehicles (%)	2%	2%	2%	10%	6%	0%	2%	0%	0%	0%	4%	32%
Adj. Flow (vph)	0	0	0	54	442	0	119	0	0	0	68	51
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	496	0	119	0	0	0	119	0
Turn Type				Perm	NA		Prot				NA	
Protected Phases					2		6				5	
Permitted Phases				2								
Detector Phase				2	2		6				5	
Switch Phase												
Minimum Initial (s)				4.0	4.0		4.0				4.0	
Minimum Split (s)				18.0	18.0		8.0				21.0	
Total Split (s)				34.0	34.0		24.0				22.0	
Total Split (%)				42.5%	42.5%		30.0%				27.5%	
Maximum Green (s)				30.0	30.0		20.0				18.0	
Yellow Time (s)				3.0	3.0		3.0				3.0	
All-Red Time (s)				1.0	1.0		1.0				1.0	
Lost Time Adjust (s)					0.0		0.0				0.0	
Total Lost Time (s)					4.0		4.0				4.0	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				2.0	2.0		2.0				2.0	
Recall Mode				C-Max	C-Max		None				None	
Walk Time (s)				7.0	7.0						7.0	
Flash Dont Walk (s)				7.0	7.0						10.0	
Pedestrian Calls (#/hr)				10	10						10	
Act Effct Green (s)					52.7		10.3				9.4	
Actuated g/C Ratio					0.66		0.13				0.12	
v/c Ratio					0.42		0.58				0.55	
Control Delay					11.7		43.3				30.3	
Queue Delay					0.0		0.0				0.0	
Total Delay					11.7		43.3				30.3	
LOS					B		D				C	
Approach Delay					11.7						30.3	
Approach LOS					B						C	
Queue Length 50th (ft)					118		57				36	
Queue Length 95th (ft)					280		93				55	
Internal Link Dist (ft)		531			646			439			287	
Turn Bay Length (ft)												
Base Capacity (vph)					1186		398				375	
Starvation Cap Reductn					0		0				0	
Spillback Cap Reductn					0		0				0	
Storage Cap Reductn					0		0				0	
Reduced v/c Ratio					0.42		0.30				0.32	

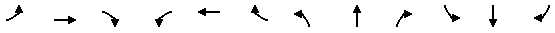
Intersection Summary			
Area Type:	CBD		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 19.8		Intersection LOS: B	
Intersection Capacity Utilization 45.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 10: Ruggles Street & Shawmut Avenue

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	4	0	0	115	80
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.94	0.94
Hourly flow rate (vph)	0	4	0	0	122	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1056	580	
pX, platoon unblocked						
vC, conflicting volume	165	165	207			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	165	165	207			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	826	880	1364			

Direction, Lane #	EB 1	SB 1
Volume Total	4	207
Volume Left	0	0
Volume Right	4	85
cSH	880	1700
Volume to Capacity	0.00	0.12
Queue Length 95th (ft)	0	0
Control Delay (s)	9.1	0.0
Lane LOS	A	
Approach Delay (s)	9.1	0.0
Approach LOS	A	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	105	19	1	10	0	0	0	0	15	67	56
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.92	0.92	0.92	0.25	0.25	0.25	0.81	0.81	0.81
Hourly flow rate (vph)	0	136	25	1	11	0	0	0	0	19	83	69
Pedestrians		43			58			20				
Lane Width (ft)		16.0			16.0			0.0				
Walking Speed (ft/s)		4.0			4.0			4.0				
Percent Blockage		5			6			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								367			1269	
pX, platoon unblocked												
vC, conflicting volume	203	255	180	325	290	58	195			58		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	203	255	180	325	290	58	195			58		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	76	97	100	98	100	100			99		
cM capacity (veh/h)	647	569	826	426	548	948	1324			1417		

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	161	12	170
Volume Left	0	1	19
Volume Right	25	0	69
cSH	597	534	1417
Volume to Capacity	0.27	0.02	0.01
Queue Length 95th (ft)	27	2	1
Control Delay (s)	13.2	11.9	0.9
Lane LOS	B	B	A
Approach Delay (s)	13.2	11.9	0.9
Approach LOS	B	B	

Intersection Summary					
Average Delay	7.1				
Intersection Capacity Utilization	29.7%	ICU Level of Service		A	
Analysis Period (min)	15				

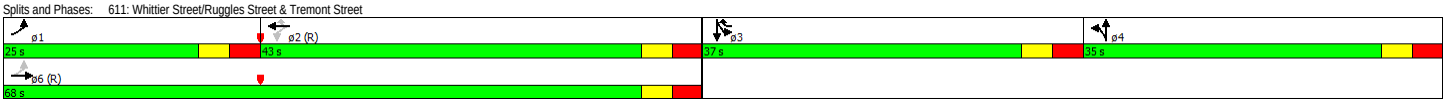
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	196	1310	4	24	960	555	65	35	57	541	17	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	12	12
Storage Length (ft)	200		0	0		0	50		0	0		300
Storage Lanes	1		0	1		1	0		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor						0.97		0.95				
Frt						0.850		0.951			0.861	
Flt Protected	0.950			0.950				0.980		0.950		
Satd. Flow (prot)	1624	4489	0	1624	3217	1371	0	1698	0	2945	1472	0
Flt Permitted	0.076			0.175				0.980		0.950		
Satd. Flow (perm)	130	4489	0	299	3217	1330	0	1682	0	2945	1472	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)								18			239	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			315			702			458	
Travel Time (s)		12.5			7.2			16.0			10.4	
Confl. Peds. (#/hr)						1	20		65			
Confl. Bikes (#/hr)						9			1			
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.65	0.65	0.65	0.89	0.89	0.89
Heavy Vehicles (%)	0%	4%	0%	0%	1%	6%	2%	0%	3%	7%	0%	0%
Adj. Flow (vph)	211	1409	4	26	1021	590	100	54	88	608	19	239
Shared Lane Traffic (%)												
Lane Group Flow (vph)	211	1413	0	26	1021	590	0	242	0	608	258	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		20			20			0			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.97	1.14	1.14	1.14	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	pm+ov	Split	NA		Split	NA	
Protected Phases	1	6			2	3	4	4		3	3	
Permitted Phases	6			2		2						
Detector Phase	1	6		2	2	3	4	4		3	3	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	7.0	7.0		8.0	8.0	
Minimum Split (s)	14.0	26.0		26.0	26.0	14.0	32.0	32.0		14.0	14.0	
Total Split (s)	25.0	68.0		43.0	43.0	37.0	35.0	35.0		37.0	37.0	
Total Split (%)	17.9%	48.6%		30.7%	30.7%	26.4%	25.0%	25.0%		26.4%	26.4%	
Maximum Green (s)	19.0	62.0		37.0	37.0	31.0	29.0	29.0		31.0	31.0	
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	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0		6.0	6.0	
Lead/Lag	Lead			Lag	Lag	Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	C-Max		C-Max	C-Max	None	None	None		None	None	
Walk Time (s)		8.0		8.0	8.0		7.0	7.0				
Flash Dont Walk (s)		12.0		12.0	12.0		19.0	19.0				
Pedestrian Calls (#/hr)		4		4	4		17	17				
Act Effct Green (s)	68.6	68.6		46.6	46.6	77.5		22.5		30.9	30.9	
Actuated g/C Ratio	0.49	0.49		0.33	0.33	0.55		0.16		0.22	0.22	
v/c Ratio	0.90	0.64		0.26	0.95	0.79		0.84		0.94	0.50	
Control Delay	74.6	29.0		41.0	59.5	29.3		75.3		76.3	10.8	
Queue Delay	0.0	0.0		0.0	26.0	0.0		0.0		0.0	0.0	
Total Delay	74.6	29.0		41.0	85.5	29.3		75.3		76.3	10.8	
LOS	E	C		D	F	C		E		E	B	
Approach Delay		35.0			64.5			75.3			56.8	
Approach LOS		C			E			E			E	
Queue Length 50th (ft)	144	346		16	~526	420		197		282	14	
Queue Length 95th (ft)	#281	435		m59	#750	#734		186		#387	90	
Internal Link Dist (ft)		470			235			622			378	
Turn Bay Length (ft)	200											
Base Capacity (vph)	266	2200		99	1071	746		366		652	512	
Starvation Cap Reductn	0	0		0	105	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.79	0.64		0.26	1.06	0.79		0.66		0.93	0.50	

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 56 (40%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 52.6 Intersection LOS: D
Intersection Capacity Utilization 99.2% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 611: Whittier Street/Ruggles Street & Tremont Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1671	237	0	1414	0	0	0	0	0	0	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.97										
Frt		0.981										0.865
Flt Protected												
Satd. Flow (prot)	0	4181	0	0	4668	0	0	0	0	0	0	1309
Flt Permitted												
Satd. Flow (perm)	0	4181	0	0	4668	0	0	0	0	0	0	1309
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		51										71
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		315			473			580			203	
Travel Time (s)		7.2			10.8			13.2			4.6	
Confl. Peds. (#/hr)			50									
Confl. Bikes (#/hr)			11									
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.83	0.83	0.83
Heavy Vehicles (%)	0%	6%	5%	0%	0%	0%	0%	0%	0%	0%	0%	13%
Adj. Flow (vph)	0	1797	255	0	1520	0	0	0	0	0	0	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2052	0	0	1520	0	0	0	0	0	0	152
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			7			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2			2							1
Detector Template		Thru			Thru							Right
Leading Detector (ft)		100			100							20
Trailing Detector (ft)		0			0							0
Detector 1 Position(ft)		0			0							0
Detector 1 Size(ft)		6			6							20
Detector 1 Type		Cl+Ex			Cl+Ex							Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0			0.0							0.0
Detector 1 Queue (s)		0.0			0.0							0.0
Detector 1 Delay (s)		0.0			0.0							0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type		NA			NA							Prot
Protected Phases		1			1							5
Permitted Phases												
Detector Phase		1			1							5
Switch Phase												
Minimum Initial (s)		8.0			8.0							8.0
Minimum Split (s)		19.0			19.0							30.0
Total Split (s)		109.0			109.0							31.0
Total Split (%)		77.9%			77.9%							22.1%
Maximum Green (s)		104.0			104.0							26.0
Yellow Time (s)		3.0			3.0							3.0
All-Red Time (s)		2.0			2.0							2.0
Lost Time Adjust (s)		0.0			0.0							0.0
Total Lost Time (s)		5.0			5.0							5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0							2.0
Recall Mode		C-Max			C-Max							None
Walk Time (s)		8.0			8.0							8.0
Flash Dont Walk (s)		6.0			6.0							17.0
Pedestrian Calls (#/hr)		0			0							37
Act Effct Green (s)		108.4			108.4							21.6
Actuated g/C Ratio		0.77			0.77							0.15
v/c Ratio		0.63			0.42							0.58
Control Delay		2.3			3.5							36.9
Queue Delay		0.3			0.9							0.2
Total Delay		2.6			4.4							37.2
LOS		A			A							D
Approach Delay		2.6			4.4							
Approach LOS		A			A							
Queue Length 50th (ft)		26			91							66
Queue Length 95th (ft)		32			m117							124
Internal Link Dist (ft)		235			393			500			123	
Turn Bay Length (ft)												
Base Capacity (vph)		3248			3614							300
Starvation Cap Reductn		479			1679							0
Spillback Cap Reductn		54			517							11
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.74			0.79							0.53

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 32 (23%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 4.7 Intersection LOS: A
Intersection Capacity Utilization 47.4% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

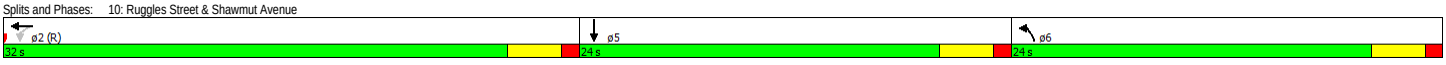
Splits and Phases: 3082: Ruggles Street & Tremont Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	38	708	0	66	0	0	0	100	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	16	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.99						0.95	
Frt											0.953	
Flt Protected					0.997		0.950					
Satd. Flow (prot)	0	0	0	0	1909	0	1593	0	0	0	1645	0
Flt Permitted					0.997		0.950					
Satd. Flow (perm)	0	0	0	0	1900	0	1593	0	0	0	1645	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											32	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			726			519			367	
Travel Time (s)		13.9			16.5			11.8			8.3	
Confl. Peds. (#/hr)				35								49
Confl. Bikes (#/hr)						6			5			6
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.57	0.57	0.57	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%	2%	0%	0%	0%	3%	14%
Adj. Flow (vph)	0	0	0	40	753	0	116	0	0	0	111	59
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	793	0	116	0	0	0	170	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.14	1.14	1.14	1.14	0.97	1.14	1.14	1.14	1.14	1.14	0.97	1.14
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2		1				2	
Detector Template				Left	Thru		Left				Thru	
Leading Detector (ft)				20	100		20				100	
Trailing Detector (ft)				0	0		0				0	
Detector 1 Position(ft)				0	0		0				0	
Detector 1 Size(ft)				20	6		20				6	
Detector 1 Type				Cl+Ex	Cl+Ex		Cl+Ex				Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0		0.0				0.0	
Detector 1 Queue (s)				0.0	0.0		0.0				0.0	
Detector 1 Delay (s)				0.0	0.0		0.0				0.0	
Detector 2 Position(ft)					94						94	
Detector 2 Size(ft)					6						6	
Detector 2 Type					Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0						0.0	
Turn Type				Perm	NA		Prot				NA	
Protected Phases					2		6				5	
Permitted Phases				2								
Detector Phase				2	2		6				5	
Switch Phase												
Minimum Initial (s)				4.0	4.0		4.0				4.0	
Minimum Split (s)				18.0	18.0		8.0				21.0	
Total Split (s)				32.0	32.0		24.0				24.0	
Total Split (%)				40.0%	40.0%		30.0%				30.0%	
Maximum Green (s)				28.0	28.0		20.0				20.0	
Yellow Time (s)				3.0	3.0		3.0				3.0	
All-Red Time (s)				1.0	1.0		1.0				1.0	
Lost Time Adjust (s)					0.0		0.0				0.0	
Total Lost Time (s)					4.0		4.0				4.0	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				2.0	2.0		2.0				2.0	
Recall Mode				C-Max	C-Max		None				None	
Walk Time (s)				7.0	7.0						7.0	
Flash Dont Walk (s)				7.0	7.0						10.0	
Pedestrian Calls (#/hr)				10	10						10	
Act Effct Green (s)					48.5		10.2				11.3	
Actuated g/C Ratio					0.61		0.13				0.14	
v/c Ratio					0.69		0.57				0.66	
Control Delay					18.6		43.2				37.7	
Queue Delay					0.0		0.0				0.0	
Total Delay					18.6		43.2				37.7	
LOS					B		D				D	
Approach Delay					18.6						37.7	
Approach LOS					B						D	
Queue Length 50th (ft)					260		55				66	
Queue Length 95th (ft)					#596		60				119	
Internal Link Dist (ft)		531			646			439			287	
Turn Bay Length (ft)												
Base Capacity (vph)					1150		398				435	
Starvation Cap Reductn					0		0				0	
Spillback Cap Reductn					0		0				0	
Storage Cap Reductn					0		0				0	
Reduced v/c Ratio					0.69		0.29				0.39	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 24.3 Intersection LOS: C
Intersection Capacity Utilization 71.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

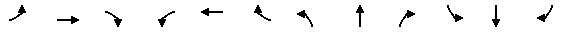
Splits and Phases: 10: Ruggles Street & Shawmut Avenue



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	2	0	0	208	66
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.87	0.87
Hourly flow rate (vph)	0	2	0	0	239	76
Pedestrians	4					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1056	580	
pX, platoon unblocked						
vC, conflicting volume	281	281	319			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	281	281	319			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	710	759	1247			

Direction, Lane #	EB 1	SB 1
Volume Total	2	315
Volume Left	0	0
Volume Right	2	76
cSH	759	1700
Volume to Capacity	0.00	0.19
Queue Length 95th (ft)	0	0
Control Delay (s)	9.8	0.0
Lane LOS	A	
Approach Delay (s)	9.8	0.0
Approach LOS	A	

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	66	9	5	18	0	0	0	0	14	138	94
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.79	0.79	0.79	0.25	0.25	0.25	0.89	0.89	0.89
Hourly flow rate (vph)	0	92	12	6	23	0	0	0	0	16	155	106
Pedestrians		83			73			27				
Lane Width (ft)		16.0			16.0			0.0				
Walking Speed (ft/s)		4.0			4.0			4.0				
Percent Blockage		9			8			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								367			1269	
pX, platoon unblocked												
vC, conflicting volume	334	395	318	398	448	73	344			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	334	395	318	398	448	73	344			73		
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 %	100	80	98	98	95	100	100			99		
cM capacity (veh/h)	470	449	660	374	420	914	1113			1415		

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	104	29	276
Volume Left	0	6	16
Volume Right	12	0	106
cSH	467	409	1415
Volume to Capacity	0.22	0.07	0.01
Queue Length 95th (ft)	21	6	1
Control Delay (s)	14.9	14.5	0.5
Lane LOS	B	B	A
Approach Delay (s)	14.9	14.5	0.5
Approach LOS	B	B	

Intersection Summary					
Average Delay		5.2			
Intersection Capacity Utilization		33.9%	ICU Level of Service	A	
Analysis Period (min)		15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	142	78
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.94	0.94
Hourly flow rate (vph)	0	0	0	0	151	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1056	580	
pX, platoon unblocked						
vC, conflicting volume	193	193	234			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	193	193	234			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	796	849	1333			

Direction, Lane #	EB 1	SB 1
Volume Total	0	234
Volume Left	0	0
Volume Right	0	83
cSH	1700	1700
Volume to Capacity	0.00	0.14
Queue Length 95th (ft)	0	0
Control Delay (s)	0.0	0.0
Lane LOS	A	
Approach Delay (s)	0.0	0.0
Approach LOS	A	

