PUBLIC NOTICE

The Boston Redevelopment Authority ("BRA"), d/b/a the Boston Planning and Development Agency ("BPDA"), pursuant to Section 80A-2 of the Boston Zoning Code ("Code"), hereby gives notice that a Project Notification Form ("PNF") for Large Project Review was received by the BPDA on November 30, 2018, from Alexandra Partners, LLC (the "Proponent"), for the Hotel Alexandra project (the "Proposed Project"), to be constructed on the approximately 8,025 square foot site (the Project site), located on the southwestern corner of the Washington Street and Massachusetts Avenue intersection in the South End neighborhood of Boston (the "Site").

The Proponent proposes to retain and restore the façade of the existing Hotel Alexandra, and construct a new, approximately 150 room, twelve story boutique hotel with ground floor restaurant and café space, and a rooftop level bar/restaurant.

The Proponent is seeking the issuance of a Scoping Determination by the BPDA pursuant to Article 80, Section 80B-5.3 of the Code. The BPDA in the Scoping Determination for such PNF may waive further review pursuant to Section 80B-5.3(d) of the Code, if, after reviewing public comments, the BPDA finds that such PNF adequately describes the Proposed Project's impacts.

The PNF may be obtained from the BPDA website – www.bostonplans.org – or may be reviewed in the Office of the Secretary of the BPDA, Room 910, Boston City Hall, 9th Floor, Boston MA 02201, between 9:00 AM and 5:00 PM, Monday through Friday, except legal holidays. Public comments on the PNF, including the comments of public agencies, should be submitted in writing to Michael Sinatra, BPDA, at the address stated above, or via email at michael.a.sinatra@boston.gov, within thirty (30) days of the publication of this notice.

BOSTON REDEVELOPMENT AUTHORITY
D/B/A BOSTON PLANNING & DEVELOPMENT AGENCY

Teresa Polhemus
Executive Director/Secretary

PROJECT NOTIFICATION FORM

Hotel Alexandra

Submitted to:
Boston Planning and Development Agency
One City Hall Square
Boston, MA 02201

Submitted by:
Alexandra Partners, LLC
121 Charles Street South
Boston, MA 02116

Prepared by:
Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

In Association with:
CBT Architects
Marc LaCasse Law, LLC
Howard Stein Hudson
The Green Engineer
R. G. Vanderweil Engineers, LLP
McPhail Associates, LLC

November 30, 2018

Epsilon
ASSOCIATES INC.

EXPANDED PROJECT NOTIFICATION FORM

Hotel Alexandra

Submitted to:
Boston Planning and Development Agency
One City Hall Square
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Chapter 1.0

Introduction/Project Description

1.0 INTRODUCTION/ PROJECT DESCRIPTION

1.1 Introduction

Alexandra Partners, LLC (the Proponent) proposes to redevelop an approximately 8,025 square foot site (the Project site), located on the southwestern corner of the Washington Street and Massachusetts Avenue intersection in the South End neighborhood of Boston. The Project site is comprised of currently vacant land which formerly contained a brick row house known as the Ivory Bean house and the existing Hotel Alexandra building, which is vacant except for a beauty supply store on the ground floor. The Hotel Alexandra building is one of the few remaining historic structures along Washington Street in the blocks immediately west of Massachusetts Avenue, and has experienced significant water and fire damage over the many years it has been vacant and could lead to permanent loss if the current state of neglect were to continue. The Proponent proposes to retain and restore the façade of the existing Hotel Alexandra, and construct a new, approximately 150 room, twelve story boutique hotel with ground floor restaurant and café space (the Project).

The South End has become home to some of Boston's most exciting restaurants, cafes, boutiques, and shops. To continue that tradition, the Project will include ground-floor café and restaurant space, as well as a rooftop bar. These new, active ground floor uses will improve the pedestrian experience compared to the currently dark, vacant condition of the Project site. In addition to restoring the Hotel Alexandra façade and improving the public realm, the Project will generate public benefits that include meeting the growing need for additional hotel space in Boston, creating construction and permanent jobs, and increasing City of Boston tax revenues.

This Expanded Project Notification Form (PNF) is being submitted to the Boston Redevelopment Authority (BRA), doing business as Boston Planning and Development Agency (herein, the BPDA), to initiate review of the Project under Article 80B of the Zoning Code, Large Project Review. The PNF offers a description of the Project, its minimal impacts and proposed mitigation strategies, and its substantial benefits to the City of Boston.

1.2 Project Identification

Address/Location:	631 Massachusetts Avenue, 1767-1769 Washington Street
Developer:	Alexandra Partners, LLC 121 Charles Street South Boston, MA 02116 Jas Bhogal Thomas Calus Nick Colavito

Architect:	CBT Architects 110 Canal Street Boston, MA 02114 (617) 262-4354 David Nagahiro Vickie Alani Andrew Wang Stephen Walnut
Legal Counsel:	Marc LaCasse Law, LLC 75 Arlington Street, Suite 500 Boston, MA 02116 (617) 605-2767 Marc LaCasse
Permitting Consultants:	Epsilon Associates, Inc. 3 Mill & Main Place, Suite 250 Maynard, MA 01754 (978) 897-7100 Cindy Schlessinger Talya Moked
Transportation Consultant and Civil Engineer	Howard Stein Hudson 11 Beacon Street, Suite 1010 Boston, MA 02108 (617) 482-7080 Richard Latini Brian Beisel James Downing Andrew Fabiszewski
Sustainability Consultant	The Green Engineer 23 Bradford Street, 1st Floor Concord, MA 01742 (978) 369-8978 Sarah Michelman Erica Downs
MEP Engineer	R. G. Vanderweil Engineers, LLP 274 Summer Street Boston, MA 02210 (617) 574-8132 Alex Vanderweil

1.3 Project Description

1.3.1 Project Site

The approximately 8,025 sf Project site, located on the southwestern corner of the Washington Street and Massachusetts Avenue intersection, is comprised of two parcels. The first parcel, 1767-1769 Washington Street, is currently vacant land which formerly contained a brick row house known as the Ivory Bean house. The second parcel, 631 Massachusetts Avenue, contains a five-story, approximately 27,400 sf stone-clad structure known as the Hotel Alexandra. Completed in 1875, the Hotel Alexandra building is one of the few remaining historic structures along Washington Street in the blocks immediately west of Massachusetts Avenue. With the exception of a beauty supply store on the ground floor, the building has been vacant for many years and has suffered from a lack of maintenance and internal fire damage. An aerial locus map is presented in Figure 1-1, and Figures 1-2 and 1-3 present existing conditions on the site.

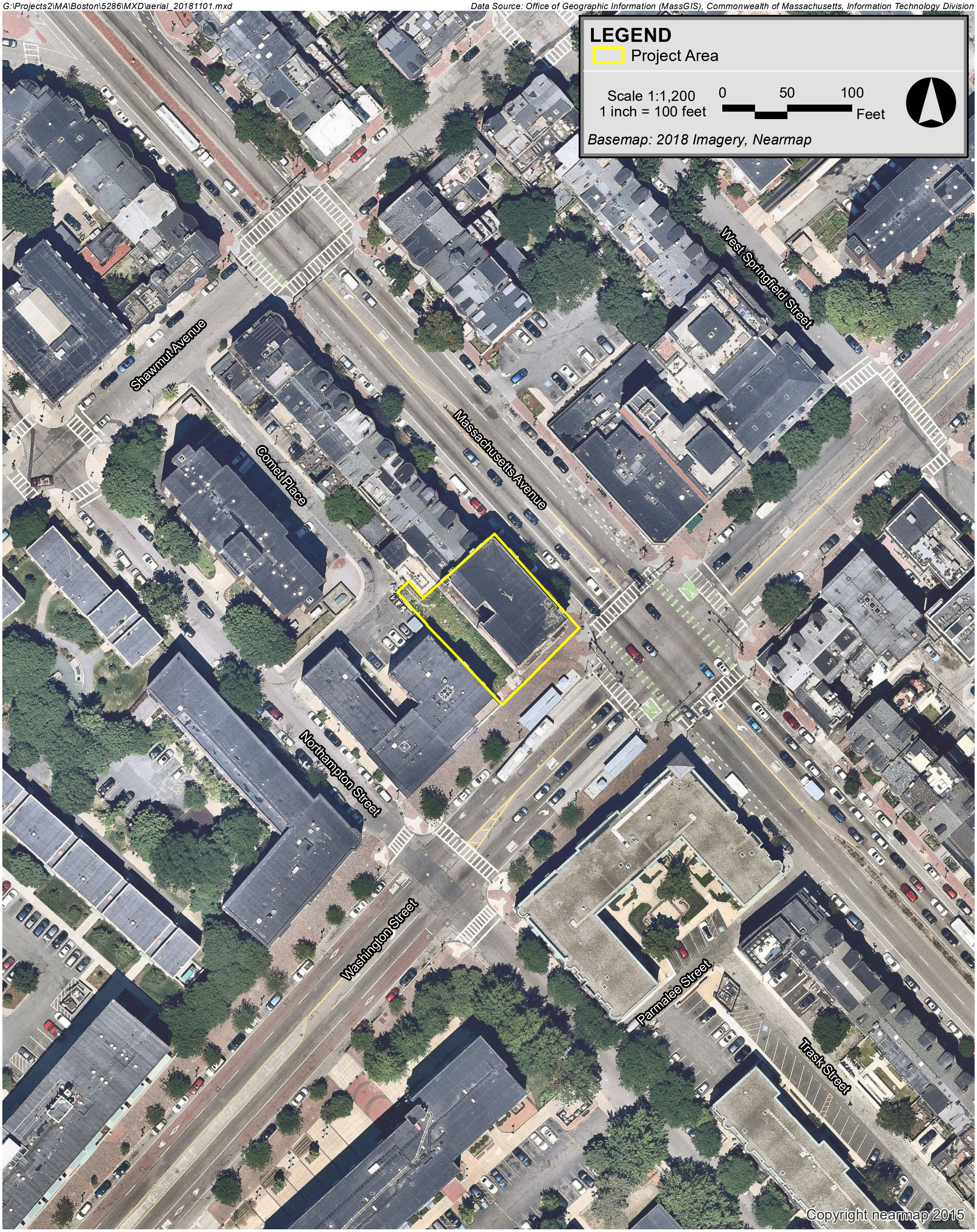
1.3.2 Area Context

The Project site is located within the South End Landmarks District and is also located on the eastern edge of the Roxbury Neighborhood District. The area surrounding the Project site contains primarily low to mid-rise residential buildings with ground floor commercial space along Washington Street and Massachusetts Avenue. The Project site provides access to several public transit options including an MBTA bus stop directly adjacent to the site that provides access to the Silver Line as well as several other bus routes. The Project site is also within walking distance to the MBTA Orange Line Massachusetts Avenue station.

1.3.3 Proposed Project

The Project will retain and restore the façade of the existing building and will recreate and/or refurbish the original historic design elements. Due to the decades of neglect and extensive water infiltration, the existing structure is no longer viable and will accordingly be replaced. Behind the façade and on the adjacent vacant parcel, a new, approximately 150 room, twelve story boutique hotel will be constructed with approximately 66,000 sf. The basement may include a fitness room as an amenity for the hotel guests. On the twelfth floor, there will be a rooftop level bar/restaurant with access to a roof deck overlooking the City. Figure 1-4 presents a site plan, and Appendix A provides floor plans and elevations.

The Project will not include on-site parking due to site constraints and the proximity of the Project site to public transportation. Valet service will be provided that will utilize a nearby parking garage or lot. As has been requested by members of the public during informal public meetings, the Proponent will work with the MBTA to relocate the outbound bus stop to the southern end of the block at the Northampton Street intersection. The relocation will minimize bus blockage of Massachusetts Avenue.



Hotel Alexandra **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 1-1

Aerial Locus Map

Hotel Alexandra **Boston, Massachusetts**

cbt

Figure 1-2
Existing Conditions

Hotel Alexandra Boston, Massachusetts

Figure 1-3
Existing Conditions

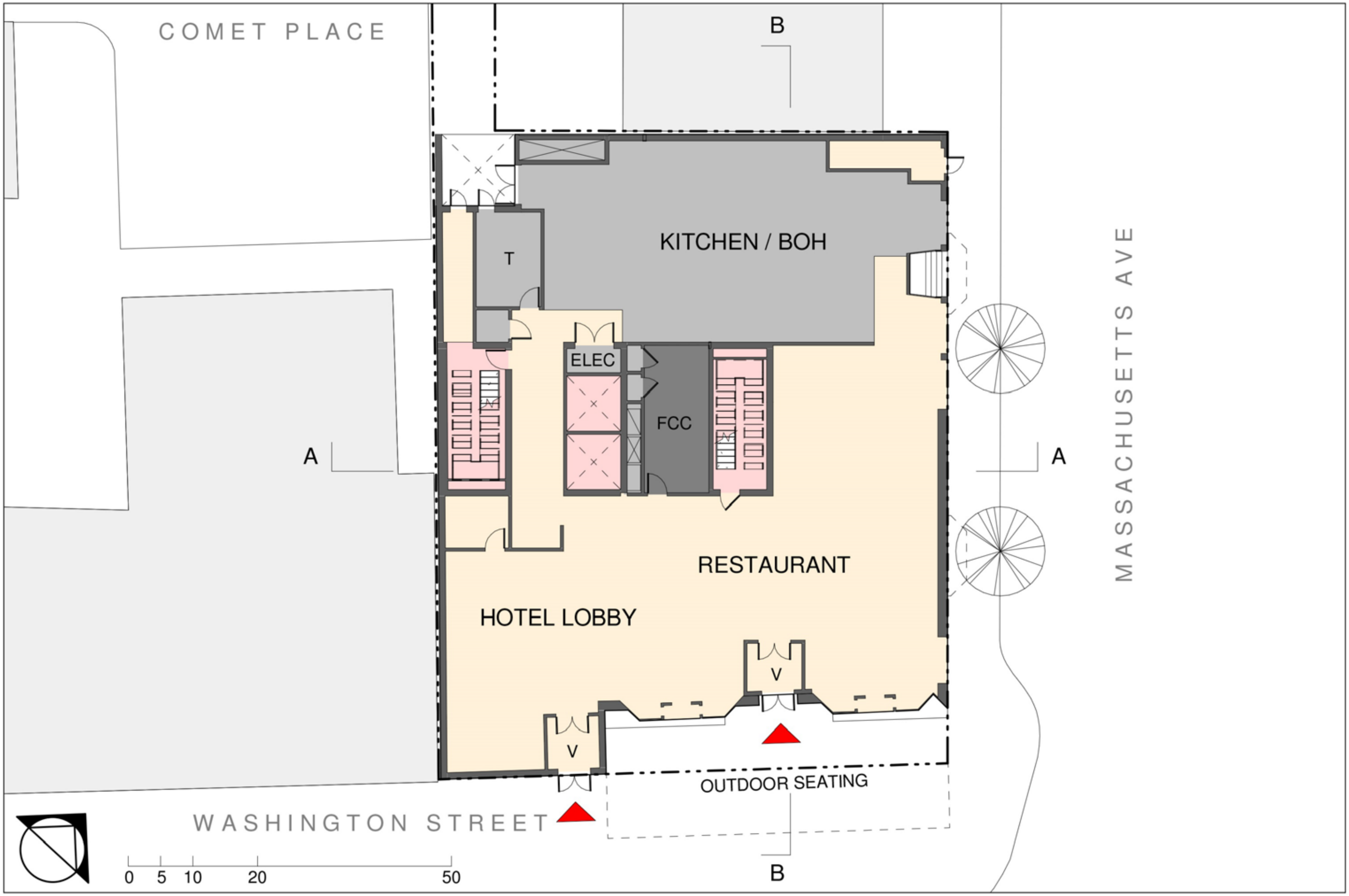


Figure 1-4
Site Plan

The hotel entrance will share an entrance and lobby with a restaurant and café, in order to create active uses on the ground floor. The Project will feature a dramatic double height ground floor with visual access to the publicly accessible lobby and lounges. Food and beverage use, lounges, and meeting spaces will be visible from Massachusetts Avenue to activate the lower floors. The wide sidewalk along Washington Street allows space for the restaurant or café to include sidewalk seating on Washington Street, consistent with the South End's identity as a destination for dining.

1.4 Public Benefits

The Project will generate numerous and varied public benefits for the surrounding neighborhood and the City of Boston as a whole, both during construction and on an ongoing basis upon its completion.

Façade Restoration

The Project will retain and restore the façade of the existing Hotel Alexandra building, which has been vacant for many years and has experienced fire and water damage that could lead to permanent loss if the current state of neglect were to continue.

Site Activation

The Project will improve the site with ground floor lobby, restaurant, and café space.

Sustainable Design/Green Building

The Proponent is committed to building a LEED certifiable project, incorporating sustainable design features into the Project to preserve and protect the environment.

Increased Employment

The Project will create approximately 275 construction jobs and approximately 75 permanent jobs upon stabilization.

New Property Tax

The Project will result in increased tax revenues to the City of Boston compared to the existing condition.

1.5 City of Boston Zoning

The Project site is situated within the Roxbury Neighborhood District governed by Article 50 of the Boston Zoning Code. It is further located in the Multifamily residential/local service [MFR/LS] sub-district established by Article 50-26(5).

There are three applicable overlay districts: (1) Boulevard Planning established by Article 50-37; (2) Restricted Parking established by Article 3-1A(c); and (3) Neighborhood Design Review established by Article 50-36. All of these zoning designations are as shown on Zoning Maps 6A and 6C.

While the Project site is located in the Roxbury Neighborhood District for zoning purposes, it is also located within the South End Landmarks District and is accordingly subject to the jurisdiction of the South End Landmarks District Commission.

As set forth in the list of permits required at Section 1.7, it is anticipated that the proposed Project will require zoning relief from the City of Boston Board of Appeal related to the use of the property as a boutique hotel which is designated as a conditional use in Table B of Article 50, certain dimensional variances, and a variance for insufficient parking.

1.6 Legal Information

1.6.1 Legal Judgments Adverse to the Proposed Project

There are no pending legal actions concerning either the property or the proposed Project. A search of the Suffolk County Registry of Deeds reveals no pending actions, liens, lis pendens or any other indication of legal action concerning the property. The Proponent is similarly not aware of any legal judgments or actions pending concerning the Project.

1.6.2 History of Tax Arrears on Property

The Proponent has no history of tax arrears on property owned or previously owned in Boston. All taxes on all properties currently owned by the project Proponent are current and paid in full.

1.6.3 Site Control/ Public Easements

The Proponent is under contract with the current owner of the property, Church of Scientology of Boston, Inc., to purchase the property upon successful completion of the permitting process to convert the property into a boutique hotel. The Church of Scientology of Boston, Inc. is the record owner of the property pursuant to a Quitclaim Deed recorded in the Suffolk County Registry of Deeds at Book 43025 Page 119. There are no easements of record on the Quitclaim Deed nor are any easements into, through or surrounding the site apparent on the record.

1.7 Anticipated Permits

Table 1-1 presents a preliminary list of permits and approvals from governmental agencies that are expected to be required for the Project, based on currently available information. It is possible that only some of these permits or actions will be required, or that additional permits or actions will be required.

Table 1-1 Anticipated Permits and Approvals

Agency	Approval
	City
Boston Board of Appeal	Conditional Use Permit Height Variance FAR Variance Yard/Set-back Variances
Boston Civic Design Commission	Design Review
Boston Employment Commission	Construction Employment Plan
Boston Interagency Green Building Committee	Zoning Article 37 Green Buildings
Boston Parks Department	Design Review
Boston Planning & Development Agency	Article 80B Large Project Review Boulevard Planning and Neighborhood District Design Review
Boston Transportation Department	Transportation Access Plan Agreement Construction Management Plan
Boston Water and Sewer Commission	Site Plan Review Temporary Groundwater Dewatering Discharge Permit (if required) Water and Sewer Connection Permits
Inspectional Services Department	Building Permit Certificate of Occupancy
Public Improvement Commission	Sidewalk Repairs
	State
Massachusetts Water Resources Authority	Construction Dewatering Discharge Permit (if required)

1.8 Public Participation

As part of its planning efforts, the Proponent has contacted nearby residents and representatives of numerous neighborhood groups, elected officials, and public agencies. The formal community outreach process begins with the filing of this PNF.

The Proponent continues to be committed to a comprehensive and effective community outreach and will continue to engage the community to ensure public input on the Project. The Proponent looks forward to working with the BPDA and city agencies, local officials, neighbors, and others as the design and review processes move forward.

1.9 Schedule

It is anticipated that construction will commence in the summer of 2019. Once begun, construction is expected to last approximately 24 months.

Chapter 2.0

Transportation

2.0 TRANSPORTATION

The Project team has conducted an evaluation of the transportation impacts of the proposed Project in the South End neighborhood of Boston. This transportation study adheres to the Boston Transportation Department (BTD) Transportation Access Plan Guidelines and Boston Planning and Development Agency (BPDA) Article 80 Large Project 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 activity. The Project is not expected to have a significant impact on the existing neighborhood or surrounding transportation facilities.

2.1 Project Description

The Project site is located on the corner of Washington Street and Massachusetts Avenue. The site currently consists of two parcels, known as 1676-1769 Washington Street, and 631 Massachusetts Avenue. One parcel consists of a five-story building, the Hotel Alexandra, which contains a beauty supply store on the first floor, and the rest of the building is vacant. The approximately 27,400 sf building had included ground floor retail space and hotel uses above. The second parcel is vacant, the previous building having been demolished due to structural integrity issues.

The proposed Project will consist of an approximately 66,000 sf hotel, which will include 150 guest rooms, a ground floor restaurant, rooftop amenity space, conference rooms, and other services typically associated with a boutique-style hotel. No on-site parking will be provided due to site constraints and the proximity of the Project site to public transportation, but valet service will be provided for private vehicle trips to the site.

2.1.1 Study Area

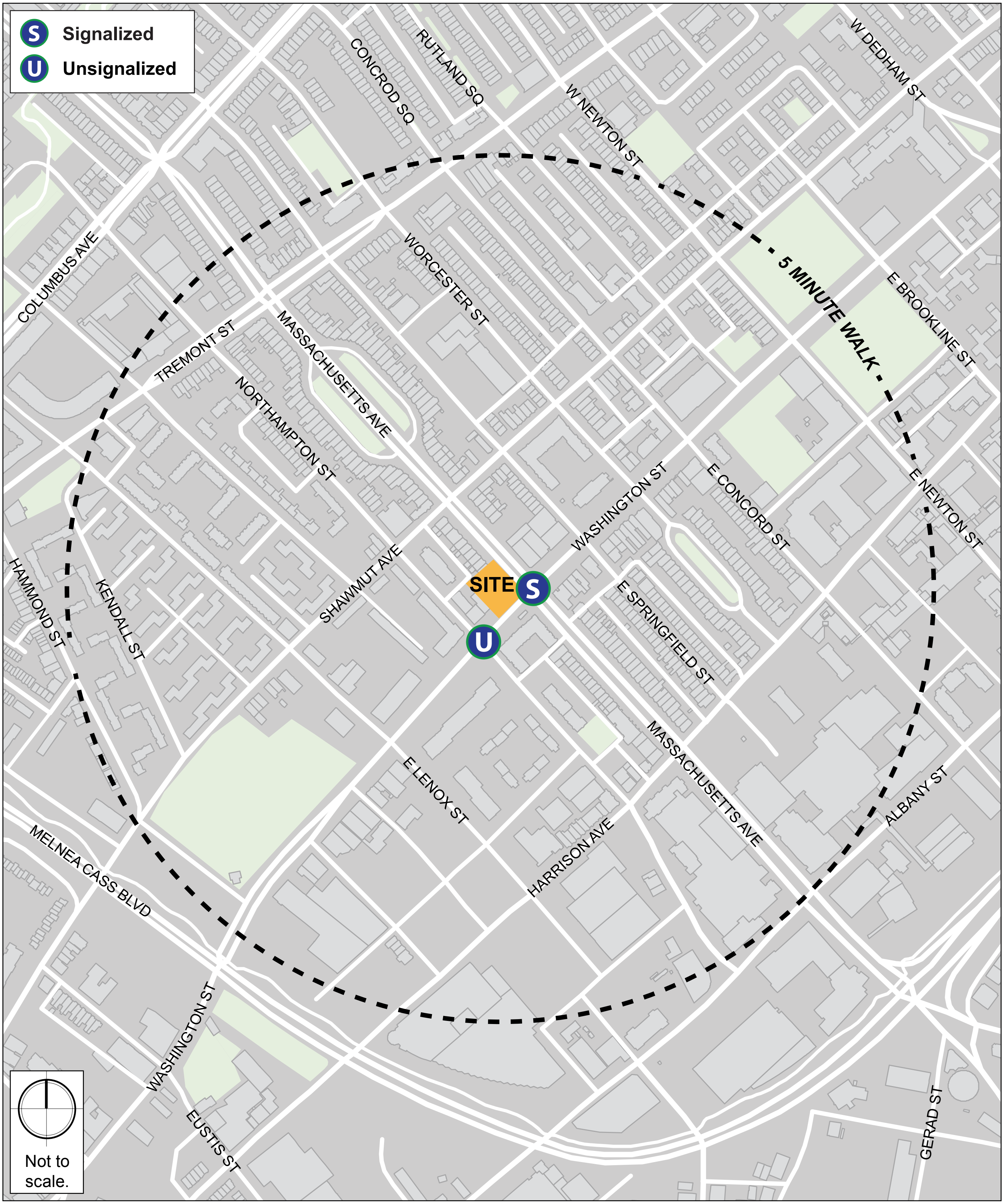
The transportation study area runs along Washington Street and consists of the following two intersections, also shown in Figure 2-1:

- Washington Street/Massachusetts Avenue; and
- Washington Street/Northampton Street.

2.1.2 Study Methodology

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

The Existing (2018) Condition analysis includes an inventory of the existing transportation conditions that was undertaken in the fall of 2018, such as traffic characteristics, parking, curb usage, transit, pedestrian circulation, bicycle facilities, loading, and site conditions. Existing counts for vehicles, bicycles, and pedestrians were collected at the study area intersections.



Hotel Alexandra **Boston, Massachusetts**

Figure 2-1

Study Area

A traffic data collection effort forms 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. The long-term transportation impacts are evaluated for the year 2025, based on a seven-year horizon from the year of the filing of this traffic study.

The No-Build (2025) Condition analysis includes general background traffic growth, traffic growth associated with specific developments (not including this Project), and transportation improvements that are planned in the vicinity of the Project site.

The Build (2025) Condition analysis includes a net change in traffic volume due to the addition of Project-generated trip estimates, to the traffic volumes developed as part of the No-Build (2025) Condition analysis. The transportation study identifies expected roadway, parking, transit, pedestrian, and bicycle accommodations, as well as loading capabilities and deficiencies.

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.

2.2 Existing Condition

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

2.2.1 Existing Roadway Conditions

The study area includes the following roadways, which are categorized according to the Massachusetts Department of Transportation (MassDOT) Office of Transportation Planning functional classifications:

Washington Street is a two-way, four-lane roadway located to the east of the Project site. Washington Street is classified as an urban principal arterial under City of Boston jurisdiction near the Project site. Washington Street runs between Water Street in the town of Walpole to the south and Court Street in Boston to the north. Shared bus/bike lanes, on-street parking, sidewalks, and crosswalks are provided along both sides of the roadway in the vicinity of the Project site.

Massachusetts Avenue is a two-way, four-lane roadway located to the north of the Project site. Massachusetts Avenue is classified as an urban principal arterial under City of Boston jurisdiction near the Project site. Massachusetts Avenue runs between Marrett Road in the town of Lexington to the north and Everett Square in Boston to the south. Bike lanes, on-street parking, sidewalks, and crosswalks are generally provided along both sides on the roadway in the vicinity of the Project site.

Northampton Street is a one-way, one-lane roadway located to the west of the Project site. Northampton Street is classified as an urban collector under City of Boston jurisdiction. Northampton Street runs between Watson Street to the north and Melnea Cass Boulevard to the south. On-street parking, sidewalks, and crosswalks are provided along both sides of the roadway.

2.2.2 Existing Intersection Conditions

The existing study area intersections are described below. Intersection characteristics such as traffic control, lane usage, pedestrian facilities, and pavement markings are described.

Washington Street/Massachusetts Avenue is a four-legged, signalized intersection located to the east of the Project site. The Massachusetts Avenue eastbound approach consists of a left-turn lane, one through lane, one through/right lane, and a bike lane. The Massachusetts Avenue westbound approach consists of a left-turn lane, one through lane, one through/right lane, and a bike lane. The Washington Street northbound approach consists of a left-turn lane, a through lane, and a right-turn lane. The Washington Street southbound approach consists of a left-turn lane, a through lane, and a right-turn lane. Crosswalks, curb ramps, and pedestrian signal equipment are provided across all approaches of the intersection. Two-stage turn queue boxes for bikes are also provided for the eastbound and westbound approaches.

Washington Street/Northampton Street is a four-legged, unsignalized intersection located to the south of the Project site. The Northampton Street westbound approach consists of a single left-turn/through/right-turn lane. The Washington Street northbound approach consists of a left-turn lane, a through lane, and a bus/bike lane. The Washington Street southbound approach consists of a through/right lane and a bus/bike lane. Crosswalks and curb ramps are provided across the eastbound, westbound, and southbound approaches.

2.2.3 Existing Parking

An inventory of the existing on-street and off-street parking, as well as car sharing services in the vicinity of the Project, was collected. The curb use surrounding the site consists of unregulated, metered, and resident only parking, as well as several bus stops. There is no dedicated curb space for pick-ups/drop-offs. The on-street parking regulations within the study area are shown in Figure 2-2. There are two parking lots and four parking garages located within a quarter-mile of the Project site. A detailed summary of all parking lots and garages are shown in Table 2-1. The off-street lots and garage locations are shown in Figure 2-3.

Table 2-1 Off-Street Parking within a Quarter-Mile of the Site

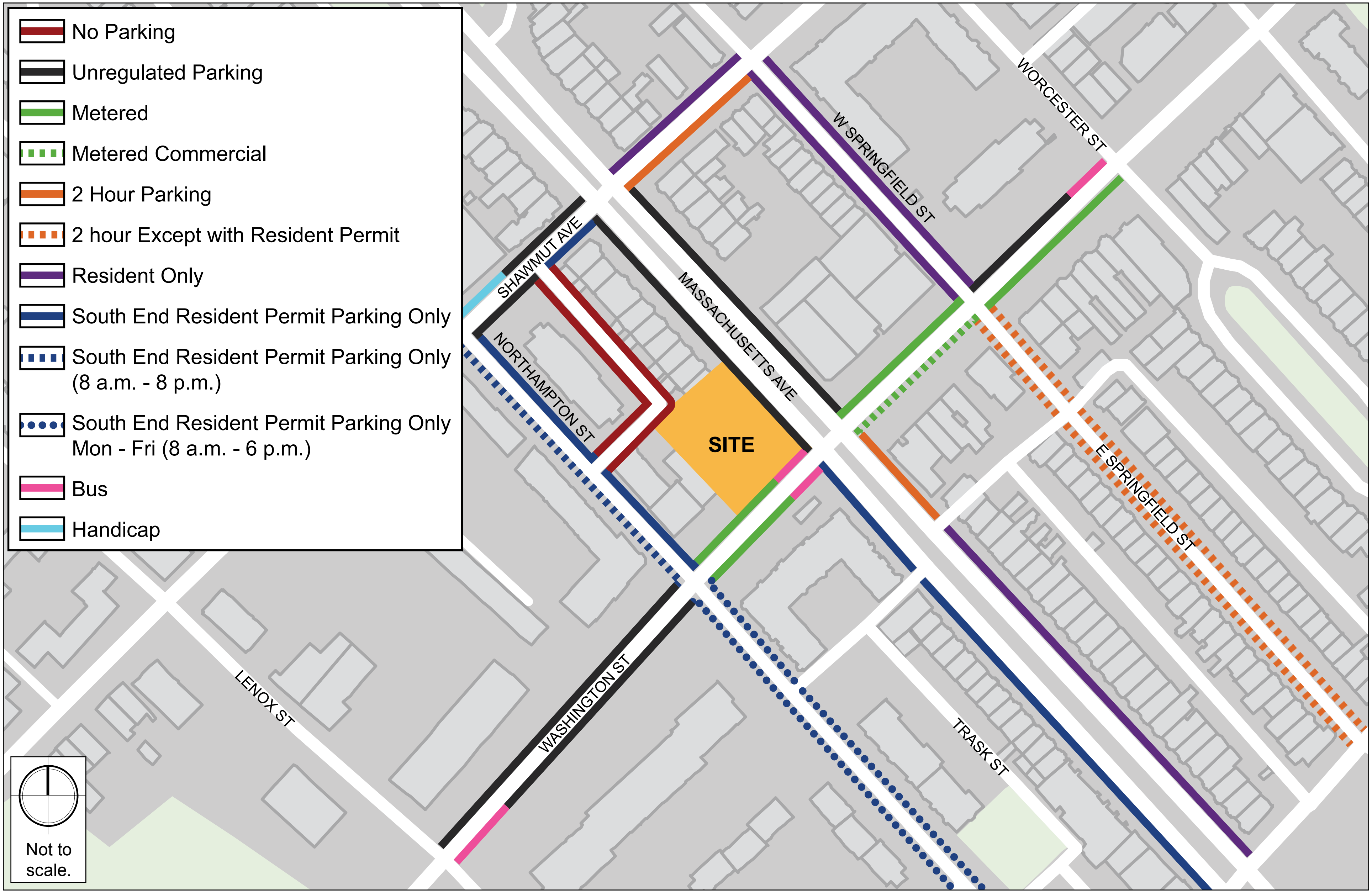
Map #	Address	Facility	Private Capacity	Public Capacity
Parking Lots				
1	53 Northampton Street	53 Northampton Street	0	17
2	BUMC – Menino Pavilion	840 Harrison Avenue	75	0
Parking Lots – Subtotal			**75**	**17**
Parking Garages				
A	35 Northampton Street	Northampton Square	0	539
B	710 Albany Street	710 Albany Garage	0	1019
C	7 Melnea Cass Boulevard	Crosstown Center Garage	0	1500
D	277 Northampton Street	277 Northampton Street	0	38
Parking Garages – Subtotals			**0**	**3,096**
Parking Lots + Garages – TOTAL			**75**	**3,113**

As shown in Table 2-1, there are a total of 75 private parking spaces and 3,113 public spaces within a quarter-mile radius of the Project site.

2.2.4 Car 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.

Car sharing, predominantly served by Zipcar in the Boston area, provides easy access to vehicular transportation for those who do not own cars. There are four Zipcar locations within an approximately five-minute walk of the Project site: Parmelee Street, 36 East Springfield Street, 45 East Newton Street, and 146 West Concord Street. The nearby car sharing locations within a quarter-mile walk of the Project site are shown in Figure 2-4.