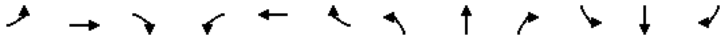
Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	16.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	49	398	0	99	0	0	0	51	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	16	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.99						0.96	
Frt											0.938	
Flt Protected					0.995		0.950					
Satd. Flow (prot)	0	0	0	0	1812	0	1593	0	0	0	1495	0
Flt Permitted					0.995		0.950					
Satd. Flow (perm)	0	0	0	0	1801	0	1593	0	0	0	1495	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											49	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			726			519			367	
Travel Time (s)		13.9			16.5			11.8			8.3	
Confl. Peds. (#/hr)				19								26
Confl. Bikes (#/hr)												4
Peak Hour Factor	0.92	0.92	0.92	0.90	0.90	0.90	0.83	0.83	0.83	0.72	0.72	0.72
Heavy Vehicles (%)	2%	2%	2%	10%	6%	0%	2%	0%	0%	0%	4%	32%
Adj. Flow (vph)	0	0	0	54	442	0	119	0	0	0	71	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	496	0	119	0	0	0	131	0
Turn Type				Perm	NA		Prot				NA	
Protected Phases					2		6				5	
Permitted Phases				2								
Detector Phase				2	2		6				5	
Switch Phase												
Minimum Initial (s)				4.0	4.0		4.0				4.0	
Minimum Split (s)				18.0	18.0		8.0				21.0	
Total Split (s)				34.0	34.0		24.0				22.0	
Total Split (%)				42.5%	42.5%		30.0%				27.5%	
Maximum Green (s)				30.0	30.0		20.0				18.0	
Yellow Time (s)				3.0	3.0		3.0				3.0	
All-Red Time (s)				1.0	1.0		1.0				1.0	
Lost Time Adjust (s)					0.0		0.0				0.0	
Total Lost Time (s)					4.0		4.0				4.0	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				2.0	2.0		2.0				2.0	
Recall Mode				C-Max	C-Max		None				None	
Walk Time (s)				7.0	7.0						7.0	
Flash Dont Walk (s)				7.0	7.0						10.0	
Pedestrian Calls (#/hr)				10	10						10	
Act Effct Green (s)					50.0		10.3				9.6	
Actuated g/C Ratio					0.62		0.13				0.12	
v/c Ratio					0.44		0.58				0.59	
Control Delay					12.2		43.3				31.1	
Queue Delay					0.0		0.0				0.0	
Total Delay					12.2		43.3				31.1	
LOS					B		D				C	
Approach Delay					12.2						31.1	
Approach LOS					B						C	
Queue Length 50th (ft)					120		57				39	
Queue Length 95th (ft)					280		93				59	
Internal Link Dist (ft)		531			646			439			287	
Turn Bay Length (ft)												
Base Capacity (vph)					1124		398				374	
Starvation Cap Reductn					0		0				0	
Spillback Cap Reductn					0		0				0	
Storage Cap Reductn					0		0				0	
Reduced v/c Ratio					0.44		0.30				0.35	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 20.5 Intersection LOS: C
Intersection Capacity Utilization 45.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 10: Ruggles Street & Shawmut Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	105	19	1	10	0	0	0	0	15	75	56
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.92	0.92	0.92	0.25	0.25	0.25	0.81	0.81	0.81
Hourly flow rate (vph)	0	136	25	1	11	0	0	0	0	19	93	69
Pedestrians		43			58			20				
Lane Width (ft)		16.0			16.0			0.0				
Walking Speed (ft/s)		4.0			4.0			4.0				
Percent Blockage		5			6			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								367			1269	
pX, platoon unblocked												
vC, conflicting volume	213	265	190	335	300	58	205			58		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	213	265	190	335	300	58	205			58		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	76	97	100	98	100	100			99		
cM capacity (veh/h)	637	561	816	418	542	948	1313			1417		

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	161	12	180
Volume Left	0	1	19
Volume Right	25	0	69
cSH	590	527	1417
Volume to Capacity	0.27	0.02	0.01
Queue Length 95th (ft)	28	2	1
Control Delay (s)	13.4	12.0	0.9
Lane LOS	B	B	A
Approach Delay (s)	13.4	12.0	0.9
Approach LOS	B	B	

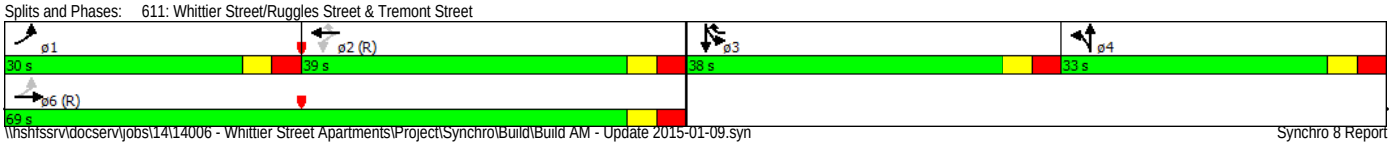
Intersection Summary					
Average Delay		7.0			
Intersection Capacity Utilization		29.8%	ICU Level of Service		A
Analysis Period (min)		15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	1422	8	30	848	534	38	41	28	550	13	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	12	12
Storage Length (ft)	300		0	0		0	50		0	0		300
Storage Lanes	1		0	1		1	0		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor						0.94		0.99				
Frt		0.999				0.850		0.965			0.862	
Flt Protected	0.950			0.950				0.983		0.950		
Satd. Flow (prot)	1279	4485	0	1624	3008	1358	0	1664	0	2891	1077	0
Flt Permitted	0.090			0.150				0.983		0.950		
Satd. Flow (perm)	121	4485	0	256	3008	1279	0	1662	0	2891	1077	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)		1						11			179	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			315			702			458	
Travel Time (s)		12.5			7.2			16.0			10.4	
Confl. Peds. (#/hr)						11	4		13			
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.92	0.92	0.92	0.85	0.85	0.85
Heavy Vehicles (%)	27%	4%	0%	0%	8%	7%	9%	9%	11%	9%	0%	40%
Adj. Flow (vph)	241	1563	9	34	964	607	41	45	30	647	15	179
Shared Lane Traffic (%)												
Lane Group Flow (vph)	241	1572	0	34	964	607	0	116	0	647	194	0
Turn Type	pm+pt	NA		Perm	NA	pm+ov	Split	NA		Split	NA	
Protected Phases	1	6			2	3	4	4		3	3	
Permitted Phases	6			2		2						
Detector Phase	1	6		2	2	3	4	4		3	3	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	7.0	7.0		8.0	8.0	
Minimum Split (s)	14.0	26.0		26.0	26.0	14.0	32.0	32.0		14.0	14.0	
Total Split (s)	30.0	69.0		39.0	39.0	38.0	33.0	33.0		38.0	38.0	
Total Split (%)	21.4%	49.3%		27.9%	27.9%	27.1%	23.6%	23.6%		27.1%	27.1%	
Maximum Green (s)	24.0	63.0		33.0	33.0	32.0	27.0	27.0		32.0	32.0	
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	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0		6.0	6.0	
Lead/Lag	Lead			Lag	Lag	Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	C-Max		C-Max	C-Max	None	None	None		None	None	
Walk Time (s)		8.0		8.0	8.0		7.0	7.0				
Flash Dont Walk (s)		12.0		12.0	12.0		19.0	19.0				
Pedestrian Calls (#/hr)		12		14	14		5	5				
Act Effct Green (s)	75.4	75.4		46.6	46.6	78.6		14.6		32.0	32.0	
Actuated g/C Ratio	0.54	0.54		0.33	0.33	0.56		0.10		0.23	0.23	
v/c Ratio	0.95	0.65		0.40	0.96	0.82		0.63		0.98	0.51	
Control Delay	84.1	25.6		35.8	48.2	36.5		67.9		83.9	12.9	
Queue Delay	0.0	0.0		0.0	41.4	0.0		0.0		0.0	0.0	
Total Delay	84.1	25.6		35.8	89.7	36.5		67.9		83.9	12.9	
LOS	F	C		D	F	D		E		F	B	
Approach Delay		33.4			68.4			67.9			67.5	
Approach LOS		C			E			E			E	
Queue Length 50th (ft)	172	352		15	491	525		95		304	11	
Queue Length 95th (ft)	#358	493		#78	#693	#786		144		#389	70	
Internal Link Dist (ft)		470			235			622			378	
Turn Bay Length (ft)	300											
Base Capacity (vph)	263	2414		85	1000	736		329		660	384	
Starvation Cap Reductn	0	0		0	123	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.92	0.65		0.40	1.10	0.82		0.35		0.98	0.51	

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 96 (69%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 53.7 Intersection LOS: D
Intersection Capacity Utilization 89.1% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 611: Whittier Street/Ruggles Street & Tremont Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1877	124	0	1368	0	0	0	0	0	0	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99										
Frt		0.991										0.865
Flt Protected												
Satd. Flow (prot)	0	4352	0	0	4363	0	0	0	0	0	0	1243
Flt Permitted												
Satd. Flow (perm)	0	4352	0	0	4363	0	0	0	0	0	0	1243
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		19										63
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		315			473			580			203	
Travel Time (s)		7.2			10.8			13.2			4.6	
Confl. Peds. (#/hr)			17									
Confl. Bikes (#/hr)			18									
Peak Hour Factor	0.94	0.94	0.94	0.88	0.88	0.88	0.92	0.92	0.92	0.83	0.83	0.83
Heavy Vehicles (%)	0%	5%	14%	0%	7%	0%	2%	2%	2%	0%	0%	19%
Adj. Flow (vph)	0	1997	132	0	1555	0	0	0	0	0	0	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2129	0	0	1555	0	0	0	0	0	0	53
Turn Type		NA			NA							Prot
Protected Phases		1			1							5
Permitted Phases												
Detector Phase		1			1							5
Switch Phase												
Minimum Initial (s)		8.0			8.0							8.0
Minimum Split (s)		19.0			19.0							30.0
Total Split (s)		107.0			107.0							33.0
Total Split (%)		76.4%			76.4%							23.6%
Maximum Green (s)		102.0			102.0							28.0
Yellow Time (s)		3.0			3.0							3.0
All-Red Time (s)		2.0			2.0							2.0
Lost Time Adjust (s)		0.0			0.0							0.0
Total Lost Time (s)		5.0			5.0							5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0							2.0
Recall Mode		C-Max			C-Max							None
Walk Time (s)		8.0			8.0							8.0
Flash Dont Walk (s)		6.0			6.0							17.0
Pedestrian Calls (#/hr)		0			0							0
Act Effct Green (s)		125.4			125.4							8.2
Actuated g/C Ratio		0.90			0.90							0.06
v/c Ratio		0.55			0.40							0.40
Control Delay		0.4			1.1							20.0
Queue Delay		0.2			0.5							0.0
Total Delay		0.6			1.6							20.0
LOS		A			A							B
Approach Delay		0.6			1.6							
Approach LOS		A			A							
Queue Length 50th (ft)		7			20							0
Queue Length 95th (ft)		m5			m90							29
Internal Link Dist (ft)		235			393			500			123	
Turn Bay Length (ft)												
Base Capacity (vph)		3901			3909							299
Starvation Cap Reductn		656			1749							0
Spillback Cap Reductn		113			308							6
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.66			0.72							0.18

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 73 (52%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 1.3 Intersection LOS: A
Intersection Capacity Utilization 47.6% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3082: Ruggles Street & Tremont Street

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	240	59
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.87	0.87
Hourly flow rate (vph)	0	0	0	0	276	68
Pedestrians	4					
Lane Width (ft)	16.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1056	580	
pX, platoon unblocked						
vC, conflicting volume	314	314	348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	314	314	348			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	680	728	1217			

Direction, Lane #	EB 1	SB 1
Volume Total	0	344
Volume Left	0	0
Volume Right	0	68
cSH	1700	1700
Volume to Capacity	0.00	0.20
Queue Length 95th (ft)	0	0
Control Delay (s)	0.0	0.0
Lane LOS	A	
Approach Delay (s)	0.0	0.0
Approach LOS	A	

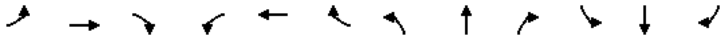
Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	21.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	38	708	0	66	0	0	0	103	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	16	12	12	12	12	12	16	12
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					0.99						0.95	
Frt											0.950	
Flt Protected					0.997		0.950					
Satd. Flow (prot)	0	0	0	0	1909	0	1593	0	0	0	1628	0
Flt Permitted					0.997		0.950					
Satd. Flow (perm)	0	0	0	0	1900	0	1593	0	0	0	1628	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)											36	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		611			726			519			367	
Travel Time (s)		13.9			16.5			11.8			8.3	
Confl. Peds. (#/hr)				35								49
Confl. Bikes (#/hr)						6			5			6
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.57	0.57	0.57	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%	2%	0%	0%	0%	3%	14%
Adj. Flow (vph)	0	0	0	40	753	0	116	0	0	0	114	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	793	0	116	0	0	0	182	0
Turn Type				Perm	NA		Prot				NA	
Protected Phases					2		6				5	
Permitted Phases				2								
Detector Phase				2	2		6				5	
Switch Phase												
Minimum Initial (s)				4.0	4.0		4.0				4.0	
Minimum Split (s)				18.0	18.0		8.0				21.0	
Total Split (s)				32.0	32.0		24.0				24.0	
Total Split (%)				40.0%	40.0%		30.0%				30.0%	
Maximum Green (s)				28.0	28.0		20.0				20.0	
Yellow Time (s)				3.0	3.0		3.0				3.0	
All-Red Time (s)				1.0	1.0		1.0				1.0	
Lost Time Adjust (s)					0.0		0.0				0.0	
Total Lost Time (s)					4.0		4.0				4.0	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Vehicle Extension (s)				2.0	2.0		2.0				2.0	
Recall Mode				C-Max	C-Max		None				None	
Walk Time (s)				7.0	7.0						7.0	
Flash Dont Walk (s)				7.0	7.0						10.0	
Pedestrian Calls (#/hr)				10	10						10	
Act Effct Green (s)					48.0		10.2				11.7	
Actuated g/C Ratio					0.60		0.13				0.15	
v/c Ratio					0.70		0.57				0.68	
Control Delay					19.1		43.2				37.9	
Queue Delay					0.0		0.0				0.0	
Total Delay					19.1		43.2				37.9	
LOS					B		D				D	
Approach Delay					19.1						37.9	
Approach LOS					B						D	
Queue Length 50th (ft)					264		55				70	
Queue Length 95th (ft)					#601		60				124	
Internal Link Dist (ft)		531			646			439			287	
Turn Bay Length (ft)												
Base Capacity (vph)					1140		398				434	
Starvation Cap Reductn					0		0				0	
Spillback Cap Reductn					0		0				0	
Storage Cap Reductn					0		0				0	
Reduced v/c Ratio					0.70		0.29				0.42	

Intersection Summary

Area Type: CBD
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 24.8 Intersection LOS: C
Intersection Capacity Utilization 71.5% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 10: Ruggles Street & Shawmut Avenue



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	66	9	5	18	0	0	0	0	14	149	94
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.79	0.79	0.79	0.25	0.25	0.25	0.89	0.89	0.89
Hourly flow rate (vph)	0	92	12	6	23	0	0	0	0	16	167	106
Pedestrians		83			73			27				
Lane Width (ft)		16.0			16.0			0.0				
Walking Speed (ft/s)		4.0			4.0			4.0				
Percent Blockage		9			8			0				
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								367			1269	
pX, platoon unblocked												
vC, conflicting volume	346	408	330	410	460	73	356			73		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	346	408	330	410	460	73	356			73		
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 %	100	79	98	98	94	100	100			99		
cM capacity (veh/h)	461	442	650	366	413	914	1102			1415		

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	104	29	289
Volume Left	0	6	16
Volume Right	12	0	106
cSH	460	402	1415
Volume to Capacity	0.23	0.07	0.01
Queue Length 95th (ft)	22	6	1
Control Delay (s)	15.1	14.7	0.5
Lane LOS	C	B	A
Approach Delay (s)	15.1	14.7	0.5
Approach LOS	C	B	

Intersection Summary				
Average Delay	5.1			
Intersection Capacity Utilization	34.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	196	1305	23	76	960	555	71	41	66	539	24	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	12	12
Storage Length (ft)	200		0	0		0	50		0	0		300
Storage Lanes	1		0	1		1	0		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Ped Bike Factor						0.97		0.95				
Frt		0.997				0.850		0.950			0.865	
Flt Protected	0.950			0.950				0.980		0.950		
Satd. Flow (prot)	1624	4478	0	1624	3217	1371	0	1694	0	2945	1479	0
Flt Permitted	0.079			0.168				0.980		0.950		
Satd. Flow (perm)	135	4478	0	287	3217	1330	0	1679	0	2945	1479	0
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)		2						19			239	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		550			315			702			458	
Travel Time (s)		12.5			7.2			16.0			10.4	
Confl. Peds. (#/hr)						1	20		65			
Confl. Bikes (#/hr)						9			1			
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.65	0.65	0.65	0.89	0.89	0.89
Heavy Vehicles (%)	0%	4%	0%	0%	1%	6%	2%	0%	3%	7%	0%	0%
Adj. Flow (vph)	211	1403	25	81	1021	590	109	63	102	606	27	239
Shared Lane Traffic (%)												
Lane Group Flow (vph)	211	1428	0	81	1021	590	0	274	0	606	266	0
Turn Type	pm+pt	NA		Perm	NA	pm+ov	Split	NA		Split	NA	
Protected Phases	1	6			2	3	4	4		3	3	
Permitted Phases	6			2		2						
Detector Phase	1	6		2	2	3	4	4		3	3	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0	8.0	7.0	7.0		8.0	8.0	
Minimum Split (s)	14.0	26.0		26.0	26.0	14.0	32.0	32.0		14.0	14.0	
Total Split (s)	25.0	68.0		43.0	43.0	37.0	35.0	35.0		37.0	37.0	
Total Split (%)	17.9%	48.6%		30.7%	30.7%	26.4%	25.0%	25.0%		26.4%	26.4%	
Maximum Green (s)	19.0	62.0		37.0	37.0	31.0	29.0	29.0		31.0	31.0	
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	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0		6.0	6.0	
Lead/Lag	Lead			Lag	Lag	Lead	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Recall Mode	None	C-Max		C-Max	C-Max	None	None	None		None	None	
Walk Time (s)		8.0		8.0	8.0		7.0	7.0				
Flash Dont Walk (s)		12.0		12.0	12.0		19.0	19.0				
Pedestrian Calls (#/hr)		4		4	4		17	17				
Act Effct Green (s)	66.6	66.6		44.4	44.4	75.2		24.6		30.8	30.8	
Actuated g/C Ratio	0.48	0.48		0.32	0.32	0.54		0.18		0.22	0.22	
v/c Ratio	0.89	0.67		0.90	1.00	0.82		0.88		0.94	0.52	
Control Delay	73.7	30.9		110.8	71.0	32.3		77.8		76.2	11.8	
Queue Delay	0.0	0.0		0.0	34.8	0.0		0.0		0.0	0.0	
Total Delay	73.7	30.9		110.8	105.8	32.3		77.8		76.2	11.8	
LOS	E	C		F	F	C		E		E	B	
Approach Delay		36.4			80.4			77.8			56.5	
Approach LOS		D			F			E			E	
Queue Length 50th (ft)	145	367		78	~564	423		226		281	20	
Queue Length 95th (ft)	#278	442		#167	#750	#733		213		#385	99	
Internal Link Dist (ft)		470			235			622			378	
Turn Bay Length (ft)	200											
Base Capacity (vph)	266	2130		90	1019	725		365		652	513	
Starvation Cap Reductn	0	0		0	93	0		0		0	0	
Spillback Cap Reductn	0	0		0	0	0		0		0	0	
Storage Cap Reductn	0	0		0	0	0		0		0	0	
Reduced v/c Ratio	0.79	0.67		0.90	1.10	0.81		0.75		0.93	0.52	