Hotel Alexandra Boston, Massachusetts

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Figure 2-2
Existing Curb Regulations

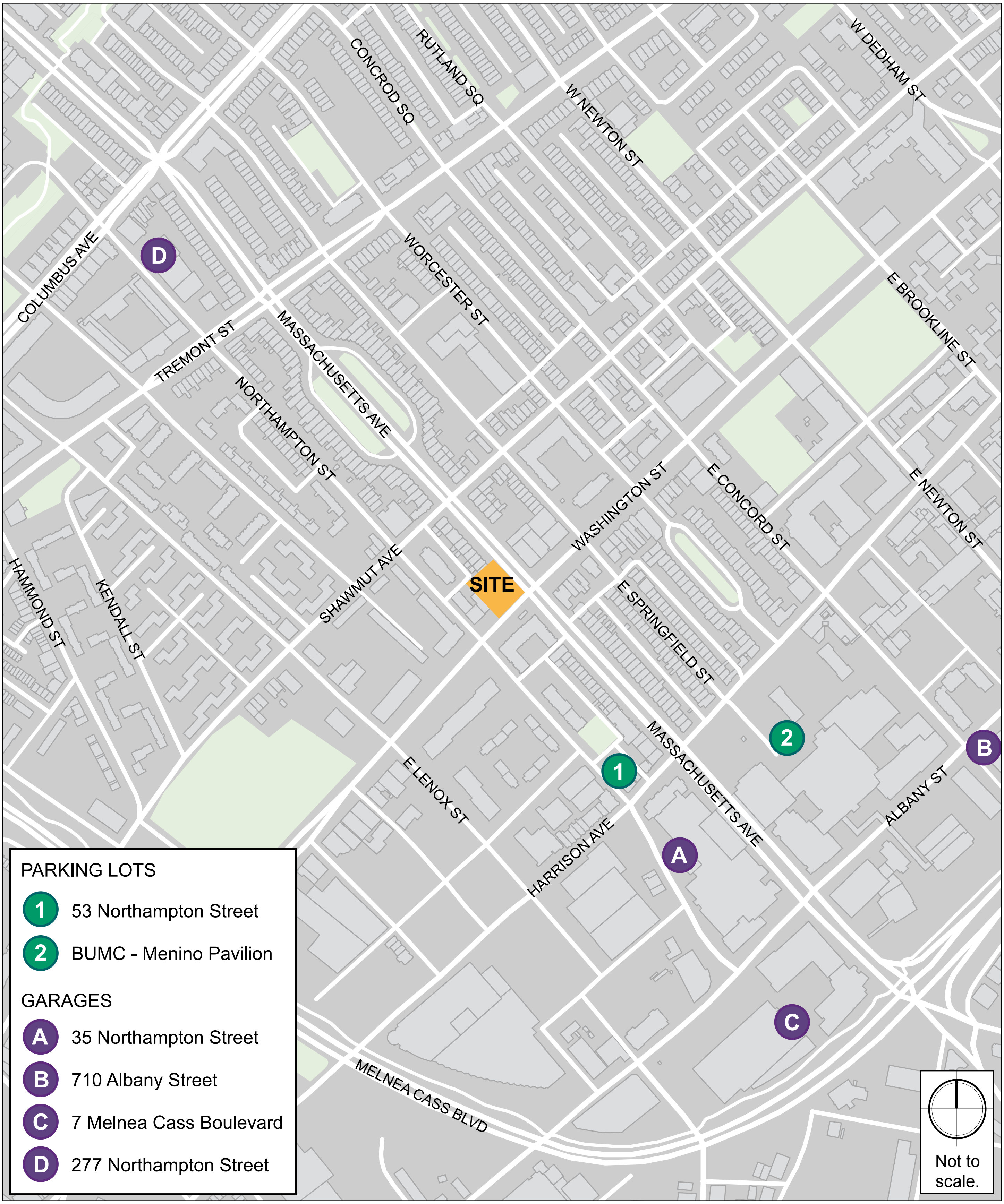

Figure 2-3
Off-Street Parking

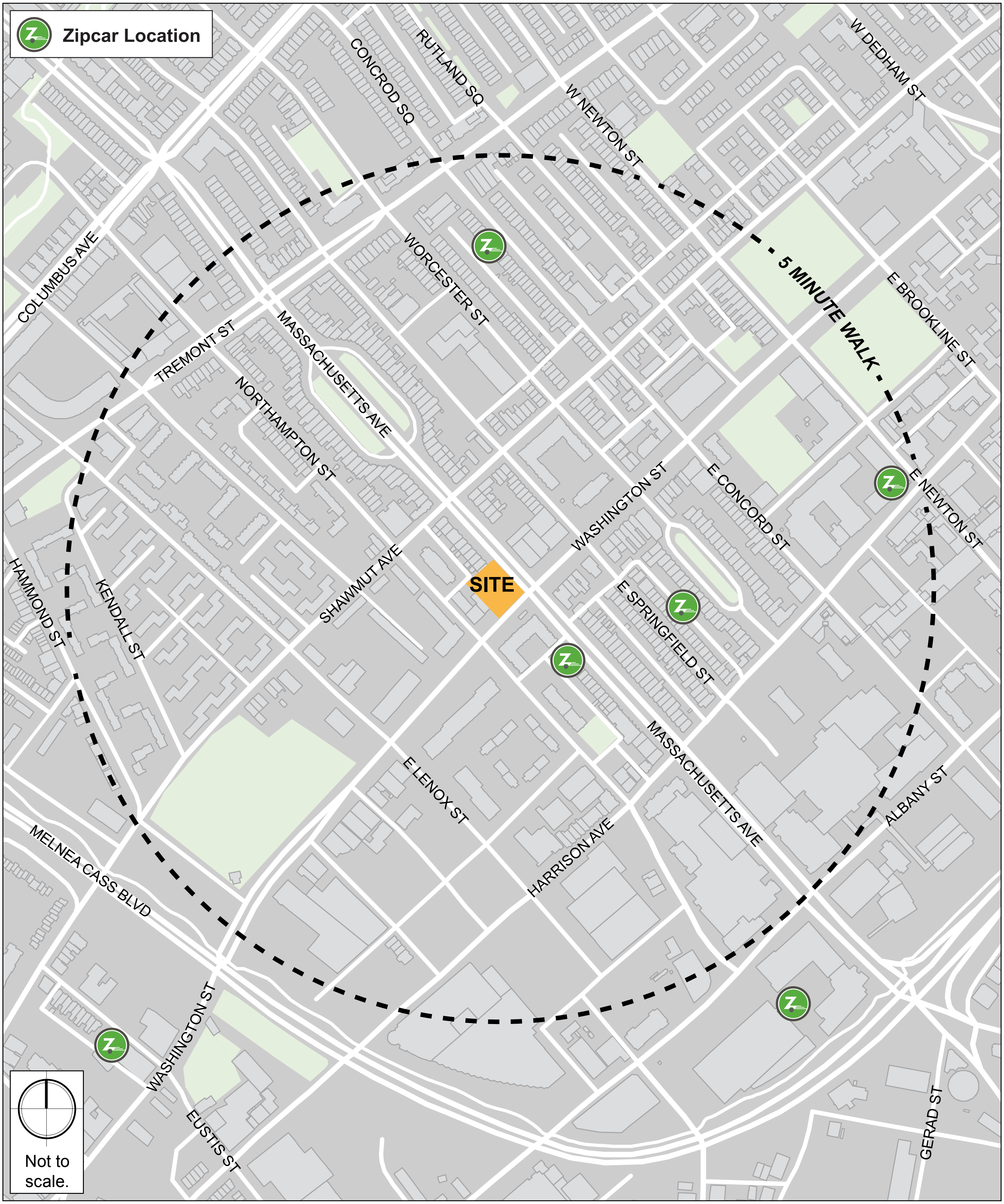

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Figure 2-4
Car Sharing Locations

2.2.5 Existing Traffic Data

Traffic volume data was collected in the study area intersections on October 3, 2018. Turning Movement Counts (TMCs) 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 TMCs collected vehicle classification including car, heavy vehicle, pedestrian, and bicycle movements. The detailed traffic counts for the study area intersections are provided in Appendix C.

In order to account for seasonal variation in traffic volumes throughout the year, data provided by MassDOT were reviewed. The most recent (2016) MassDOT Weekday Seasonal Factors were used to determine the need for seasonal adjustments to the October 2018 TMCs. The seasonal adjustment factor for roadways similar to the study area (Group U3 – Urban Principal Arterials) during the month of October is 0.93. This indicates that average month traffic volumes are approximately seven percent lower than the traffic volumes that were collected. The traffic counts were not adjusted to reflect average month conditions in order to provide an analysis consistent with the peak season traffic volumes. The MassDOT 2016 Weekday Seasonal Factors table is provided in Appendix C.

2.2.5.1 Existing (2018) Traffic Volumes

Existing traffic volumes were balanced, where necessary, to develop the Existing (2018) Condition vehicular traffic volumes. The Existing (2018) Condition weekday a.m. and p.m. peak hour traffic volumes are shown in Figure 2-5.

2.2.5.2 Existing Pedestrian Volumes and Accommodations

Sidewalks are provided along both sides of all the roadways in the study area. In general, the sidewalks provided along nearby roadways are in good condition with few cracks and level grades. The closest crosswalks to the Project site are located at the signalized intersection of Washington Street/Massachusetts Avenue which is adjacent to the Project site. Wheelchair ramps are typically provided along all intersections.

To determine the amount of pedestrian activity within the study area, pedestrian counts were conducted concurrent with the TMCs on October 3, 2018 at the study area intersections and are presented in Figure 2-6.

2.2.5.3 Existing Bicycle Volumes and Accommodations

In recent years, bicycle use has increased dramatically throughout the City of Boston and is expected to continue growing. The Project site is located in close proximity to bicycle facilities and the following roadways within the study area have bike infrastructure providing added safety to cyclists. Washington Street has dedicated bus/bike lanes in both the

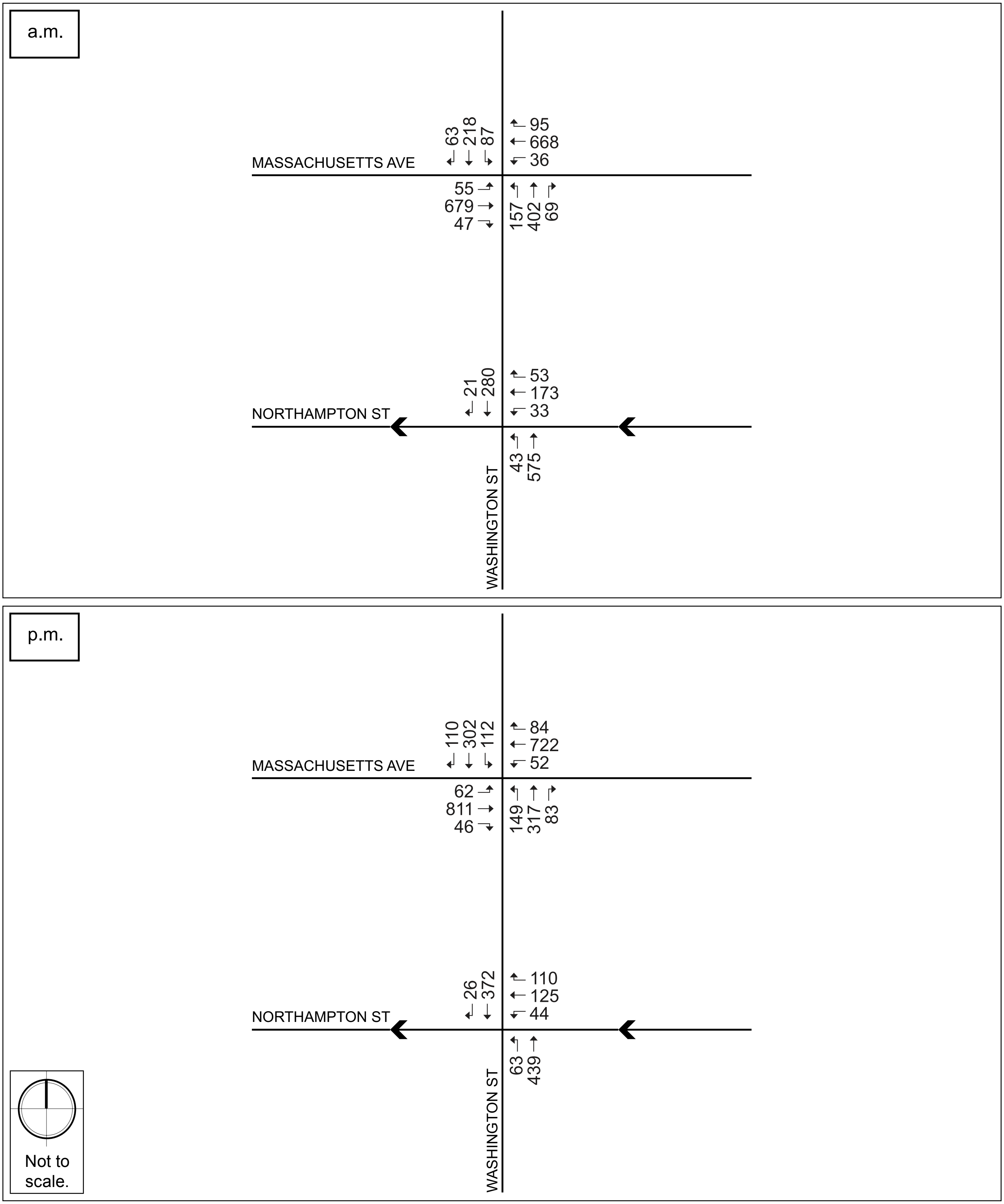

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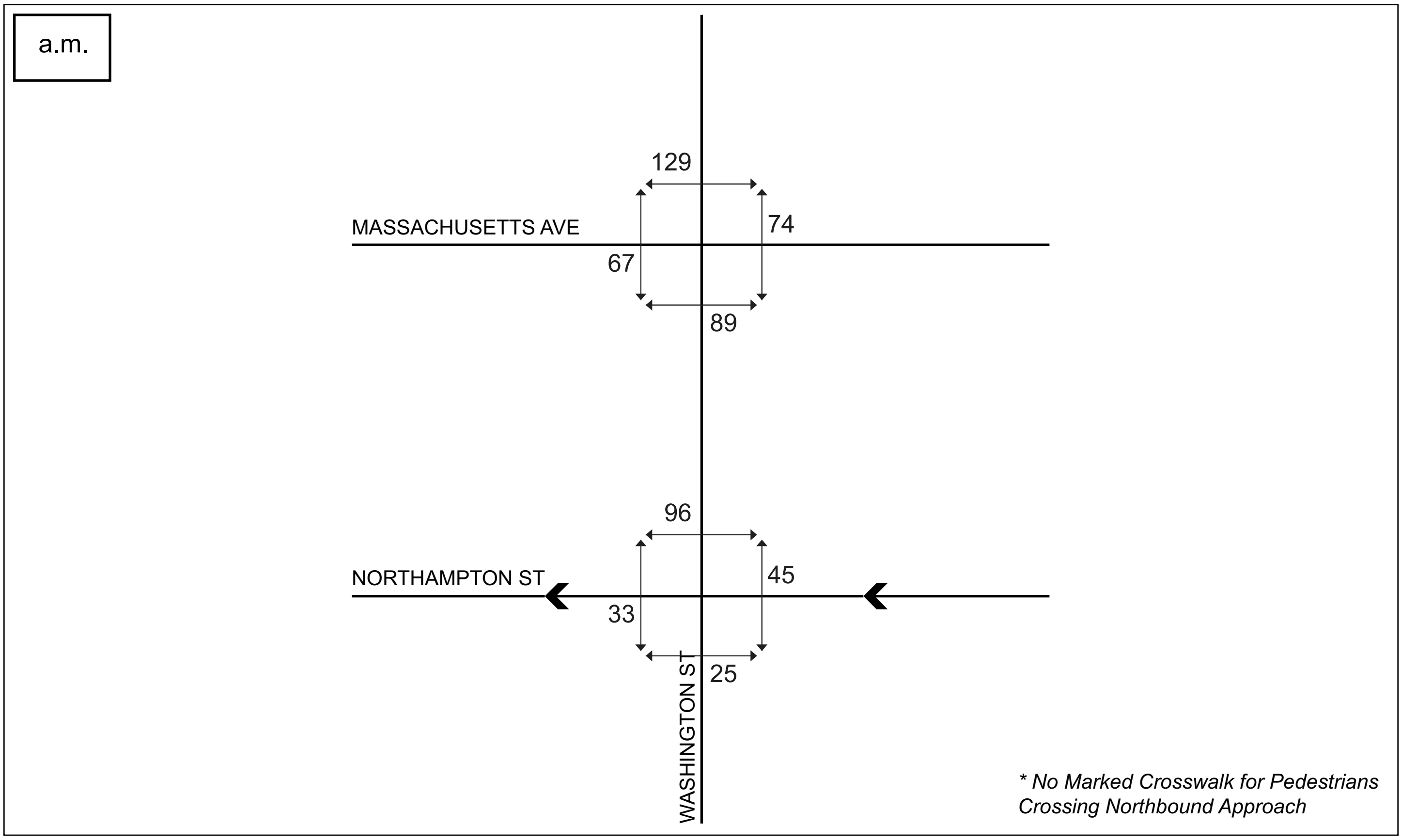
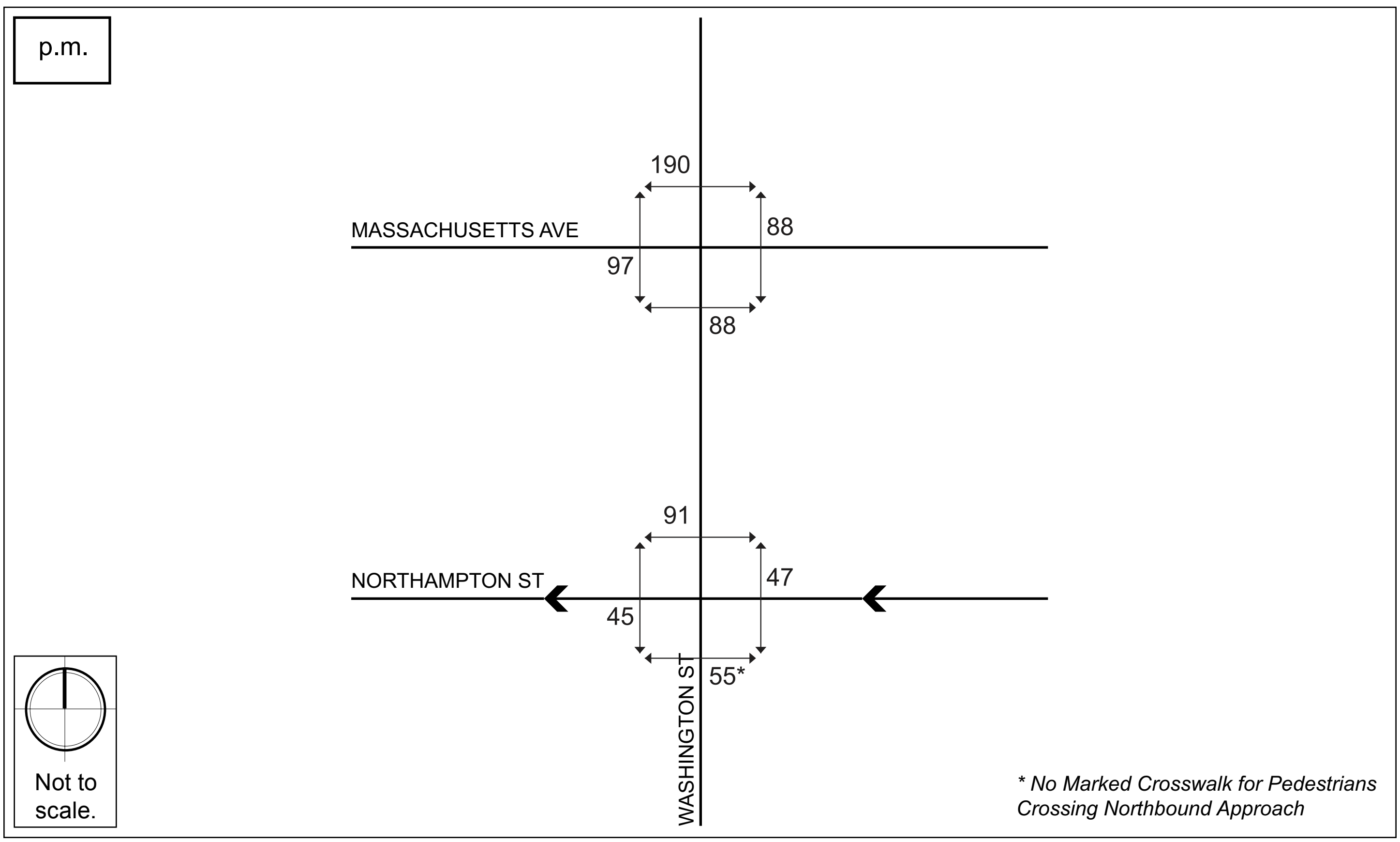
Figure 2-5

Existing (2018) Condition Traffic Volumes, Weekday a.m. and p.m. Peak Hours





Hotel Alexandra Boston, Massachusetts

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Figure 2-6

Existing (2018) Condition Pedestrian Volumes, Weekday a.m. and p.m. Peak Hours northbound and southbound directions. Massachusetts Avenue has bike lanes in both the eastbound and westbound directions, as well as two-stage turn queue boxes and green striping through the intersection to alert drivers to the presence of cyclists.

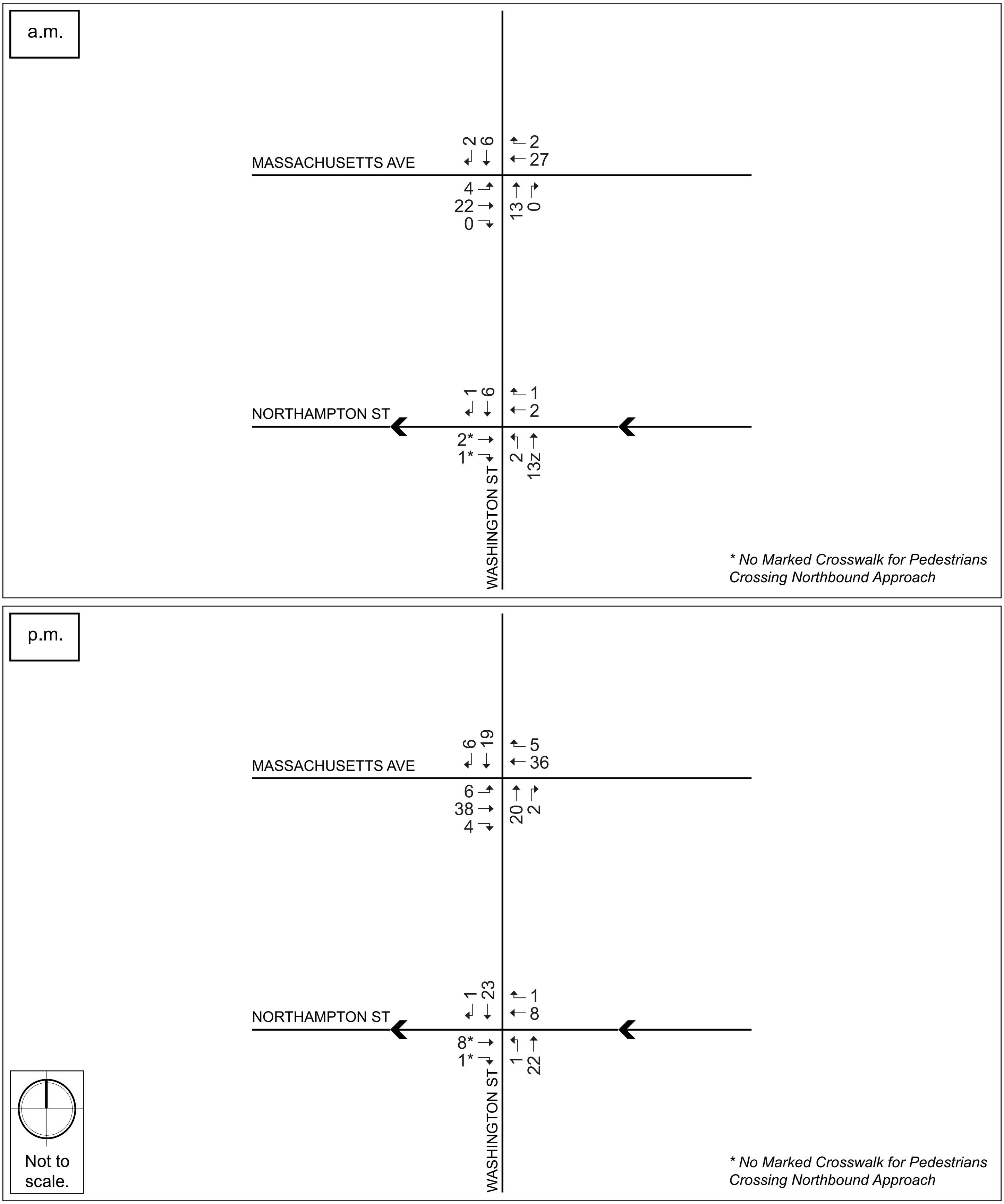
To determine the amount of cyclist activity within the study area, bicycle counts were conducted concurrent with the TMCs on October 3, 2018 at the study area intersections and are presented in Figure 2-7.

The Project site is also located in proximity to four bicycle sharing stations provided by BLUEbikes. BLUEbikes is the Boston area's largest bicycle sharing service, which was launched in 2011 (as Hubway) and currently consists of more than 1,800 shared bicycles at more than 200 stations throughout Boston, Brookline, Cambridge, and Somerville. The nearest BLUEbikes stations to the Project site are located at Washington Street at Lenox Street, Washington Street at Melnea Cass Boulevard, Boston Medical Center – East Concord Street at Harrison Avenue, and Washington Street at Rutland Street, which are located within an approximately five-minute walk from the Project site. The BLUEbikes stations located in proximity to the Project site are shown in Figure 2-8.

2.2.6 Existing Public Transportation

The Project site is located in Boston's South End neighborhood and is well situated to take advantage of the City's public transportation system. The Project site is located on the MBTA Silver Line with direct access to routes SL4 and SL5 through the Washington Street at Massachusetts Avenue bus stop. SL4 and SL5 are part of the bus rapid transit system in Boston and connect to Dudley Square to points downtown via dedicated bus lanes on Washington Street. The same bus stop provides access to MBTA bus routes 8, 10, 15, and 170. At the same intersection, the MBTA Massachusetts Avenue at Washington Street bus stop provides access to the 1 and CT1 bus routes. Within an approximately 5-minute walking distance, bus stops that provide access to MBTA routes 9, 171, CT3, and 47 can be reached. The Project site is also an approximately 10-minute walk from the MBTA Massachusetts Avenue Station, which provides access to Orange Line subway service, and an approximately 13-minute walk from the MBTA Symphony Station which provides access to Green Line light rail service.

Figure 2-9 shows a map of all public transportation services located in close proximity of the Project site, and Table 2-2 provides a brief summary of all routes.



Hotel Alexandra **Boston, Massachusetts**

Figure 2-7

Existing (2018) Condition Bicycle Volumes, Weekday a.m. and p.m. Peak Hours

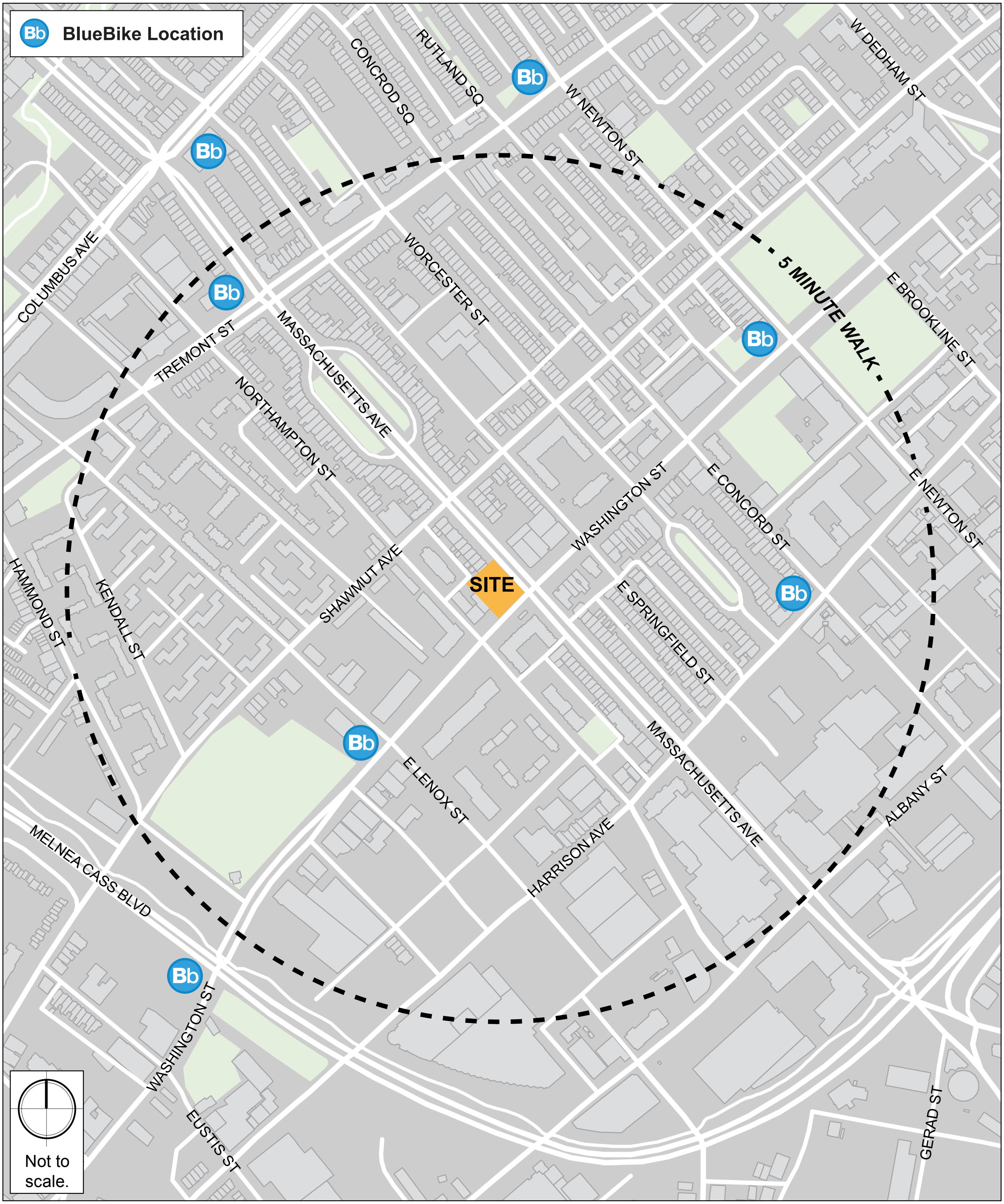


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Figure 2-8
Bicycle Sharing Locations

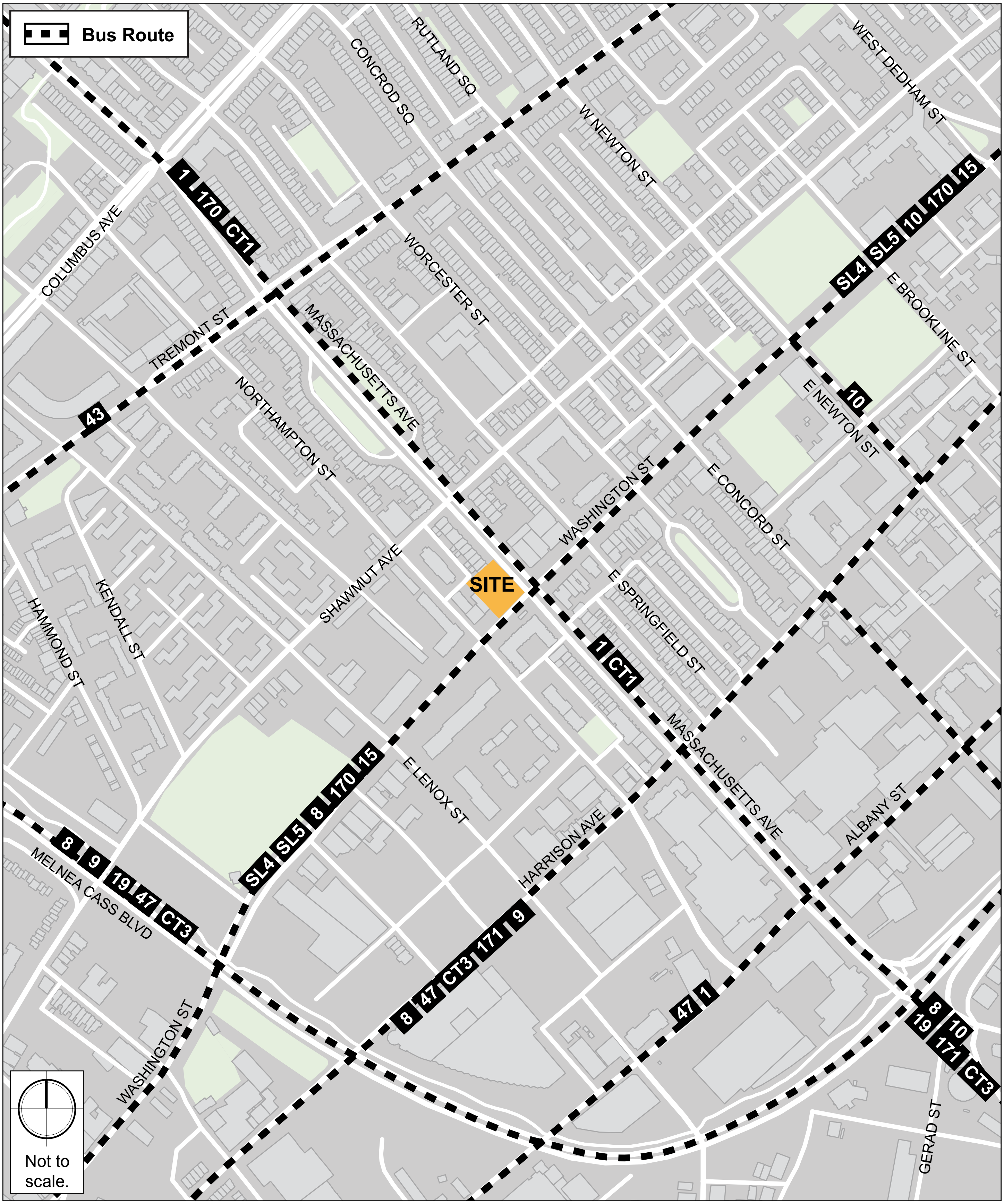

Figure 2-9
Public Transportation

Table 2-2 Existing Public Transportation

Route	Description	Peak-hour Headway	Weekday Service Duration
Rapid Transit			
Orange Line	Forest Hills – Oak Grove	6	5:16 a.m. – 12:30
Green Line – E	Heath Street – Lechmere	6	5:01 a.m. – 12:47
Bus Rapid Transit (Silver Line)			
SL4	Dudley Station – South Station	12	2:54 a.m. – 12:52
SL5	Dudley Station – Downtown Crossing	8	5:15 a.m. – 1:18 a.m.
Local Bus Routes			
CT1	Central Square – Boston Medical Center	20	6:00 a.m. – 7:44
CT3	Boston Medical Center – Andrew	10-15	6:05 a.m. – 8:40
1	Harvard – Dudley Station	8-10	4:37 a.m. – 1:27 a.m.
8	Harbor Point/UMass – Kenmore Station	15	5:15 a.m. – 12:56
9	City Point via Andrew Station	5-6	5:13 a.m. – 1:13 a.m.
10	City Point – Copley Square via BMC	20	6:00 a.m. – 1:11 a.m.
15	Haymarket via Dudley & Fields Corner	4	3:26 a.m. – 2:44 a.m.
47	Central Square – Broadway Station	10	5:15 a.m. – 1:31 a.m.
170	Waltham – Dudley	10	6:15 a.m. – 6:11
171	Dudley – Logan Airport (outbound only)	25-30	3:50 a.m. – 4:58 a.m.

Headway is the time between service, Headways vary. Source: MBTA October 2018.

2.3 No-Build (2025) Condition

The No-Build (2025) Condition reflects a future scenario that incorporates anticipated traffic volume changes associated with background traffic growth independent of any specific project, traffic associated with other planned specific developments, and planned infrastructure improvements that will affect travel patterns throughout the study area. These infrastructure improvements include roadway, public transportation, pedestrian and bicycle improvements.

2.3.1 Background Traffic Growth

The methodology to account for future traffic growth, independent of the Project, consists of two parts. The first part of the methodology accounts for general background traffic growth that may be affected by changes in demographics, automobile usage, and automobile ownership. Based on a review of recent and historic traffic data collected for nearby projects and to account for any additional unforeseen traffic growth, a one-half percent per year annual traffic growth rate was used to develop the future conditions traffic volumes.

2.3.2 Specific Development Traffic Growth

The second part of the methodology identifies any specific planned developments that are expected to affect traffic patterns throughout the study area within the future analysis time horizon. Figure 2-10 shows the specific development projects in the vicinity of the study area, which are summarized below:

Melnea Hotel and Residences – This project is located to the south of the Project site and will consist of the construction of a 145-room hotel, 50 residential units, retail spaces, restaurant and community uses, and accessory parking for approximately 122 vehicles. This project is currently under construction.

1950 Washington Street – This project is located to the south of the Project site and will consist of the renovation of an existing four-story building and the construction of a new six-story addition. Upon completion, the project will include 31 residential units, a 4,500-sf restaurant, 795-sf of office space, and 21 ground-level parking garage spaces. This project is currently approved by the BPDA.

One Newcomb Place – This project will consist of the demolition of an existing parking lot and the construction of a six-story residential building consisting of 23 rental units. No parking will be included on the site. This project is currently approved by the BPDA.

755 Harrison Avenue – This project will consist of the renovation of the current site containing the Church of the Immaculate Conception into residential housing with approximately 62 rental units. This will include the construction of 3 additional townhome style units on the site. This project is currently in the process of being submitted to the BPDA for review.

2.3.3 Proposed Infrastructure Improvements

A review of planned improvements to roadway, transit, bicycle, and pedestrian facilities was conducted to determine if there are any nearby improvement projects in the vicinity of the study area. Based on this review, there are no proposed infrastructure improvements at the study area intersections.

2.3.4 No-Build (2025) Condition Traffic Volumes

The one-half percent per year annual growth rate, compounded annually, was applied to the Existing (2018) Condition traffic volumes, then the traffic volumes associated with the background development projects were added to develop the No-Build (2025) Condition traffic volumes. The No-Build (2025) Condition weekday a.m. peak hour and p.m. peak hour traffic volumes are shown on Figure 2-11.

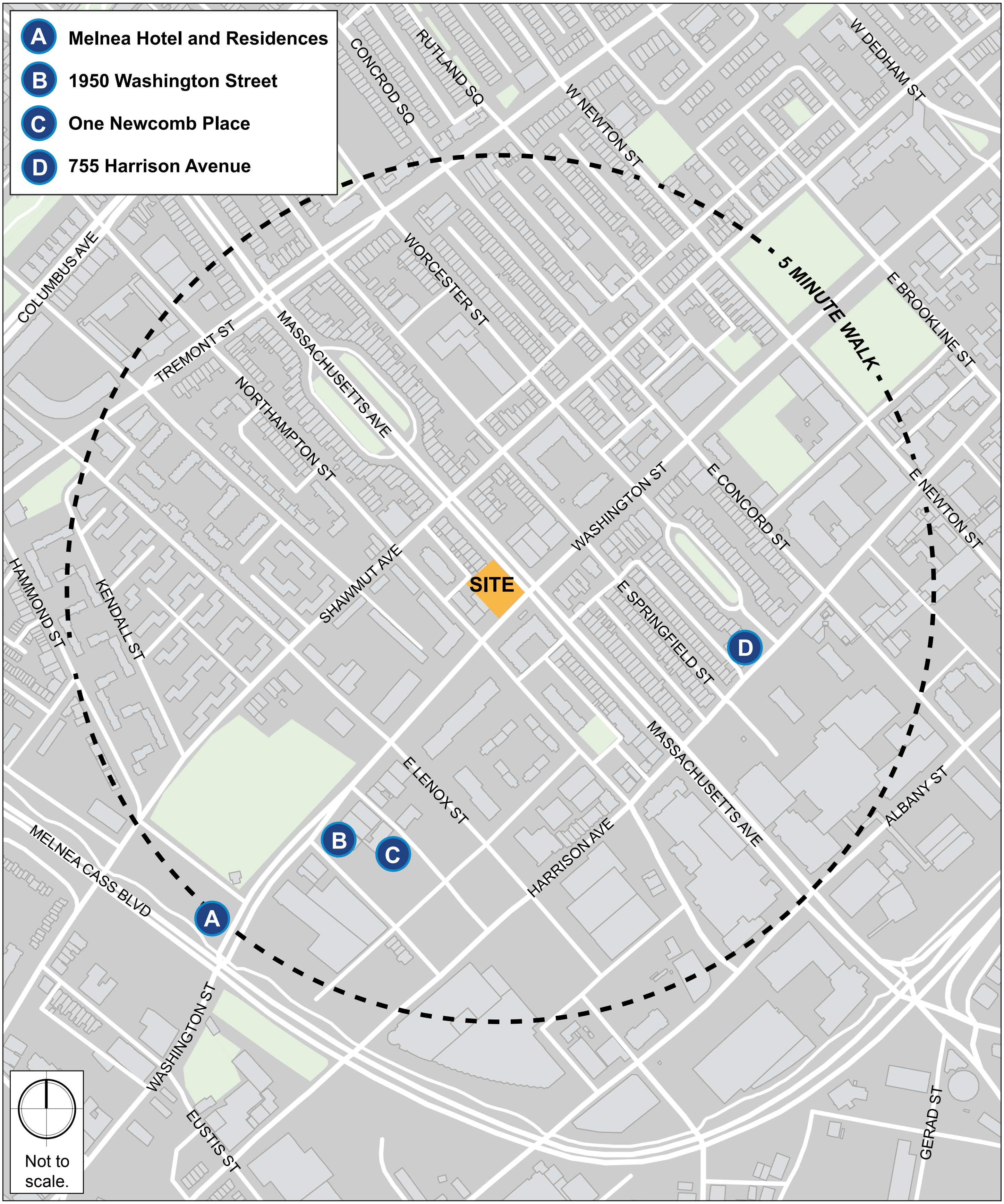

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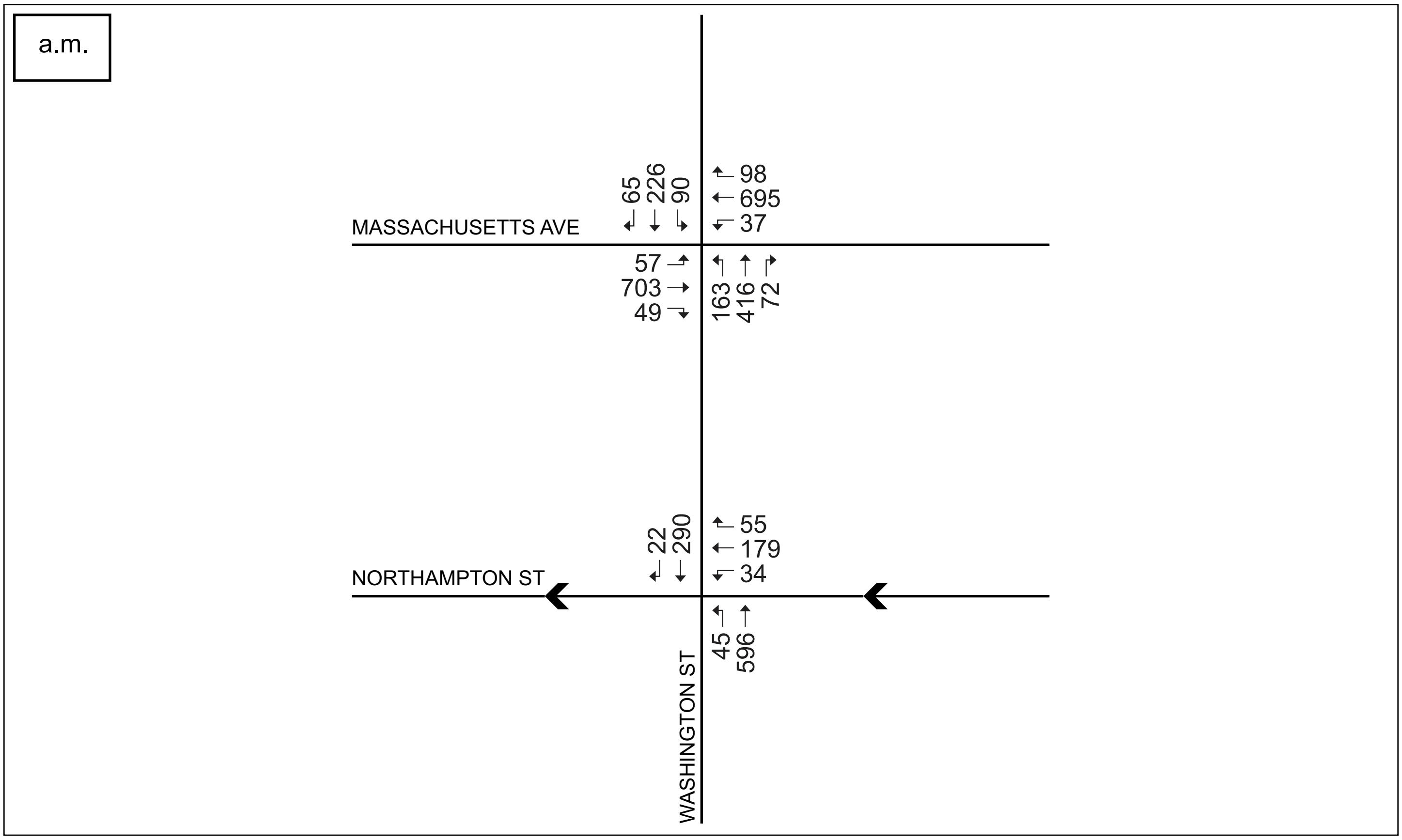
Figure 2-10
Background Projects



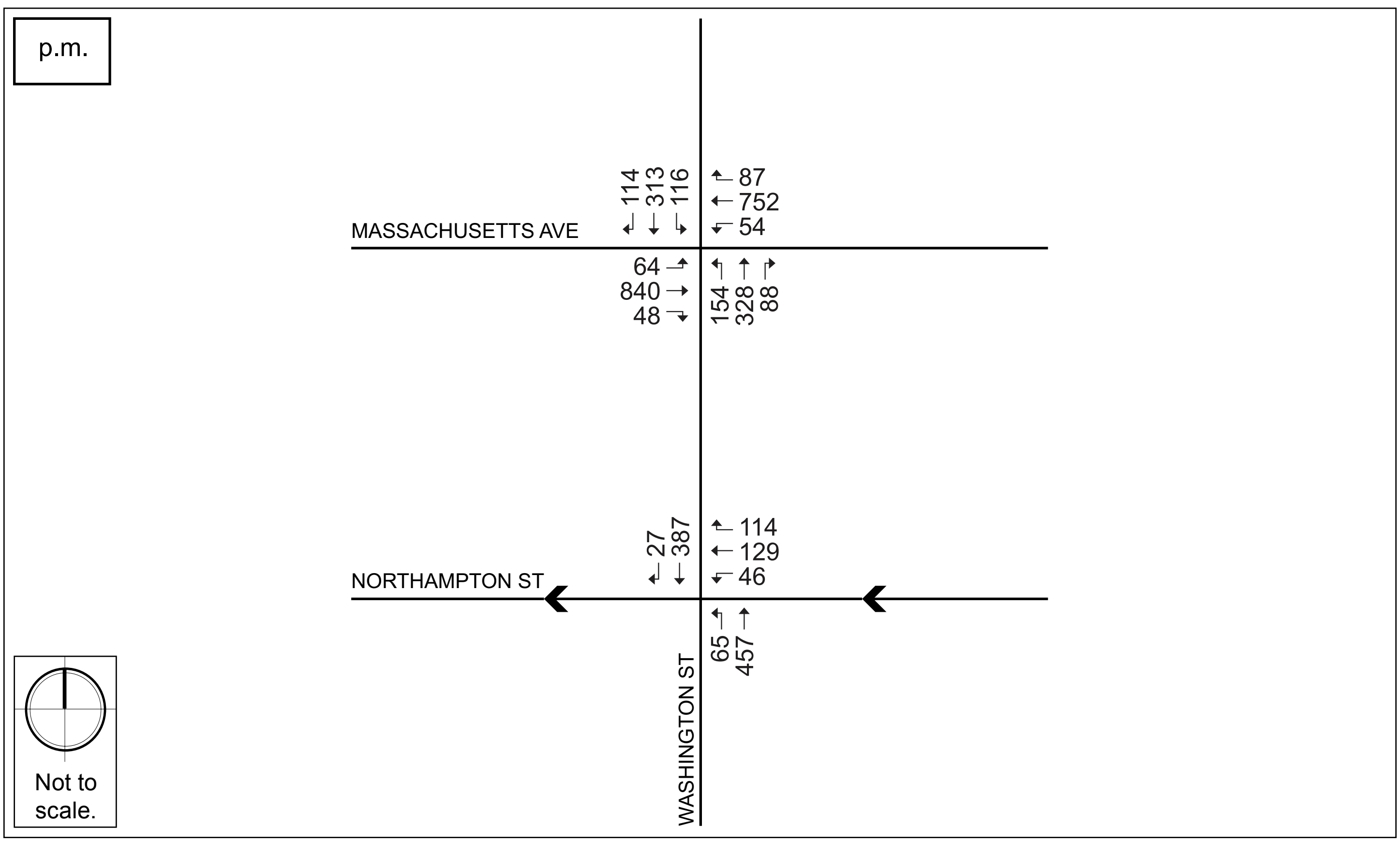


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Figure 2-11

No-Build (2025) Condition Traffic Volumes, Weekday a.m. and p.m. Peak Hour

2.4 Build (2025) Condition

As previously summarized, the Project will consist of approximately 150 hotel rooms, a ground floor restaurant, rooftop amenity space, conference rooms, and other services typically associated with a boutique-style hotel. No on-site parking will be provided due to site constraints and the proximity of the Project to public transportation. Valet parking will be provided for guests and will utilize a nearby parking garage or lot.

2.4.1 Site Access and Vehicle Circulation

Vehicular access to the Project site will consist of curbside pick-ups and drop-offs along Washington Street in front of the Project site. The site access plan is shown in Figure 2-12.

2.4.2 Project Parking

There will be no parking on provided on the Project site. The hotel will provide valet parking for guests and will utilize a nearby parking garage or lot. The hotel will establish an agreement to park private vehicles at nearby garages, which are outlined in Section 2.2.3. The largest capacity garage nearby is the Crosstown Center Garage. As documented in unpublished surveys conducted by HSH in several downtown neighborhoods, based on current Boston parking trends, parking demand has been declining over the last few years. This trend is only expected to exacerbate with the continued use of new mobility options (including TNCs and shuttle services, both public and private) and the advent of autonomous vehicles within a few years.

2.4.3 Loading and Service Accommodations

Loading and service access will be provided behind the building off of Comet Place. Comet Place is an existing public alley that has a narrow width. SU-30s, panel trucks, vans, and other small vehicles are able to utilize Comet Place. Should a delivery occur in a larger vehicle, the valet spaces on Washington Street will be utilized.

2.4.4 Bicycle Accommodations

BTD has established guidelines requiring projects subject to Transportation Access Plan Agreements to provide secure bicycle parking for guests and employees and short-term bicycle racks for visitors. Based on BTD guidelines, the Project will supply a minimum of 18 secure bicycle parking/storage spaces within the building at a rate of 0.3 secure indoor bicycle parking spaces per 1,000 sf of development. Additional storage will be provided by outdoor bicycle racks accessible to visitors to the site in accordance with BTD guidelines.

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Figure 2-12
Site Access Plan

2.4.5 *Trip Generation Methodology*

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

To estimate the unadjusted number of vehicular trips for the Project, the following ITE land use code (LUC) was used:

Land Use Code 310 – Hotel. A hotel is a place of lodging that provides sleeping accommodations and supporting facilities such as restaurants, cocktail lounges, meeting and banquet rooms or convention facilities, limited recreational facilities (pool, fitness room), and/or other retail and service shops. Calculations of the number of trips use ITE's average rate per room.

2.4.6 *Travel Mode Share*

The BTD provides vehicle, transit, and walking mode split rates for different areas of Boston. The Project is located in the easterly portion of 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 travel mode shares are shown in Table 2-3.

---

1 Trip Generation Manual, 10th Edition; Institute of Transportation Engineers; Washington, D.C.; 2017.
2 Summary of Travel Trends: 2009 National Household Travel Survey; FHWA; Washington, D.C.; June 2011.

Table 2-3 Travel Mode Shares

Land Use	Direction	Walk/ Bicycle Share	Transit Share	Auto Share	Vehicle Occupancy
Daily					
Hotel	In Out	35% 35%	12% 12%	53% 53%	1.84
a.m. Peak Hour					
Hotel	In Out	13% 21%	36% 37%	51% 42%	1.84
p.m. Peak Hour					
Hotel	In Out	21% 13%	37% 36%	42% 51%	1.84

2.4.7 Project Trip Generation

The mode share percentages shown in Table 2-3 were applied to the number of person trips to develop walk/bicycle, transit, and vehicle trip generation estimates for the Project. The trip generation for the Project by mode is shown in Table 2-4. The detailed trip generation information is provided in Appendix C.

Table 2-4 Project Trip Generation

Land Use	Direction	Walk/ Bicycle Trips	Transit Trips	Vehicle Trips
Daily				
Hotel – 150 rooms ITE LUC 310: Hotel	In Out	404 404	138 138	386 386
Total Daily	**Total**	**808**	**276**	**772**
a.m. Peak Hour				
Hotel – 150 rooms ITE LUC 310: Hotel	In Out	28 20	10 11	25 14
Total a.m. Peak Hour	**Total**	**48**	**21**	**39**
p.m. Peak Hour				
Hotel – 150 rooms ITE LUC 310: Hotel	In Out	31 29	18 11	23 26
Total p.m. Peak Hour	**Total**	**60**	**29**	**49**

As shown in Table 2-4, there are 808 pedestrian/bicycle trips, 276 transit trips, and 772 vehicle trips throughout the day. During the a.m. Peak Hour, there are 48 pedestrian/bicycle trips (28 in and 20 out), 21 transit trips (10 in and 11 out), and 39 vehicle trips (25 in and 14 out). During the p.m. Peak Hour, there are 60 pedestrian/bicycle trips (31 in and 29 out), 29 transit trips (18 in and 11 out), and 49 vehicle trips (23 in and 26 out). New vehicle trips to the Site will be a combination of taxi/TNCs and private vehicles utilizing the valet service.

2.4.8 Trip Distribution

The trip distribution identifies the various travel paths for vehicles associated with the Project. Trip distribution patterns for the Project were based on BTD's origin-destination data for Area 15 – South End/Roxbury, and trip distribution patterns presented in traffic studies for nearby projects. The trip distribution for the Project is illustrated in Figure 2-13.

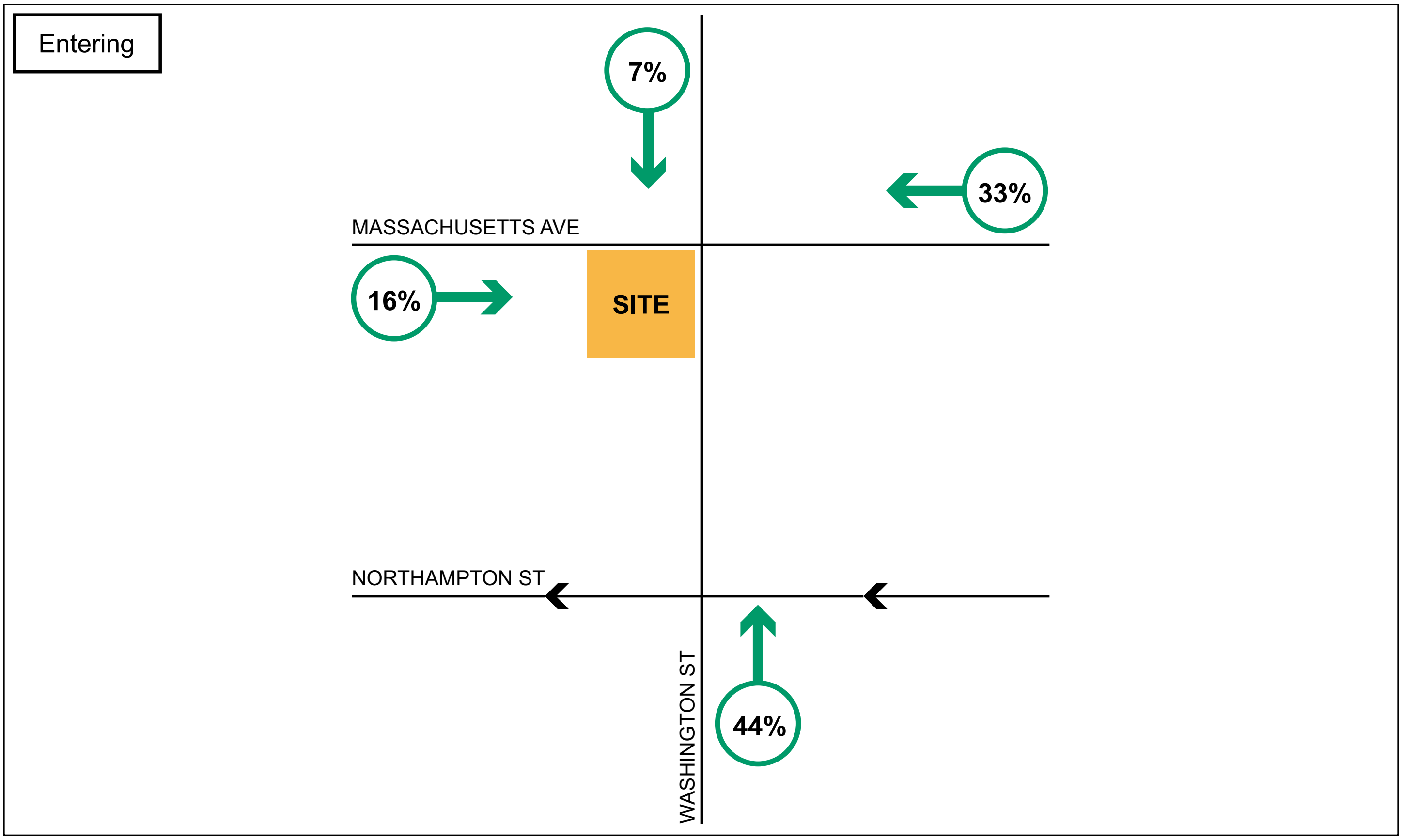
2.4.9 Build (2025) Condition Traffic Volumes

The new Project-generated trips for the a.m. and p.m. peak hours are shown in Figure 2-14. The trip assignments were added to the No-Build (2025) Condition vehicular traffic volumes to develop the Build (2025) Condition vehicular traffic volumes. The Build (2025) Condition a.m. and p.m. peak hour traffic volumes are shown on Figure 2-15.

2.6 Traffic Capacity Analysis

Trafficware's Synchro (version 9) 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 2010 Highway Capacity Manual (HCM).

LOS designations are based on the average delay per vehicle for all vehicles entering an intersection. Table 2-5 displays the intersection LOS criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst condition, with significant traffic delay. 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.



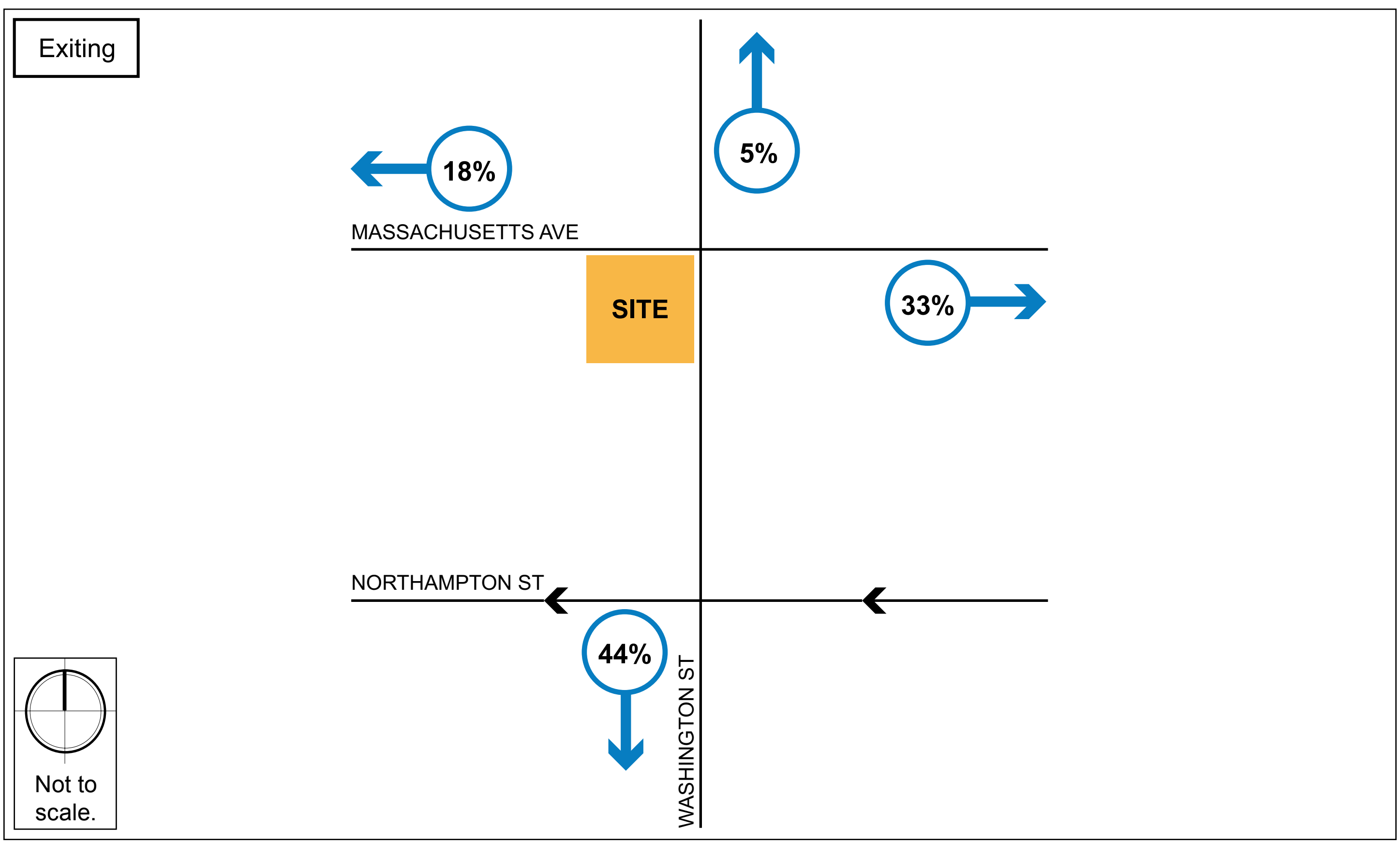
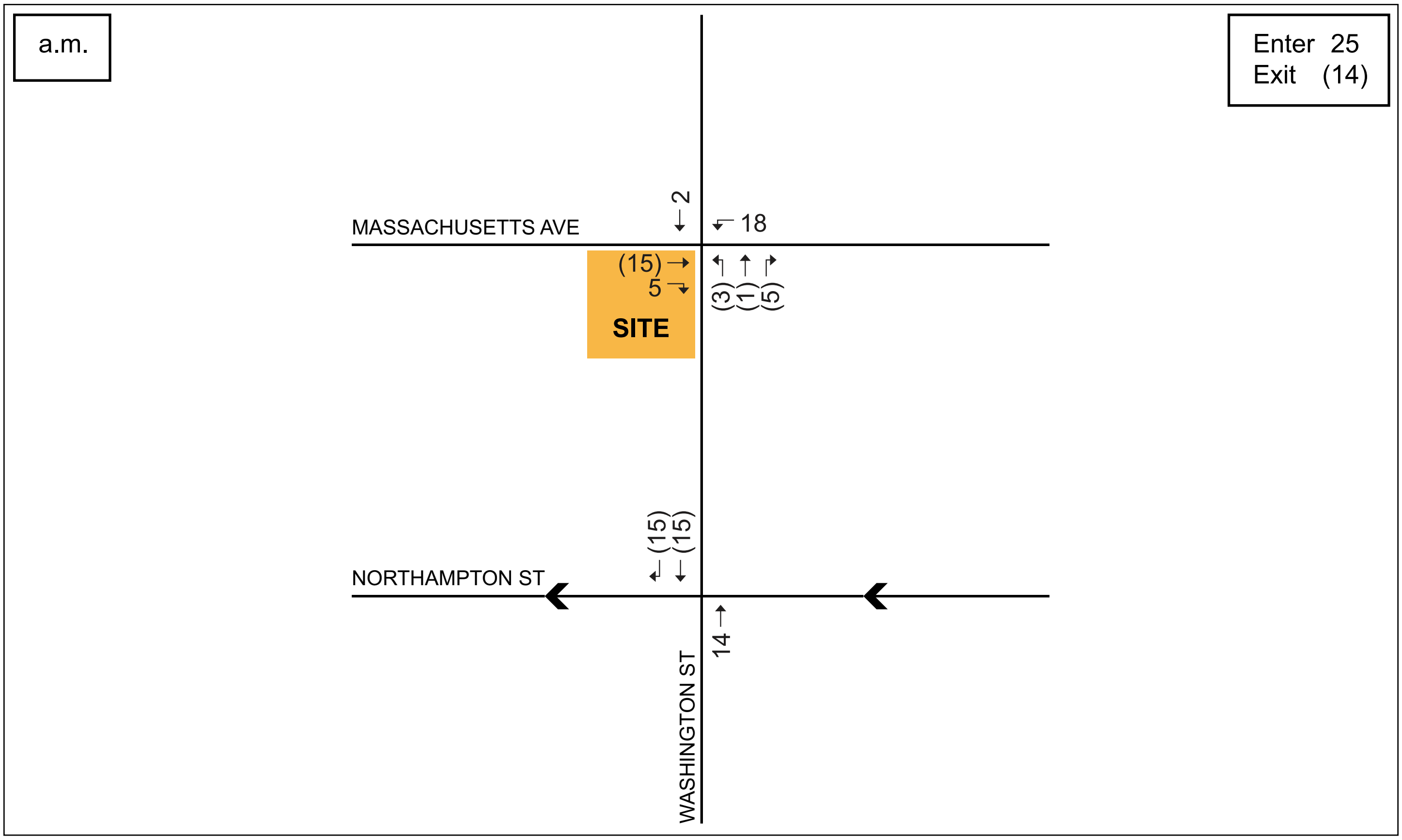


Figure 2-13
Trip Distribution - Entering and Exiting



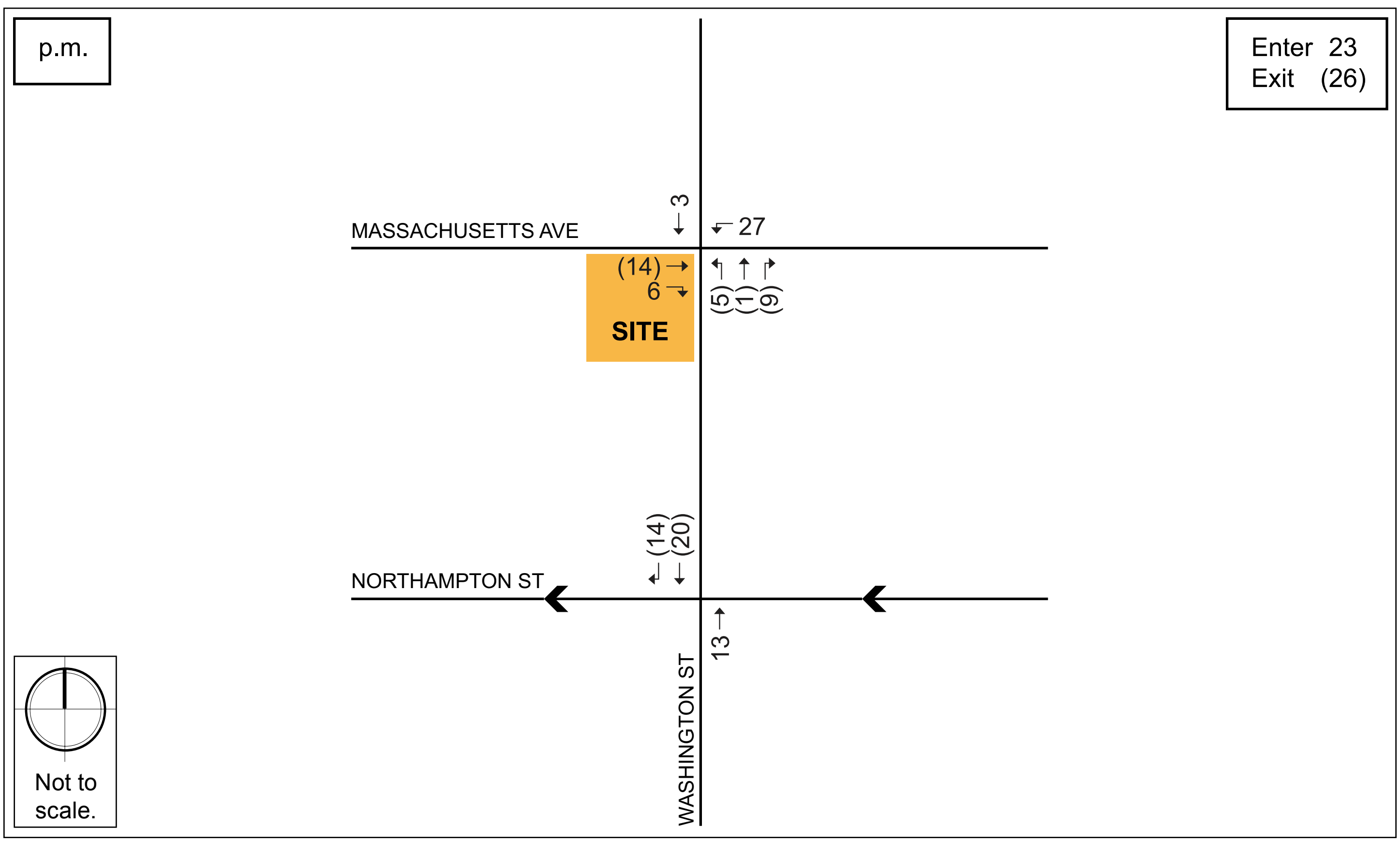


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Figure 2-14

Project Generated Vehicle Trips, Weekday a.m. and p.m. Peak Hours

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Figure 2-15

Build (2025) Condition Traffic Volumes, Weekday a.m. and p.m. Peak Hours

Table 2-5 Vehicle Level of Service Criteria

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: 2010 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 2-6 and Table 2-7 summarize the Existing (2018) Condition, the No-Build (2025) Condition, and the Build (2025) Condition capacity analysis for the study area intersection during the weekday a.m. and p.m. Peak hours, respectively. The detailed analysis of the Synchro results is provided in Appendix C.