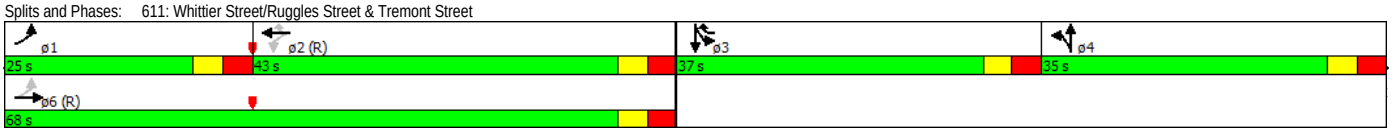
Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 56 (40%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 59.5 Intersection LOS: E
Intersection Capacity Utilization 99.3% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 611: Whittier Street/Ruggles Street & Tremont Street



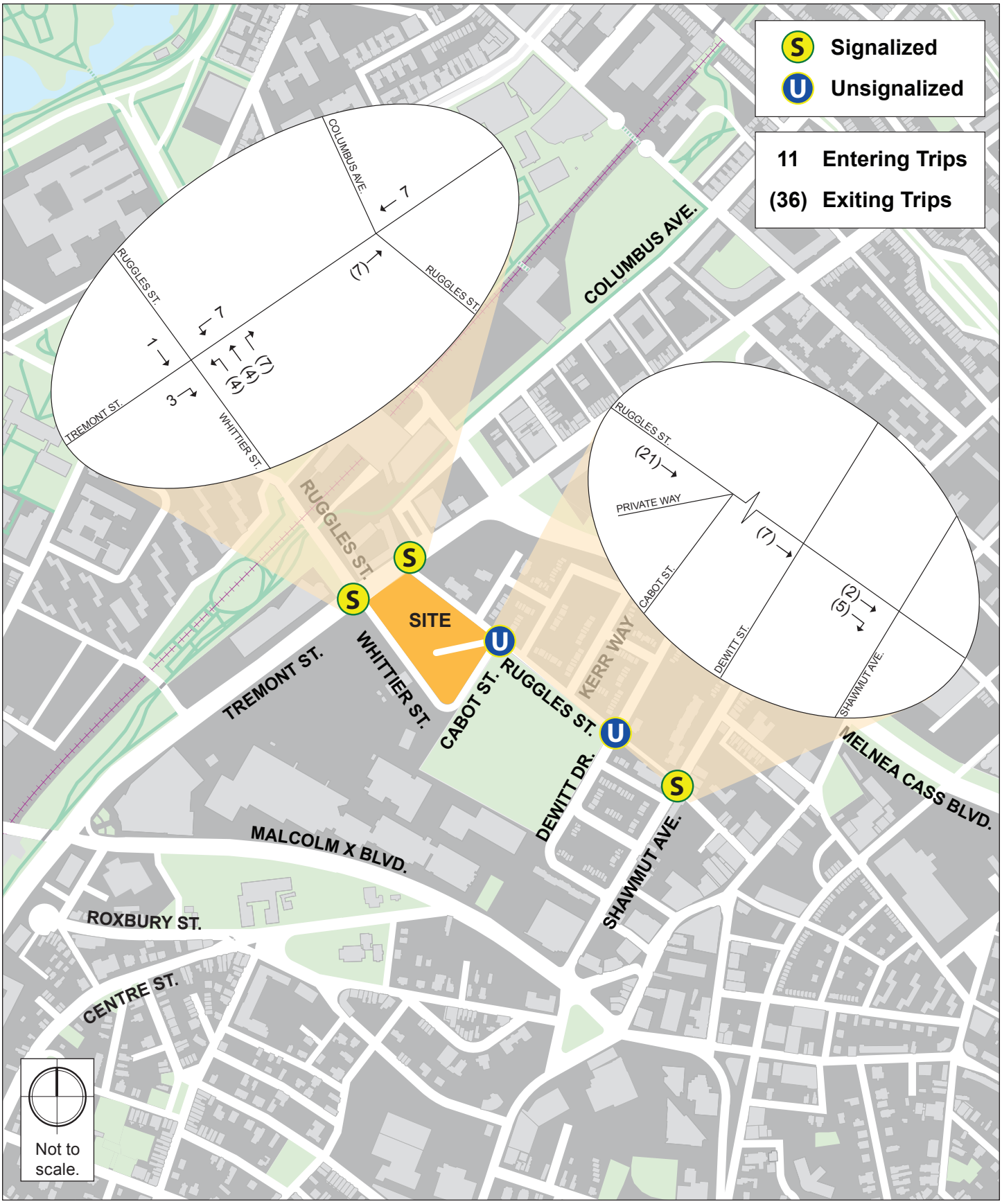
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1681	228	0	1466	0	0	0	0	0	0	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.97										
Frt		0.982										0.865
Flt Protected												
Satd. Flow (prot)	0	4191	0	0	4668	0	0	0	0	0	0	1309
Flt Permitted												
Satd. Flow (perm)	0	4191	0	0	4668	0	0	0	0	0	0	1309
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		48										64
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		315			473			580			203	
Travel Time (s)		7.2			10.8			13.2			4.6	
Confl. Peds. (#/hr)			50									
Confl. Bikes (#/hr)			11									
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.92	0.83	0.83	0.83
Heavy Vehicles (%)	0%	6%	5%	0%	0%	0%	0%	0%	0%	0%	0%	13%
Adj. Flow (vph)	0	1808	245	0	1576	0	0	0	0	0	0	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2053	0	0	1576	0	0	0	0	0	0	152
Turn Type		NA			NA							Prot
Protected Phases		1			1							5
Permitted Phases												
Detector Phase		1			1							5
Switch Phase												
Minimum Initial (s)		8.0			8.0							8.0
Minimum Split (s)		19.0			19.0							30.0
Total Split (s)		109.0			109.0							31.0
Total Split (%)		77.9%			77.9%							22.1%
Maximum Green (s)		104.0			104.0							26.0
Yellow Time (s)		3.0			3.0							3.0
All-Red Time (s)		2.0			2.0							2.0
Lost Time Adjust (s)		0.0			0.0							0.0
Total Lost Time (s)		5.0			5.0							5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0			2.0							2.0
Recall Mode		C-Max			C-Max							None
Walk Time (s)		8.0			8.0							8.0
Flash Dont Walk (s)		6.0			6.0							17.0
Pedestrian Calls (#/hr)		0			0							37
Act Effct Green (s)		108.4			108.4							21.6
Actuated g/C Ratio		0.77			0.77							0.15
v/c Ratio		0.63			0.44							0.59
Control Delay		1.8			3.7							40.3
Queue Delay		0.3			1.0							0.1
Total Delay		2.1			4.8							40.4
LOS		A			A							D
Approach Delay		2.1			4.8							
Approach LOS		A			A							
Queue Length 50th (ft)		31			105							72
Queue Length 95th (ft)		34			m130							131
Internal Link Dist (ft)		235			393			500			123	
Turn Bay Length (ft)												
Base Capacity (vph)		3256			3614							295
Starvation Cap Reductn		482			1662							0
Spillback Cap Reductn		57			551							7
Storage Cap Reductn		0			0							0
Reduced v/c Ratio		0.74			0.81							0.53

Intersection Summary

Area Type: CBD
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 32 (23%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 4.8 Intersection LOS: A
Intersection Capacity Utilization 48.5% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

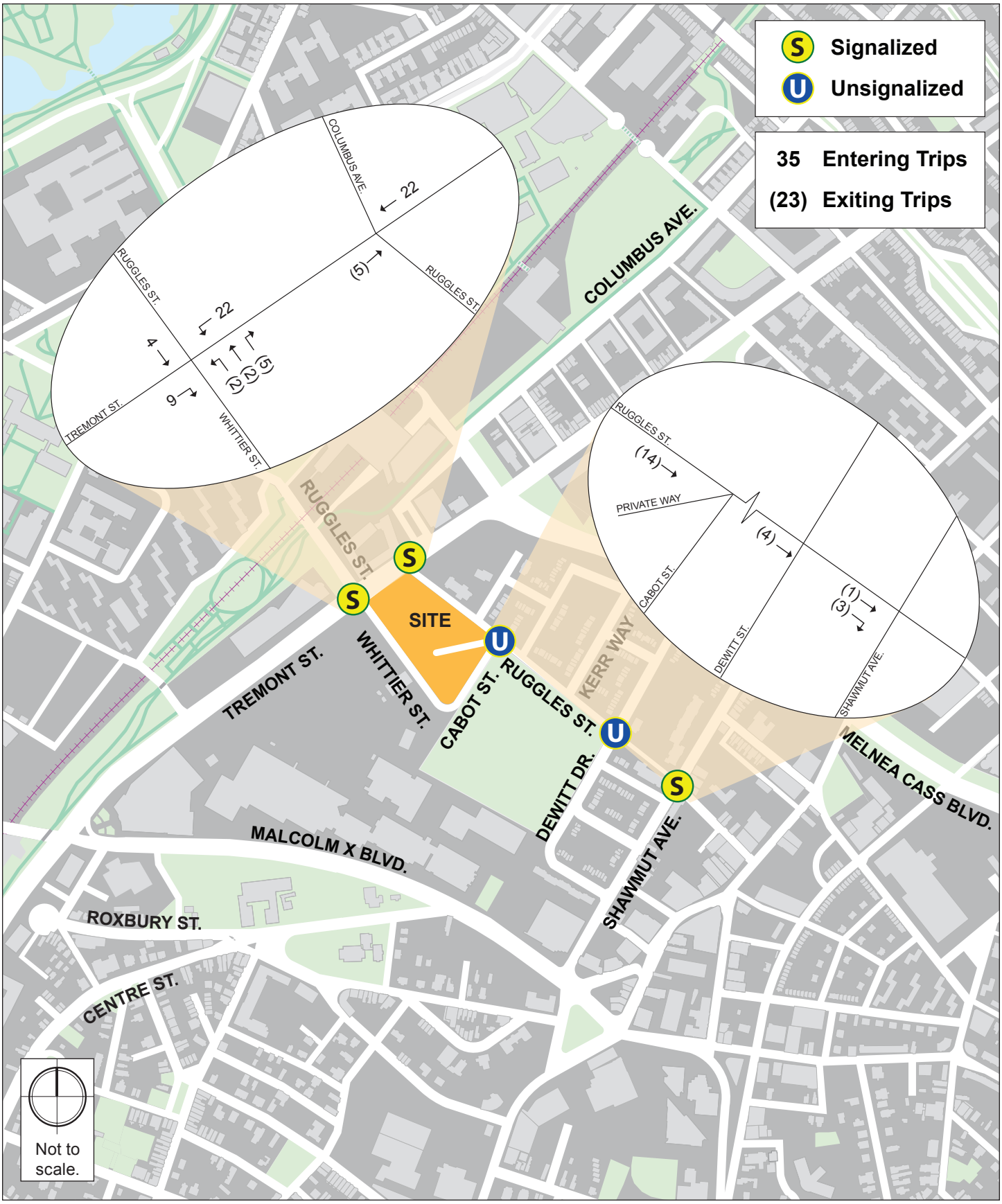
Splits and Phases: 3082: Ruggles Street & Tremont Street

EXISTING SITE TRIPS



Whittier Street Apartments
Roxbury, MA

Figure A-1
Existing Site Trips (2-Way Whittier Street Scenario), a.m. Peak Hour



Whittier Street Apartments
Roxbury, MA

Figure A-2
Existing Site Trips (2-Way Whittier Street Scenario), p.m. Peak Hour

TRIP GENERATION CALCULATIONS

Whittier Street Apartments
Trip Generation Assessment--Daily

HOWARD/STEIN-HUDSON ASSOCIATES
11-Jun-15

			Vehicular Trip Generation					Conversion to Person Trips		Mode Share Split								Vehicular Trips		
Land Use	**Size**	**Category**	**Unadjusted Vehicle Trips**	**Internal trips**	**Pass-by %**	**Pass-By Trips**	**Less capture trips**	**Assumed national vehicle occupancy rate[1]**	**Converted to New Person trips**	**Transit Share[2]**	**Transit Trips**	**Walk/Bike/ Other Share[2]**	**Walk/ Bike/ Other Trips**	**Vehicle Share[2]**	**Total Vehicle Person Trips**	**Pass-By vehicle Share**	**Total Vehicle Pass-By Person Trips**	**Assumed local auto occupancy rate for autos[3]**	**Total Adjusted Auto Trips**	**Total Adjusted Auto Trips (Pass-By)**
Daily																				
Apartment[4]	386	Total	2,566	0			2,566	1.13	**2,900**		**494**		**754**		**1,653**			1.13	**1,462**	
	Units	In	1,283		0.00		1,283	1.13	**1,450**	17%	**247**	26%	**377**	57%	**827**			1.13	**731**	
		Out	1,283		0.00		1,283	1.13	**1,450**	17%	**247**	26%	**377**	57%	**827**			1.13	**731**	
Retail[5]	8	Total	1,280	0			1,280	1.78	**2,278**		**274**		**798**		**1,207**			1.78	**678**	
	KSF	In	640		0.00		640	1.78	**1,139**	12%	**137**	35%	**399**	53%	**604**			1.78	**339**	
		Out	640		0.00		640	1.78	**1,139**	12%	**137**	35%	**399**	53%	**604**			1.78	**339**	
AM Peak Hour																				
Apartment[4]	386	Total	196	0			196	1.13	**221**		**59**		**60**		**102**			1.13	**90**	
	Units	In	39		0.00		39	1.13	**44**	19%	**8**	27%	**12**	54%	**24**			1.13	**21**	
		Out	157		0.00		157	1.13	**177**	29%	**51**	27%	**48**	44%	**78**			1.13	**69**	
Retail[5]	8	Total	32	0			32	1.78	**57**		**9**		**21**		**27**			1.78	**15**	
	KSF	In	20		0.00		20	1.78	**36**	13%	**5**	36%	**13**	51%	**18**			1.78	**10**	
		Out	12		0.00		12	1.78	**21**	21%	**4**	37%	**8**	42%	**9**			1.78	**5**	
PM Peak Hour																				
Apartment[4]	386	Total	240	0			240	1.13	**271**		**69**		**74**		**129**			1.13	**114**	
	Units	In	156		0.00		156	1.13	**176**	29%	**51**	27%	**48**	44%	**77**			1.13	**69**	
		Out	84		0.00		84	1.13	**95**	19%	**18**	27%	**26**	54%	**51**			1.13	**45**	
Retail[5]	8	Total	108	0			108	1.78	**193**		**33**		**70**		**90**			1.78	**51**	
	KSF	In	52		0.00		52	1.78	**93**	21%	**20**	37%	**34**	42%	**39**			1.78	**22**	
		Out	56		0.00		56	1.78	**100**	13%	**13**	36%	**36**	51%	**51**			1.78	**29**	

1. 2009 National vehicle occupancy rates - 1.13:home to work; 1.84: family/personal business; 1.78: shopping; 2.2 social/recreational
2. Mode shares based on peak-hour BTD Data for Area 15 - Roxbury.
3. Local vehicle occupancy rates based on 2009 National vehicle occupancy rates.
4. ITE Trip Generation Rate, 9th Edition, LUC 220 (Residential), Average rate
5. ITE Trip Generation Rate, 9th Edition, LUC 820 (Shopping Center), Fitted Curve

Appendix C

PEDESTRIAN LEVEL WIND STUDY

150 Research Lane, Suite 105
Guelph, ON, N1G 4T2
226.706.8080 | www.novusenv.com

Date: February 13, 2015

To: Judith Kohn
Fort Point Associates Inc.
22 Union Street, 3rd Floor
Boston, MA 02108-2414

Re: **Pedestrian Wind Assessment**
Whittier Street Development
Boston, MA
Novus Project # 13-0273

Credit: The Architectural Team

Novus Team:

Scientist:	Jenny Vesely, B.Eng., EIT
Specialist:	Tahrana Lovlin, MAES, P.Eng.

TABLE OF CONTENTS

1.0 Introduction 2
1.1 Existing Development 2
1.2 Approved Development 2
1.3 Proposed Development 4
1.4 Areas of Interest 4
2.0 Approach 6
2.1 Methodology 6
2.2 Wind Climate 8
3.0 Pedestrian Wind Criteria 10
4.0 Wind Comfort Results 11
4.1 Tremont Street 11
4.2 Whittier Street 13
4.3 Cabot Street 13
4.4 Ruggles Street 13
4.5 Proposed Development 13
5.0 Effective Gust Results 15
5.1 Surrounding Streets 15
5.2 Proposed Development 15
6.0 Recommendations 17
7.0 Conclusions 18
8.0 Assessment Applicability 18
9.0 References 19
Appendix A 20

1.0 INTRODUCTION

Novus Environmental Inc. (Novus) was retained by Fort Point Associates Inc. to conduct a pedestrian wind assessment for the proposed Whittier Street development in Boston, Massachusetts. This report is in support of the Extended Project Notification Form (EPNF) review with the Boston Redevelopment Authority (BRA). This report encompasses the preliminary qualitative wind study.

1.1 Existing Development

The proposed development encompasses an entire city block bounded by Tremont Street to the north, Ruggles Street to the east, Cabot Street to the south and Whittier Street to the west. The site is currently occupied by four four to eight storey residential buildings. **Figure 1** provides an aerial view of the immediate study area.

Immediately surrounding the development are low-rise commercial buildings to the west, mid-rise commercial buildings to the north, single dwelling residential properties to the east and Madison Park sports fields to the southeast. Beyond the immediate surroundings are mid-rise commercial buildings to the north, low-rise residential and commercial buildings to the east and single dwelling residential properties to the south and west.

1.2 Approved Developments

Existing, under construction and planned developments in the surrounding area were considered for both the No Build and Build Configurations. A search of the area within a 2000 ft radius of the development for planned developments yielded seven approved planned developments. These included 1004-1012 Tremont Street, 1065 Tremont Street, 20 Sussex Street, the Melnea Hotel and Residences, the Dudley Municipal Building, the Madison Tropical Parcel 10 development and the Northeastern University Interdisciplinary Science and Engineering CTR. Under direction by the BRA, the Tremont Crossing (Parcel 3) project was also included though it is still under review, due to its size and proximity to the project site. **Figure 2** shows the locations of the identified planned and approved developments, as well as the Tremont Crossing project in relationship to the project.

Figure 1: Context Plan
Credit: Google Earth™, Dated August 24, 2013

Figure 2: Nearby Approved Developments
(Includes existing buildings)

Legend

1 – 1004-1012 Tremont Street

2 – 1065 Tremont Street

3 – 20 Sussex Street

4 – Melnea Hotel and Residences

5 – Madison Tropical 10

6 – Norheastern University Interdisciplinary Science and Engineering CTR

7 – Proposed Tremont Crossing (Parcel 3)

1.3 Proposed Development

The proposed development consists of three new residential buildings. Building 1 is L-shaped, with a height of 14-storeys along Tremont Street and ten-storeys along Whittier Street. It also contains commercial space at grade along Tremont Street. Buildings 2 and 3 are five-storeys in height, while Building 4 is four-storeys tall. A site plan can be seen in **Figure 3**.