2.6.1 Existing (2018) Condition Traffic Capacity Analysis

As shown in Table 2-6 and Table 2-7, in the Existing (2018) Condition, most of the study area intersections and approaches operate at acceptable levels of service (LOS D or better) during the weekday a.m. and p.m. peak hours with one exception. The Northampton Street westbound approach at the intersection of Washington Street/Northampton Street operates at LOS F during the a.m. and p.m. peak hours. This LOS is typical for stop-controlled minor streets intersecting a major roadway.

2.6.2 No-Build (2025) Condition Traffic Capacity Analysis

As shown in the No-Build (2025) Condition, most of the study area intersections and approaches continue to operate at the same levels of service during the weekday a.m. and p.m. peak hours, with one exception. The Washington Street northbound approach of Washington Street/Massachusetts Avenue degrades from LOS C to LOS D during the p.m. peak hour.

2.6.3 Build (2025) Condition Traffic Capacity Analysis

As shown in the Build (2025) Condition, most of the study area intersections and approaches continue to operate at the same levels of service during the weekday a.m. and p.m. peak hours, with one exception. The Washington Street southbound left-turn lane of Washington Street/Massachusetts Avenue degrades from LOS C to LOS D during the p.m. peak hour.

Table 2-6 Capacity Analysis Summary, Weekday a.m. Peak Hour

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Signalized Intersection															
1. Washington Street/Massachusetts Avenue	**D**	**39.8**	**-**	**-**	**-**	**D**	**41.0**	**-**	**-**	**-**	**D**	**41.3**	**-**	**-**	**-**
EB Massachusetts Ave L	C	33.5	0.27	26	55	C	34.8	0.29	26	57	C	34.8	0.29	26	57
EB Massachusetts Ave T | T/R	D	41.8	0.71	263	347	D	42.6	0.74	275	363	D	43.4	0.76	285	375
WB Massachusetts Ave L	C	27.5	0.17	17	41	C	28.5	0.18	18	42	C	33.4	0.28	26	57
WB Massachusetts Ave T | T/R	D	46.3	0.82	295	#411	D	48.1	0.85	311	#443	D	48.1	0.85	311	#443
NB Washington St L	C	28.4	0.39	82	127	C	29.1	0.41	85	130	C	29.4	0.42	87	133
NB Washington St T	D	46.9	0.74	299	#450	D	48.7	0.77	312	#474	D	48.8	0.77	313	#477
NB Washington St R	A	0.9	0.17	0	0	A	0.9	0.18	0	0	A	1.2	0.19	0	2
SB Washington St L	C	31.9	0.35	45	78	C	33.8	0.38	47	80	C	33.9	0.38	47	80
SB Washington St T	D	36.4	0.42	148	226	D	36.9	0.43	154	234	D	37.0	0.44	156	236
SB Washington St R	A	0.6	0.14	0	0	A	0.6	0.14	0	0	A	0.6	0.14	0	0

Table 2-6 Capacity Analysis Summary, Weekday a.m. Peak Hour (Continued)

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Unsignalized Intersection															
2. Washington Street/Northampton Street	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB Northampton St	F	69.3	0.91	-	215	F	88.2	0.98	-	252	F	106.3	1.04	-	276
NB Washington St L	A	8.1	0.04	-	3	A	8.1	0.04	-	3	A	8.2	0.04	-	3
NB Washington St T	A	0.0	0.36	-	0	A	0.0	0.37	-	0	A	0.0	0.68	-	0
SB Washington St T/R	A	0.0	0.19	-	0	A	0.0	0.20	-	0	A	0.0	0.22	-	0

\# 95th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.

Table 2-7 Capacity Analysis Summary, Weekday p.m. Peak Hour

Intersection/Movement	Existing (2018) Condition					No-Build (2025) Condition					Build (2025) Condition				
	LOS	Delay (s)	V/C Ratio	Queues (ft) 50t	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50t	Queues (ft) 95th	LOS	Delay (s)	V/C Ratio	Queues (ft) 50th	Queues (ft) 95th
Signalized Intersections															
1. Washington Street/Massachusetts Avenue	**D**	**42.0**	-	-	-	**D**	**42.9**	-	-	-	**D**	**44.9**	-	-	-
EB Massachusetts Avenue L	D	37.5	0.34	28	60	D	39.2	0.35	29	61	D	38.6	0.34	29	60
EB Massachusetts Avenue T | T/R	D	46.9	0.83	32	#450	D	46.9	0.84	338	#478	D	48.8	0.87	350	#499
WB Massachusetts Avenue L	D	36.8	0.30	25	54	D	37.7	0.31	26	56	D	44.5	0.46	39	75
WB Massachusetts Avenue T | T/R	D	47.8	0.85	31	#448	D	48.3	0.86	335	#482	D	48.6	0.86	336	#482
NB Washington Street L	C	33.6	0.45	82	125	D	36.2	0.49	84	128	D	40.4	0.54	87	136
NB Washington Street T	D	45.0	0.63	24	350	D	47.4	0.67	251	#371	D	52.1	0.74	252	#407
NB Washington Street R	A	2.3	0.22	0	9	A	3.1	0.24	0	13	A	4.3	0.28	0	21
SB Washington Street L	C	30.4	0.35	59	95	C	32.6	0.38	61	99	D	35.3	0.41	61	102
SB Washington Street T	D	43.8	0.59	22	328	D	45.8	0.63	234	341	D	50.2	0.70	237	#375
SB Washington Street R	A	4.9	0.26	0	31	A	5.5	0.28	0	34	A	5.9	0.30	0	35
Unsignalized Intersections															
2. Washington Street/Northampton Street	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WB Northampton Street	F	77.1	0.95	-	242	F	100.1	1.03	-	284	F	124.6	1.10	-	317
NB Washington Street L	A	8.5	0.06	-	5	A	8.6	0.06	-	5	A	8.7	0.07	-	5
NB Washington Street T	A	0.0	0.27	-	0	A	0.0	0.29	-	0	A	0.0	0.29	-	0
SB Washington Street T/R	A	0.0	0.25	-	0	A	0.0	0.26	-	0	A	0.0	0.28	-	0

\# 95th percentile volume exceeds capacity. Queue shown is the maximum after two cycles.

2.7 Transportation Demand Management

The Proponent is committed to implementing Transportation Demand Management (TDM) measures to minimize automobile usage and Project related traffic impacts. TDM will be facilitated by the nature of the Project (which does not generate significant peak hour trips) and its proximity to numerous public transit alternatives.

On-site management will keep a supply of transit information (schedules, maps, and fare information) to be made available to the guests 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 good transit access in marketing the site to future patrons and customers by implementing the following TDM measures to encourage the use of non-vehicular modes of travel.

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

- **Transportation Coordinator:** The Proponent will require the hotel operator to designate a full-time, on-site employee as the transportation coordinator for the site. The transportation coordinator will oversee all transportation issues. This includes managing vehicular and valet operations, service and loading, valet parking, and TDM programs.

- **Project Web Site:** The web site will include transportation-related information for visitors and employees to promote transit use.

- **Transit Pass Programs:** The Proponent will encourage the hotel operator employees to use transit and will encourage MBTA pass subsidies to full-time employees.

- **Information and Promotion of Travel Alternatives:** The Proponent will encourage the hotel operator to provide employees and visitors with public transit system maps, schedules, and other information on transit services in the area; provide an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options; provide information on travel alternatives for employees and visitors via the Internet and in the building lobby; and provide information on travel alternatives to new employees.

2.8 Transportation Mitigation Measures

While the traffic impacts associated with the new 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 use.

The Proponent will bring all abutting sidewalks to the City of Boston standards in accordance with the Boston Complete Streets design guidelines. This will include the reconstruction of the sidewalks where possible, retaining the existing ADA accessible ramps, improvements to street lighting where necessary, planting of street trees, and providing bicycle storage racks surrounding the site, where appropriate.

As has been requested by members of the public during informal public meetings, the Proponent will work with the MBTA to relocate the outbound bus stop to the southern end of the block at the Northampton Street intersection. This will minimize bus blockage of Massachusetts Avenue. With the relocated bus stop, valet parking can be accommodated along the curb in front of the hotel.

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 the BTD. Because the TAPA must incorporate the results of the technical analysis, it must be executed after these other processes have been completed. The proposed measures listed above and any additional transportation improvements to be undertaken as part of this Project will be defined and documented in the TAPA.

2.9 Evaluation of Short-term Construction Impacts

Most construction activities will be accommodated within the current Project site boundaries. 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.

To minimize transportation impacts during the construction period, the following measures will be considered for the CMP:

- Parking will not be provided on-site for construction workers;
- Construction workers will be encouraged to use public transportation and/or carpool;
- Consideration of a subsidy for MBTA passes for full-time employees; and
- Providing secure spaces on-site for workers' supplies and tools so they do not have to be brought to the site each day.

The CMP to be executed with the City prior to commencement of construction will document all committed measures.

Chapter 3.0

Environmental Review Component

3.0 ENVIRONMENTAL REVIEW COMPONENT

3.1 Wind

3.1.1 Introduction

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Alexandra Partners, LLC and CBT Architects to conduct a Pedestrian Wind Comfort Study for the Project. The criteria recommended by the Boston Planning and Development Agency (BPDA) were used in this study.

The results of the wind study show that with the addition of the Project, wind conditions in the study area are predicted to continue to be suitable for pedestrian use similar to the No-Build condition. The effective gust criterion is met both seasonally and annually at all locations in both the No Build and Build configurations.

3.1.1.1 Project Description

The Project site is located at the southwestern corner of the intersection of Washington Street and Massachusetts Avenue. The proposed Project consists of an approximately 144 foot tall, 12-story hotel building with an outdoor terrace at Level 12, and the restoration of the existing Hotel Alexandra façade.

3.1.1.2 Objectives

The objective of the study was to assess the effect of the proposed Project on local wind conditions in pedestrian areas around the Project site. The study involved wind simulations on a 1:300 scale model of the proposed building and surroundings. These simulations were conducted in RWDI's boundary-layer wind tunnel at Guelph, Ontario, to quantify local wind speed conditions and compare to appropriate criteria for gauging wind comfort in pedestrian areas. The assessment focused on critical pedestrian areas including the main and secondary entrances and sidewalks along the adjacent and nearby streets.

3.1.2 Background and Approach

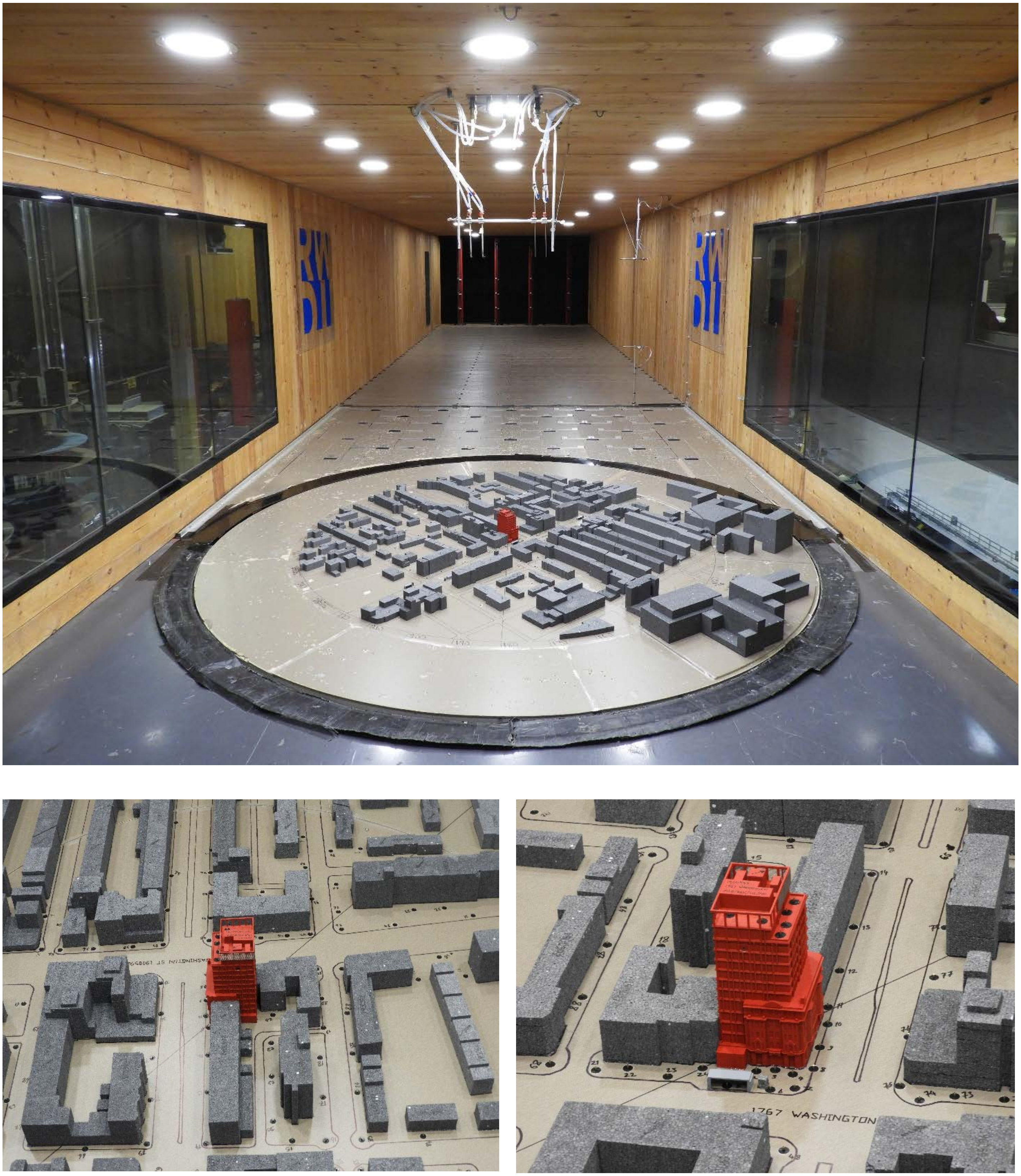
3.1.2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:300 scale model of the Project site and surroundings was constructed for the wind tunnel test with the following configurations tested:

- No Build: Existing site with existing surroundings, including buildings that are under construction or BPDA approved (Figure 3.1-1); and

- Build: Proposed Project with existing surroundings, including buildings that are under construction or BPDA approved (Figure 3.1-2).

Figure 3.1-1
Wind Tunnel Study Model – No Build



Hotel Alexandra **Boston, Massachusetts**

Figure 3.1-2
Wind Tunnel Study Model – Build

The scale model of the proposed Project (as shown in Figure 3.1-2) was constructed using the design information provided by CBT Architects. The wind tunnel model included all relevant surrounding buildings and topography within an approximately 1,200 foot radius of the Project site. The mean speed profile and turbulence of the natural wind approaching the modeled area were also simulated in RWDI's boundary layer wind tunnel. The scale model was equipped with specially designed wind speed sensors that were connected to the wind tunnel's data acquisition system to record the mean and fluctuating components of wind speed at a full scale height of five feet above the area of interest throughout the study site. Wind speeds were measured for 36 wind directions, in 10° increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model.

Wind measurements were taken at a total of 132 locations on and around the Project. The placement of wind measurement locations was based on RWDI's experience and understanding of the pedestrian usage for the site, and was reviewed by both the Project team and the BPDA.

3.1.3 Meteorological Data

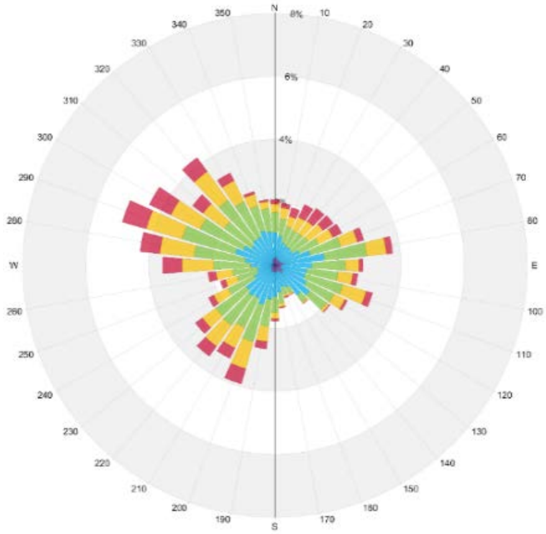
The results were then combined with long term meteorological data, recorded during the years 1995 through 2017 at Boston Logan International Airport to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 3.1-3 and 3.1-4 present "wind roses", summarizing the seasonal and annual wind climates in the Boston area respectively, based on the data from Logan Airport. For example, the first wind rose in Figure 3.1-3, summarizes the spring (March, April, and May) wind data which in general, indicate prevailing winds occurring from the northwest to south-southwest and northeast to east-southeast and strong winds (red bands), primarily occurring from the west-northwest, northwest, south-southwest and west directions.

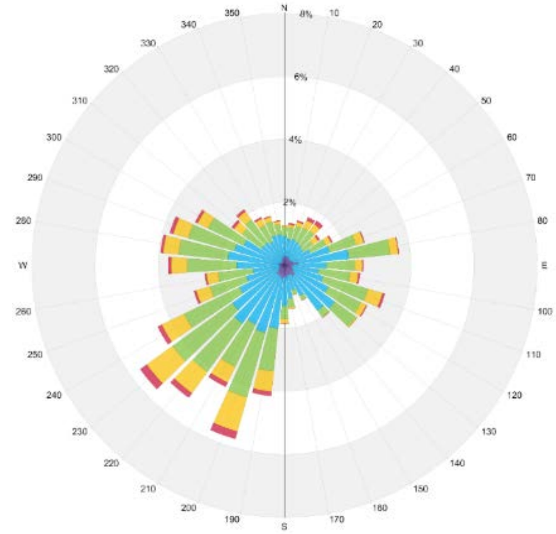
On an annual basis, common wind directions are those between north-northwest and south-southwest. Winds from the east-northeast to the east-southeast are also relatively common. In the case of strong winds, west-northwest, northwest and west are the dominant wind directions.

3.1.4 Wind Criteria

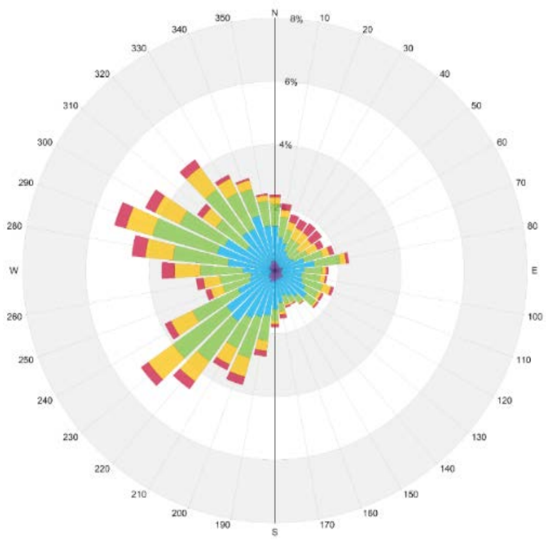
The BPDA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BPDA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root mean square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BPDA



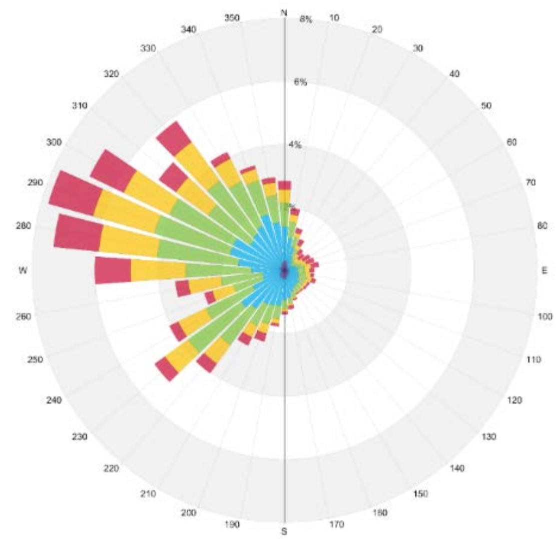
Spring (March to May)



Summer (June to August)



Fall (September to November)

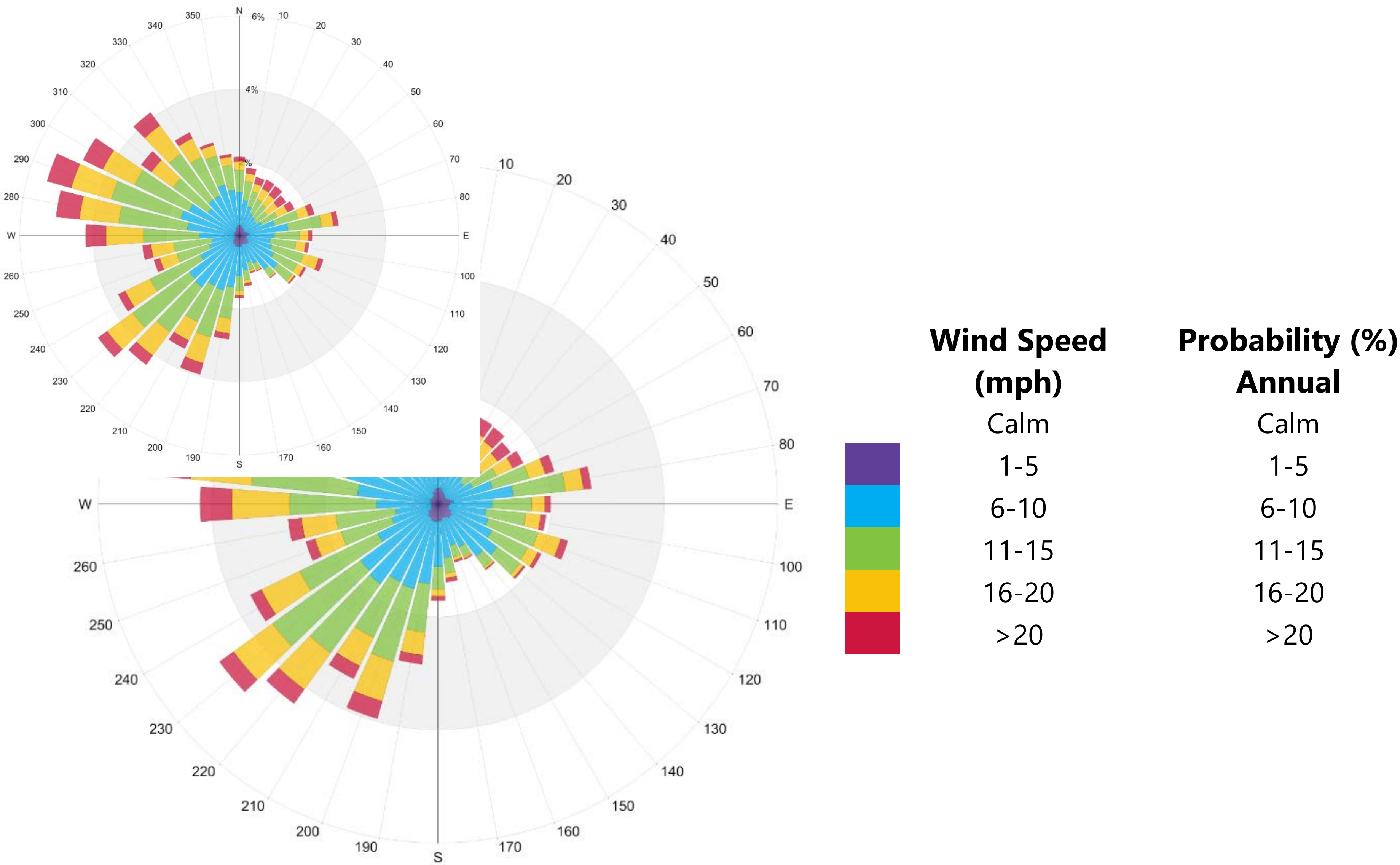


Winter (December to February)

Wind Speed (mph)	Probability (%)			
	Spring	Summer	Fall	Winter
Calm	2.8	3.1	3.4	2.6
1-5	6.8	9.5	8.7	6.5
6-10	28.9	38.7	34.5	27.9
11-15	32.5	34.4	32.0	30.8
16-20	19.1	11.8	14.6	19.7
>20	10.0	2.6	6.8	12.4

Figure 3.1-3

Seasonal Directional Distribution of Winds Approaching Boston Logan International Airport (1995 through 2017)



Hotel Alexandra Boston, Massachusetts

Figure 3.1-4

Annual Directional Distribution of Winds Approaching Boston Logan International Airport (1995 through 2017) to determine the acceptability of specific locations is based on the work of Melbourne[1]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the one-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed). They are presented in Table 3.1-1.

Table 3.1-1 Boston Planning and Development Agency Mean Wind Criteria*

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

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

The consideration of wind in planning outdoor activity areas is important since high winds in an area tend to deter pedestrian use. For example, winds should be light or relatively light in areas where people would be sitting, such as outdoor cafes or playgrounds. For bus stops and other locations where people would be standing, somewhat higher winds can be tolerated. For frequently used sidewalks, where people are primarily walking, stronger winds are acceptable. For infrequently used areas, the wind comfort criteria can be relaxed even further.

The wind climate found in a typical downtown location in Boston is generally comfortable for the pedestrian use of sidewalks and thoroughfares and meets the BPDA effective gust velocity criterion of 31 mph. However, without any mitigation measures, this wind climate is likely to be frequently uncomfortable for more passive activities such as sitting.

3.1.5 Results

The predicted wind comfort and safety conditions pertaining to the two tested configurations are graphically depicted on site plans in Figures 3.1-5 through 3.1-8. These conditions and the associated wind speeds are also presented in Appendix D. Typically, the summer and fall winds tend to be more comfortable than the annual winds while the winter and spring winds are less comfortable than the annual winds. The following discussion of pedestrian wind comfort is based on the annual winds for each configuration tested.

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

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Figure 3.1-5

Pedestrian Wind Conditions – Mean Speed – No-Build

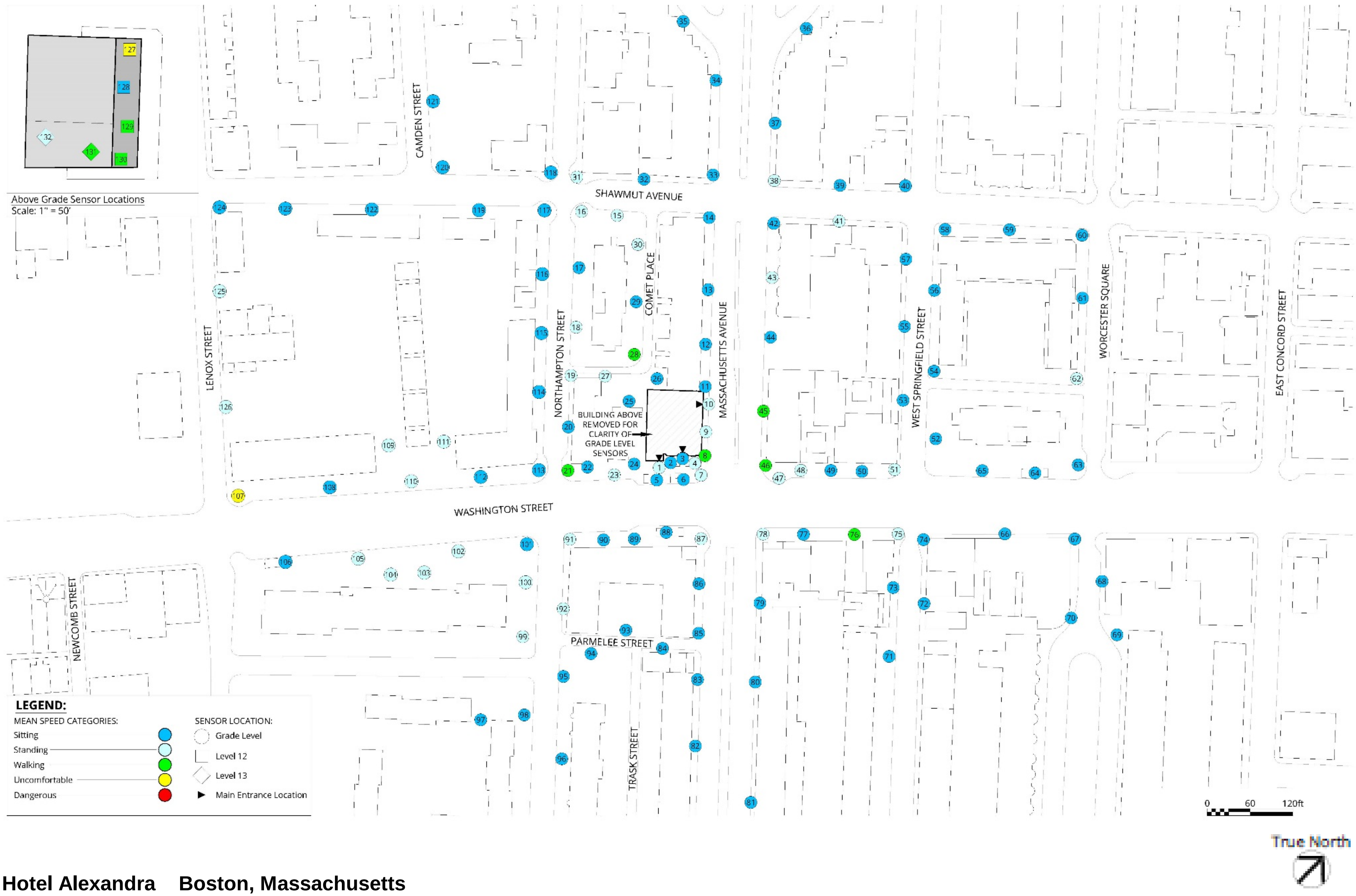

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Figure 3.1-6

Pedestrian Wind Conditions – Mean Speed – Build

Hotel Alexandra Boston, Massachusetts

Figure 3.1-7

Pedestrian Wind Conditions – Effective Gust Speed – No-Build

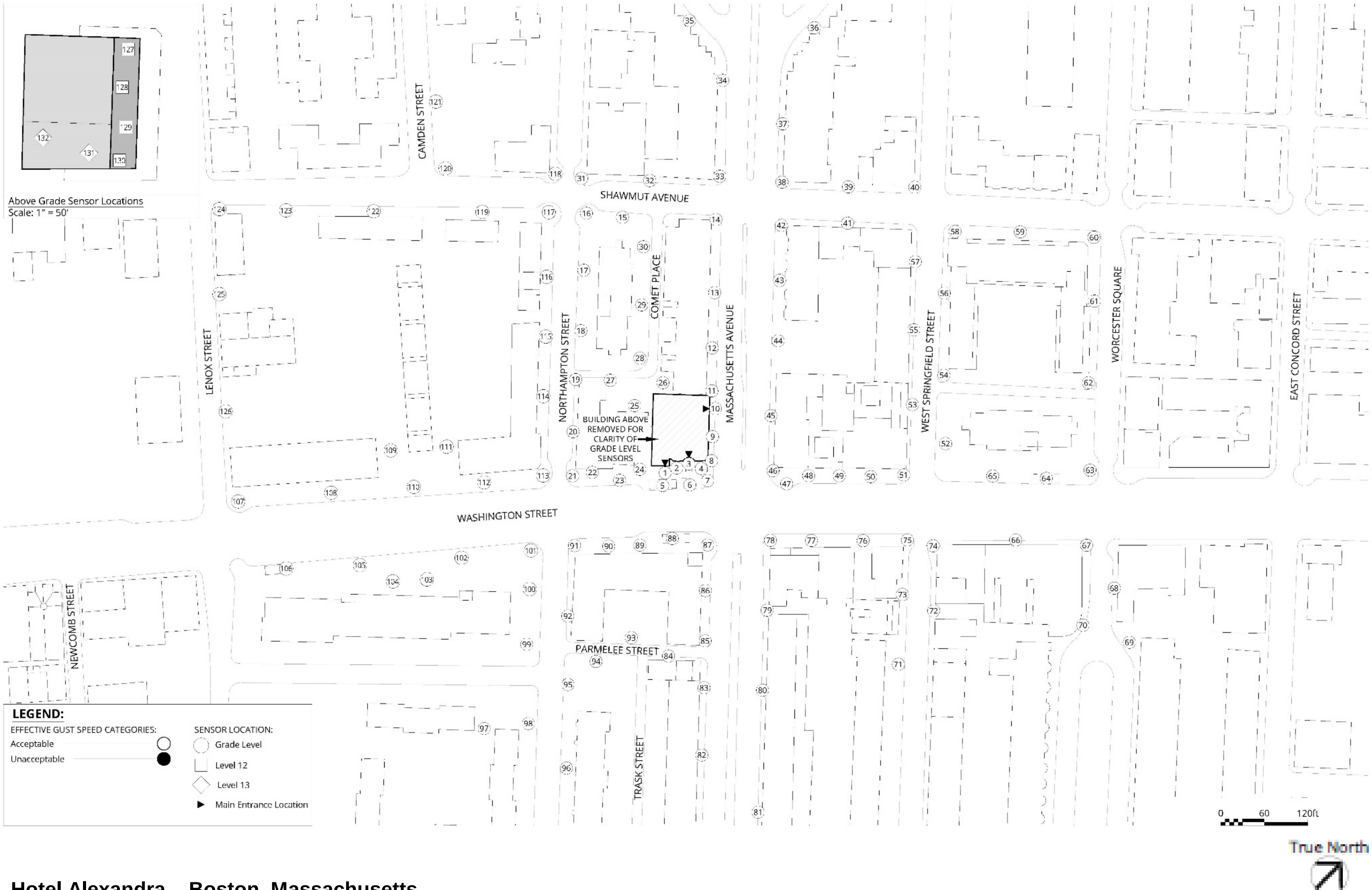

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Figure 3.1-8

Pedestrian Wind Conditions – Effective Gust Speed – Build

3.1.5.1 Project and Immediate Surroundings (Locations 1 through 11, 24 through 26 and 127 through 132)

The main café/hotel lobby entrance, main restaurant entrance and secondary restaurant entrance of the Project are, respectively, situated near Locations 3, 10 and 1 in Figures 3.1-6 and 3.1-8. Outdoor restaurant seating is proposed in front of the main restaurant entrance (Locations 2 and 4) and an existing covered bus stop is located on Washington Street (Location 5). Wind speeds comfortable for standing are preferred at entrance locations and bus-stops where pedestrians are apt to linger. Low wind speeds comfortable for sitting are desirable at outdoor dining areas. Increased wind speeds comfortable for walking are appropriate for sidewalks and walkways, as pedestrians will be more active and less likely to remain in one area for prolonged periods of time.