1.4 Areas of Interest

Areas of interest for pedestrian wind conditions include those areas which pedestrians are expected to use on a frequent basis. Typically these include sidewalks, main entrances, transit stops, plazas and parks. For instance, there is a transit stop on Tremont Street, immediately adjacent the development (**Figure 4**). Two additional transit stops are along Ruggles Street, one at Cabot Street and another at the intersection with Kerr Way.

The main residential entrance to Building 1 is located on Tremont Street, at the northwest corner of the building. There is also an entrance from the courtyard. Along Tremont Street and the east facade of the north block are commercial entrances to the building. Along Whitter Street, as well as long the east face there are individual townhouse entrances (**Figure 4**).

The main entrance to Building 2/3 is located at the southwest corner, along Whittier Street. There are also individual unit entrances located along all building facades (**Figure 4**). The main entrance to Building 4 is located on Ruggles Street, with individual unit entrances located along the east and west facades of the building.

In the center of the development there is a large courtyard with greenspace and walkways, which will be the main thoroughfare for local residents.

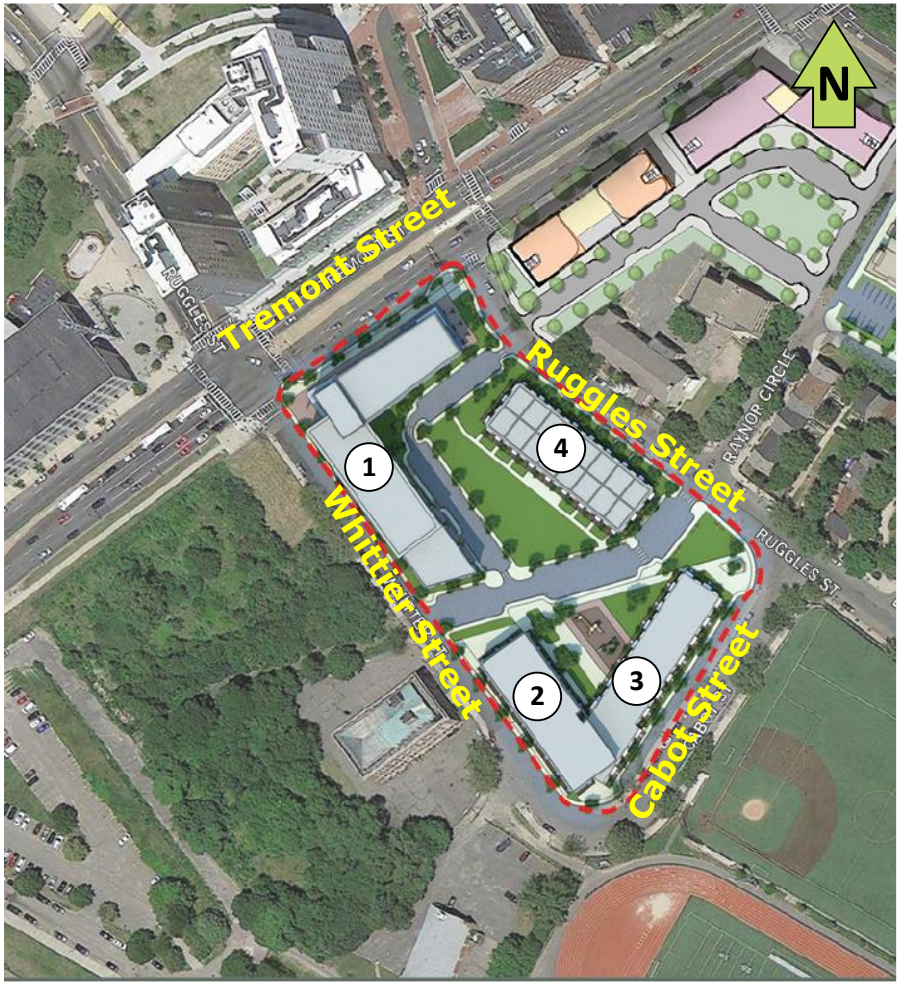


Figure 3: Site Plan of the proposed development
Credit: The Architectural Team

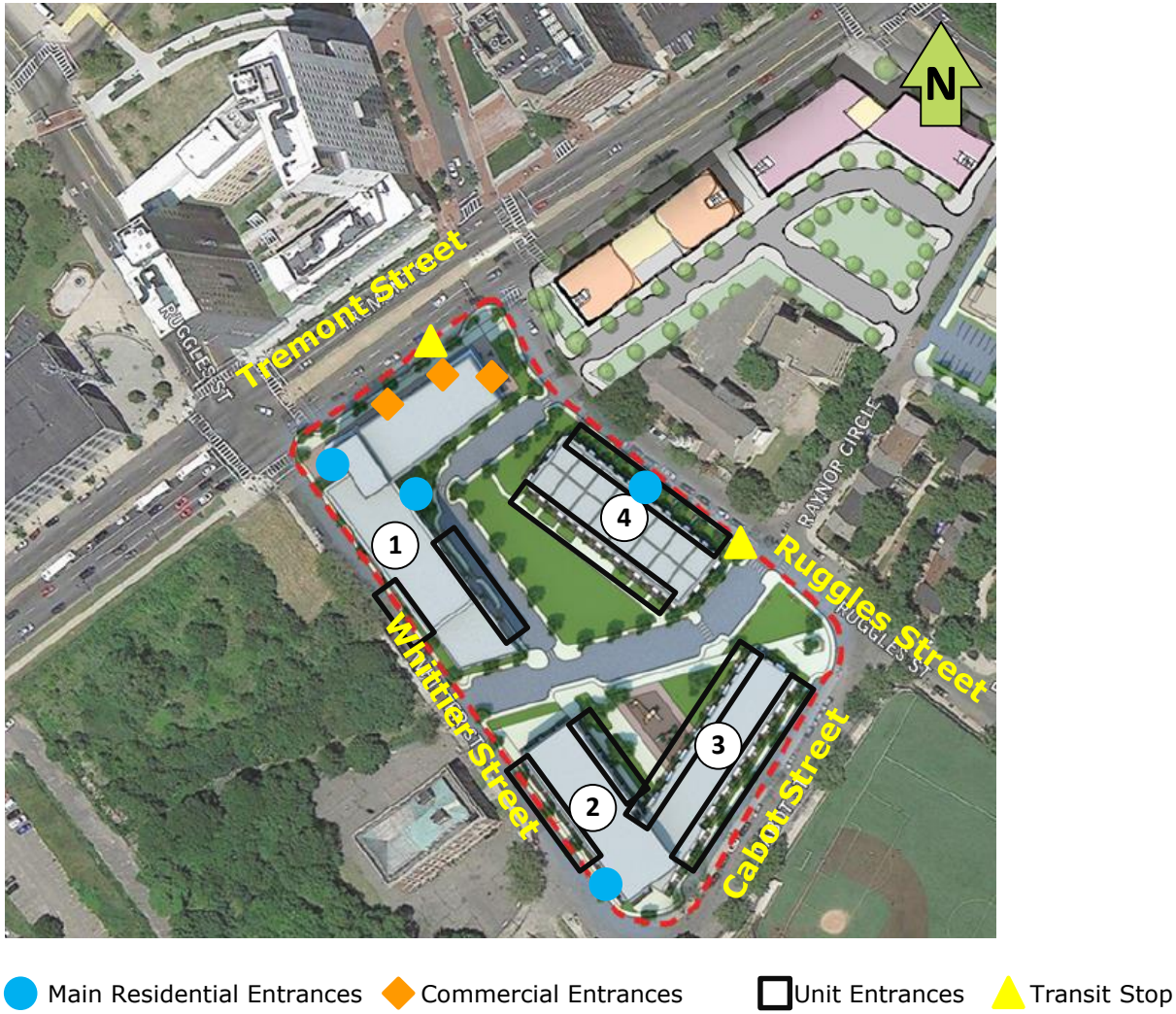


Figure 4: Areas of Interest

2.0 APPROACH

A preliminary qualitative study was conducted using computational fluid dynamics (CFD). As with any simulation, there are some limitations with this modeling technique, specifically in the ability to simulate the turbulence, or gustiness, of the wind. Nonetheless, CFD analysis remains a useful tool to identify potential wind issues, especially when assessing mean wind speeds. This CFD-based mean wind speed assessment employs a comparable analysis methodology to that used in wind tunnel testing. The results of CFD modelling are an excellent means of readily identifying relative changes in wind conditions associated with different site configurations or with alternative built forms.

2.1 Methodology

Wind comfort conditions for areas of interest were predicted on and around the development site to identify potentially problematic windy areas. A 3D model of the proposed development was provide on January 9, 2015 and floor plans were provided on January 22, 2014 by the architectural team. A view of the 3D model used in the computer wind comfort analysis is shown in **Figure 5**. This model included surrounding buildings within approximately 1600 ft from the study site. The simulations were performed using CFD software by Meteodyn Inc.

The entire 3D space throughout the modeled area is filled with a three-dimensional grid. The CFD virtual wind tunnel calculates wind speed at each one of the 3D grid points. The upstream "roughness" for each test direction is adjusted to reflect the various upwind conditions and wind characteristics encountered around the actual site. Wind speeds for a total of 16 compass directions were assessed. Although wind speeds are calculated throughout the entire modeled area, wind comfort conditions were plotted for a smaller area within approximately two blocks of the development site to reduce computational run time.

Wind flows were predicted for both the No Build, as well as the Build Configurations, for comparison purposes. The CFD-predicted wind speeds for all test directions and grid points were then combined with historical wind climate data for the region to predict the occurrence of wind speeds in the pedestrian realm, and to compare against the BRA wind comfort criteria and their Effective Gust Guideline. The analysis of wind conditions was undertaken for all four seasons (spring, summer, autumn, winter), however only the annual results are presented within the main body of this report. Results for individual seasons can be found in **Appendix A**.

Results are presented through discussion of the wind conditions along major streets and the areas of interest. The comfort criteria are based on predictions of localized wind forces combined with frequency of occurrence. Climate issues that influence a person's overall "thermal" comfort, (e.g., temperature, humidity, wind chill, exposure to sun or shade, etc.) are not considered in the comfort rating.

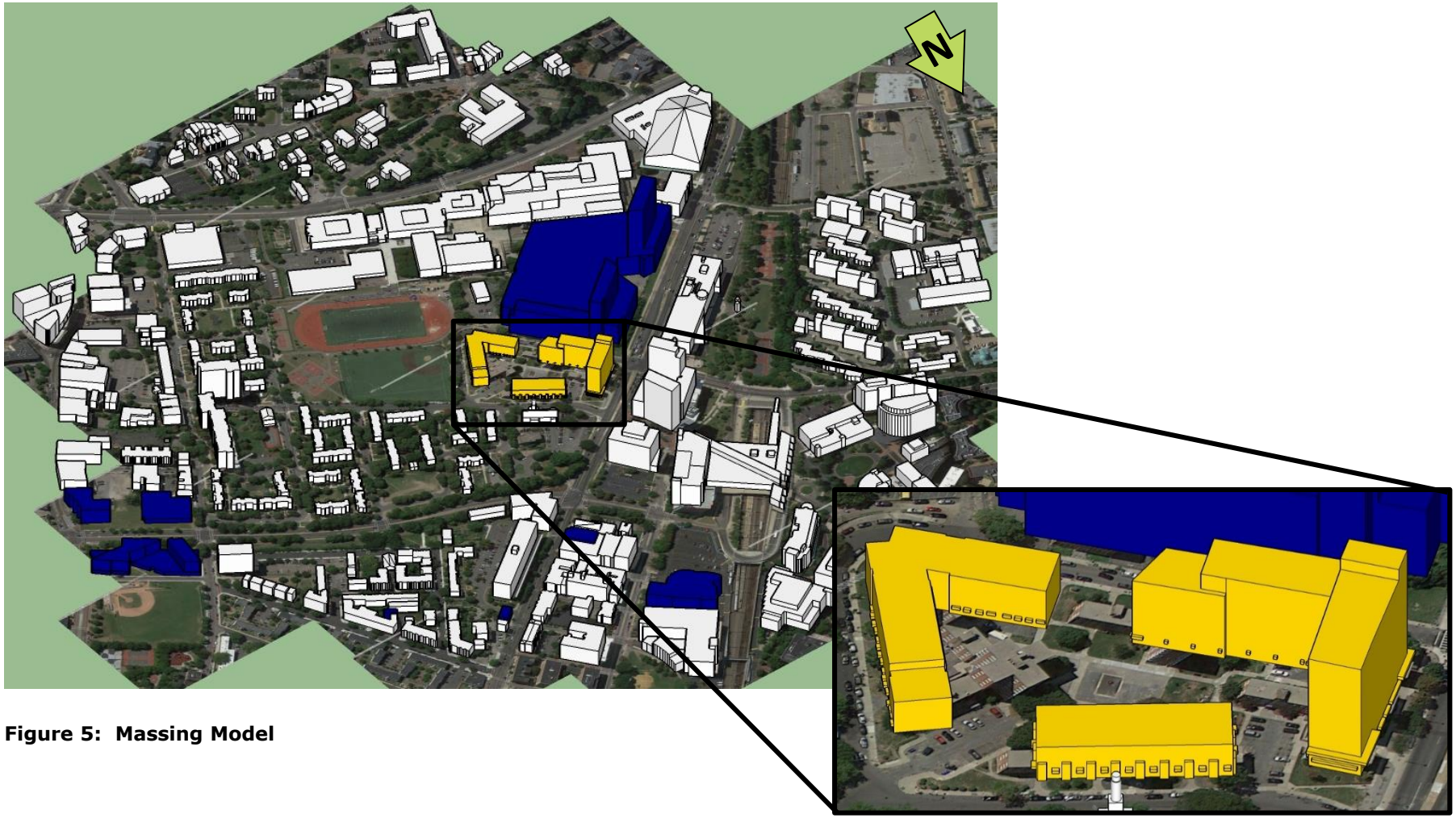


Figure 5: Massing Model

2.2 Wind Climate

Wind data recorded at Boston Logan International Airport for the period 1981 to 2011 were obtained and analysed to create a wind climate model for the seasonal extremes. Annual and seasonal wind distribution diagrams ("wind roses") are shown in **Figure 6a**. These diagrams illustrate the percentage of time wind blows from the 16 main compass directions. Of main interest are the longest peaks that identify the most frequently occurring wind directions. The annual wind rose indicates that wind approaching from the west-northwest, northwest and southwest directions are most prevalent. The seasonal wind roses readily show how the prevalent winds shift throughout the year.

The directions from which stronger winds (e.g., > 19 mph) approach are also of interest as they have the highest potential of creating problematic wind conditions, depending upon site exposure and the building configurations. The wind roses in **Figure 6a** also identify the directional frequency of these stronger winds, as indicated in the figure's legend colour key. On an annual basis, strong winds occur from the northwesterly and southwesterly sectors. All wind speeds and directions were included in the wind climate model.

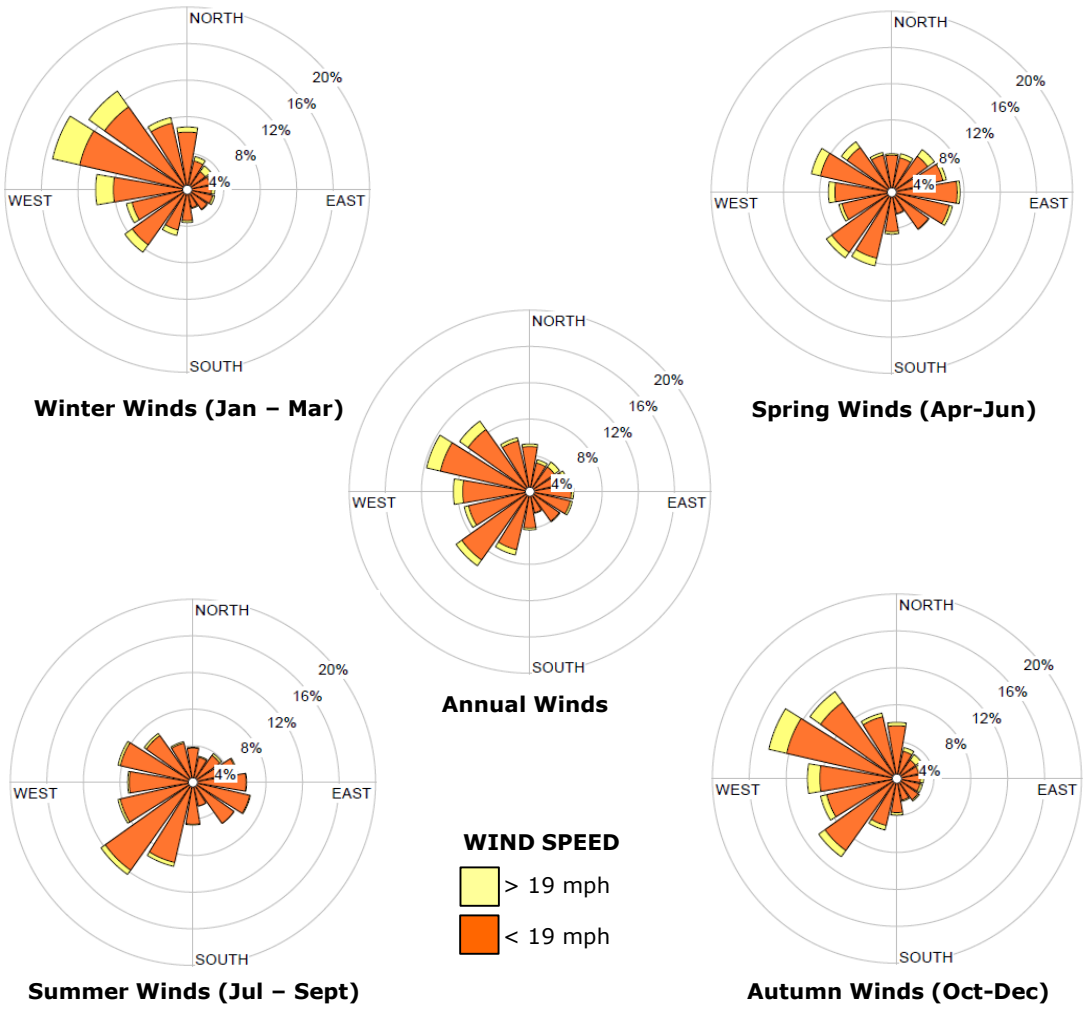


Figure 6a: Wind Roses for Boston Logan International Airport (1981-2011)

The thirty years of data were also analysed to generate wind roses that illustrate directionality associated with the BRA 1% wind criterion.

The mean wind speeds that occur 1% of the time were determined for each season and on an annual basis. The directional distribution is plotted in the wind roses shown in **Figure 6b**.