No-Build Configuration

Wind conditions on the existing site are comfortable for sitting or standing on an annual basis (Figure 3.1-5).

The effective gust criterion is met seasonally and annually at all the above-mentioned locations (Figure 3.1-7).

Build Configuration

Grade Level

The addition of the Project is not expected to change the wind environment around the Project site in a significant way. An increase in wind speeds is predicted in the immediate vicinity of the Project, but conditions are predicted to continue to be suitable for pedestrian use.

Wind conditions comfortable for sitting or standing are predicted at the entrances (Locations 1, 3 and 10), dining area and pedestrian areas in front of the Project site including the bus stop (Locations 5 through 7), sidewalk along Massachusetts Avenue (Locations 9 through 11) and all other areas along the proposed building perimeter (Locations 24 through 26).

The effective gust criterion will be met seasonally and annually at all the above-mentioned locations (Figure 3.1-8).

Above Grade Level

An outdoor restaurant terrace is proposed on Level 12 (Locations 127 through 130 in Figures 3.1-6 and 3.1-8). Wind conditions are expected to be comfortable for sitting at the terrace access (Location 128) and comfortable for walking on the majority of the terrace area (Locations 129 and 130). Wind speeds at the north end are predicted to be uncomfortable for walking (Location 127).

Wind speeds at the roof (Level 13) were also measured (Locations 131 and 132 in Figures 1b and 2b). Wind speeds at the roof level are predicted to be comfortable for standing or walking.

Wind control solutions such as wind screens and landscaping elements may be considered to improve the higher wind speeds at the terrace and roof levels.

The effective gust criterion will be met seasonally and annually at all the above-grade locations (Figure 3.1-8).

3.1.5.2 Extended Surroundings (Locations 12 through 23 and 27 through 126)

No-Build Configuration

Wind conditions are comfortable for walking or more passive activities in all the surrounding locations tested (Figure 1a) except for one location. At the northwestern corner of the intersection of Washington Street and Lenox Street, existing conditions are uncomfortable for walking (Location 107 in Figure 3.1-5).

The effective gust criterion is met seasonally and annually at all locations (Figure 3.1-7).

Build Configuration

The addition of Project is not expected to result in noticeably higher wind speeds at the surrounding areas (Figure 1b). Wind conditions comfortable for walking or passive activities are expected throughout the studied areas. The existing high wind speeds at the intersection of Washington Street and Lenox Street (Location 107) are predicted to remain unchanged.

The effective gust criterion is expected to be met seasonally and annually at all locations (Figure 3.1-8).

3.1.6 Conclusions

The results of the wind study show that with the addition of the Project, wind conditions in the study area are predicted to continue to be suitable for pedestrian use, similar to the No-Build condition. The effective gust criterion is met both seasonally and annually at all locations in both the No Build and Build configurations.

3.2 Shadow

3.2.1 Introduction and Methodology

As typically required by the BPDA, a shadow impact analysis was conducted to investigate shadow impacts from the Project during three time periods (9:00 a.m., 12:00 noon, and 3:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), and winter solstice (December 21). In addition, shadow studies were conducted for the 6:00 p.m. time period during the summer solstice and autumnal equinox.

The shadow analysis presents the existing shadow and new shadow that would be created by the proposed Project, illustrating the incremental impact of the Project. The analysis focuses on nearby open spaces, sidewalks and bus stops adjacent to and in the vicinity of the Project site. Figures showing the net new shadow from the Project are provided in Figures 3.2-1 to 3.2-14 at the end of this section.

The Project site contains an existing five-story building, and the Project will retain the existing façade and construct a new, twelve story building that will be set back from the street on both Washington Street and Massachusetts Avenue. As a result, shadow impacts associated with the Project will be minimal, and will be limited to nearby streets and sidewalks. During the time periods studied, the Project will not cast new shadow on nearby public open spaces. New shadow will be cast onto the Massachusetts Avenue at Washington Street bus stop during one of the fourteen time periods studied (March 21 at 3:00 p.m.).

3.2.2 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, new shadow from the Project will be cast to the northwest and will mostly be limited to nearby rooftops. New shadow will be cast onto a sliver of Shawmut Avenue and its southern sidewalk. No new shadow will be cast onto nearby bus stops or open spaces.

At 12:00 p.m., new shadow from the Project will be cast to the north onto a portion of Massachusetts Avenue. No new shadow will be cast onto nearby bus stops or open spaces.

At 3:00 p.m., new shadow from the Project will be cast to the northeast onto a portion of Massachusetts Avenue's northeastern sidewalk. New shadow will be cast onto the Massachusetts Avenue at Washington Street bus stop. No new shadow will be cast onto nearby open spaces.

3.2.3 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, new shadow from the Project will be cast to the west onto Comet Place and its sidewalks and onto Northampton Street and its northeastern sidewalk. No new shadow will be cast onto nearby bus stops or open spaces.

At 12:00 p.m., no new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces as a result of the Project.

At 3:00 p.m., new shadow from the Project will be cast to the east onto a portion of Massachusetts Avenue. No new shadow will be cast onto nearby bus stops or open spaces.

At 6:00 p.m., new shadow from the Project will be cast to the southeast onto Washington Street and its southern sidewalk, and onto Massachusetts Avenue and its sidewalk. No new shadow will be cast onto nearby bus stops or open spaces.

3.2.4 Autumnal Equinox (September 21)

At 9:00 a.m., new shadow from the Project will be cast to the northwest extending slightly the existing shadow on Comet Place, and onto a sliver of Shawmut Avenue and its southern sidewalk. No new shadow will be cast onto nearby bus stops or open spaces.

At 12:00 p.m., new shadow from the Project will be cast to the north onto Massachusetts Avenue. No new shadow will be cast onto nearby sidewalks, bus stops or open spaces.

At 3:00 p.m., no new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces as a result of the Project.

At 6:00 p.m., most of the streets and sidewalks are under existing shadow. No new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces as a result of the Project.

3.2.5 Winter Solstice (December 21)

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., new shadow from the Project will be cast to the northwest and will be mostly limited to nearby rooftops. New shadow will be cast onto a small portion of Massachusetts Avenue and its southerly sidewalk. No new shadow will be cast onto nearby bus stops or open spaces.

At 12:00 p.m., new shadow from the Project will be cast to the north and will be mostly limited to nearby rooftops. New shadow will be cast onto a portion of Massachusetts Avenue and its northeastern sidewalk.

At 3:00 p.m., no new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces as a result of the Project.

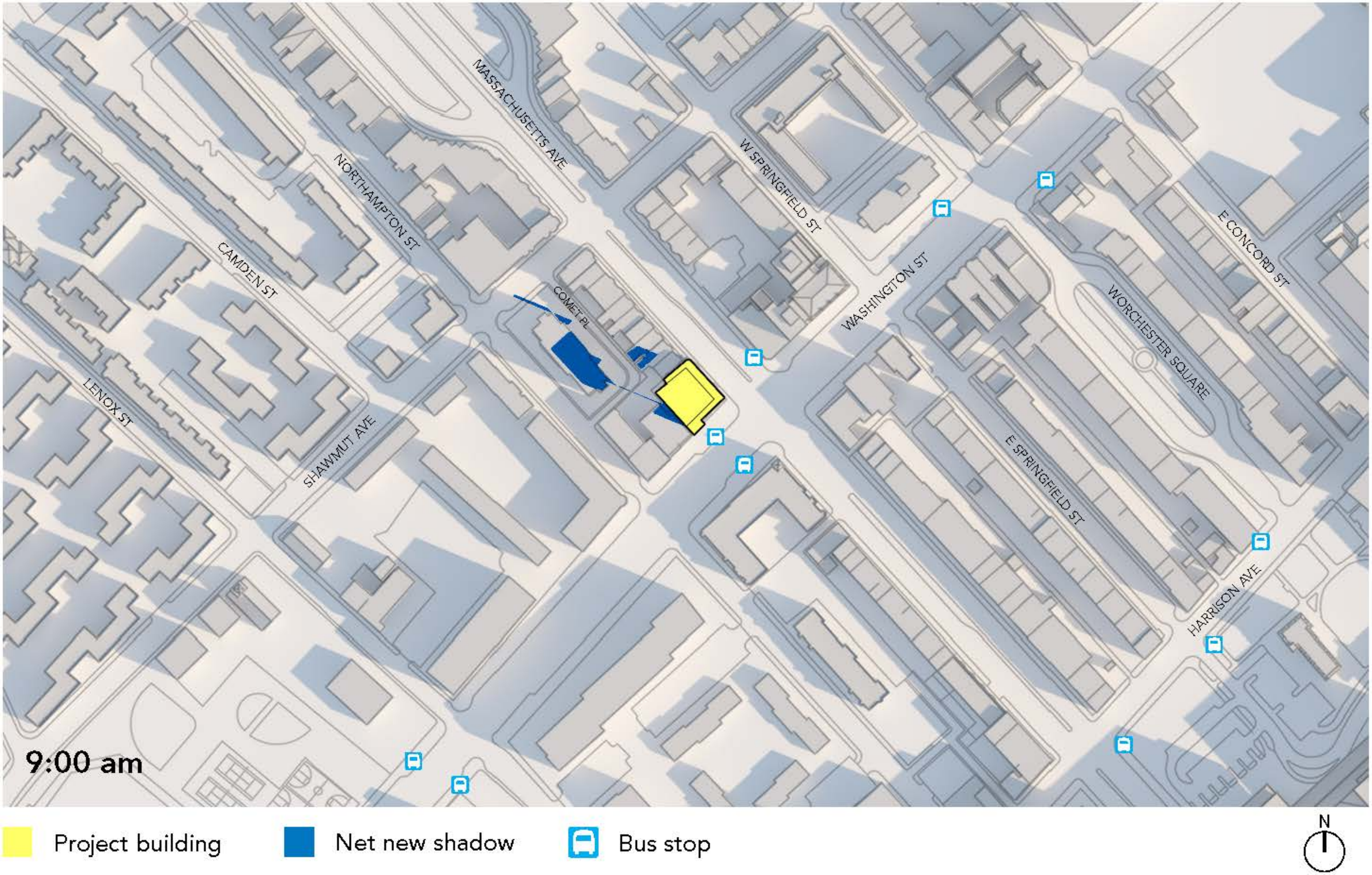

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Figure 3.2-1

Shadow Study: March 21, 9:00 a.m.

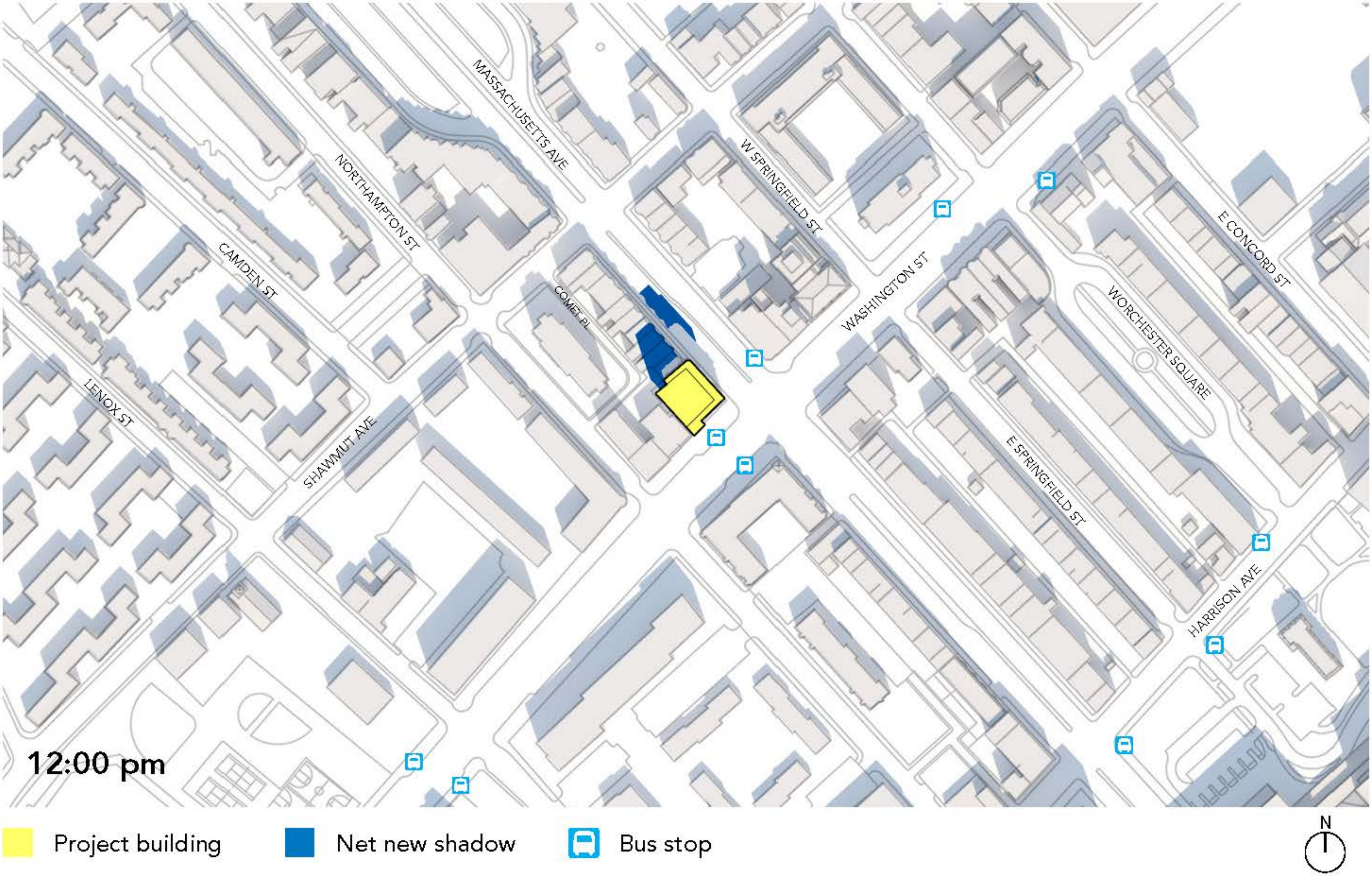

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Figure 3.2-2

Shadow Study: March 21, 12:00 p.m.

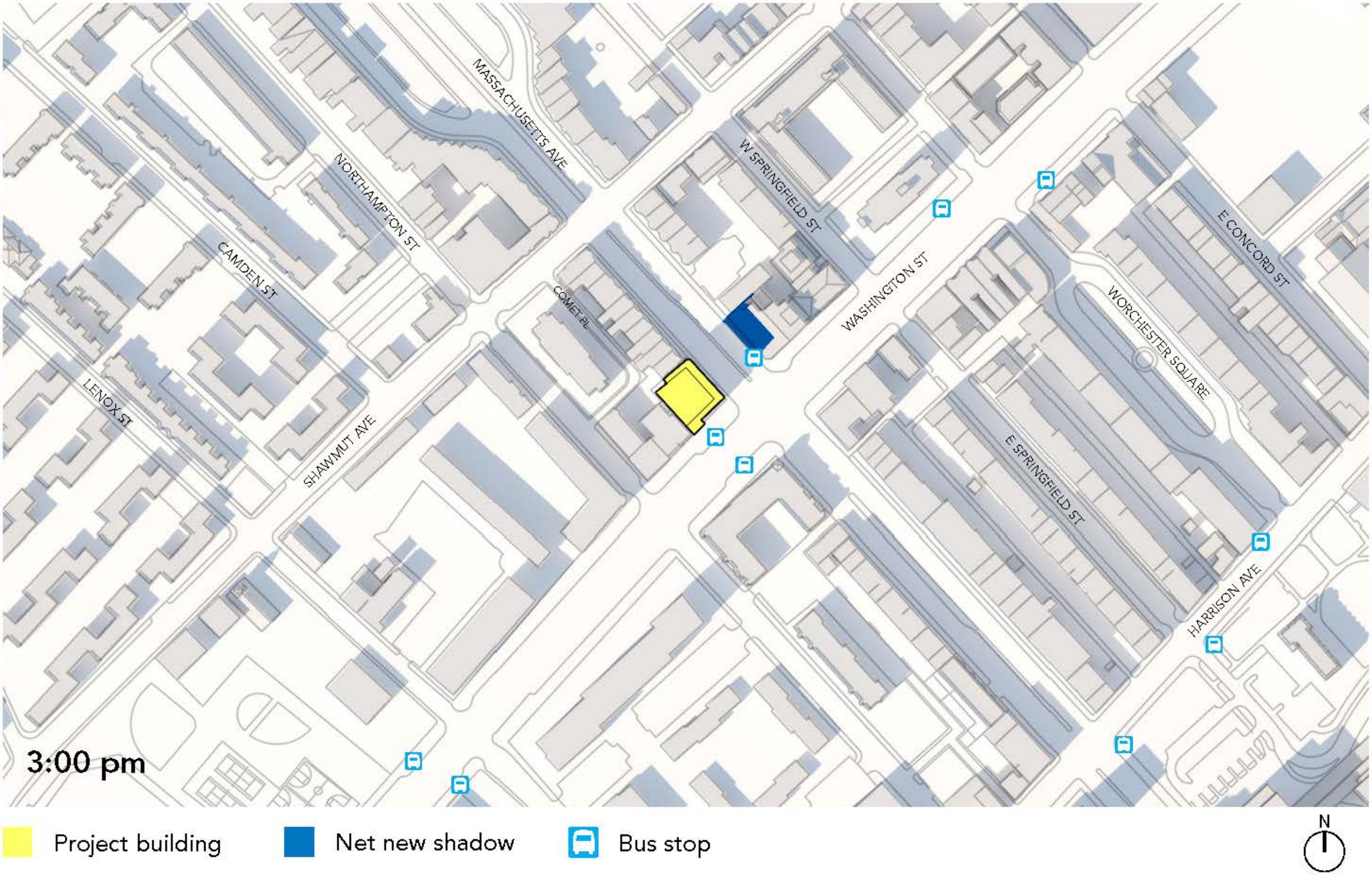

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Figure 3.2-3

Shadow Study: March 21, 3:00 p.m.

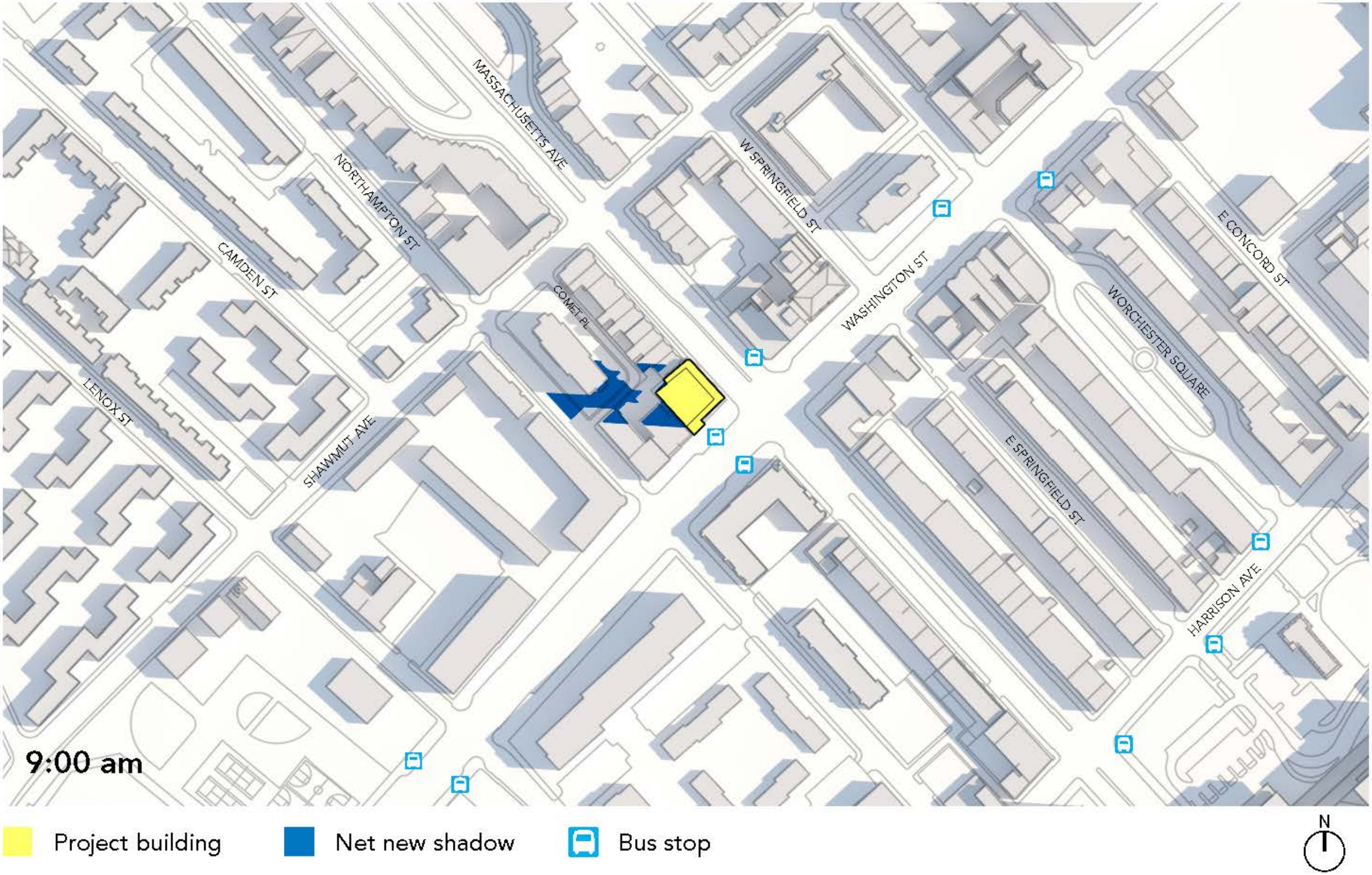

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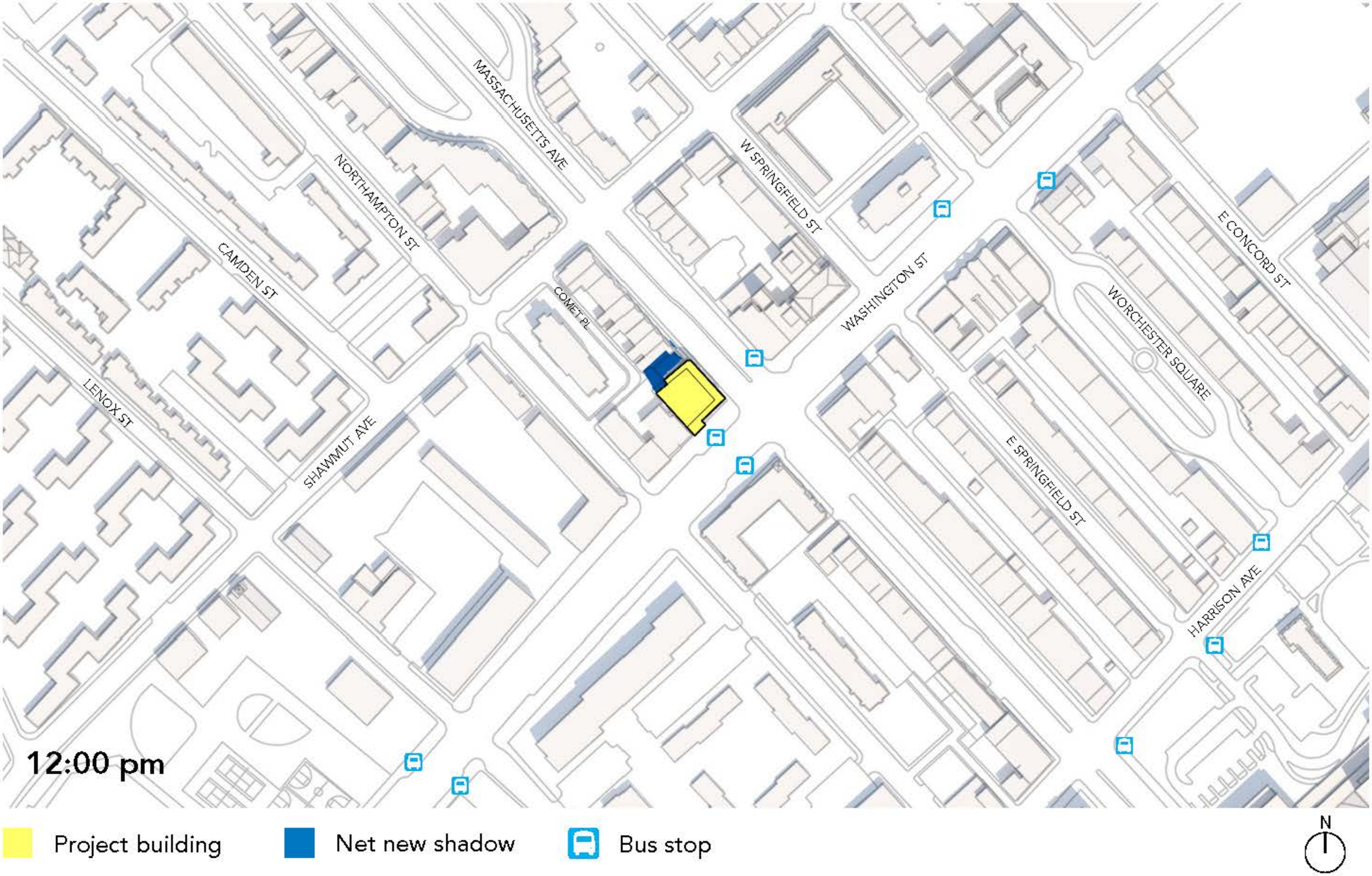
Figure 3.2-4
Shadow Study: June 21, 9:00 a.m.

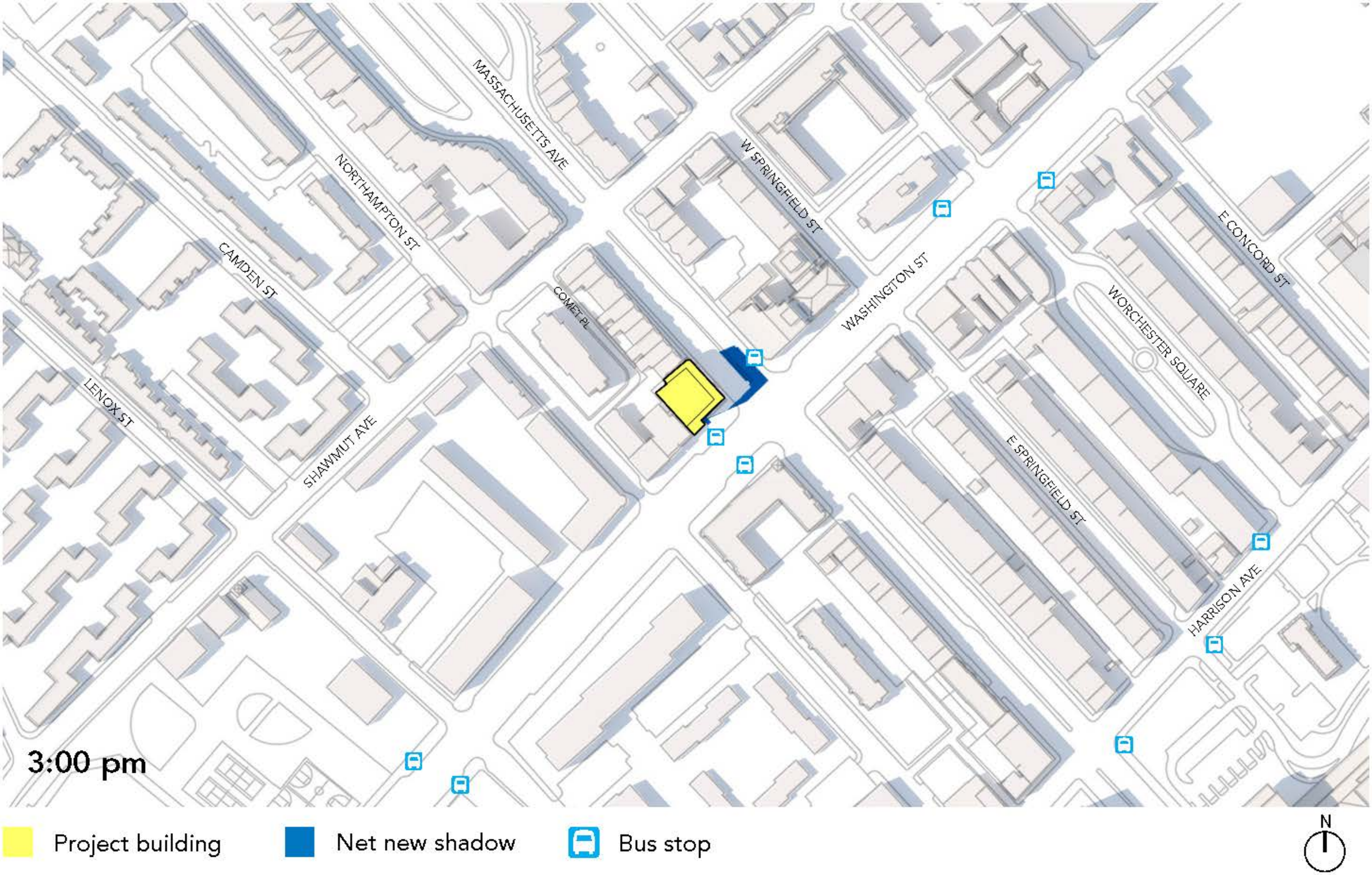


Hotel Alexandra **Boston, Massachusetts**

cbt

Figure 3.2-5

Shadow Study: June 21, 12:00 p.m.



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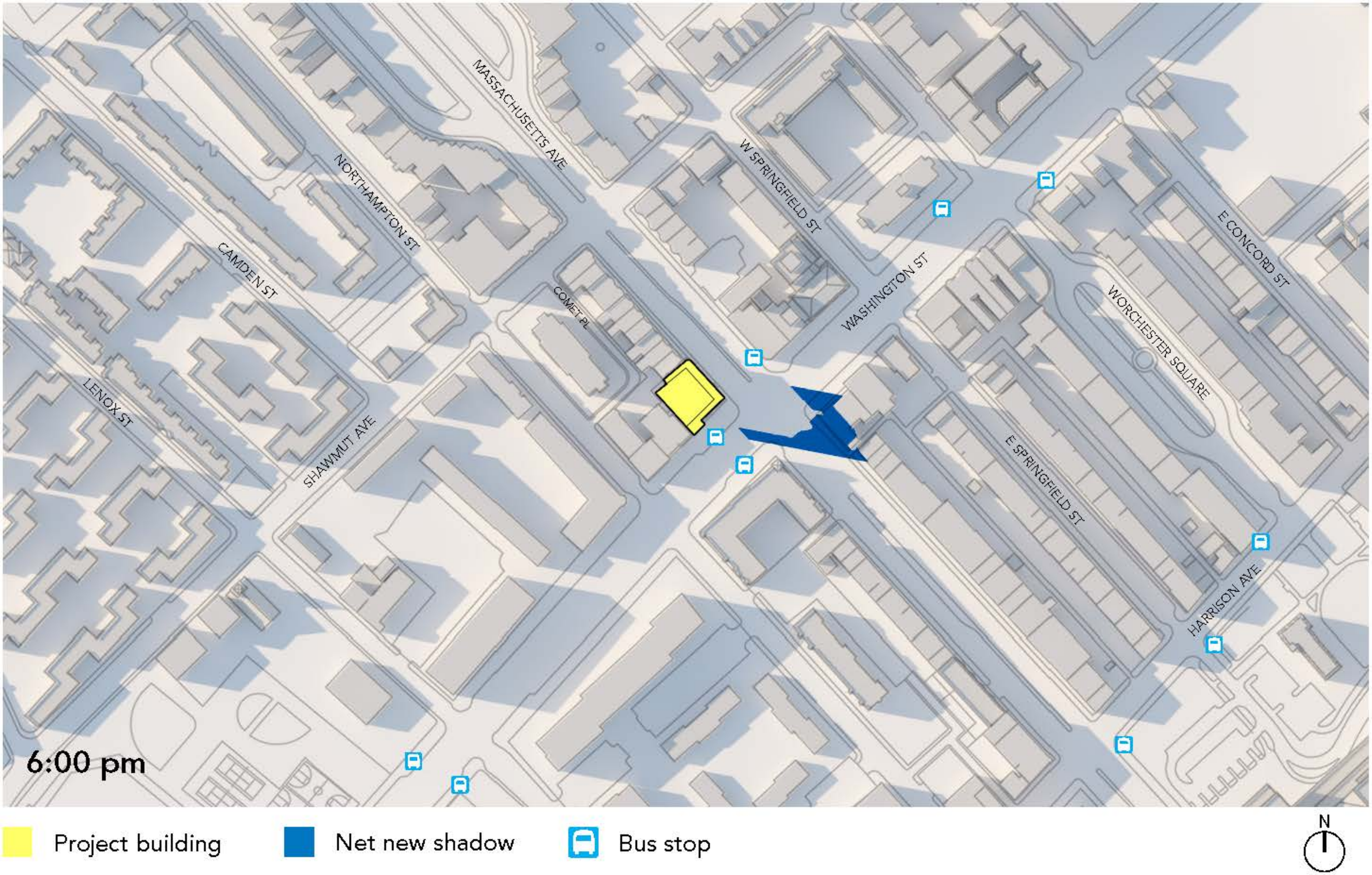
cbt

Figure 3.2-6

Shadow Study: June 21, 3:00 p.m.



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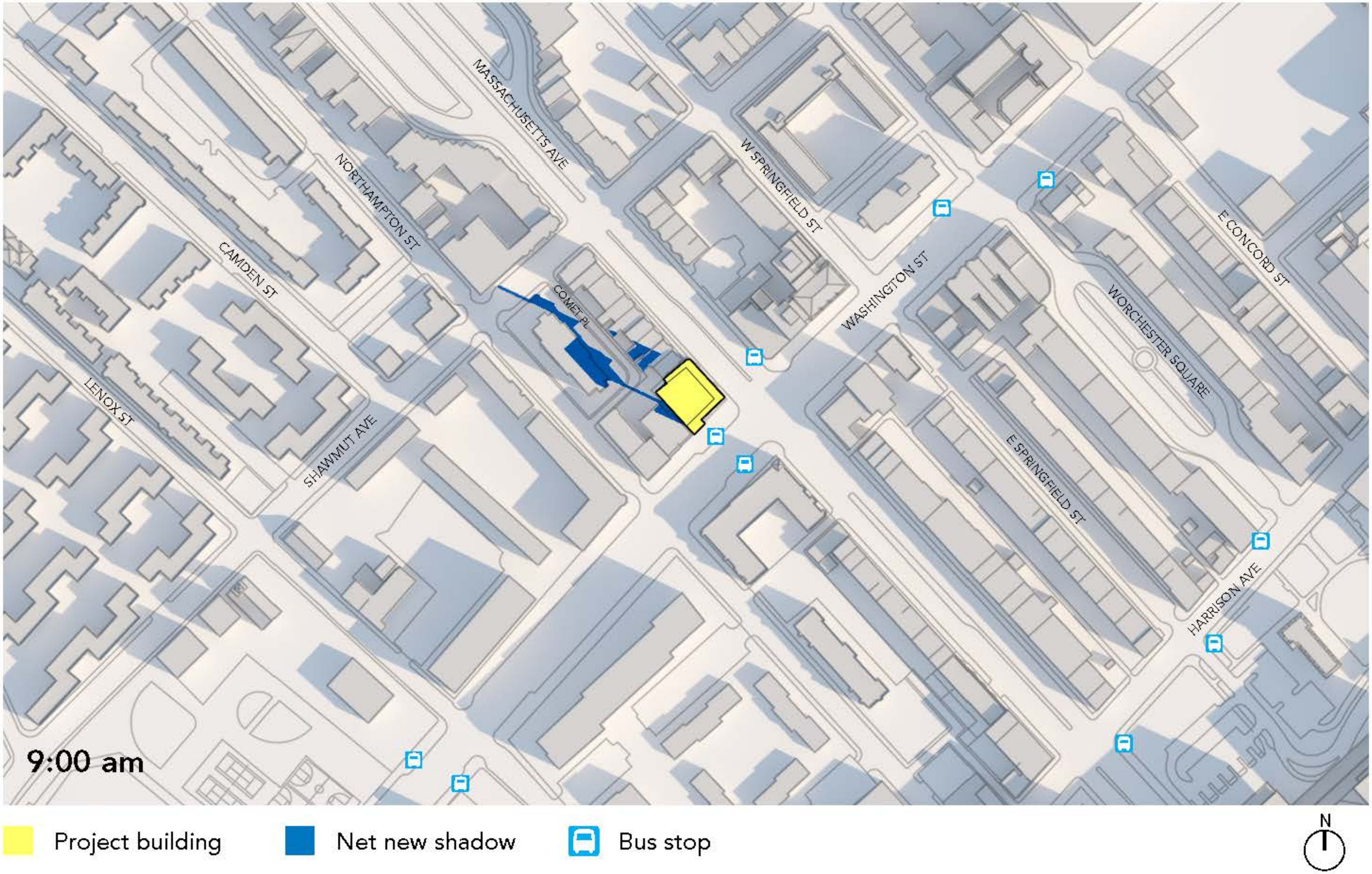
cbt

Figure 3.2-7

Shadow Study: June 21, 6:00 p.m.



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cbt

Figure 3.2-8

Shadow Study: September 21, 9:00 a.m.

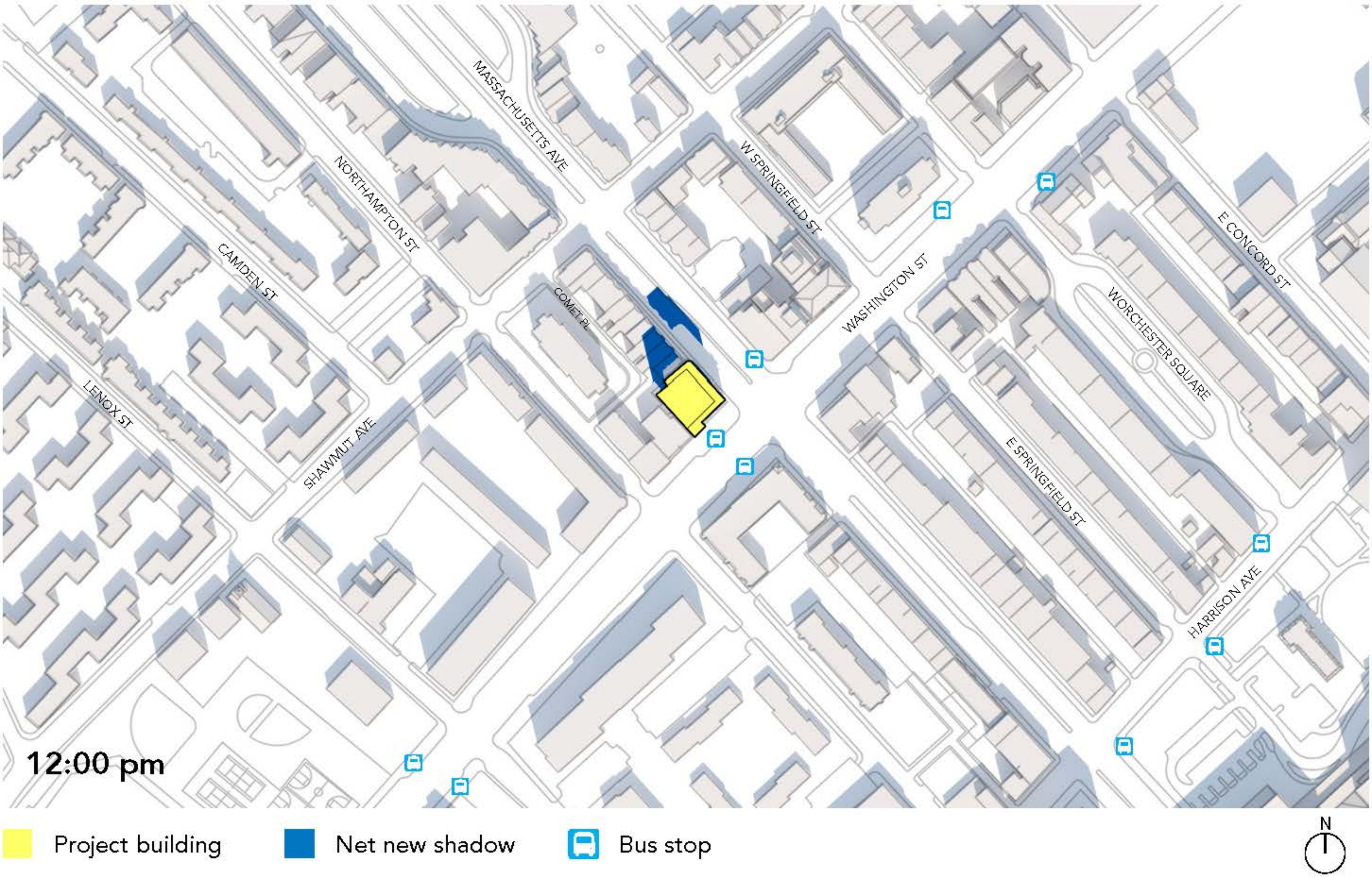

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Figure 3.2-9

Shadow Study: September 21, 12:00 p.m.

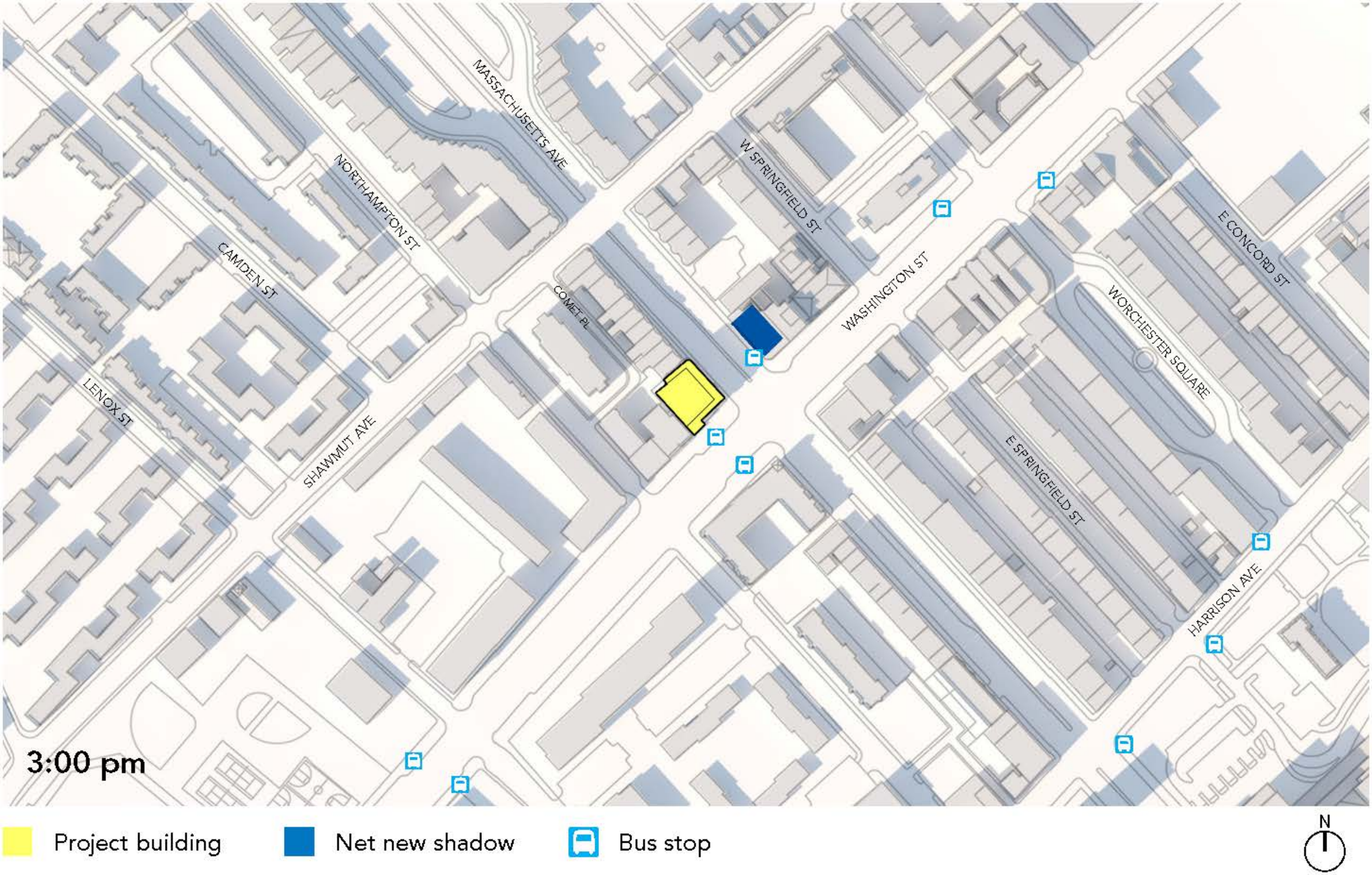

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Figure 3.2-10

Shadow Study: September 21, 3:00 p.m.

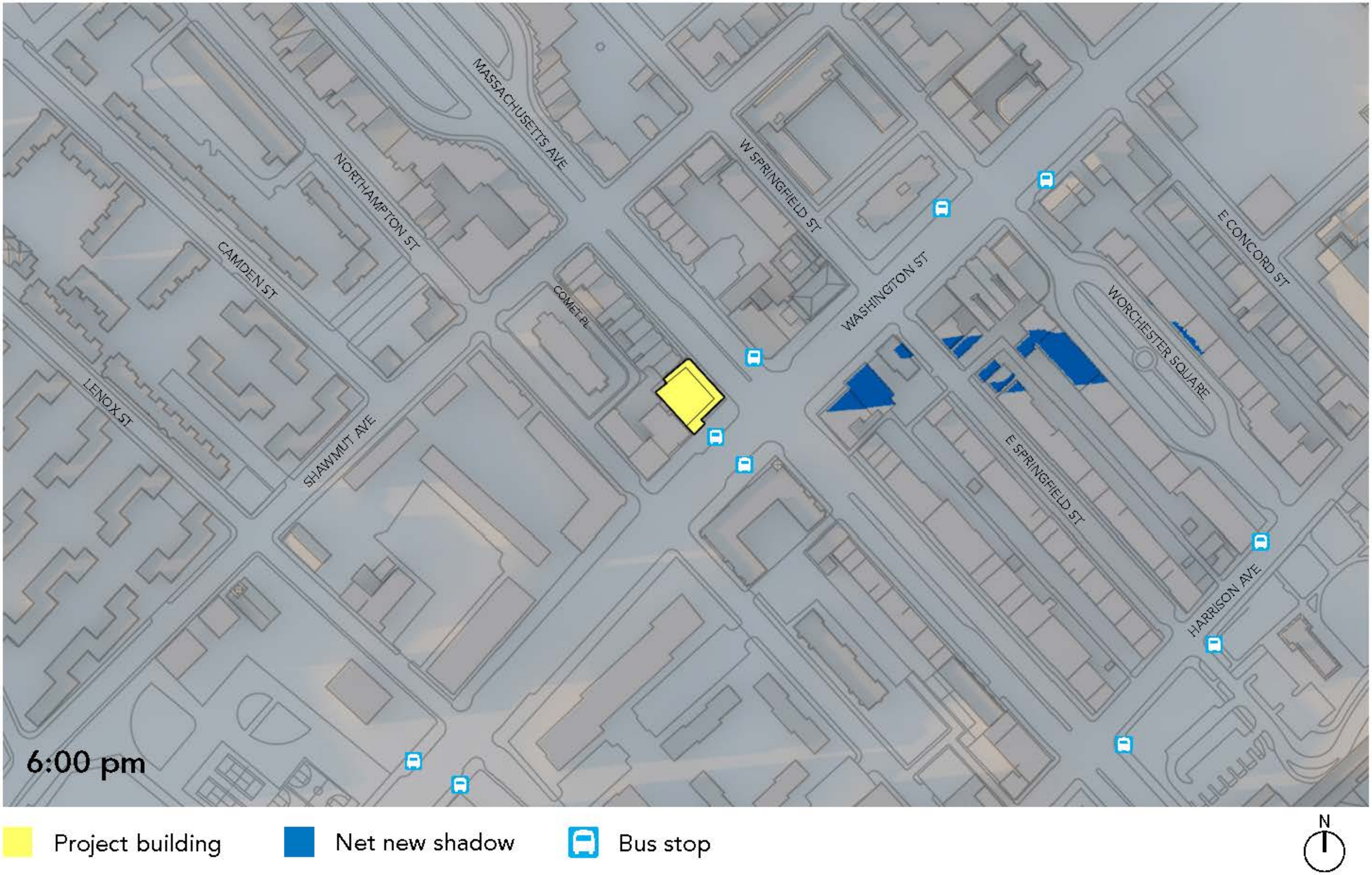

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Figure 3.2-11

Shadow Study: September 21, 6:00 p.m.

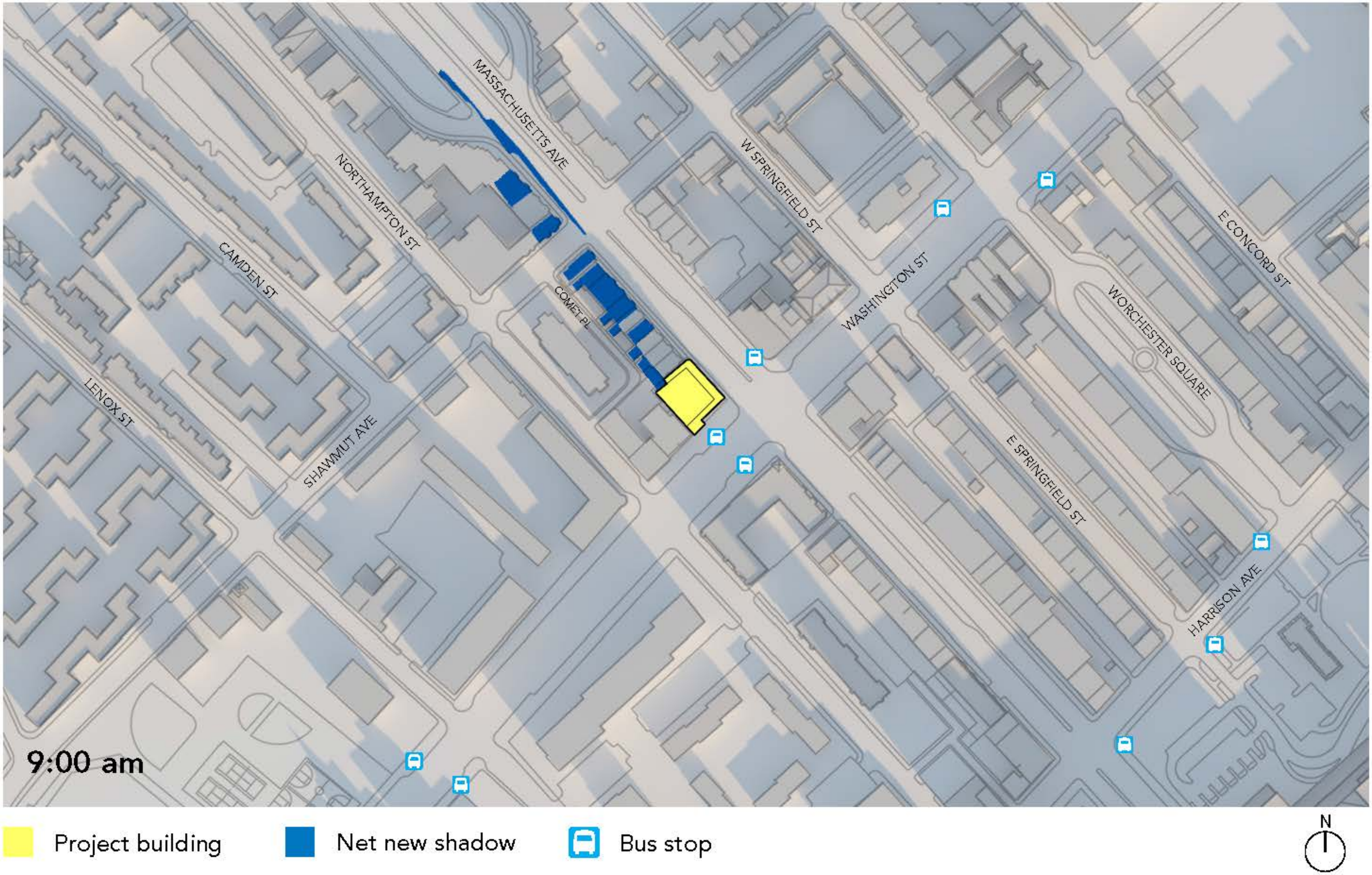

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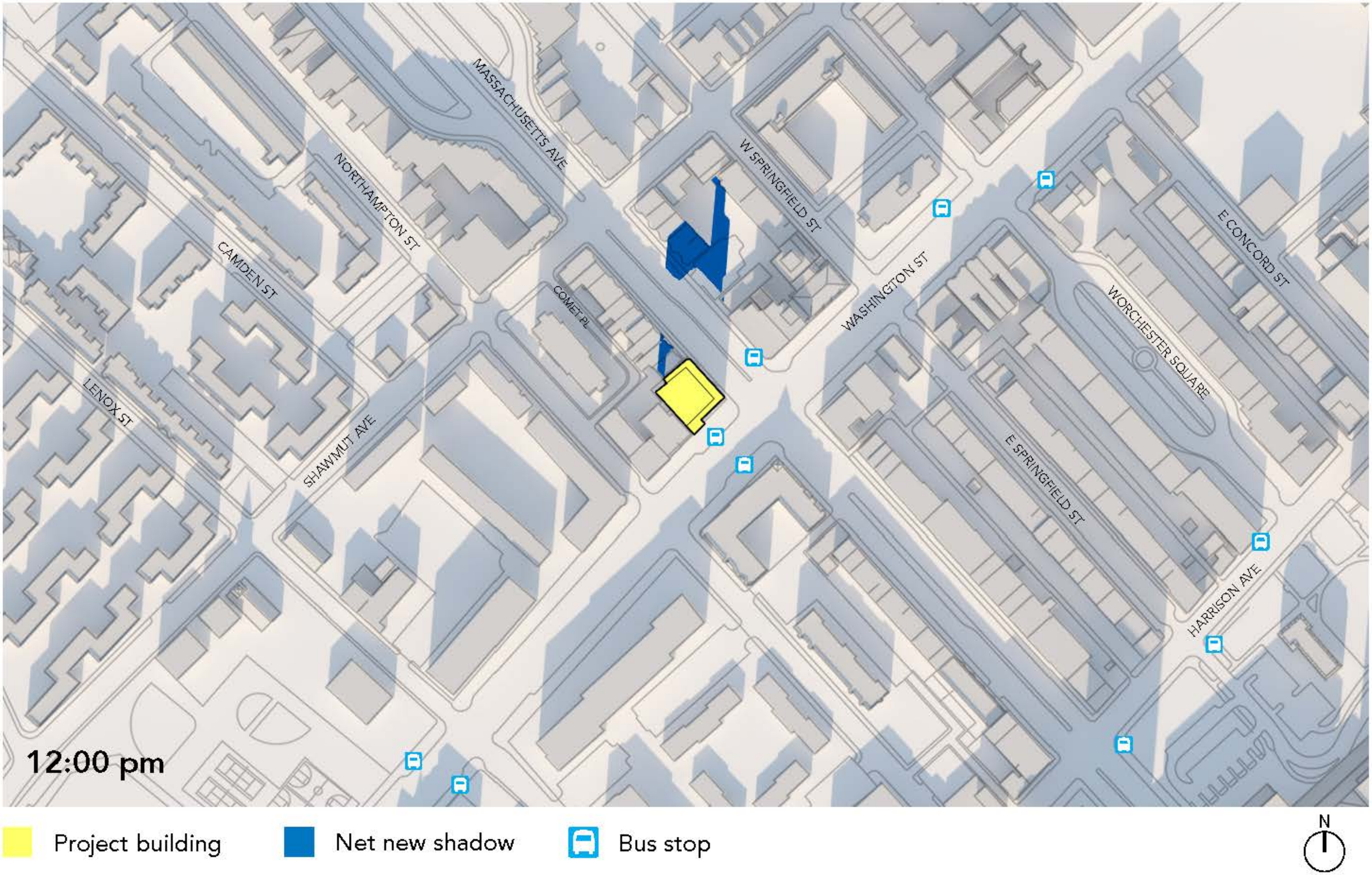
Figure 3.2-12

Shadow Study: December 21, 9:00 a.m.



Hotel Alexandra **Boston, Massachusetts**

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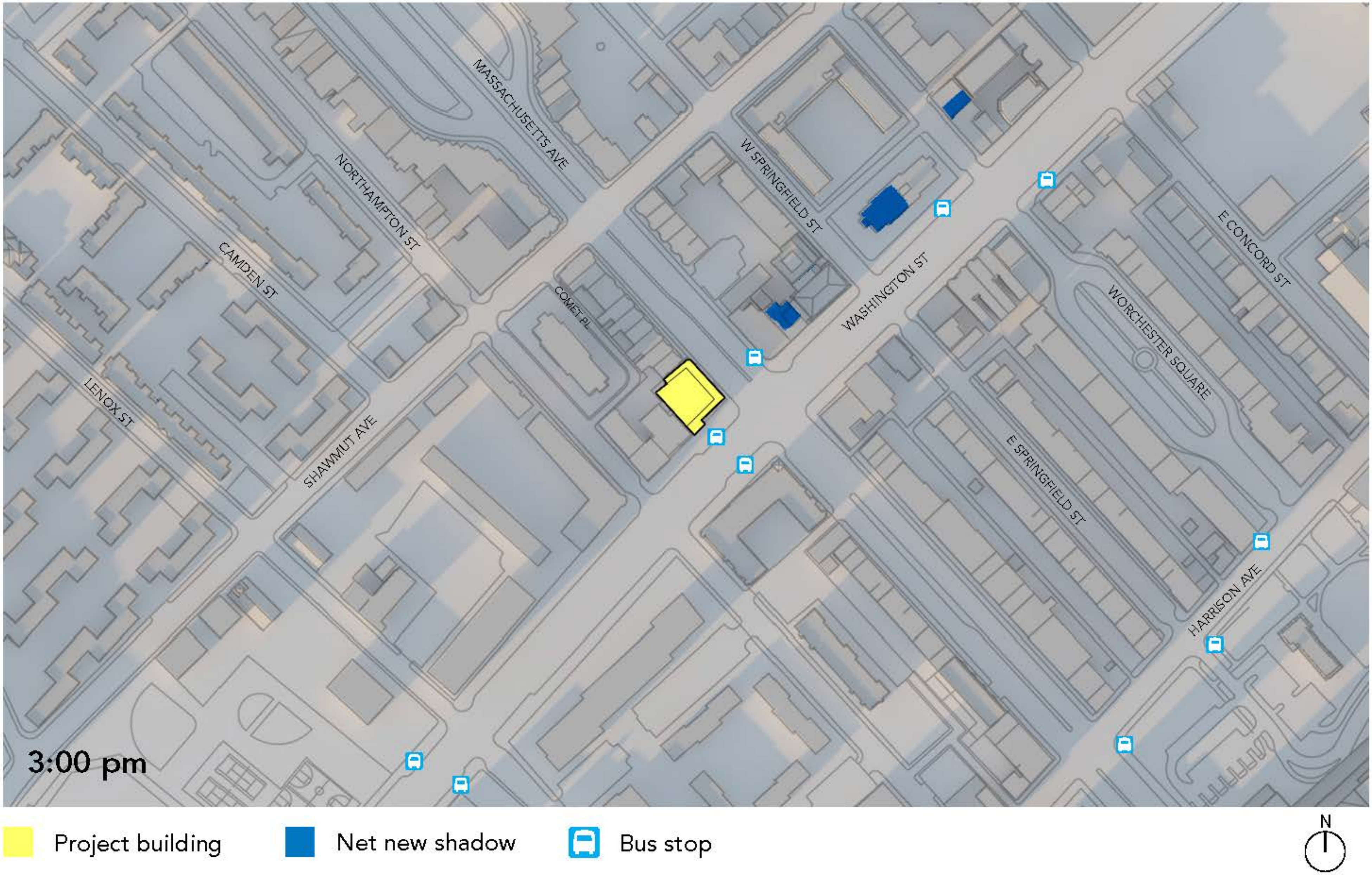
Figure 3.2-13

Shadow Study: December: 21, 12:00 p.m.



Alexandra Hotel **Boston, Massachusetts**

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Figure 3.2-14

Shadow Study: December 21, 3:00 p.m.

3.2.6 Conclusions

The shadow impact analysis investigated net new shadow created by the Project during fourteen time periods. Due to the presence of shadows created by the existing building and the design and orientation of the new building, shadow impacts from the Project are anticipated to be minor. No new shadow will be cast onto nearby public open spaces during the time periods studied. New shadow will be cast onto a bus stop, the Massachusetts Avenue at Washington Street bus stop, during only one of the fourteen time periods studied (March 21 at 3:00 p.m.).

3.3 Daylight Analysis

3.3.1 Introduction

The purpose of the daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching the streets and the sidewalks in the immediate vicinity of a project site.

The Project includes the retention and restoration of the existing façade, and replacing the existing structure with a new, twelve-story hotel. Because the new structure will be taller than the existing building, the Project will inherently increase daylight obstruction. The resulting conditions will be similar to or slightly higher than what is typical of the area.

3.3.2 Methodology

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program[2]. This program measures the percentage of sky-dome that is obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

Using BRADA, a silhouette view of the building is taken at ground level from the middle of the adjacent city streets or pedestrian ways centered on the proposed building. The façade of the building facing the viewpoint, including heights, setbacks, corners and other features, is plotted onto a base map using lateral and elevation angles. The two-dimensional base map generated by BRADA represents a figure of the building in the "sky dome" from the viewpoint chosen. The BRADA program calculates the percentage of daylight that will be obstructed on a scale of 0 to 100 percent based on the width of the view, the distance between the viewpoint and the building, and the massing and setbacks incorporated into the design of the building; the lower the number, the lower the percentage of obstruction of daylight from any given viewpoint.

---

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

The analysis compares three conditions: Existing Conditions; Proposed Conditions; and the context of the area.

Two viewpoints were chosen to evaluate the daylight obstruction for the Existing and Proposed conditions, one from Washington Street and one from Massachusetts Avenue. Three area context points were considered in order to provide a basis of comparison to existing conditions in the surrounding area. The viewpoint and area context viewpoints were taken in the following locations and are shown in Figure 3.3-1.

- **Viewpoint 1:** View from Washington Street facing northwest toward the Project site.
- **Viewpoint 2:** View from Massachusetts Avenue facing southwest toward the Project site.
- **Area Context Viewpoint AC1:** View from Washington Street facing northwest toward the building at 1855 Washington Street.
- **Area Context Viewpoint AC2:** View from Washington Street facing northwest toward the building at 1723 Washington Street.

3.3.3 Results

The results for each viewpoint are described in Table 3.3-1. Figures 3.3-2 through 3.3-4 illustrate the BRADA results for each analysis.