The annual wind rose indicates that for wind speeds above the 1% threshold of 27 mph, winds approaches most frequently from the west-northwest and northeast. In the spring, the 1% wind speed threshold is 26 mph and the dominant direction is northeast. In the summer season the 1% threshold wind speed is 21 mph and southwesterly winds prevail. The autumn 1% wind speed threshold is 21 mph and the most frequently occurring direction is west-northwest. During the winter the 1% threshold wind speed is highest at 28 mph, wherein the west-northwest and northeast winds prevail.

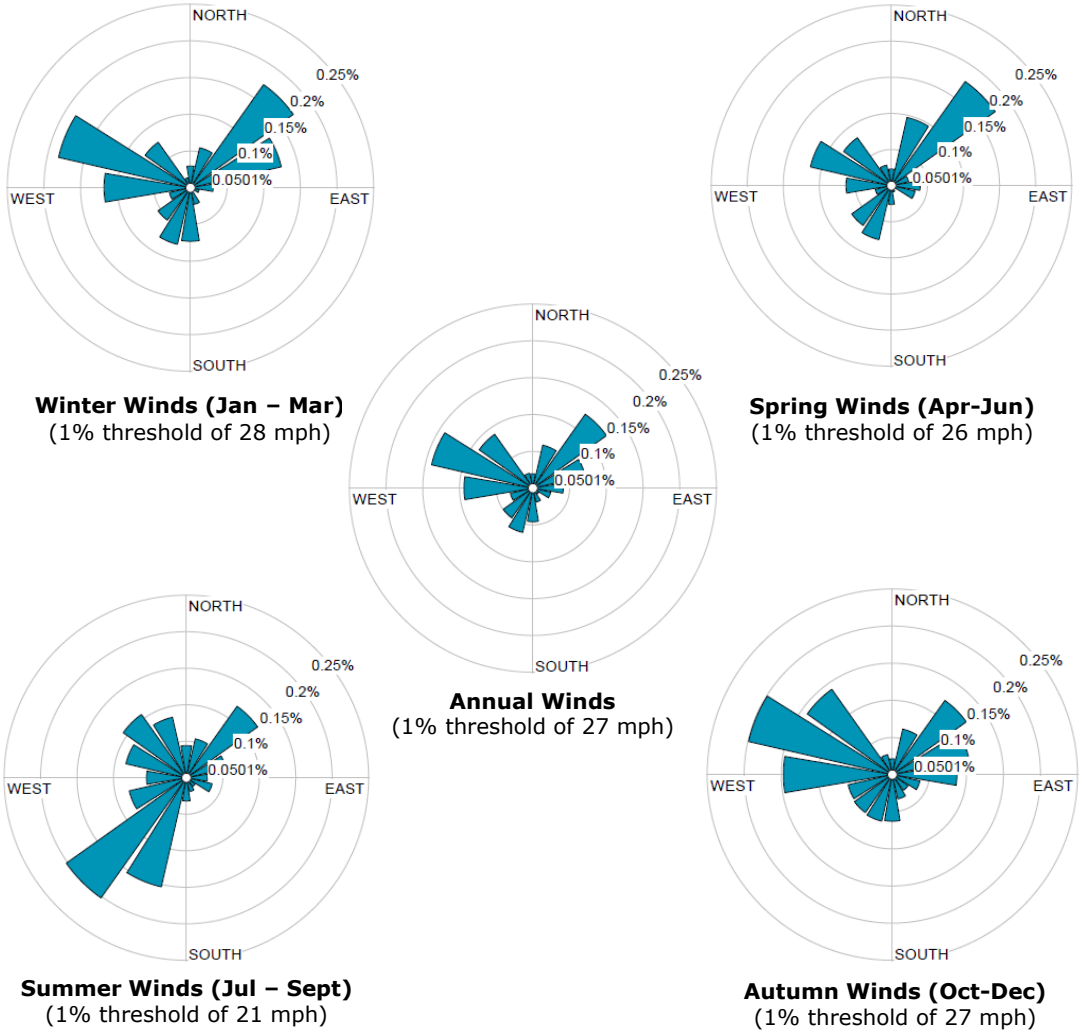


Figure 6b: Wind Roses for Boston Logan International Airport (1981-2011)
Winds Exceeded 1% of the Time

3.0 PEDESTRIAN WIND CRITERIA

The wind comfort conditions are discussed in terms of being acceptable for certain pedestrian activities and are based on wind force. Pedestrian activity, wind chill, clothing, humidity and exposure to direct sun, for example, all affect pedestrian (thermal) comfort; however, these influences are not considered in the BRA wind comfort criteria.

The criteria for wind comfort and safety used in this assessment are based on those adopted by the BRA for assessing pedestrian level winds. This criteria is based on the work of Melbourne. Information regarding the criteria can be found in **Section 7 – References**.

The wind comfort criteria, which is based on predicted hourly mean wind speeds being exceeded 1% of the time, are summarized in **Table 1**. A second method adopted by the BRA for evaluating wind comfort is a guideline based on effective gust wind speed. The effective gust velocity (defined as the mean hourly wind speed + 1.5 times the root mean square variation about the mean wind speed) of 31 mph should not be exceeded more than 1% of the time (approximately 18 hours per year). The BRA effective gust guideline is shown in **Table 2**.

The simulation of turbulence in CFD modeling has inherent challenges in terms of simulating turbulent flow conditions. The CFD software used in this study includes turbulence modelling which allowed for an effective gust analysis. The results of the CFD wind comfort analysis remain qualitative, but they do provide insight into relative changes between the No Build and Build Configurations. In summary, wind tunnel simulations remain the best tool to quantify wind effects associated with turbulence and (effective) gust.

Table 1: BRA Wind Comfort Criteria

Activity	Comfort Ranges for Mean Wind Speed Criteria Exceeded 1% of the Time		Melbourne Criteria Wind Category
Sitting	≤ 12mph	≤ 5 m/s	1
Standing	12 to ≤ 15 mph	> 5 ≤ 7 m/s	2
Walking	15 to ≤ 19 mph	7 to ≤ 8.5 m/s	3
Uncomfortable	19 and ≤ 27 mph	8.5 to ≤ 12 m/s	4
Unacceptable - Dangerous	> 27 mph	> 12 m/s	5

Table 2: BRA Effective Gust Guideline

Acceptability	Exceeded 1% of the Time *(Mean Wind Speed + 1.5 Times Root Mean Square)*	
Meets Guidelines	≤ 31 mph	≤ 13.9 m/s

Note: Mean wind speed criteria based on Melbourne criteria.

4.0 WIND COMFORT RESULTS

Figures 7a through **8** present graphical images of the wind comfort conditions on an annual basis around the proposed development. The "comfort zones" shown are based on an integration of wind speed and frequency for all 16 wind directions tested with the seasonal wind climate model. The comfort zones relate directly to the BRA's 1% wind criteria categories, and, although this CFD assessment is qualitative in nature, the analysis method to derive the resultant wind comfort categories follows typical wind tunnel-based practices.

This assessment does not account for the presence of mature trees throughout the area, thus wind comfort conditions for months when foliage is present would tend to be better than those predicted.

There are generally accepted wind comfort levels that are desired for various pedestrian uses. For example, for public sidewalks, wind comfort suitable for **walking** would be desirable year-round. For main entrances and transit stops, wind conditions conducive to **standing** would be preferred throughout the year, but can be difficult to achieve in regions where winter winds are inherently harsh. For amenity spaces, wind conditions suitable for **sitting** and/or **standing** are generally desirable during the summer months. The most stringent category of **sitting** is considered appropriate for cafes and dedicated seating areas, while for public parks **sitting** and/or **standing** would be appropriate in the summer.

Directional references around on and around the site will be made to construction north, which is 35° counter-clockwise from true north.

4.1 Tremont Street

In the No Build Configuration, wind conditions along Tremont Street are generally uncomfortable west of Ruggles Street and suitable for walking or better east of Ruggles Street, on an annual basis **(Figure 7a**). Dangerous wind conditions occur at the northeast corner of the proposed Tremont Crossing, as well as at the intersection of Tremont Street and Whittier Street. Wind conditions at the existing transit stop on Tremont Street are uncomfortable on an annual basis.

In the Build Configuration, wind conditions along Tremont Street improve west of Whittier Street to be comfortable for walking, and remain comfortable for walking or better east of Ruggles Street. Between Whittier Street and Ruggles Street wind conditions remain uncomfortable **(Figure 7b**). At the northeast corner of Building 1, including the existing transit stop, wind conditions are rated as dangerous on an annual basis. It is recommended that the existing bus shelter remain to provide protection for patrons during stronger winds.

As the dangerous wind conditions at the northeast corner of the proposed development are due to the building itself, we recommend wind control measures be incorporated into the design. These will be described in **Section 6**.

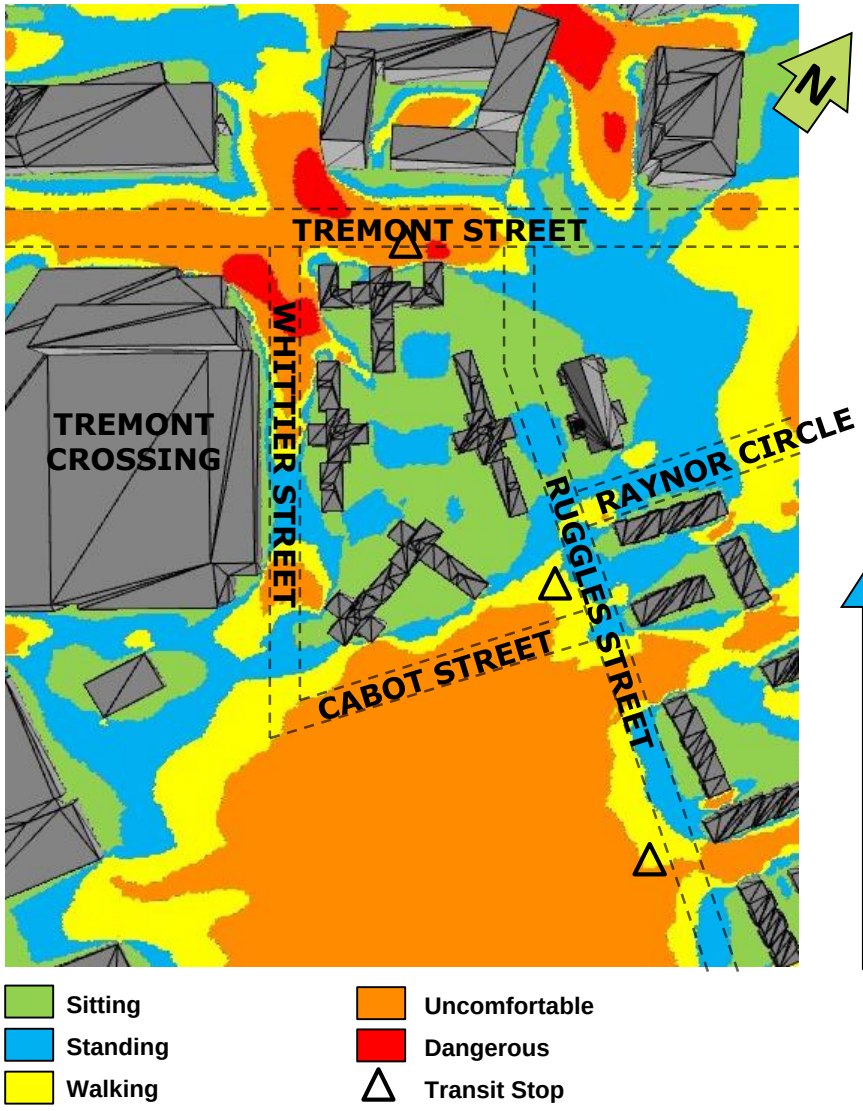


Figure 7a: Pedestrian Wind Comfort – No Build, Annual

Construction North

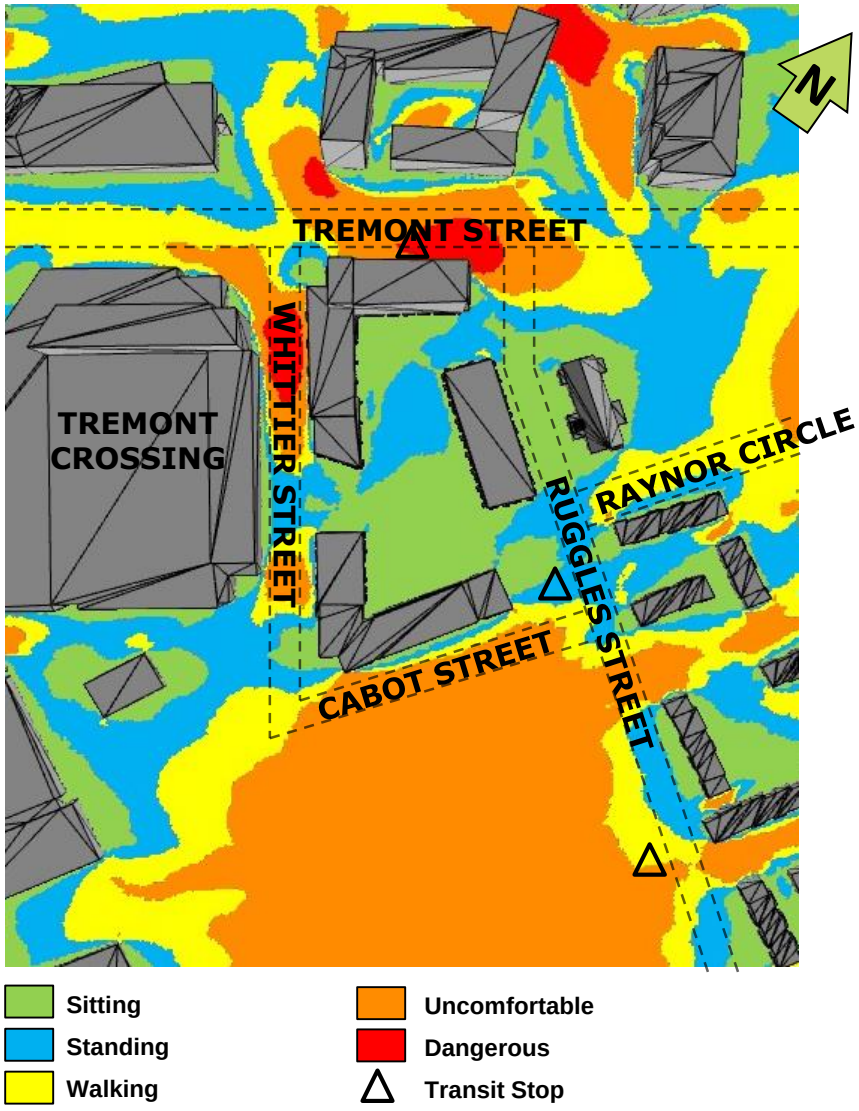


Figure 7b: Pedestrian Wind Comfort – Build, Annual

4.2 Whittier Street

In the No Build Configuration, wind conditions along Whittier Street are generally uncomfortable, although some areas toward the south are rated suitable for standing on an annual basis (**Figure 7a**). At the northeast corner of the Tremont Crossing development, wind conditions are considered dangerous.

In the Build Configuration, wind conditions generally remain uncomfortable on an annual basis **(Figure 7b**). The channeling of the predominant westerly and northwesterly winds along Whittier Street (due to the masses of Building 1 and Tremont Crossing) cause the dangerous wind conditions noted in the Existing Configuration to shift south along Whittier Street. We recommend wind control measures in this area (see **Section 6**). Otherwise, wind conditions on Whittier Street in the Build Configuration are generally similar to those of the No Build Configuration.

4.3 Cabot Street

In the No Build Configuration, annual wind conditions are uncomfortable along Cabot Street (**Figure 7a**). In the Build Configuration, wind conditions remain unchanged with the addition of the proposed development **(Figure 7b**).

4.4 Ruggles Street

In the No Build Configuration wind conditions along Ruggles Street are generally comfortable for sitting or standing (**Figure 7a**). However, just east of Cabot Street, wind conditions are uncomfortable on an annual basis. At the two transit stops along Ruggles, wind conditions are suitable for walking.

In the Build Configuration, wind conditions along Ruggles Street are generally similar to the No Build Configuration. The exception is at the intersection with Tremont Street, where wind conditions are uncomfortable and/or dangerous (**Figure 7b**). Wind control measures for this area will be described in **Section 6**. At the transit stop at Cabot Street, wind conditions improve to be comfortable for standing on an annual basis, while wind conditions at the other transit stop remain suitable for walking.

4.5 Proposed Development

In the Build Configuration, wind conditions at all the main entrances are comfortable for sitting on an annual basis **(Figure 8**). As wind conditions conducive to standing or better are desired at main entrances, these wind conditions are considered ideal.

Around Building 1, retail and individual entrances located on the east facades are comfortable for sitting on an annual basis (**Figure 8**). However, along the north and west facades wind conditions are rated as uncomfortable and/or dangerous. At the unit entrances for Building 2/3 wind conditions are generally comfortable for sitting. The exception was on the west side of Building 2, where some unit entrances are suitable for walking or are considered uncomfortable. Individual unit entrances to Building 4 are comfortable for sitting on an annual basis (**Figure 8**). We recommend the incorporation of wind control measures for Buildings 1 and 2, which will be described in **Section 6**.

In the central courtyard, wind conditions are comfortable for sitting or standing on an annual basis (**Figure 8**). These wind conditions are considerd ideal for any outdoor amenity spaces that may be planned in this area.

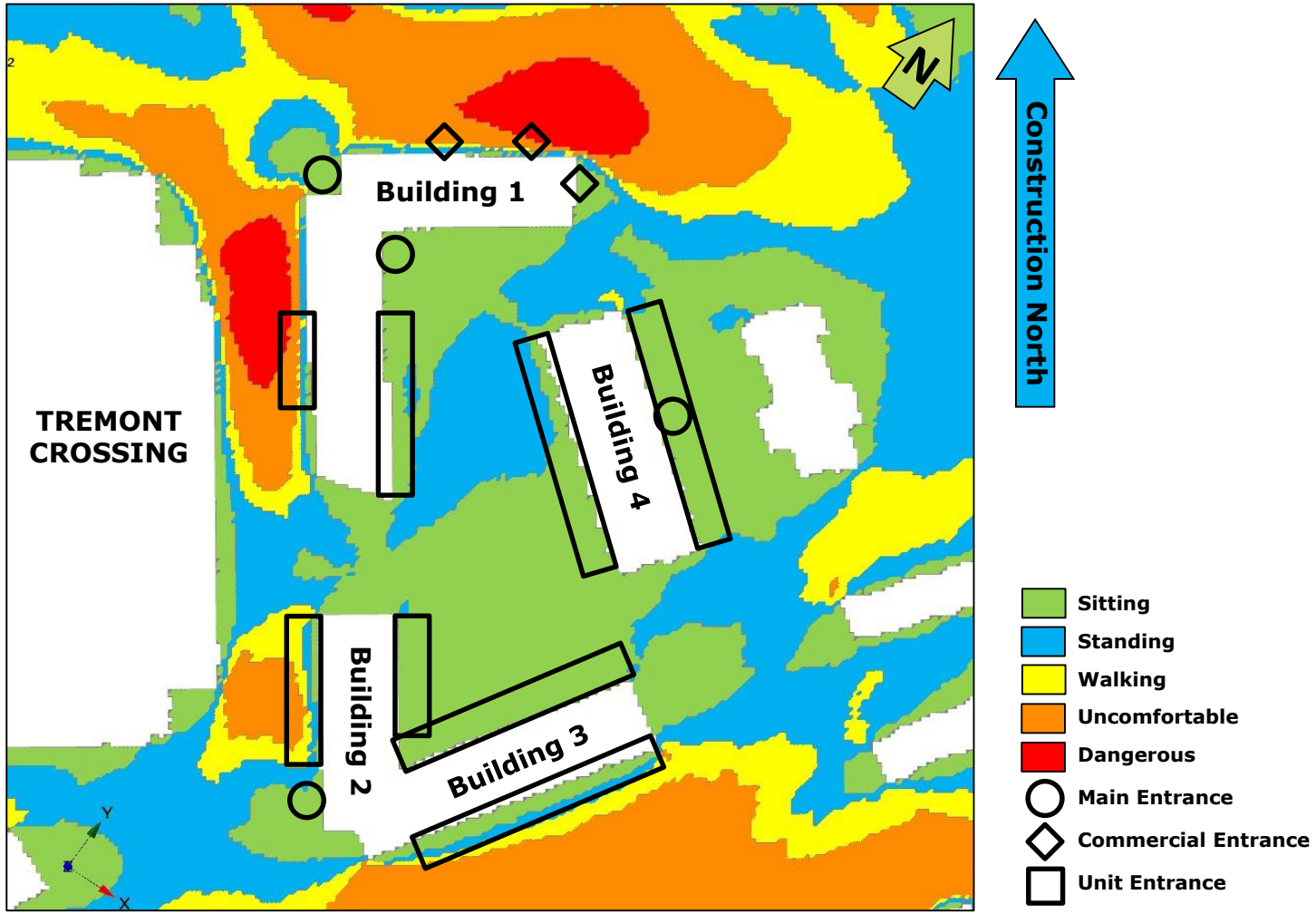


Figure 8: Pedestrian Wind Comfort – Build, Annual, Buildings Removed
(buildings removed for ease of viewing)

5.0 EFFECTIVE GUST RESULTS

BRA utilizes an effective gust guideline to assess developments in terms of their potential to exceed a 31 mph effective gust wind speed, which the BRA considers as a threshold of acceptance. The results of this analysis are presented in **Figures 9a** and **9b** on an annual basis for the No Build and Build Configurations.

5.1 Surrounding Streets

The wind gust guideline is exceeded along portions of Tremont Street, Whittier Street and Cabot Street in the No Build Configuration (**Figure 9a**). The wind gust guideline is also exceeded north of Tremont Street near an existing tower, and south of Cabot Street in the sports field.

In the Build Configuration, areas of exceedance of the wind gust guideline are generally similar to those of the No Build Configuration **(Figure 9b**). With the proposed development in place, the area of exceedance at the northeast corner of the proposed Tremont Crossing is reduced and shifted south along Whittier Street. At the northeast corner of Building 1, the area of exceedance of the gust guideline is enlarged, wrapping around the corner of the building. On the sports fields, the area of exceedance of the gust guideline is enlarged in the Build Configuration.

Of note, many of the exceedances of the gust criterion occur in the No Build Configuration, illustrating they are an existing issue. However, we still recommend the incorporation of wind control measures for Building 1, in order to improve wind conditions locally; details will be provided in **Section 6**.

5.2 Proposed Development

In the Build Configuration, the wind gust guideline is exceeded at the northeast corner of Building 1, along both Tremont Street and Whittier Street. Exceedance of the gust guideline also occurs at the southwest corner of Building 2/3. The wind gust criterion is met throughout the courtyard between the proposed buildings. Recommendations to improve wind conditions are provided in **Section 6** for Buildings 1, 2 and 3.

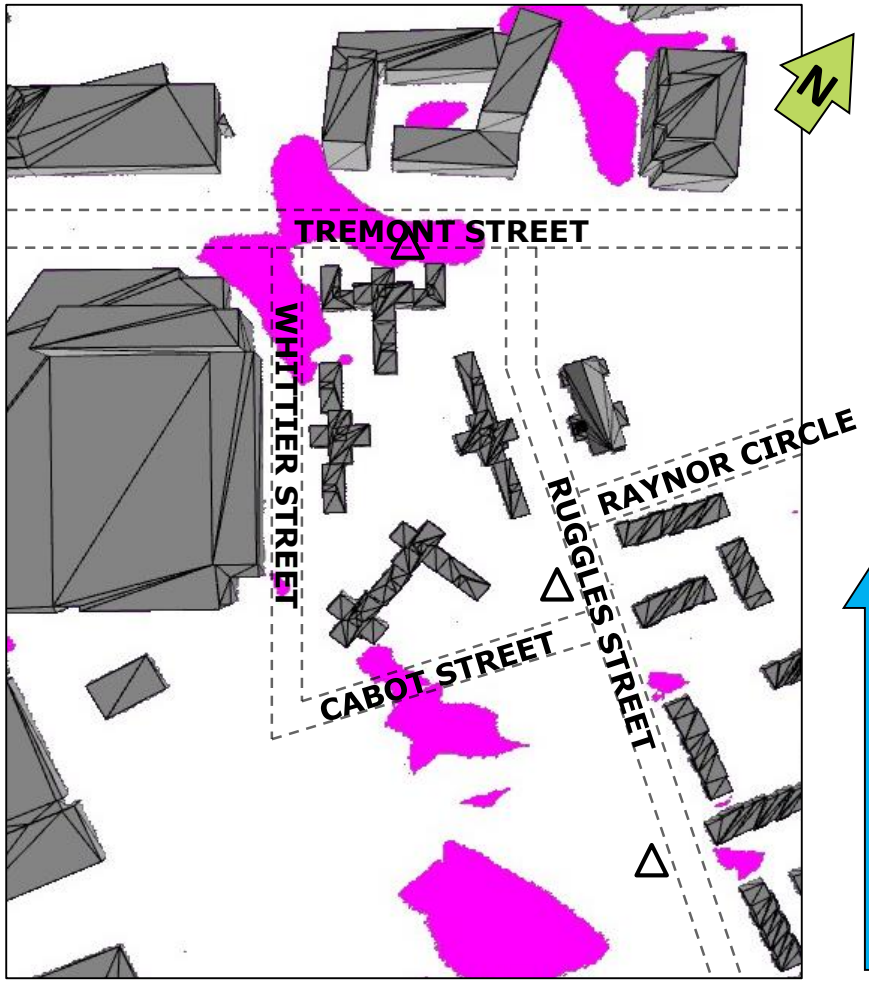


Figure 9a: Effective Wind Gust – No Build, Annual

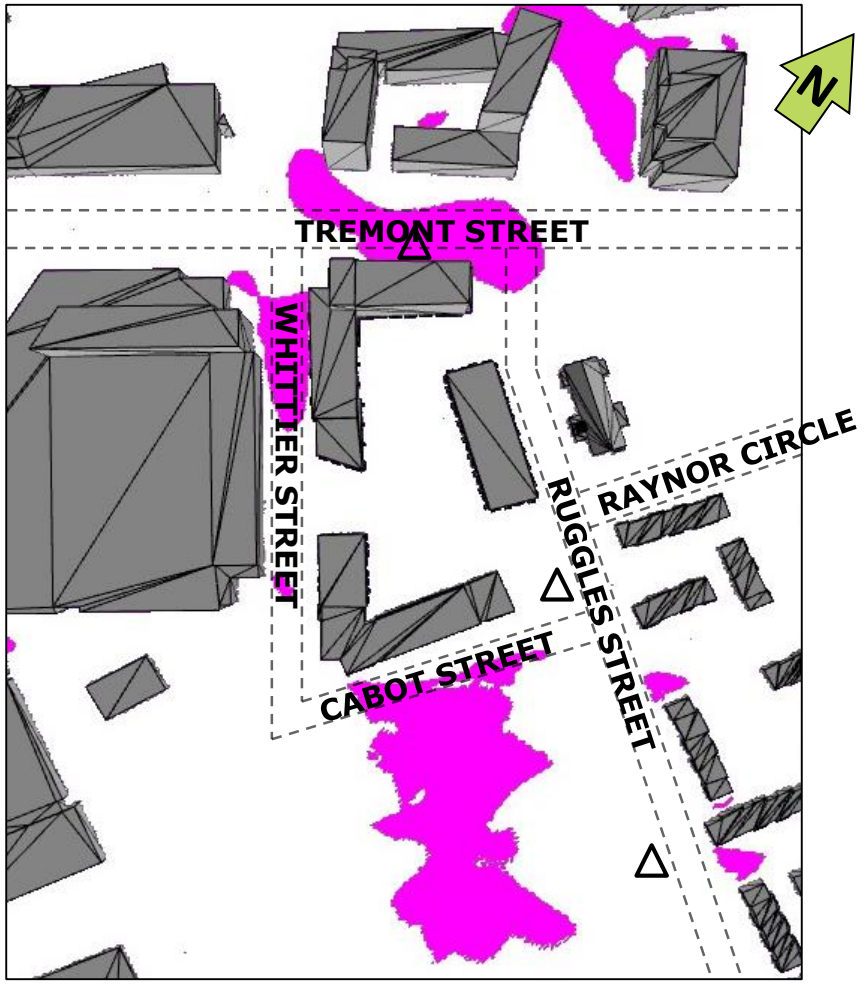


Figure 9b: Effective Wind Gust – Build, Annual

Construction North

6.0 RECOMMENDATIONS

To improve annual wind comfort and curtail the exceedance of the effective gust guideline, we recommend the design team consider the following recommendations:

- The dangerous and gusty wind conditions at the northeast corner of Building 1 are due to the downwashing of the prevailing northwesterly winds around the northeast corner of the building (**Figure 10**). To minimize these issues, we recommend the design team consider massing changes to Building 1. Options to consider (either in concert or individually) include:
    - Chamfering the northeast corner, with a minimum setback of 15 ft from the current corner.
    - Stepping the northeast corner (Figure 11).
    - Incorporating a horizontal element (i.e., podium or canopy) between the second and fourth floors along the north and east facades. This should be a minimum of 15 ft wide.
    - Extending the upper canopy along the entire north façade, with a minimum width of 15 ft. The extension of this canopy around the east side is a positive design feature that should be kept.
    - Incorporate a colonnade along the west façade, to provide pedestrians with a calmer area in which to walk.
- Include marcescent landscaping (in the form of trees) along Tremont Street and Whittier Street to improve comfort conditions.
- Along Whittier Street, the dangerous and gusty winds are due to the interaction of the proposed development with the nearby Tremont Crossing and the prevailing northwesterly winds channeling along the street. To improve wind conditions in this area, the design team should consider (either):
    - Incorporating a horizontal element (i.e., podium or canopy) between the second and fourth floors along the west facade of Building 1. This should be a minimum of 15 ft wide.
    - Incorporate a colonnade along the west façade, to provide pedestrians with a calmer area in which to walk.
- For the individual unit entrances along the west facade of Building 2 we recommend including marcescent landscaping along the sidewalk, as well as individual wind screens on the north side of each door.

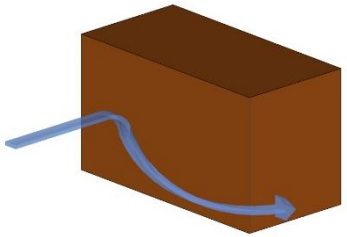


Figure 10: Downwashing flows concentrated to corner

Figure 11: Setback Corners

7.0 CONCLUSIONS

The annual pedestrian wind comfort conditions for the proposed Whittier Street development have been assessed through CFD techniques. This assessment is in support of the Extended Project Notification Form (EPNF) review with the Boston Redevelopment Authority (BRA). Based on the results of the assessment, the following conclusions are presented:

- The BRA effective gust guideline was exceeded in both the No Build and Build Configurations in the vicinity of the proposed development. Recommendations have been provided to improve local wind conditions.
- The main entrances for each of the proposed building are well situated and have wind conditions suitable for the intended usage.
- Wind conditions on and around the proposed development are generally suitable for the intended usage. The exceptions are along Tremont Street and Whittier Street, particularly in the vicinity of Building 1. Wind control measures have been recommend for these areas.
- On the surrounding streets, wind conditions in the Build Configuration were generally similar to the No Build Configuration.
- We recommend the design team consider a more detailed wind comfort analysis (i.e., wind tunnel testing) moving forward.

8.0 ASSESSMENT APPLICABILITY

This assessment is based on computer modeling techniques and provides a qualitative overview of the pedestrian wind comfort conditions on and surrounding the proposed development site. Any subsequent alterations to the design may influence these findings, possibly requiring further review by Novus.

Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,
Novus Environmental Inc.

Jenny Vesely, B.Eng., EIT
Scientist – Microclimate

Tahrana Lovlin, MAES, P.Eng.
Specialist - Microclimate

9.0 REFERENCES

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

BRA Development Review Guidelines 2006.

Durgin, F.H. (1997) "Pedestrian level wind criteria using the equivalent average" *Journal of Wind Engineering and Industrial Aerodynamics* 66.

Wu, H., C.J. Williams, H.A. Baker and W.F. Waechter (2004) "Knowledge-based Desk-top Analysis of Pedestrian Wind Conditions", ASCE Structures Conference 2004.

Caniot, Guillaume, Li, Wang, and Dupont, Guillaume (2011) "Validations and Applications of a CFD Tool Dedicated to Wind Assessment in Urban Areas".

Dupont, G., Clarenc, T., and Leyronnas, P. (2009) "UrbaWind Use of a CFD model for modeling the wind in Urban Area". International Small Wind Conference 2009, Watford, UK.

Irwin, P.A. (2004) "Overview of ASCE Report on Outdoor Comfort Around Buildings: Assessment and Methods of Control" ASCE Structures Conference 2004.

Franke, J., Hirsch, C., Jensen, A.G., et al. (2004) "Recommendations on the use of CFD in Wind Engineering". Proc. Int. Conf. Urban Wind Eng. Build. Aerodyn, von Karman Institute, Sint-Genesius-Rode, Belgium, 5-7 May, 2004.

Appendix A

Pedestrian Wind Comfort Analysis

Winter (January – March), Spring (April – June),
Summer (July – September), Autumn (October – December)