Table 3.3-1 Daylight Analysis Results

Viewpoint Locations		Existing Conditions	Proposed Conditions
Viewpoint 1	View from Washington Street facing northwest toward the Project site.	32.6%	61.5%
Viewpoint 2	View from Massachusetts Avenue facing southwest toward the Project site.	61.3%	69.7%
Area Context Points			
AC1	View from Washington Street facing northwest toward the building at 1855 Washington Street.	61.8%	N/A
AC2	View from Washington Street facing northwest toward the building at 1723 Washington Street.	57.7%	N/A

G:\Projects2\MA\Boston\5286\MXD\viewpoints_20181101.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division

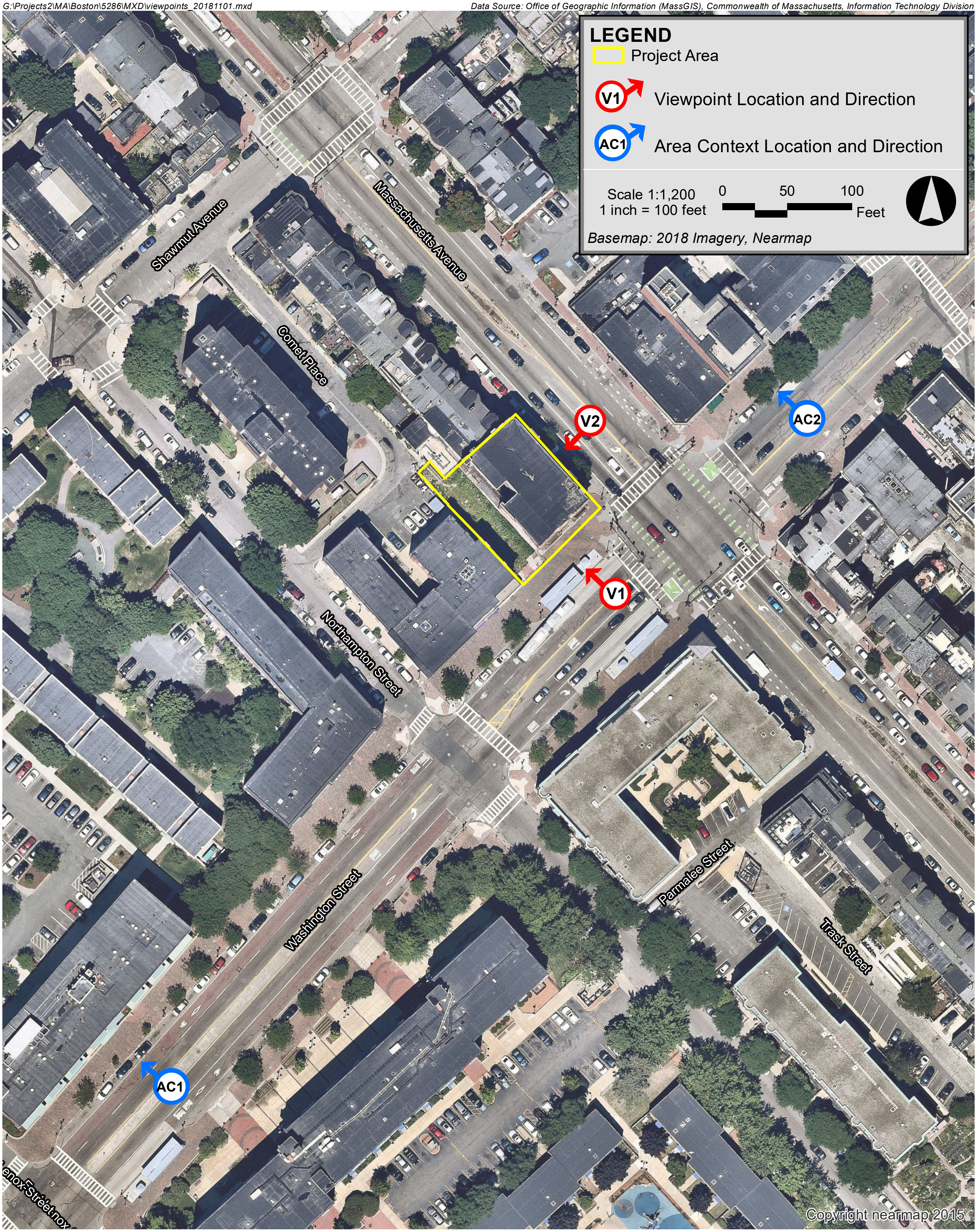

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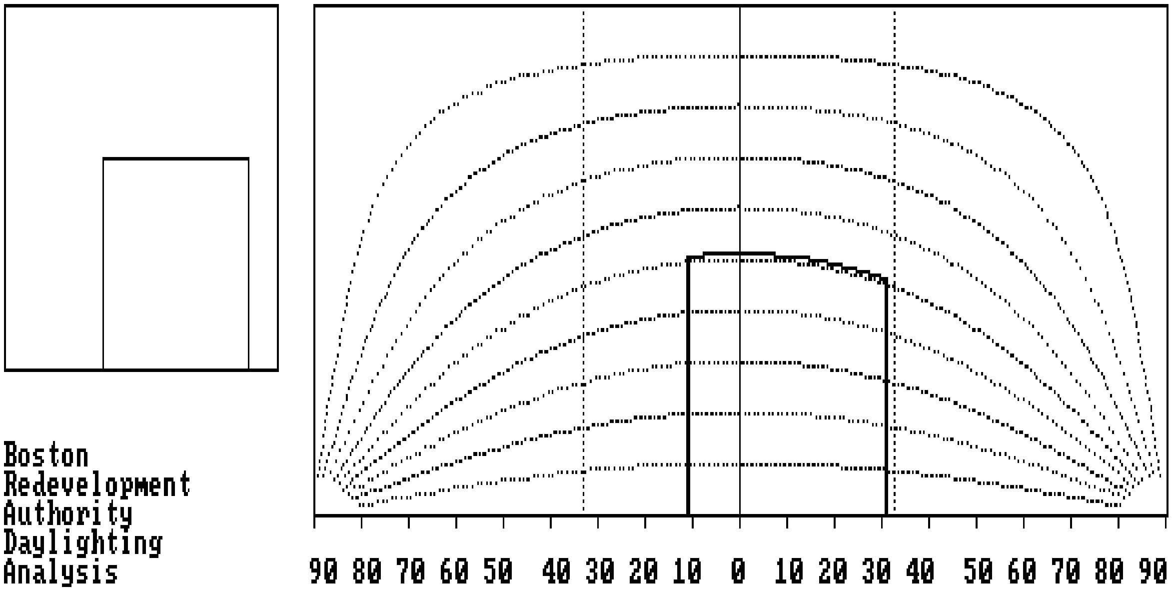
Figure 3.3-1

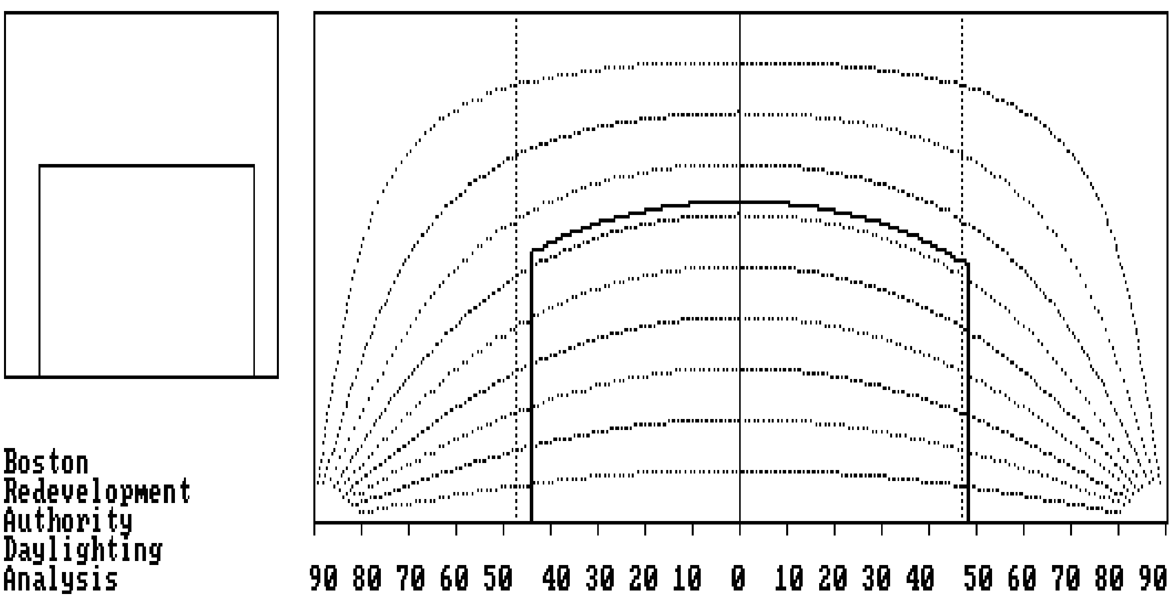
Viewpoint and Area Context Locations

Viewpoint 1: View from Washington Street facing northwest toward the Project site



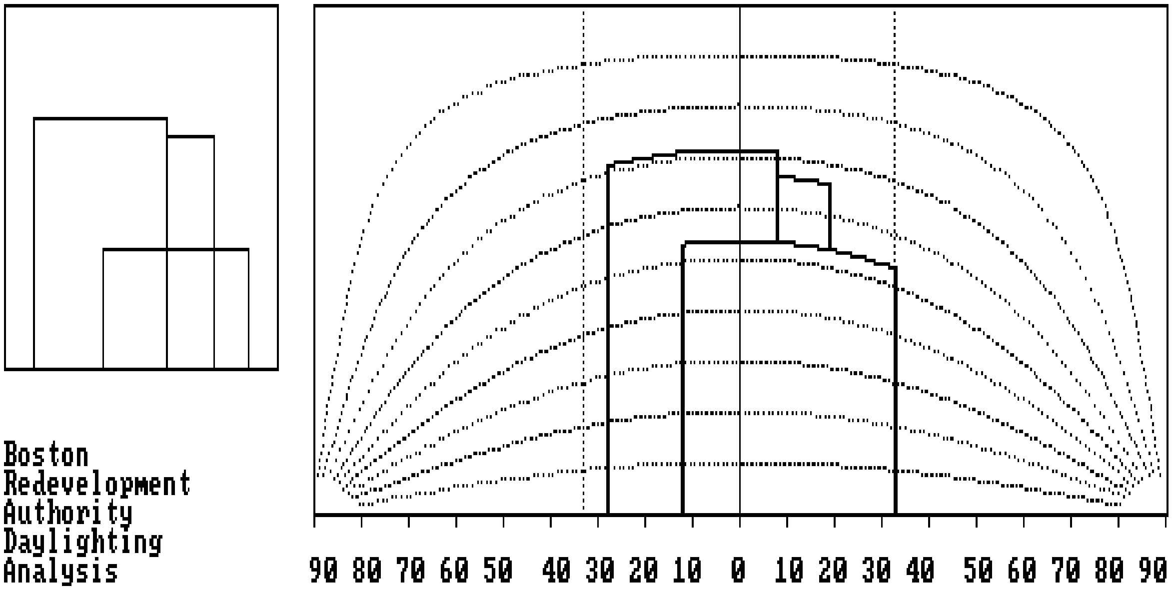
Obstruction of daylight by the building is 32.6 %

Viewpoint 2: View from Massachusetts Avenue facing southwest toward the Project site



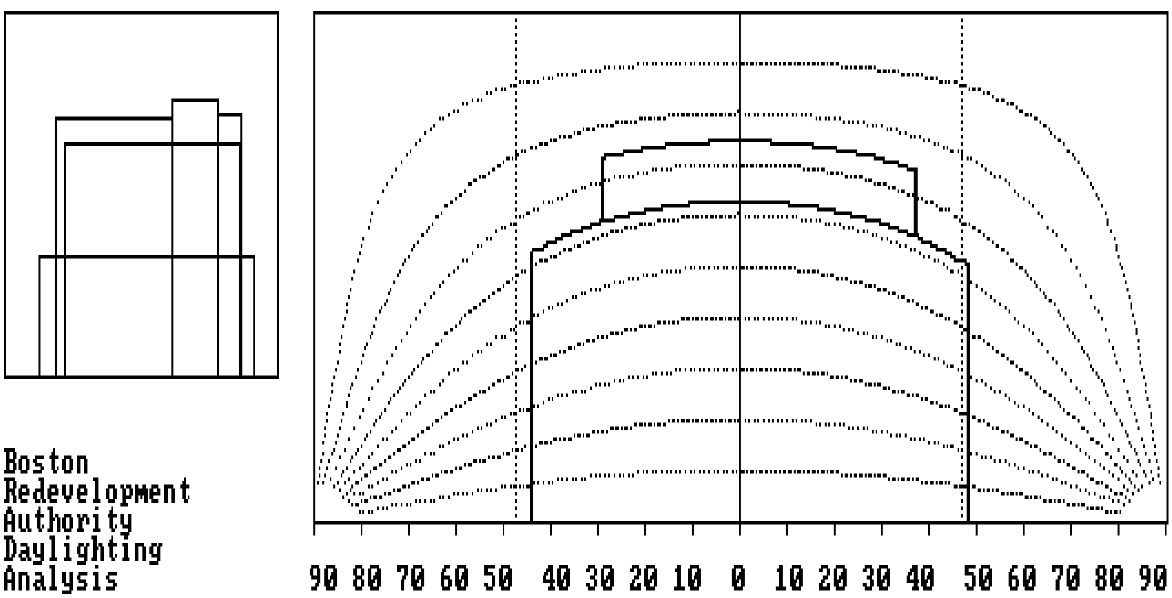
Obstruction of daylight by the building is 61.3 %

Viewpoint 1: View from Washington Street facing northwest toward the Project site



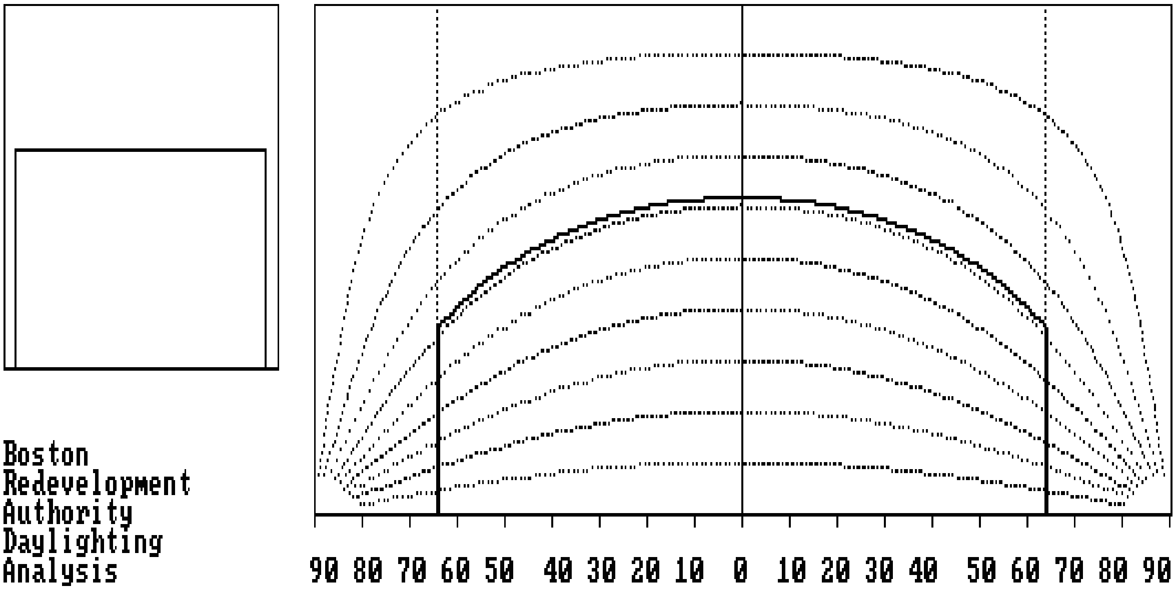
Obstruction of daylight by the building is 61.5 %

Viewpoint 2: View from Massachusetts Avenue facing southwest toward the Project site



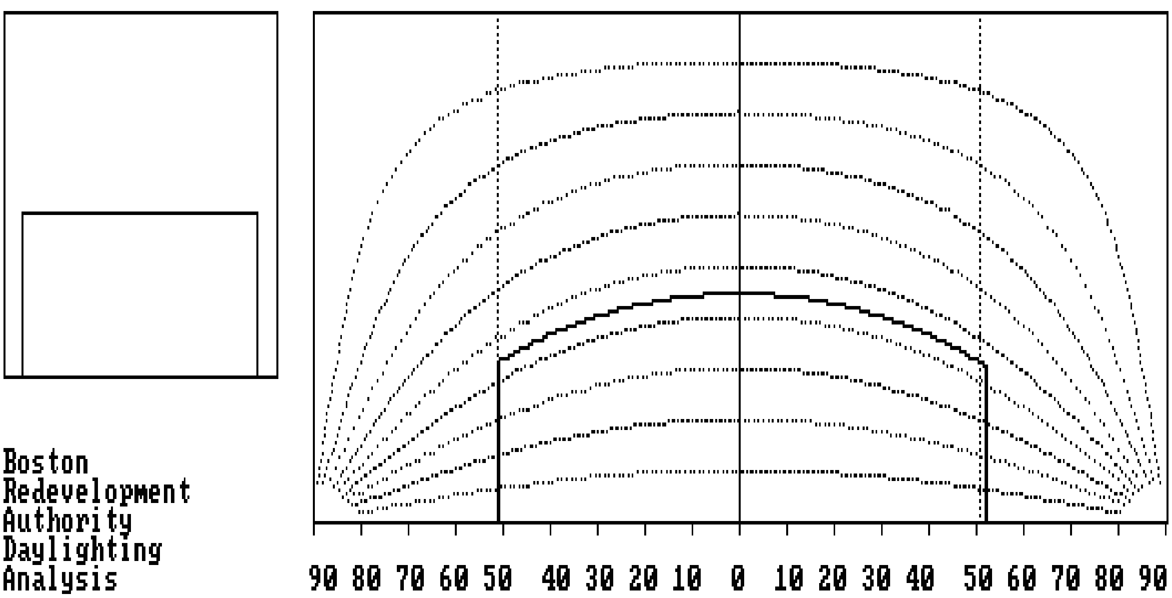
Obstruction of daylight by the building is 69.7 %

Area Context Viewpoint AC1: View from Washington Street facing northwest toward 1855 Washington Street



Obstruction of daylight by the building is 61.8 %

Area Context Viewpoint AC2: View from Washington Street facing northwest toward the building at 1723 Washington Street



Obstruction of daylight by the building is 45.0 %

Washington Street – Viewpoint 1

Washington Street runs along the eastern edge of the Project site. Viewpoint 1 was taken from the center of Washington Street facing northwest toward the Project site. The Project will increase the daylight obstruction value to 61.5%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

Massachusetts Avenue – Viewpoint 2

Massachusetts Avenue runs along the northeastern edge of the Project site. Viewpoint 2 was taken from the center of Massachusetts Avenue facing southwest toward the Project site. The Project will increase the daylight obstruction value to 69.7%, a minor increase over existing conditions and a daylight obstruction value typical of urban areas.

Area Context Viewpoints

The Project area consists primarily of mid-rise residential buildings with ground floor commercial space. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for the two Area Context viewpoints described above and shown on Figure 3.3-1. The daylight obstruction values ranged from 57.7% for AC2 to 61.8% for AC1.

3.3.4 Conclusions

The daylight analysis conducted for the Project describes existing and proposed daylight obstruction conditions at the Project site and in the surrounding area. The results of the BRADA analysis indicate that the Project will result in increased daylight obstruction over existing conditions with values of the Proposed Conditions similar to or slightly higher than the Area Context viewpoints, and typical of urban areas.

3.4 Solar Glare

The Project materials are still being studied and glazing of the windows will be determined as the design progresses. Due to the type of potential glass and glazing used, solar glare impacts are not currently anticipated.

3.5 Air Quality Analysis

The air quality analysis assesses the impact on air quality at nearby intersections from trips generated by the Project.

The Project does not generate enough traffic to require a mesoscale vehicle emissions quantification analysis. However, the Project creates new trips through local intersections operating at LOS D or worse. Therefore, a microscale analysis of carbon monoxide has been completed to provide information on the Project's impact to air quality from mobile sources. Based on the analysis, there are no anticipated adverse air quality impacts resulting from increased traffic from the Project.

Any new stationary sources will be reviewed by the Massachusetts Department of Environmental Protection (MassDEP) under the Environmental Results Program, as required. It is expected that all stationary sources will be small, and any impacts from stationary sources would be minimal.

3.5.1 National Ambient Air Quality Standards and Background Concentrations

Background air quality concentrations and federal air quality standards were utilized to conduct the microscale analysis. Federal National Ambient Air Quality Standards (NAAQS) were developed by the U.S. Environmental Protection Agency (EPA) to protect the human health against adverse health effects with a margin of safety. The modeling methodologies were developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[3] The following sections outline the NAAQS standards and detail the sources of background air quality data.

3.5.1.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, the EPA promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM-10 and PM-2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS are listed in Table 3-1. Massachusetts Ambient Air Quality Standards (MAAQS) are typically identical to NAAQS (differences are highlighted in **bold** in Table 3.5-1).

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

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[3] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

Table 3.5-1 National (NAAQS) and Massachusetts (MAAQS) Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)		MAAQS ($\mu g/m^3$)	
		Primary	Secondary	Primary	Secondary
NO_2	Annual (1)	100	Same	100	Same
	1-hour (2)	**188**	None	**None**	None
SO_2	Annual (1)(9)	80	None	80	None
	24-hour (3)(9)	365	None	365	None
	3-hour (3)	None	1300	None	1300
	1-hour (4)	**196**	None	**None**	None
PM-2.5	Annual (1)	**12**	**15**	**None**	**None**
	24-hour (5)	**35**	**Same**	**None**	**None**
PM-10	Annual (1)(6)	**None**	None	**50**	Same
	24-hour (3)(7)	150	Same	150	Same
CO	8-hour (3)	10,000	Same	10,000	Same
	1-hour (3)	40,000	Same	40,000	Same
Ozone	8-hour (8)	**147**	Same	**235**	Same
Pb	3-month (1)	1.5	Same	1.5	Same

(1) Not to be exceeded.
(2) 98th percentile of one-hour daily maximum concentrations, averaged over three years.
(3) Not to be exceeded more than once per year.
(4) 99th percentile of one-hour daily maximum concentrations, averaged over three years.
(5) 98th percentile, averaged over three years.
(6) EPA revoked the annual PM-10 NAAQS in 2006.
(7) Not to be exceeded more than once per year on average over three years.
(8) Annual fourth-highest daily maximum eight-hour concentration, averaged over three years.
(9) EPA revoked the annual and 24-hour SO_2 NAAQS in 2010. However, they remain in effect until one year after the area's initial attainment designation, unless designated as "nonattainment".

Source: http://www.epa.gov/ttn/naaqs/criteria.html and 310 CMR 6.04

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

3.5.1.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP to EPA was obtained for 2014 to 2016. Data for the pollutant and averaging time combinations were obtained from MassDEP's annual reports and the EPA's AirData website.

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

Background concentrations were determined from the closest available monitoring stations to the Project site. All pollutants are not monitored at every station, so data from multiple locations are necessary. The closest monitor is at Harrison Avenue, roughly 0.5 miles southwest of the Project site. A summary of the background air quality concentrations are presented in Table 3.5-2. The specific monitor sites associated with each pollutant are presented in Appendix E. Air quality in the vicinity of the site is generally good, with all local background concentrations found to be well below the NAAQS.

Table 3.5-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Time	2014	2015	2016	Background Concentration ($\mu g/m^3$)	NAAQS	Percent of NAAQS
SO_2 (1)(6)	1-Hour (5)	32.2	24.6	12.3	23.1	196.0	12%
	3-Hour (6)	56.3	22.8	13.4	56.3	1300.0	4%
	24-Hour	13.4	11.3	5.0	13.4	365.0	4%
	Annual	2.8	2.1	1.2	2.8	80.0	3%
PM-10	24-Hour	61.0	28.0	29.0	61.0	150.0	41%
	Annual	13.9	12.4	11.8	13.9	50.0	28%
PM-2.5	24-Hour (5)	12.7	19.0	16.3	16.0	35.0	46%
	Annual (5)	6.0	8.8	6.2	7.0	12.0	58%
NO_2 (3)	1-Hour (5)	95.9	99.6	92.1	95.9	188.0	51%
	Annual	29.6	28.1	24.8	29.6	100.0	30%
CO (2)	1-Hour	1963.1	1560.9	2750.4	2750.4	40000.0	7%
	8-Hour	1489.8	1031.4	2062.8	2062.8	10000.0	21%
Ozone (4)	8-Hour	106.0	109.9	113.9	113.9	147.0	77%
Lead	Rolling 3-Month	0.014	0.016	0.017	0.017	0.15	12%

Notes:
From 2014-2016 EPA's AirData Website
(1) SO_2 reported ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2.62 $\mu g/m^3$.
(2) CO reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1146 $\mu g/m^3$.
(3) NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1.88 $\mu g/m^3$.
(4) O_3 reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1963 $\mu g/m^3$.
(5) Background level is the average concentration of the three years.
(6) The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

3.5.2 *Mobile Sources*

Mobile sources of air pollution include emissions from gasoline, diesel, and natural gas fueled vehicle traffic. Emissions from mobile sources have continually decreased as engine technology and efficiency have been improved.

3.5.2.1 Methodology

A "microscale" analysis is required for any intersection where (1) Project traffic would impact intersections or roadway links currently operating at LOS D, E, or F, or would cause LOS to decline to D, E, or F; (2) Project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or, (3) the Project will generate 3,000 or more new average daily trips on roadways providing access to a single location. The microscale analysis involves modeling of CO emissions from vehicles idling at and traveling through signaled intersections. Predicted ambient concentrations of CO for the Build and No-Build cases are compared with federal (and state) ambient air quality standards for CO.

The microscale analysis typically examines ground-level CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. The NAAQS standards do not allow ambient CO concentrations to exceed 35 parts per million (ppm) for a one-hour averaging period, and 9 ppm for an eight-hour averaging period, more than once per year at any location. The widespread use of CO catalysts on current vehicles has reduced the occurrences of CO hotspots. Air quality modeling techniques (computer simulation programs) are typically used to predict CO levels for both existing and future conditions to evaluate compliance of the roadways with the standards. The microscale analysis has been conducted using the latest versions of EPA's MOVES and CAL3QHC programs to estimate CO concentrations at sidewalk receptor locations. Baseline (2018) and future year (2025) emission factor data calculated from the MOVES model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections. The modeling methodology was developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[4]

Existing background values of CO at the nearest monitor location at Harrison Avenue were obtained from MassDEP. CAL3QHC results were then added to background CO values of 2.4 ppm (one-hour) and 1.8 ppm (eight-hour), as provided by MassDEP, to determine total air quality impacts due to the Project. These values were compared to the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

[4] 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

Modeling assumptions and backup data for results presented in this section are provided in Appendix E.

Intersection Selection

One signalized intersection included in the traffic study meets the conditions described at the beginning of this section (see Chapter 2). The traffic volumes and LOS calculations provided in Chapter 2 form the basis of evaluating the traffic data versus the microscale thresholds. The intersection of Massachusetts Avenue and Washington Street was found to meet the criteria.

Microscale modeling was performed for this intersection based on the aforementioned methodology. The 2018 Existing Condition and the 2025 No-Build and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak.

Emissions Calculations (MOVES)

The EPA MOVES computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOVES model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the county specific vehicle age registration distribution, fleet mix, meteorology, and other inputs. The inputs for MOVES for the existing (2018) and future year (2025) are provided by MassDEP.

All link types for the modeled intersections were input into MOVES. Idle emission factors are obtained from factors for a link average speed of 0 miles per hour (mph). Moving emissions are calculated based on speeds at which free-flowing vehicles travel through the intersection as stated in traffic modeling (Synchro) reports. A speed of 25 mph is used for all free-flow traffic, consistent with the City of Boston speed limit. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary), and left turns, respectively. Roadway emissions factors were obtained from MOVES using EPA guidance.[5]

Winter CO emission factors are typically higher than summer. Therefore, January weekday emission factors were conservatively used in the microscale analysis.

Receptors and Methodology Inputs

Sets of up to 160 receptors were placed in the vicinity of the modeled intersections. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersections. The roadway links and receptor locations of the modeled intersection are presented in Figures 3.5-1.

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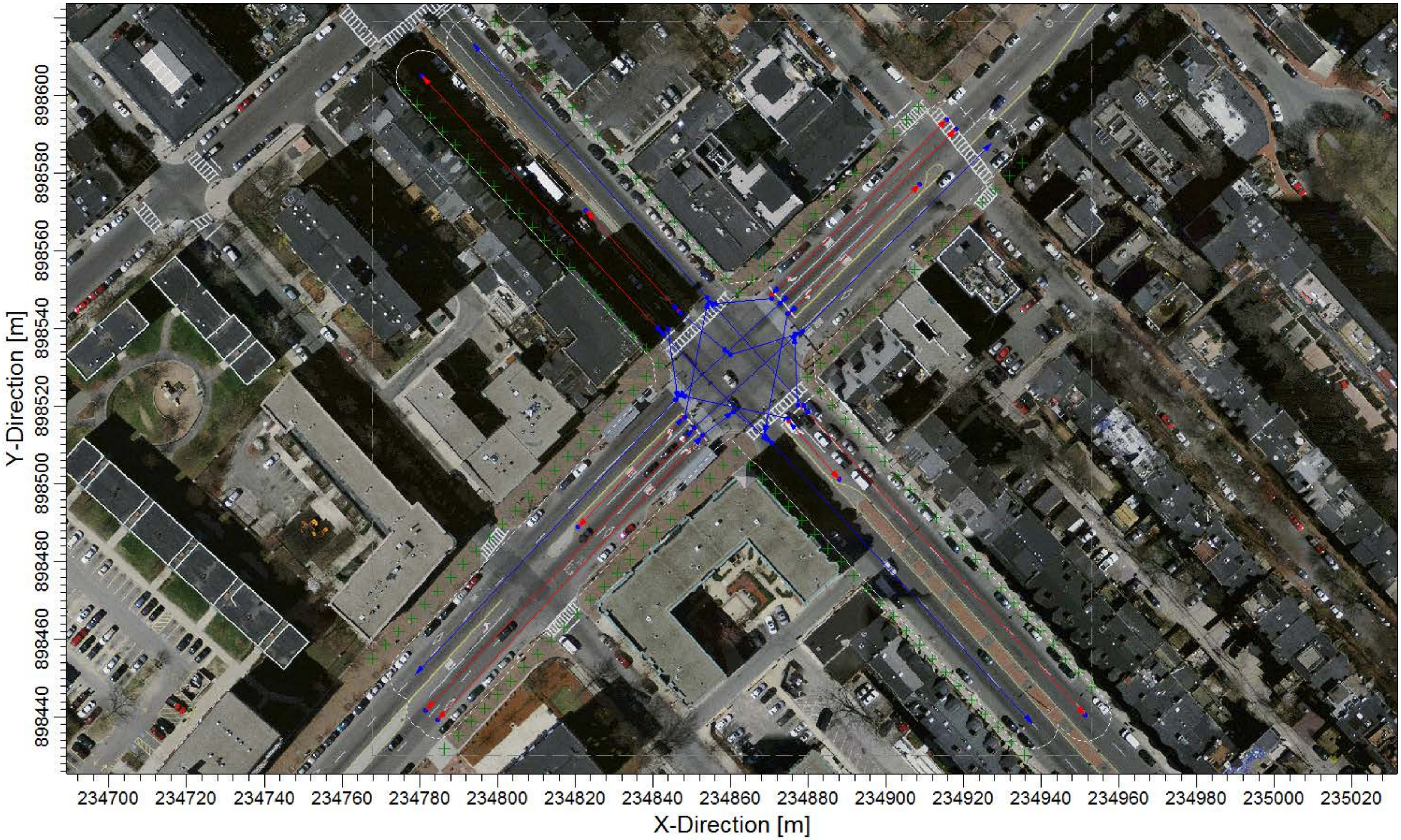
[5] U.S. EPA, 2010. Using MOVES in Project-Level Carbon Monoxide Analyses. EPA-420-B-10-041



Hotel Alexandra **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 3.5-1

Intersection of Massachusetts Avenue and Washington Street

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[6], a wind speed of one meter per second, stability class D(4), and a mixing height of 1,000 meters were used. To account for the intersection geometry, wind directions from 0° to 350°, at every 10° were selected. A surface roughness length of 321 centimeters was selected due to the urban environment.[7]

Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue-links at signalized intersections, worst-case meteorological conditions, and traffic input data. The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs.

For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 2.4 ppm (2,750 $\mu g/m^3$) for one-hour and 1.8 ppm (2,062 $\mu g/m^3$) for eight-hour CO.

3.5.2.2 Air Quality Results

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3.5-3 through 3.5-5 for the 2018 and 2025 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.9.[8]

The results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the area of the Project for the future modeled conditions (0.2 ppm) plus background (2.4 ppm) is 2.6 ppm. The highest eight-hour traffic-related concentration predicted in the area of the Project for the future modeled conditions (0.2 ppm) plus background (1.8 ppm) is 2.0 ppm. All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

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

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

[8] U.S. EPA, AERSCREEN User's Guide; EPA-454/B-11-001, March 2011.

Table 3.5-3 Summary of Microscale Modeling Analysis (Existing 2018)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Massachusetts Avenue & Washington Street	AM	0.3	2.4	2.7	35
	PM	0.3	2.4	2.7	35
8-Hour					
Massachusetts Avenue & Washington Street	AM	0.3	1.8	2.1	9
	PM	0.3	1.8	2.1	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.

Table 3.5-4 Summary of Microscale Modeling Analysis (No-Build 2025)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Massachusetts Avenue & Washington Street	AM	0.1	2.4	2.5	35
	PM	0.2	2.4	2.6	35
8-Hour					
Massachusetts Avenue & Washington Street	AM	0.1	1.8	1.9	9
	PM	0.2	1.8	2.0	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.

Table 3.5-5 Summary of Microscale Modeling Analysis (Build 2025)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Massachusetts Avenue & Washington Street	AM	0.1	2.4	2.5	35
	PM	0.2	2.4	2.6	35
8-Hour					
Massachusetts Avenue & Washington Street	AM	0.1	1.8	1.9	9
	PM	0.2	1.8	2.0	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.

3.5.2.3 Conclusions

Results of the microscale analysis show that all predicted CO concentrations are well below one-hour and eight-hour NAAQS. There is no discernable change to the modeled concentrations from the No-Build to Build cases. Therefore, it can be concluded that there are no anticipated adverse air quality impacts resulting from increased traffic from the Project.

3.6 Stormwater/Water Quality

Please see Section 7.3.

3.7 Flood Hazard Zones/ Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the site located in the City of Boston - Community Panel Number 25025C0079J indicates the FEMA Flood Zone Designations for the site area. The map shows that the Project is located in a Zone X, "Areas determined to be outside the 0.2% annual chance floodplain."

The site does not contain wetlands.

3.8 Geotechnical Impacts

3.8.1 Subsurface Soil and Bedrock Conditions

The Project site is underlain by a fill layer that is anticipated to extend to depths ranging from approximately five to ten feet below the existing ground surface and is underlain by a natural marine clay deposit, which is commonly referred to as Boston Blue Clay. The natural marine clay deposit is anticipated to extend to depths ranging from approximately 160 to 170 feet below the existing ground surface and is underlain by a glacial till deposit which is subsequently underlain by bedrock. The surface of the bedrock deposit is anticipated to be located at approximately 170 to 190 feet below the existing ground surface.

3.8.2 Groundwater

Groundwater at the site is anticipated to be temporarily "perched" on the surface of the natural marine clay deposit at depths ranging from approximately three to six feet below the existing ground surface. The Project site is not located within the Groundwater Conservation Overlay District (GCOD).

3.8.3 Project Impacts and Foundation Considerations

Construction of the Project will include excavation for a basement level to a depth of approximately 15 feet below the existing ground surface which surrounds the site. Based on the proposed construction and the anticipated subsurface conditions as indicated above, foundation support for the proposed Project is anticipated to be provided by a conventional reinforced concrete spread footing foundation system or reinforced concrete mat foundation that bears on the marine clay deposit. In the case where the spread footing or mat foundation bearing cannot provide adequate support for the anticipated design building loads, drilled-in mini-piles may be utilized. The perimeter spread footing foundations or the perimeter of the mat foundation will be designed to bear directly on the marine clay deposit thereby creating a groundwater cut-off in conjunction with an underslab drainage system to protect against hydrostatic uplift forces acting on the lowest level slab or mat foundation. Provided the perimeter footings or mat foundation is sealed into the relatively impermeable clay deposit, no long-term impacts on the groundwater levels which surround the site are anticipated.

Construction of the foundations and below-grade level will require temporarily bracing of the existing south and east building façades followed by an excavation that extends approximately seven feet below the bottom of the existing perimeter granite block foundations which support the south and east building façade to remain, and 15 feet below the existing ground surface where the proposed building will be located within the area of the vacant parcel which abuts the west side of the building. Therefore, temporary excavation support of the properties which surround the Project site will be required and provisions will be incorporated into the design and contract documents to limit potential impacts to adjacent structures, streets and utilities. The lateral earth support system for excavation of the below grade level is anticipated to consist of cantilevered or internally braced system of drilled-in soldier piles and lagging. With respect to the proposed excavation within the existing building footprint, a lateral earth support system consisting of internal bracing of the existing foundations in conjunction with underpinning of the existing foundations is anticipated to be utilized. Should any of the temporary earth support system be located on the City of Boston property, the Project will submit the necessary drawings to the City of Boston for review and approval by the Public Improvement Commission (PIC).

Noise and ground vibrations associated with the proposed drilling methods utilized to install the temporary earth support system and if needed the mini-piles, and excavation methods utilized for the construction of the basement level are anticipated to be minimal and have limited impact to the neighboring area.

Based on the anticipated groundwater conditions and the proposed depth of excavation related to foundation construction, temporary construction dewatering can generally be controlled using conventional sumping in conjunction with off-site discharge. Therefore, the Project will obtain a temporary groundwater dewatering discharge permit from the Boston Water and Sewer Commission (BWSC) and applicable agencies consisting of the United Stated Environmental Protection Agency (US EPA), Massachusetts Department of Environmental Protection (MassDEP), or Massachusetts Water Resource Authority (MWRA) for temporary off-site discharge of site groundwater from within the excavation.

Due to the relatively impermeable nature of the marine clay deposit, temporary construction dewatering is not anticipated to adversely affect the groundwater level outside the project site.

3.9 Solid and Hazardous Waste

3.9.1 Hazardous Waste

The Project site and the abutting properties are not listing on the MassDEP on-line database of Waste Sites & Reportable Releases. Prior to general excavation for construction of the new foundations and basement level, pre-characterization of on-site soils for off-site disposal/reuse will be performed and managed in accordance with applicable and current provisions of the Massachusetts Contingency Plan (MCP) and the MassDEP.

3.9.2 Operation Solid and Hazardous Waste Generation

The Project will generate solid waste typical of hotel uses. Solid waste is expected to include wastepaper, cardboard, glass bottles and food. Recyclable materials will be recycled through a program implemented by building management. The Project will generate approximately 110 tons of solid waste per year.