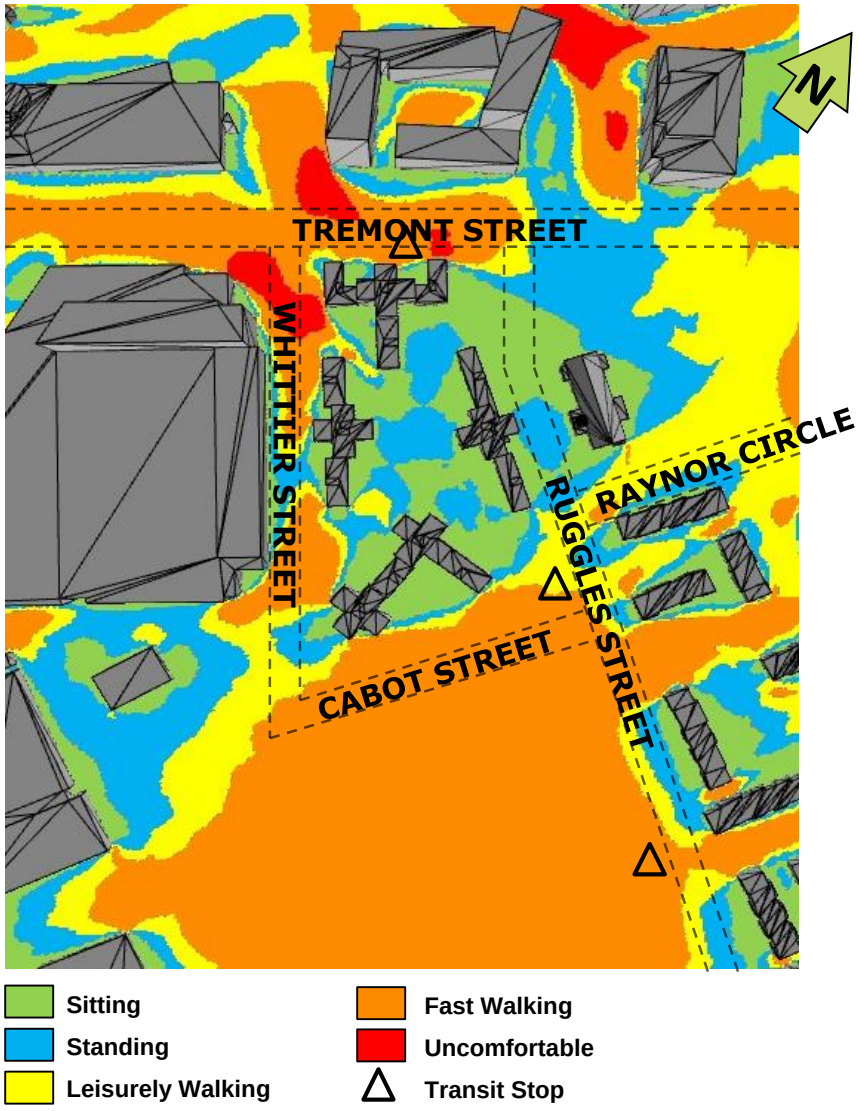


Figure A1a: No Build Configuration – Grade – Winter

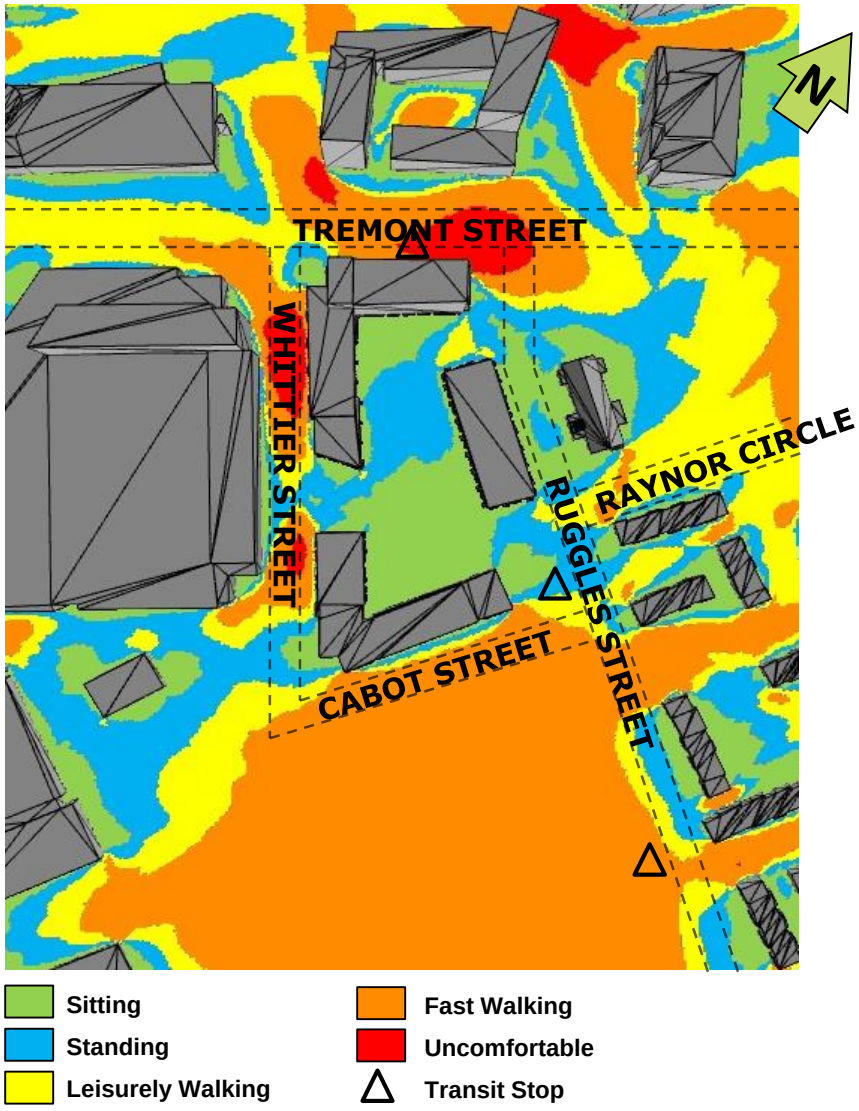


Figure A1b: Build Configuration – Grade – Winter

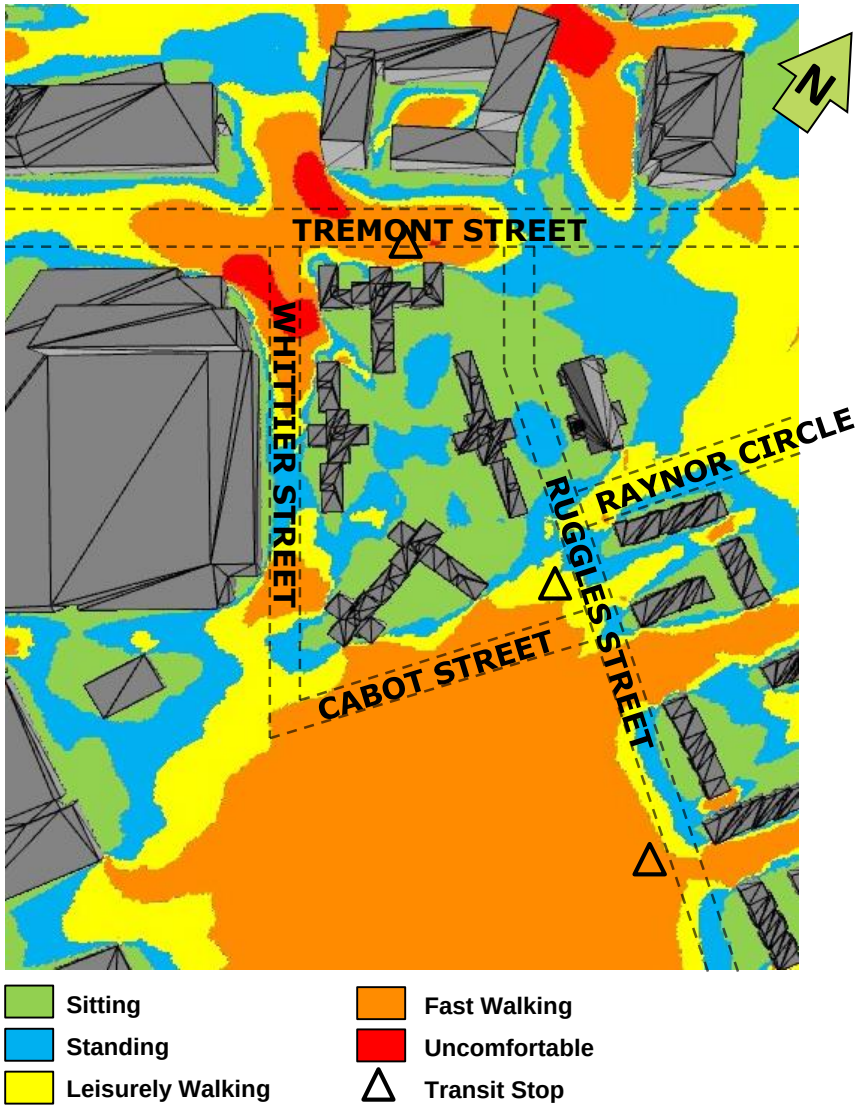


Figure A2a: No Build Configuration – Grade – Spring

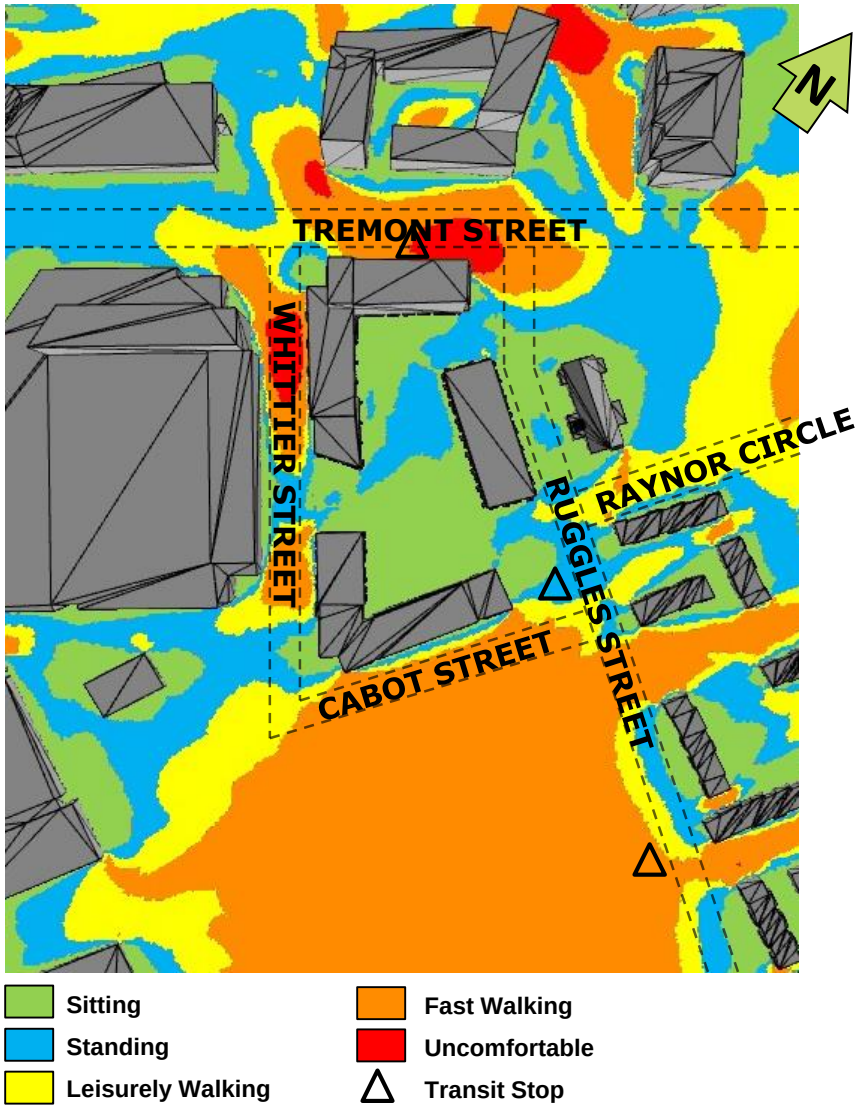


Figure A2b: Build Configuration – Grade – Spring

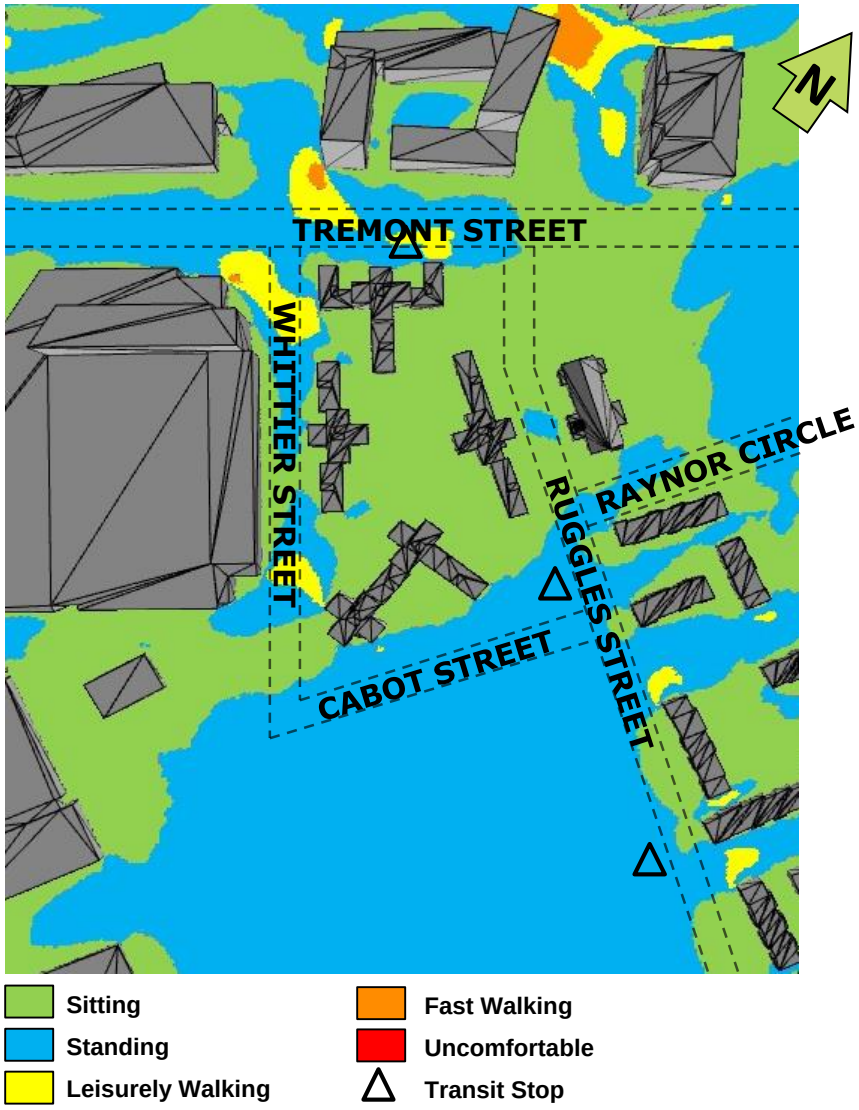


Figure A3a: No Build Configuration – Grade – Summer

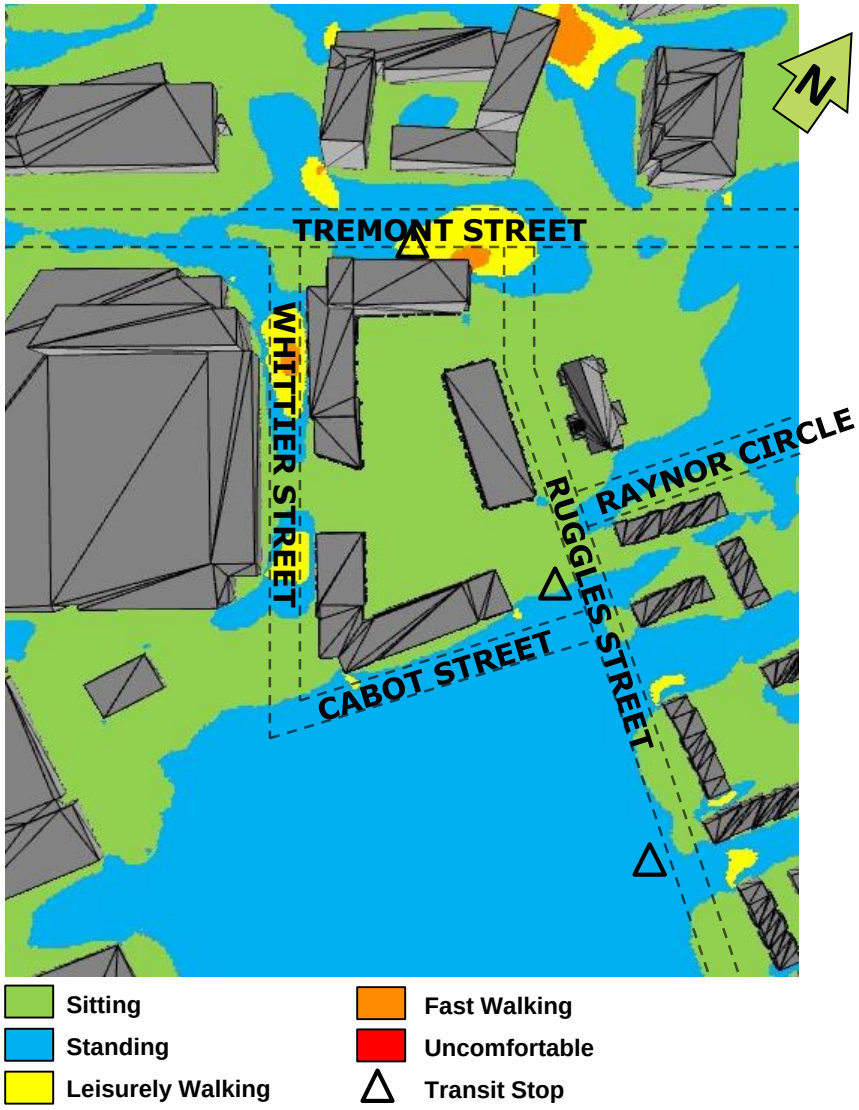


Figure A3b: Build Configuration – Grade – Summer

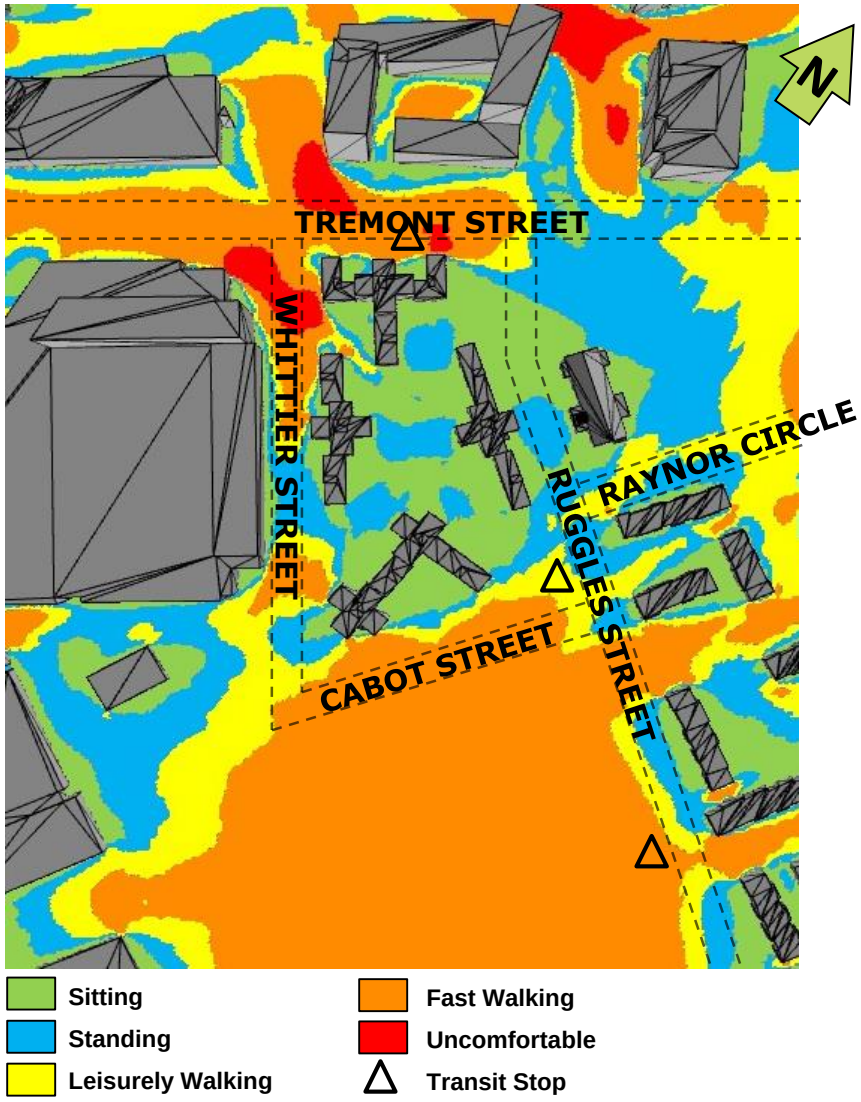


Figure A4a: No Build Configuration – Grade – Autumn

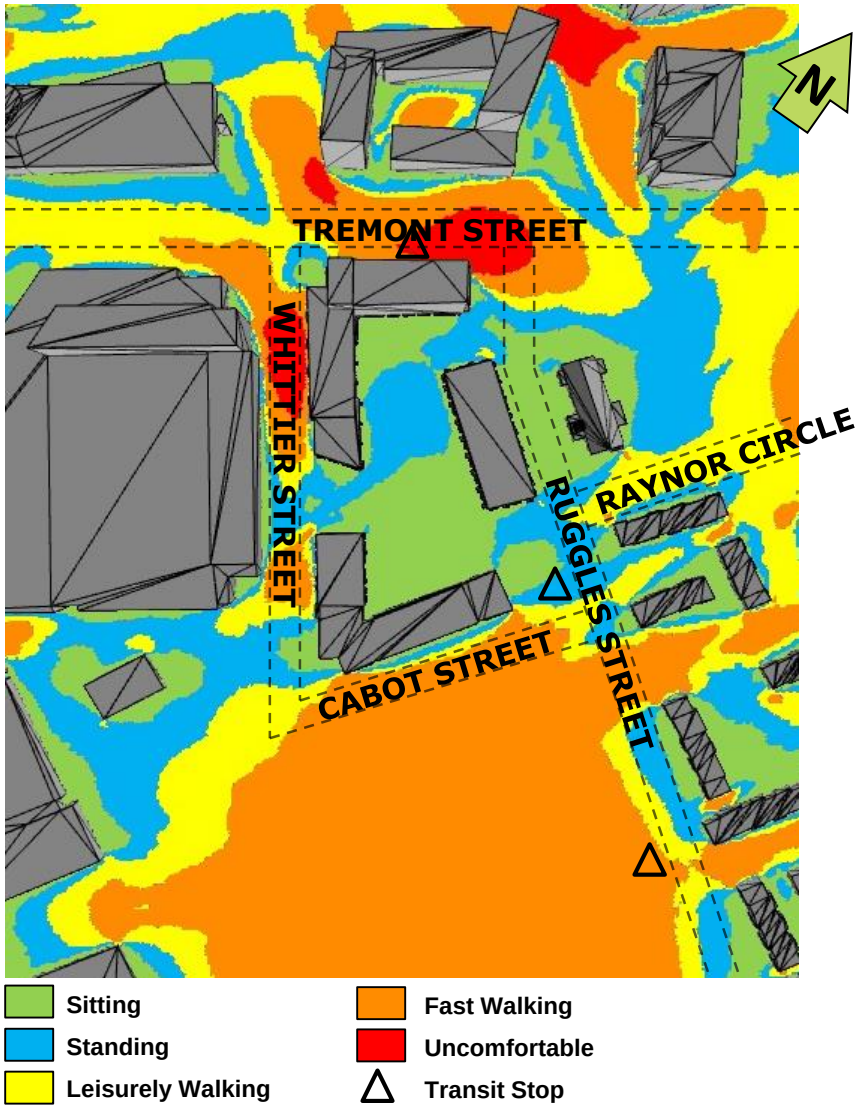


Figure A4b: No Build Configuration – Grade – Autumn

Appendix D

ACCESIBILITY CHECKLIST

Accessibility Checklist

(to be added to the BRA Development Review Guidelines)

In 2009, a nine-member Advisory Board was appointed to the Commission for Persons with Disabilities in an effort to reduce architectural, procedural, attitudinal, and communication barriers affecting persons with disabilities in the City of Boston. These efforts were instituted to work toward creating universal access in the built environment.

In line with these priorities, the Accessibility Checklist aims to support the inclusion of people with disabilities. In order to complete the Checklist, you must provide specific detail, including descriptions, diagrams and data, of the universal access elements that will ensure all individuals have an equal experience that includes full participation in the built environment throughout the proposed buildings and open space.

In conformance with this directive, all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding the following:

- improvements for pedestrian and vehicular circulation and access;
- encourage new buildings and public spaces to be designed to enhance and preserve Boston's system of parks, squares, walkways, and active shopping streets;
- ensure that persons with disabilities have full access to buildings open to the public;
- afford such persons the educational, employment, and recreational opportunities available to all citizens; and
- preserve and increase the supply of living space accessible to persons with disabilities.

We would like to thank you in advance for your time and effort in advancing best practices and progressive approaches to expand accessibility throughout Boston's built environment.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
    a. http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
    a. http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Boston Complete Street Guidelines
    a. http://bostoncompletestreets.org/
4. City of Boston Mayors Commission for Persons with Disabilities Advisory Board
    a. http://www.cityofboston.gov/Disability
5. City of Boston – Public Works Sidewalk Reconstruction Policy
    a. http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
6. Massachusetts Office On Disability Accessible Parking Requirements
    a. www.mass.gov/anf/docs/mod/hp-parking-regulations-mod.doc
7. MBTA Fixed Route Accessible Transit Stations
    a. http://www.mbta.com/about_the_mbta/accessibility/

Project Information

Project Name:	**Whittier Choice Neighborhood – Building 1**
Project Address Primary:	**1158 Tremont Street**
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	**Cory Mian, Vice President for Real Estate Development, Preservation of Affordable Housing, cmian@poah.org, 617-449-0867**

Team Description

Owner / Developer:	**Owner: Boston Housing Authority** **Developer: POAH Madison Associates LLC.**
Architect:	**The Architectural Team, Inc.**
Engineer (building systems):	**Nitsch Engineering**
Sustainability / LEED:	**New Ecology, Inc.**
Permitting:	**Fort Point Associates, Inc.**
Construction Management:	**TBD**

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)	*Residential Units and Residential Lobby*			

What is the Construction Type – select most appropriate type?

	Wood Frame	Masonry	Steel Frame	Concrete

Describe the building?

Site Area:	*165,194 SF*	Building Area:	*472,095 SF*
Building Height:	*60 Ft.*	Number of Stories:	*5 Flrs.*
First Floor Elevation:	*Elev.*	Are there below grade spaces:	*No*

Assessment of Existing Infrastructure for Accessibility:

This section explores the proximity to accessible transit lines and proximate institutions such as, but not limited to hospitals, elderly and disabled housing, and general neighborhood information. The proponent should identify how the area surrounding the development is accessible for people with mobility impairments and should analyze the existing condition of the accessible routes through sidewalk and pedestrian ramp reports.

Provide a description of the development neighborhood and identifying characteristics.	The Whittier Street Project is located in a transitional area of Roxbury along the Tremont Street corridor. To the south is Madison Park, one of Roxbury's long-standing residential communities. To the north across Tremont Street is Northeastern University's recently developed International Village. To the east is a vacant site, referred to as the Crescent Parcel. And to the west is another vacant parcel known as P-3 that is slated for redevelopment.
List the surrounding ADA compliant MBTA transit lines and the proximity to the development	The Project is located 0.2-miles from the Ruggles Station on the MBTA Orange Line and Commuter Rail. This station is accessible and provides constant subway and rapid-transit bus service on both weekday and weekend days.

site: Commuter rail, subway, bus, etc.	
List the surrounding institutions: hospitals, public housing and elderly and disabled housing developments, educational facilities, etc.	Northeastern University, Wentworth Institute of Technology, Roxbury Community College, Boston Public School North Zone Resource Center, John D. O'Bryant School of Mathematics & Science, Madison Park Technical Vocational High School, Boston Police, Greek Orthodox Cathedral of New England, St. Katherine Drexel Church, Good Shepherd Church of God, First Church of Roxbury, Whittier Street Health Center, Wing Memorial Hospital and Med Center, Boston Medical Center, Alice Taylor Family Housing, Highland Park Family Housing, Camden Family Housing, Martin Luther King Jr. Elderly/Disabled Housing,
Is the proposed development on a priority accessible route to a key public use facility? List the surrounding: government buildings, libraries, community centers and recreational facilities and other related facilities.	Boston Public Library Dudley Branch, Boston Municipal Court, US Post Office, Thomas Johnson Community Center, Madison Park Community Centerm Orchard Gardens Community Center, Eritrean Community Center, Cooper Community Center

Surrounding Site Conditions – Existing:

This section identifies the current condition of the sidewalks and pedestrian ramps around the development site.

Are there sidewalks and pedestrian ramps existing at the development site?	Yes
If yes above, list the existing sidewalk and pedestrian ramp materials and physical condition at the development site.	The sidewalks are in various conditions, with a few areas in states of disrepair.
Are the sidewalks and pedestrian ramps existing-to-remain? **If yes,** have the sidewalks and pedestrian ramps been verified as compliant? **If yes,** please provide surveyors report.	No, new sidewalks will be installed around each building in a phased manner.
Is the development site within a historic district? **If yes,** please identify.	No

Surrounding Site Conditions – Proposed

This section identifies the proposed condition of the walkways and pedestrian ramps in and around the development site. The width of the sidewalk contributes to the degree of comfort and enjoyment of walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Typically, a five foot wide Pedestrian Zone supports two people walking side by side or two wheelchairs passing each other. An eight foot wide Pedestrian Zone allows two pairs of people to comfortable pass each other, and a ten foot or wider Pedestrian Zone can support high volumes of pedestrians.

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? See: www.bostoncompletestreets.org	Yes.
If yes above, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, Boulevard.	Neighborhood Main
What is the total width of the proposed sidewalk? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone.	Frontage=3' minimum Pedestrian=5' minimum Furnishing Zone=1.5' minimum
List the proposed materials for each Zone. Will the proposed materials be on private property or will the proposed materials be on the City of Boston pedestrian right-of-way?	Frontage= landscaped with pedestrian connections to doors Pedestrian=cement concrete Furnishing Zone=permeable pavers
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the City of Boston Public Improvement Commission?	Not applicable
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way?	None
If yes above, what are the proposed dimensions of the sidewalk café or furnishings and what will the right-of-way clearance be?	Not applicable

Proposed Accessible Parking:

See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability Handicap Parking Regulations.

What is the total number of parking spaces provided at the development site parking lot or garage?	18 private on-site spaces will be eliminated as part of phase 1.
What is the total number of accessible spaces provided at the development site?	3 existing to remain in private on-site parking lot.
Will any on street accessible parking spaces be required? **If yes,** has the proponent contacted the Commission for Persons with Disabilities and City of Boston Transportation Department regarding this need?	Not that the project is aware of.
Where is accessible visitor parking located?	In private on-site parking lot.
Has a drop-off area been identified? **If yes,** will it be accessible?	No. But drop off can occur within the private on-site parking lot.
Include a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations. Please include route distances.	This will be provided as the design progresses. The project will provide accessible walkways around the site and to main entrances and emergency exits from the proposed building.

Circulation and Accessible Routes:

The primary objective in designing smooth and continuous paths of travel is to accommodate persons of all abilities that allow for universal access to entryways, common spaces and the visit-ability* of neighbors.

**Visit-ability – Neighbors ability to access and visit with neighbors without architectural barrier limitations*

Provide a diagram of the accessible route connections through the site.	This will be provided as the design progresses. The project will provide accessible walkways around the site, within the private on-site parking lot and to building entrances.
Describe accessibility at each entryway: Flush Condition, Stairs, Ramp Elevator.	Flush Condition.
Are the accessible entrance and the standard entrance integrated?	Yes they are the same.
If no above, what is the reason?	Not applicable.
Will there be a roof deck or outdoor courtyard space? **If yes,** include diagram of the accessible route.	Building 1 does not have roof deck space.
Has an accessible routes way-finding and signage package been developed? **If yes,** please describe.	Not at this time.

Accessible Units: (If applicable)

In order to facilitate access to housing opportunities this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing choice.

What is the total number of proposed units for the development?	83
How many units are for sale; how many are for rent? What is the market value vs. affordable breakdown?	All are affordable rental units
How many accessible units are being proposed?	4 units will be fully accessible

Article 80 | ACCESSIBILTY CHECKLIST

Please provide plan and diagram of the accessible units.	
How many accessible units will also be affordable? If none, please describe reason.	All accessible units will be affordable as the building will be 100% affordable.
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs at entry or step to balcony. **If yes,** please provide reason.	Townhouse style units have stairs, but the stairs serve private spaces within the units. The balance of the units are accessible via the elevator and interior corridor.
Has the proponent reviewed or presented the proposed plan to the City of Boston Mayor's Commission for Persons with Disabilities Advisory Board?	
Did the Advisory Board vote to support this project? **If no,** what recommendations did the Advisory Board give to make this project more accessible?	

Thank you for completing the Accessibility Checklist!

For questions or comments about this checklist or accessibility practices, please contact:

kathryn.quigley@boston.gov | Mayors Commission for Persons with Disabilities

Appendix E

CLIMATE CHANGE AND RESILIENCY CHECKLIST

Climate Change Preparedness and Resiliency Checklist for New Construction

In November 2013, in conformance with the Mayor's 2011 Climate Action Leadership Committee's recommendations, the Boston Redevelopment Authority adopted policy for all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding project resiliency, preparedness, and to mitigate any identified adverse impacts that might arise under future climate conditions.

For more information about the City of Boston's climate policies and practices, and the 2011 update of the climate action plan, ***A Climate of Progress***, please see the City's climate action web pages at http://www.cityofboston.gov/climate

In advance we thank you for your time and assistance in advancing best practices in Boston.

Climate Change Analysis and Information Sources:

1. Northeast Climate Impacts Assessment (www.climatechoices.org/ne/)
2. USGCRP 2009 (http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/)
3. Army Corps of Engineers guidance on sea level rise (http://planning.usace.army.mil/toolbox/library/ECs/EC11652212Nov2011.pdf)
4. Proceeding of the National Academy of Science, "Global sea level rise linked to global temperature", Vermeer and Rahmstorf, 2009 (http://www.pnas.org/content/early/2009/12/04/0907765106.full.pdf)
5. "Hotspot of accelerated sea-level rise on the Atlantic coast of North America", Asbury H. Sallenger Jr*, Kara S. Doran and Peter A. Howd, 2012 (http://www.bostonredevelopmentauthority.org/planning/Hotspot of Accelerated Sea-level Rise 2012.pdf)
6. "Building Resilience in Boston": Best Practices for Climate Change Adaptation and Resilience for Existing Buildings, Linnean Solutions, The Built Environment Coalition, The Resilient Design Institute, 2103 (http://www.greenribboncommission.org/downloads/Building_Resilience_in_Boston_SML.pdf)

Checklist

Please respond to all of the checklist questions to the fullest extent possible. For projects that respond "Yes" to any of the D.1 – Sea-Level Rise and Storms, Location Description and Classification questions, please respond to all of the remaining Section D questions.

Checklist responses are due at the time of initial project filing or Notice of Project Change and final filings just prior seeking Final BRA Approval. A PDF of your response to the Checklist should be submitted to the Boston Redevelopment Authority via your project manager.

Please Note: When initiating a new project, please visit the BRA web site for the most current Climate Change Preparedness & Resiliency Checklist.

A.1 - Project Information

Project Name:	**Whittier Choice Neighborhood**
Project Address Primary:	**1158 Tremont Street**
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	**Cory Mian, Vice President for Real Estate Development, Preservation of Affordable Housing, cmian@poah.org, 617-449-0867**

A.2 - Team Description

Owner / Developer:	**Owner: Boston Housing Authority** **Developer: POAH Madison Associates LLC.**
Architect:	**The Architectural Team, Inc.**
Engineer (building systems):	**Nitsch Engineering**
Sustainability / LEED:	**New Ecology, Inc.**
Permitting:	**Fort Point Associates, Inc.**
Construction Management:	**TBD**
Climate Change Expert:	**TBD**

A.3 - Project Permitting and Phase

At what phase is the project – most recent completed submission at the time of this response?

PNF / **Expanded PNF Submission**	Draft / Final Project Impact Report Submission	BRA Board Approved	Notice of Project Change
Planned Development Area	BRA Final Design Approved	Under Construction	Construction just completed:

A.4 - Building Classification and Description

List the principal Building Uses:	Residential
List the First Floor Uses:	*Residential Units and Residential Lobby*

What is the principal Construction Type – select most appropriate type?

Wood Frame	Masonry	Steel Frame	Concrete

Describe the building?

Site Area:	*165,194 SF*	Building Area:	*111,115 SF*
Building Height:	*60Ft.*	Number of Stories:	*5 Flrs.*
First Floor Elevation (reference Boston City Base):	*Elev.*	Are there below grade spaces/levels, if yes how many:	***No***

A.5 - 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?

Registered:	*Yes / No*	Certified:	*Yes / No*

A.6 - Building Energy

What are the base and peak operating energy loads for the building?

Electric:	*(kW)*	Heating:	*(MMBtu/hr)*
What is the planned building Energy Use Intensity:	*(kbut/SF or kWh/SF)*	Cooling:	*(Tons/hr)*

What are the peak energy demands of your critical systems in the event of a service interruption?

Electric:	*(kW)*	Heating:	*(MMBtu/hr)*
		Cooling:	*(Tons/hr)*

What is nature and source of your back-up / emergency generators?

Electrical Generation:	*(kW)*		Fuel Source:	
System Type and Number of Units:	Combustion Engine	Gas Turbine	Combine Heat and Power	*(Units)*

B - 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.

B.1 - Analysis

What is the full expected life of the project?

Select most appropriate:	10 Years	25 Years	50 Years	75 Years

What is the full expected operational life of key building systems (e.g. heating, cooling, ventilation)?

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?

/	*Deg.*

What Extreme Heat Event characteristics will be used for project planning – Peak High, Duration, and Frequency?

Deg.	*Days*	*Events / yr.*

What Drought characteristics will be used for project planning – Duration and Frequency?

Days	*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.	*7.2 Inches*	*2 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?

Peak Wind	*Hours*	*Events / yr.*

B.2 - Mitigation Strategies

What will be the overall energy performance, based on use, of the project and how will performance be determined?

Building energy use below code:	%
How is performance determined:	

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:				

What are the insulation (R) values for building envelop elements?

Roof:	*R* =	Walls / Curtain Wall Assembly:	*R* =
Foundation:	*R* =	Basement / Slab:	*R* =
Windows:	*R* = / *U* =	Doors:	*R* = / *U* =

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	None
Describe any added measures:				

Will the project employ Distributed Energy / Smart Grid Infrastructure and /or Systems?

Select all appropriate:	Connected to	Building will be	Connected to	Distributed

	local distributed electrical	Smart Grid ready	distributed steam, hot, chilled water	thermal energy ready

Will the building remain operable without utility power for an extended period?

	Yes / No	If yes, for how long:	*Days*
If Yes, is building "Islandable?			
If Yes, describe strategies:			

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
Describe other strategies:				

What measures will the project employ to accommodate rain events and more rain fall?

Select all appropriate:	On-site retention systems & ponds	**Infiltration galleries & areas**	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:				

C - 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.

C.1 - Location Description and Classification:

Do you believe the building to susceptible to flooding now or during the full expected life of the building?

*Yes / **No***

Describe site conditions?

Site Elevation – Low/High Points:	*16.5/ 19.5 BCB Base Elev.(Ft.)*
Building Proximity to Water:	*2,600' + 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*

Will the 2013 Preliminary FEMA Flood Insurance Rate Maps or future floodplain delineation updates due to Climate Change result in a change of the classification of the site or building location?

2013 FEMA Prelim. FIRMs:	*Yes / **No***	Future floodplain delineation updates:	*Yes / **No***

What is the project or building proximity to nearest Coastal, Velocity or Flood Zone or Area Prone to Flooding?

2013 Prelim Map: 3,000 + 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!***

C - Sea-Level Rise and Storms

This section explores how a project responds to Sea-Level Rise and / or increase in storm frequency or severity.

C.2 - Analysis

How were impacts from higher sea levels and more frequent and extreme storm events analyzed:

Sea Level Rise:	*2 Ft.*	Frequency of storms:	*2 per year*

C.3 - Building Flood Proofing

Describe any strategies to limit storm and flood damage and to maintain functionality during an extended periods of disruption.

What will be the Building Flood Proof Elevation and First Floor Elevation:

Flood Proof Elevation:	*Boston City Base Elev.(Ft.)*	First Floor Elevation:	*Boston City Base Elev. (Ft.)*

Will the project employ temporary measures to prevent building flooding (e.g. barricades, flood gates):

	Yes / No	If Yes, to what elevation	*Boston City Base Elev. (Ft.)*
If Yes, describe:			

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 / building(s) be accessible during periods of inundation or limited access to transportation:

Yes / No	If yes, to what height above 100 Year Floodplain:	*Boston City Base Elev. (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:

Will the building remain occupiable without utility power during an extended period of inundation:

Yes / No	If Yes, for how long:	*days*

Describe any additional strategies to addressing sea level rise and or sever storm impacts:

C.4 - 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 Proof Elevation?

Select appropriate:	*Yes / No*	Surrounding site elevation can be raised	Building ground floor can be raised	Construction been engineered
Describe additional strategies:				

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 specific or additional strategies:				

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 best practices, please contact: John.Dalzell.BRA@cityofboston.gov