With the exception of household hazardous wastes typical of hotel developments (e.g., cleaning fluids and paint), the Project will not involve the generation, use, transportation, storage, release, or disposal of potentially hazardous materials.

3.9.3 Recycling

A dedicated recyclables storage and collection program will facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. The recycling program will be fully developed in accordance with LEED standards as described in Chapter 4.

3.10 Noise Impacts

3.10.1 Introduction

A sound level assessment was conducted that included a baseline sound monitoring program to measure existing sound levels in the vicinity of the Project site, computer modeling to predict operational sound levels from the Project's anticipated mechanical equipment, and a comparison of future Project sound levels to applicable City of Boston Zoning District Noise Standards.

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

3.10.2 Noise Terminology

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

The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. A property of the decibel scale is that the sound pressure levels of two or more separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a three-dB increase (53 dB), which is equal to doubling in sound energy but not equal to a doubling in quantity (100 dB). Thus, every three-dB change in sound level represents a doubling or halving of sound energy. Relative to this characteristic, a change in sound levels of less than three dB is imperceptible to the human ear.

Another property of decibels is that if one source of noise is 10 dB (or more) louder than another source, then the total sound level is simply the sound level of the higher-level source. For example, a sound source at 60 dB plus another sound source at 47 dB is equal to 60 dB.

A sound level meter (SLM) that is used to measure noise is a standardized instrument.[9] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various circumstances. The most commonly used weighting network is the A-weighting (there are also C-, and Z-weighting networks) because it most closely approximates how the human ear responds to sound at various frequencies, described in Hertz (Hz). The A-weighting network is the accepted scale used for community sound level measurements, and sounds are frequently reported as detected with a sound level meter with this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA".

Because the sounds in the environment vary with time, many different sound metrics may be used to quantify them. There are two typical methods used for describing variable sounds. These are exceedance levels and equivalent levels, both of which are derived from a large number of moment-to-moment A-weighted sound pressure level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where "n" can have a value between 0 and 100 in terms of percentage. Equivalent levels are designated L_{eq} and quantify a hypothetical steady sound that would have the same energy as

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

the actual fluctuating sound observed. The several sound level metrics that are commonly reported in community noise monitoring and are presented in this report are described below.

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

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

- L_{10} is the sound level in dBA exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles.

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

- L_{eq} is a sound pressure level commonly A-weighted and presented in dBA. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with time-averaged mean square sound pressure values, the L_{eq} is primarily controlled by loud noises if there are fluctuating sound levels.

- In the design of noise controls, which do not function quite like the human ear, it is important to understand the frequency spectrum of the noise source of interest. The spectra of noises are usually stated in terms of octave-band sound pressure levels, in dB, with the frequency bands being those established by standard (American National Standards Institute [ANSI] S1.11, 1986). To facilitate the noise control design process, the estimates of noise levels in this analysis are also presented in terms of octave-band sound pressure levels. Octave-band measurements and modeling are used in assessing compliance with the City of Boston noise regulations.

3.10.3 Noise Regulations and Criteria

The City of Boston has both a noise ordinance and noise regulations. Chapter 16 §26 of the Boston Municipal Code sets the general standard for noise that is unreasonable or excessive: louder than 50 decibels between the hours of 11:00 p.m. and 7:00 a.m., or louder than 70 decibels at all other hours. The Boston Air Pollution Control Commission (BAPCC) has adopted regulations based on the city's ordinance - "Regulations for the

Control of Noise in the City of Boston", which distinguish among residential, business, and industrial districts in the City. In particular, BAPCC Regulation 2 is applicable to the sounds from the Project and is considered in this noise study.

Table 3.10-1 below presents the "Zoning District Noise Standards" contained in Regulation 2.5 of the BAPCC "Regulations for the Control of Noise in the City of Boston," adopted December 17, 1976. These maximum allowable sound pressure levels apply at the property line of the receiving property. The "Residential Zoning District" limits apply to any lot located within a residential zoning district or to any residential use located in another zone except an Industrial Zoning District, according to Regulation 2.2. Similarly, per Regulation 2.3, business limits apply to any lot located within a business zoning district not in residential or institutional use.

Table 3.10-1 City Noise Standards, Maximum Allowable Sound Pressure Levels

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

Notes:
1. Noise standards from Regulation 2.5 "Zoning District Noise Standards", City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976.
2. All standards apply at the property line of the receiving property.
3. dB and dBA based on a reference pressure of 20 micropascals.
4. Daytime refers to the period between 7:00 a.m. and 6:00 p.m. daily, except Sunday.

3.10.4 Existing Conditions

A background noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of the Project site. Existing noise sources around the site include: vehicular and truck traffic along local streets, pedestrian traffic, mechanical noise, an alarm and A/C noise from surrounding buildings, overhead planes, nearby and passing sirens, wind, birds, and the general city soundscape.

3.10.5 Noise Monitoring Terminology

Since noise impacts from the Project on the community will be highest when background noise levels are the lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Therefore, daytime measurements were scheduled to avoid peak traffic conditions. Sound level measurements were made on Thursday, October 4, 2018 during the daytime (11:30 a.m. to 1:30 p.m.) and on Friday, October 19, 2018 during nighttime hours (12:00 a.m. to 2:00 a.m.). All measurements were 20 minutes in duration.

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

3.10.6 Noise Monitoring Locations

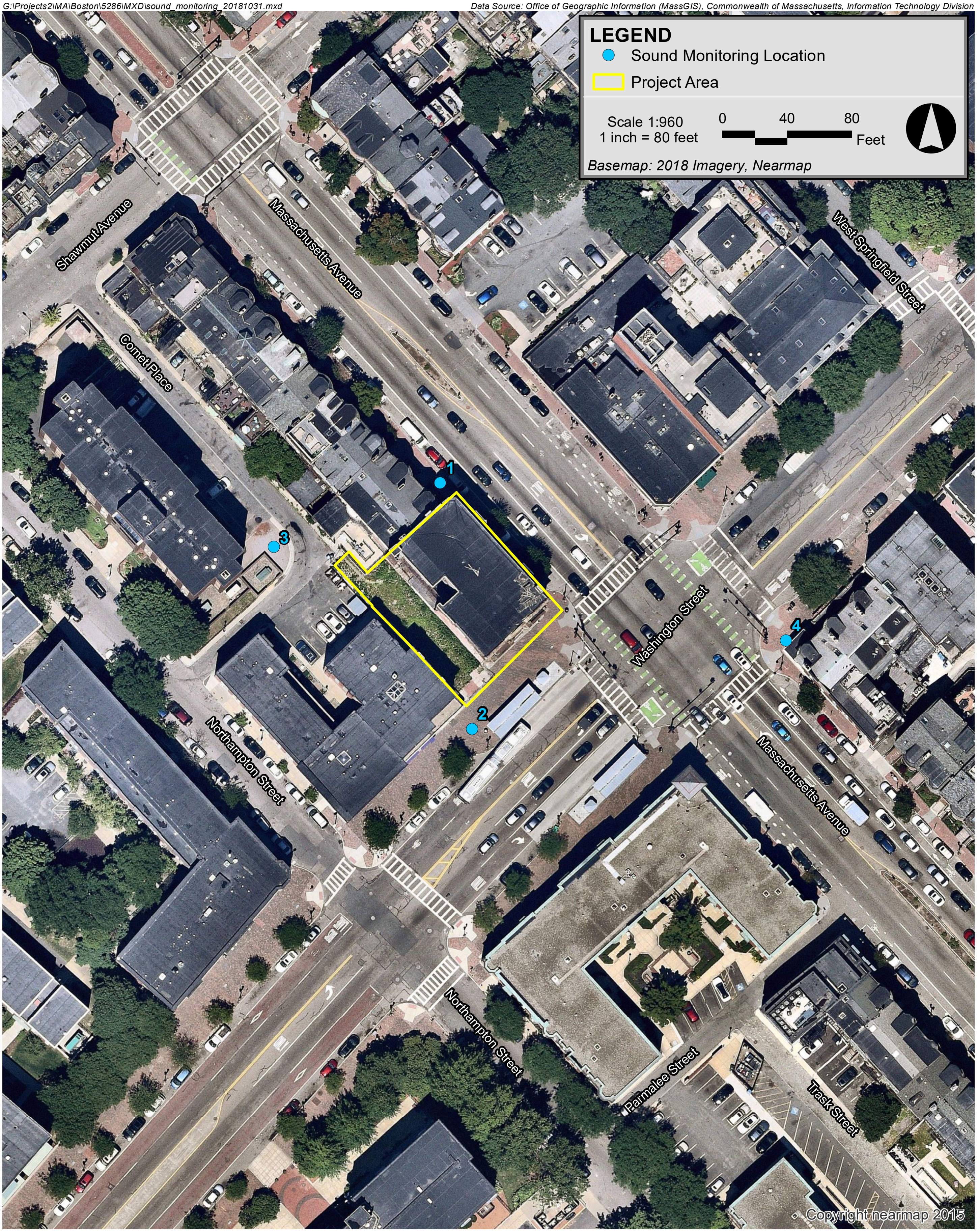
The selection of the noise monitoring locations was based upon a review of zoning and land use in the Project area. Four noise monitoring locations were selected as representative sites to obtain a sampling of the ambient baseline noise environment. These measurement locations are depicted on Figure 3.10-1 and described below.

- **Location 1** is located on the southwestern sidewalk of Massachusetts Avenue, in front of 627 Massachusetts Avenue, north of the Project site. This location is representative of the closest residential receptors northwest of the Project site.

- **Location 2** is located on the northwestern sidewalk of Washington Street., in front of 1777 Washington Street, south of the Project site. This location is representative of the closest commercial/residential receptors southwest of the Project site.

- **Location 3** is located along the corner of Comet Place, outside of 155 Northampton Street, west of the Project site. This location represents the closest residential receptors west of the Project site.

- **Location 4** is located on the southeastern sidewalk of Washington Street, in front of 1750 Washington Street at the Bar Lyon, east of the Project site. This location is representative of the closest commercial/residential receptors east of the Project site.



Hotel Alexandra Boston, Massachusetts

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Figure 3.10-1

Sound Monitoring Locations

3.10.7 Noise Monitoring Equipment

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

3.10.8 Measured Background Sound Levels

Baseline noise monitoring results are presented in Table 3.10-2 and summarized below:

- The daytime residual background (L_{90}) measurements ranged from 52 to 62 dBA;
- The nighttime residual background (L_{90}) measurements ranged from 48 to 57 dBA;
- The daytime equivalent level (L_{eq}) measurements ranged from 55 to 72 dBA;
- The nighttime equivalent level (L_{eq}) measurements ranged from 54 to 80 dBA.

Table 3.10-2 Summary of Measured Background Noise Levels – July 27, 2018 (Daytime) & July 31, 2018 (Nighttime)

Location	Period	Start Time	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{90} Sound Pressure Level by Octave-Band Center Frequency (Hz)									
								31.5	63	125	250	500	1000	2000	4000	8000	16000
			dBA	dBA	dBA	dBA	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB	dB
1	Day	11:46 AM	71	90	73	64	61	66	67	63	60	57	55	51	45	37	29
2	Day	12:12 PM	68	85	70	65	61	68	66	62	58	57	56	52	45	36	28
3	Day	12:39 PM	55	66	57	54	52	63	60	55	51	49	47	43	36	27	24
4	Day	1:05 PM	72	90	75	68	62	70	66	64	61	59	58	54	47	39	30
1	Night	1:19 AM	80	101	72	60	51	56	58	56	50	47	46	41	31	23	23
2	Night	12:33 AM	64	84	66	57	51	58	56	56	51	49	46	39	32	23	23
3	Night	12:56 AM	54	72	53	50	48	55	51	51	49	46	42	39	31	20	23
4	Night	12:10 AM	69	84	72	64	57	63	60	59	55	52	52	48	39	31	25

Note: Sound pressure levels are rounded to the nearest whole decibel.

Weather Conditions:

	Date	Temp	RH	Sky	Wind
Daytime	Thursday, October 4, 2018	65 °F	70%	Cloudy	W @ 0-5 mph
Nighttime	Friday, October 19, 2018	39 °F	44%	Few Clouds	NW @ 0-4 mph

Monitoring Equipment Used:

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	4374
Microphone	Larson Davis	377C20	165110
Preamp	Larson Davis	PRM831	46515
Calibrator	Larson Davis	CAL200	13675

3.10.9 Future Conditions – Overview of Potential Project Noise Sources

The primary sources of continuous sound exterior to the Project are expected to consist of ventilation, heating, cooling, and emergency power noise sources. Multiple noise sources are anticipated to be located on the rooftop and an exhaust fan is anticipated to be located on the northwest façade of the first floor.

Table 3.10-3 provides an anticipated list of the major sources of sound. Sound power levels used in the acoustical modeling of each piece of equipment are presented in Table 3.10-4. Sound power level data were provided by the respective manufacturer of each piece of equipment.

The Project includes select noise-control measures in order to achieve compliance with the applicable noise regulations. As the design progresses, specifications for mechanical equipment may change; however, appropriate measures will be taken to ensure compliance with the City Noise Standards. It is expected that the emergency generator sound levels will be controlled using a Level 2 sound attenuated enclosure. To further limit impacts from the standby generator, required periodic, routine testing will be conducted during daytime hours, when background sound levels are highest. A summary of potential noise mitigation considered for the Project is presented in Table 3.10-5.

Table 3.10-3 Modeled Noise Sources

Noise Source	Quantity	Approximate Location & Elevation	Size/Capacity
Cooling Tower (Air cooled)	2	North end of Level 13 (Rooftop)	93,970 CFM
Emergency Generator	1	Center of Level 13 (Rooftop)	300 kW
Energy Recovery Unit	1	South end of Level 13 (Rooftop)	11,800 CFM
Transformer Vault Exhaust Fan	1	Northwest façade of Level 1	10,000 CFM

Table 3.10-4 Modeled Sound Power Levels per Noise Source

Noise Source	Broad-band (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Cooling Tower (Air cooled)	88	92[1]	92	90	91	84	81	78	74	68
Emergency Generator[2]	96	107[1]	107	106	100	92	85	85	83	80
Energy Recovery Unit	90	93[1]	93	91	89	86	86	80	76	72
Transformer Vault Exhaust Fan	76	91[1]	91	86	77	73	70	64	58	53

Notes: Sound power levels do not include mitigation identified in Table 3.10-5.

1. No data provided by manufacturer. Octave-band sound level assumed to be equal to the 63 Hz band level.
2. Caterpillar Sound Attenuated Level 2 Enclosure.

Table 3.10-5 Attenuation Values Applied to Mitigate Each Noise Source

Noise Source	Form of Mitigation	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Transformer Vault Exhaust Fan	Louver[1]	11[2]	11	13	17	22	26	24	21	22

Notes:
1. Kinetics Noise Control KCAC-1 12-inch Acoustical Louver.
2. No data provided by manufacturer. Octave-band sound level assumed to be equal to the 63 Hz band level.

3.10.10 Noise Modeling Methodology

The noise impacts associated with the Project were predicted at the nearest and most representative receptors using the CadnaA noise calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The benefits of this software are a refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections, drop-off with distance, and atmospheric absorption. The CadnaA software allows for octave-band calculation of noise from multiple noise sources, as well as computation of diffraction around building edges.

3.10.11 Future Sound Levels – Nighttime

The analysis of sound levels at night included all the mechanical equipment operating at maximum loads, except the emergency generator, to simulate worst-case nighttime operation conditions at nearby receptors. Seven modeling locations were included in the analysis. All seven of the modeling receptors (A-G) represented nearby residentially zoned locations. Modeling location A represents monitoring location 1 on the southwestern sidewalk of Massachusetts Avenue, in front of 627 Massachusetts Avenue, north of the Project site. Modeling location B represents monitoring location 2 on the northwestern sidewalk of Washington Street., in front of 1777 Washington Street, south of the Project site. Modeling location C represents monitoring location 3 along the corner of Comet Place, outside of 155 Northampton Street, west of the Project site. Modeling location D represents monitoring location 4 on the southeastern sidewalk of Washington Street, in front of 1750 Washington Street at the Bar Lyon, east of the Project site. Modeling location E represents the 7-Eleven, Sleeping Dog Properties and residences across the street on Massachusetts Avenue on the northeast sidewalk, northeast of the Project site. Modeling location F represents residences on the southeastern sidewalk of Washington Street., in front of 1718 Washington Street, northeast of the Project site. Modeling location G represents the rear of 627 Massachusetts Avenue, immediately adjacent and to the northwest of the Project site. The modeling receptors, which correspond to residential uses in the community, are depicted in Figure 3.10-2. The predicted exterior Project-only sound

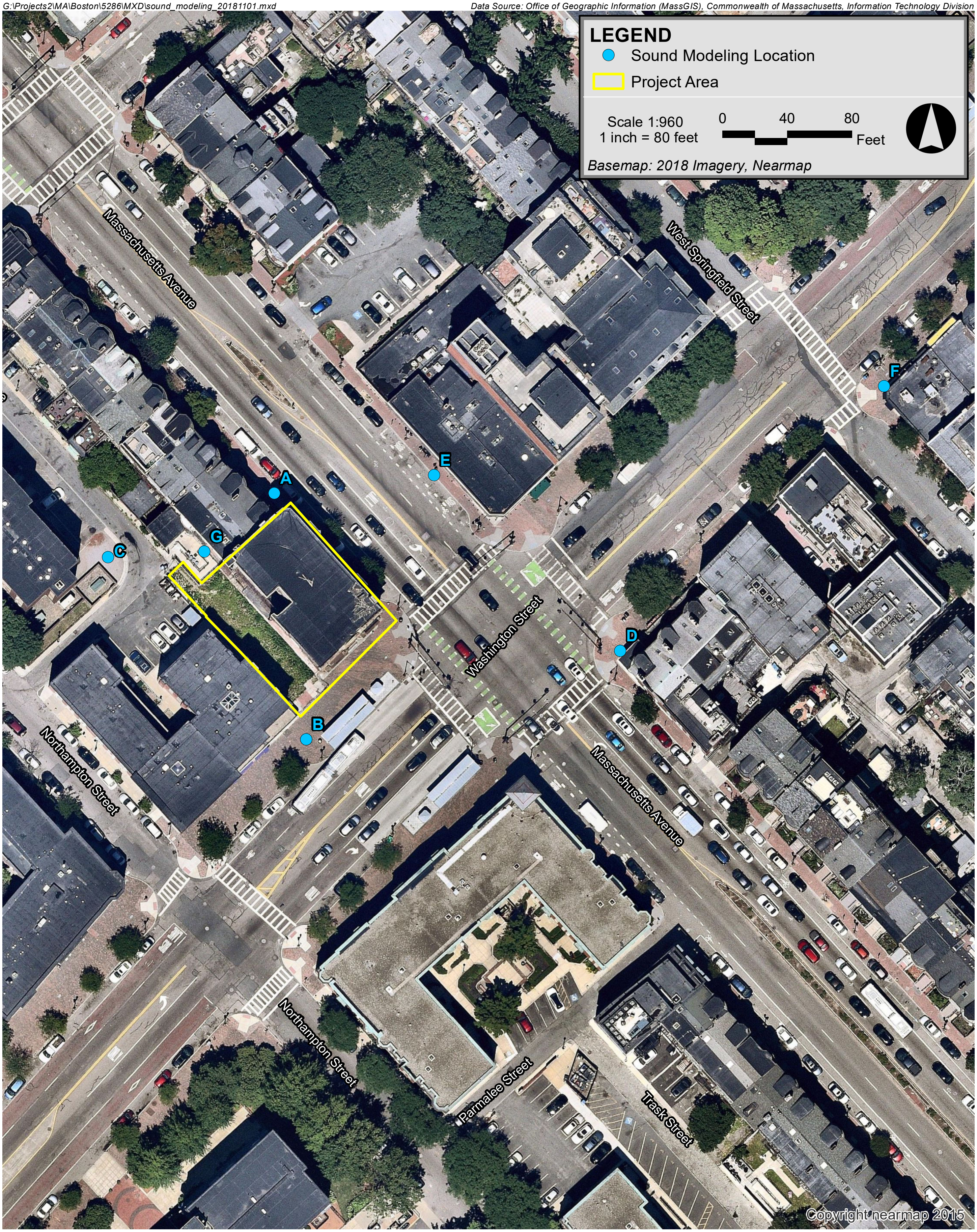

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Figure 3.10-2
Sound Modeling Locations

levels range from 28 to 42 dBA at nearby receptors. The City of Boston Residential limits have been applied to the appropriate locations. Predicted sound levels from Project-related equipment are within the broadband and octave-band nighttime limits under the City Noise Standards at the modeling locations. The evaluation results are presented in Table 3.10-6.

Table 3.10-6 Comparison of Future Predicted Project-Only Nighttime Sound Levels to the City of Boston Limits

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Residential	28	43	40	35	32	23	21	16	11	0
B	Residential	29	45	42	37	33	26	22	15	8	0
C	Residential	35	51	52	45	38	29	23	18	13	3
D	Residential	36	46	45	42	39	33	30	21	12	0
E	Residential	34	47	45	42	39	29	24	17	10	0
F	Residential	40	46	46	43	44	37	34	30	22	5
G	Residential	42	62	62	55	43	34	28	23	20	13
City of Boston Limits	**Residential/Institutional**	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

3.10.12 Future Sound Levels – Daytime

As previously noted, the emergency generator will only operate during the day for brief, routine testing when the background sound levels are high, or during an interruption of power from the electrical grid. A second analysis combined noise from the Project's anticipated mechanical equipment and its emergency generator to reflect worst-case conditions during a period of equipment testing. The sound levels were calculated at the same receptors as in the nighttime analysis and then evaluated against daytime limits. The predicted exterior Project-only daytime sound levels range from 34 to 47 dBA at nearby receptors. Predicted sound levels from Project-related equipment are within the daytime broadband and octave-band limits under the City Noise Standards at each of the modeled locations. This evaluation is presented in Table 3.10-7.

Table 3.10-7 Comparison of Future Predicted Project-Only Daytime Sound Levels to City Noise Standards

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave-Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Residential	34	54	50	46	37	26	22	18	14	5
B	Residential	34	53	50	46	37	28	23	17	12	4
C	Residential	38	56	54	49	41	31	25	21	17	8
D	Residential	41	56	54	52	44	35	31	23	17	6
E	Residential	40	56	55	53	44	33	26	21	16	6
F	Residential	47	57	57	56	50	43	37	35	29	15
G	Residential	43	63	62	56	44	35	28	25	21	14
City of Boston Limits	**Residential/Institutional**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

3.10.13 Conclusions

Baseline noise levels were measured in the vicinity of the Project site during the day and at night. At these and additional locations, future Project-only sound levels were calculated based on information provided on the expected mechanical equipment. Project-only sound levels were compared to applicable limits.

Predicted mechanical equipment noise levels from the Project at each receptor location, taking into account attenuation due to distance, structures, and noise-control measures, will be at or below the octave-band requirements of the City Noise Standards. The predicted sound levels from Project-related equipment, as modeled, are expected to remain well below 50 dBA at residences; therefore, within the nighttime residential zoning limits for the City of Boston at the nearest residential receptors. The results indicate that the Project can operate without substantial impact on the existing acoustical environment.

At this time, while the mechanical equipment and noise controls have been refined, they are still conceptual in nature. During the final design phase of the Project, mechanical equipment and noise controls will be specified and designed to meet the applicable broadband limit and the corresponding octave-band limits of the City Noise Standards.

3.11 Construction Impacts

3.11.1 Introduction

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

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

During the construction phase of the Project, the Proponent will provide the name, telephone number and address of a contact person to communicate with on issues related to the construction.

The Proponent intends to follow the guidelines of the City of Boston and the MassDEP, which direct the evaluation and mitigation of construction impacts.

3.11.2 Construction Methodology/Public Safety

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

As the design of the Project progresses, the Proponent will meet with BTD to discuss the specific location of barricades, the need for lane closures, pedestrian walkways, and truck queuing areas. Secure fencing, signage, and covered walkways may be employed to ensure the safety and efficiency of all pedestrian and vehicular traffic flows. In addition, sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. Public safety for pedestrians on abutting sidewalks will also include covered pedestrian walkways when appropriate. If required by BTD and the Boston Police Department, police details will be provided to facilitate traffic flow. These measures will be incorporated into the CMP which will be submitted to BTD for approval prior to the commencement of construction work.

3.11.3 Construction Schedule

The Proponent anticipates that the Project will commence construction in the summer of 2019 and last for approximately 24 months.

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

3.11.4 Construction Staging/Access

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

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

3.11.5 Construction Mitigation

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

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

"Don't Dump - Drains to Charles River" plaques will be installed at storm drains that are replaced or installed as part of the Project.

3.11.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 275 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 51% of the total employee work hours be for Boston residents, at least 40% of total employee work hours be for minorities and at least 12% of the total employee work hours be for women. The Proponent will enter into jobs agreements with the City of Boston.

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

3.11.7 Construction Truck Routes and Deliveries

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

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

3.11.8 Construction Air Quality

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

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

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

3.11.9 Construction Noise

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

Mitigation measures are expected to include:

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

3.11.10 Construction Vibration

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

3.11.11 Construction Waste

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

3.11.12 Protection of Utilities

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

3.11.13 Rodent Control

A rodent extermination certificate will be filed with the building permit application for the Project. 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.

3.11.14 Wildlife Habitat

The Project site is in an established urban neighborhood. There are no wildlife habitats in or adjacent to the Project site.

Chapter 4.0

Sustainable Design and Climate Change Resilience

4.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE RESILIENCE

4.1 Sustainable Design

To measure the results of their sustainability initiatives and to comply with Article 37 of the Boston Zoning Code, the Project team will use the framework of the US Green Building Council, (USGBC), Leadership in Energy and Environmental Design (LEED) rating system. The hotel project will use the LEED for New Construction (LEED-NC v4) as the rating system to demonstrate compliance with Article 37. The LEED rating system tracks the sustainable features of a project by achieving points in the following categories: Integrative Process, Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation and Design Process, and Regional Priority Credits.

A LEED checklist for the Project is included at the end of this section, and the narrative below outlines how the Project intends to achieve the prerequisites and credits for each credit category. The checklist will be updated regularly as the design develops and engineering assumptions are substantiated. At present, 45 points have been targeted. Additional credits, identified as "Maybe" on the checklist, will be evaluated as the design progresses.

Integrative Process

The Project team has met and will continue to meet regularly to ensure that the team members from the various disciplines involved are all known to each other and collectively communicating. A sustainable design focused workshop will be held during schematic design and the team will collaborate to establish shared sustainable design and energy efficiency goals for the Project. As the Project progresses, there will be regular design meetings to ensure the entire team is engaged throughout the design and construction process. Additionally, the Project team will meet with utility companies to discuss the available incentive programs and potential Energy Conservation Measures for the proposed Project.

<u>Integrative Process:</u> As stated above, the Project team will implement an integrative design process throughout design and construction.

Location and Transportation

The proposed Project is located on a previously developed site in the South End neighborhood in the City of Boston. It is located in close proximity to several services and has access to multiple bus routes as well as vehicular access to major highway routes. Hotel employees will have access to bicycle parking within the building.

<u>Sensitive Land Protection:</u> The Project is located on a parcel containing the existing Hotel Alexandra. The façade of the existing building will be restored, with a connecting new hotel constructed behind the façade and on the adjacent lot.

High Priority Site: The Project site is located within the designated historic district "South End Landmark District."

Surrounding Density and Diverse Uses: The Project site is located in a dense urban neighborhood and is within a ½-mile walking distance to at least eight services including retail establishments, restaurants and the Boston Medical Center. Additionally, the neighborhood in which the Project is located is densely built and may qualify for Option 1: Surrounding Density.

Access to Quality Transit: There are several modes of public transit located within ¼ mile of the Project site, including nine bus routes and the MBTA Silver Line, and the Massachusetts Avenue stop of the Orange Line subway.

Bicycle Facilities: The Project site is located within a 200-yard walking distance from a bicycle network that connects to at least ten diverse uses and a transit hub within 3 miles of the site. Additionally, short-term bicycle storage for at least 2.5% of all peak visitors and long-term (covered) bicycle storage for at least 5% of all regular building occupants, but no fewer than 4 spaces, will be provided. A shower and changing room will be provided for building employees.

Reduced Parking Footprint: The Project will have no designated off-street parking.

Sustainable Sites

The Project site is a previously developed urban parcel located in Boston. A site assessment will be conducted in order to determine if there are contaminated soils that require regulated removal. If deemed necessary, a compliant remediation plan will be drafted, submitted and implemented to ensure the contaminated soils removed from the site are categorized and disposed of properly.

To the extent possible, a rainwater management plan will be developed to address the rate, run off and quality of the site rainwater. The Project is planning to meet Boston Water and Sewer Commission requirements by significantly reducing the rainwater runoff by directing it into a below grade re-charge/collection system sized to treat 1-inch of rain over all impervious areas of the site. Rainwater directed to the municipal system will be treated to remove suspended solids prior to being released into the City system.

Construction Activity Pollution Prevention (prerequisite): The Project is required to provide a Storm Water Pollution Prevention Plan (SWPPP) per the City of Boston requirements. Within the SWPPP, an Erosion and Sedimentation Control (ESC) Plan is required to be developed and implemented on the Project, for the duration of construction. The ESC plan has not yet been developed, but will be included within the Project Construction Documents, and will be required during Construction Administration.

Heat Island Reduction: To minimize effects on microclimates and human and wildlife habitats, heat island effect will be reduced by specifying light colored roof and hardscape materials, to the extent possible.

Light Pollution Reduction: Light pollution and light trespass will be reduced where possible. The backlight, uplight and glare (BUG) ratings for exterior lighting will not exceed the requirement for the Project's lighting zone (LZ).

Water Efficiency

The Project documents will include specifications for low-flow and high-efficiency plumbing fixtures which will reduce the amount of potable water used throughout the building. The site will utilize native, adaptive, and/or drought tolerant plant species that require limited irrigation.

Outdoor Water Use Reduction (prerequisite): The Project will not use a permanent irrigation system. Drought-tolerant native plant species will be selected for any planting beds or planters, and these will be hand-watered as necessary.

Indoor Water Use Reduction (prerequisite): Flush and flow fixtures specified for the Project will enable the building to exceed the aggregate water consumption reduction requirement of 20% and will be WaterSense labeled, as applicable. Additionally, appliance and process water use will meet applicable requirements.

Building-level Water Metering (prerequisite): Permanent whole building water use meters will be installed on the Project to measure potable water use within the building and from site irrigation. Monthly and annual summaries will be uploaded to Energy Star Portfolio Manager.

Outdoor Water Use Reduction: The Project will not use a permanent irrigation system. Drought-tolerant native plant species will be selected for any planting beds or planters, and these will be hand-watered as necessary.

Indoor Water Use Reduction: The Project will specify high-efficiency flush and flow water fixtures with a target to reduce overall annual potable water demand by 30% or more.

Cooling Tower Water Use: The Project will conduct a one-time potable water analysis to calculate the number of cooling tower cycles required.

Water Metering: The Project will install permanent water meters for two or more water subsystems such as domestic hot water, indoor plumbing fixtures, or cooling tower water.

Energy and Atmosphere

The Project will be designed with high efficiency building systems and a high-performance building envelope. The proposed HVAC systems design for the building includes a heat pump system with cooling tower and condensing boilers. The proposed lighting will target a lighting power density below code maximums through the use of daylight dimming, carefully considered controls systems and LED fixtures. The preliminary energy use assessment has been conducted using whole building energy modeling. The proposed design must meet both the State Stretch Energy Code and LEED v4 criteria.

Refrigerants with low global warming and ozone depleting potential will be specified for use in the building systems equipment.

Additionally, the Owner will engage a Commissioning Agent (CxA) to perform fundamental commissioning services including providing reviews of design documents. The CxA's role will continue on through construction and ultimately confirm the building systems are installed and function as intended and desired.

<u>Fundamental Commissioning and Verification (prerequisite):</u> A third party Commissioning Agent, (CxA) will be engaged by the owner for purposes of providing fundamental commissioning services for the building energy related systems including HVAC & R, lighting and domestic hot water systems. The CxA will verify the building systems are installed, calibrated and perform to the building owners project requirements through verification and performance reviews of the systems to be commissioned. The commissioning agent will provide a summary report.

<u>Minimum Energy Performance (prerequisite):</u> The Project will include a high-performing envelope, efficient mechanical equipment, and efficient lighting fixtures. A whole building energy simulation will be used to assess the proposed design against the applicable reference standards. The Project will meet the Stretch Code requirement to be 10% better than current MA code in annual site energy use (using an ASHRAE Standard 90.1-2013 baseline, the Project is demonstrating 27% site energy use savings). This LEED prerequisite requires that projects achieve a minimum energy cost savings of 5% over an ASHRAE Standard 90.1-2010 baseline. The Project currently achieves 16% annual energy cost savings when compared to the ASHRAE 90.1-2010 baseline. The energy model will continue to be updated as the design progresses. New information regarding lighting power density, equipment, schedules, and site lighting will be incorporated into the model when applicable. Please refer to the Energy Model Summary provided in Appendix F.

<u>Optimize Energy Performance:</u> The preliminary energy model indicates that the Project achieves a total of six points by demonstrating a 16% estimated annual energy cost savings over ASHRAE Standard 90.1-2010 baseline. The energy model will continue to be updated as the design progresses. New information regarding lighting power density, equipment,

schedules, and site lighting will be incorporated into the model when applicable. The final iteration of the energy model submitted for LEED certification will be based on the Construction Documents. Please refer to the Energy Model Summary provided in Appendix F.

Materials and Resources

The Project will specify materials and products that are environmentally responsible and are transparent regarding the harvest and extraction of raw materials and the manufacturing processes. The design team will specify materials and products with environmental and health product declarations to help support a reduced impact of the development on the environment. Waste management will be addressed during demolition, construction and post occupancy.

<u>Storage and Collection of Recyclables (prerequisite):</u> Recyclables collected post occupancy will be accommodated in a centrally located room dedicated to the storage and collection of recyclables. Housekeeping staff will be responsible for relocating recyclables from the guest rooms to the central recycling storage room located on the ground level. Retail tenants will be responsible for relocating their own recycling to the central recycling storage room.

<u>Construction and Demolition Waste Management Planning (prerequisite):</u> The Construction Manager will be required to develop a compliant construction and demolition waste management plan that establishes waste diversion goals, specifies commingled versus site separated strategies, and enables the Project to divert least 75% of the onsite generated construction and demolition waste from area landfills.

<u>Building Life-Cycle Impact Reduction:</u> At least 50%, by surface area, and of the existing building structure, enclosure, and interior structural elements will be preserved. The building meets the USGBC definition of a blighted building.

<u>Building Product Disclosure & Optimization: Environmental Product Declarations:</u> The Project will specify and install at least 20 different permanently installed products with compliant Environmental Product Declarations sourced from at least five different manufacturers. Requirements for the CM to procure compliant materials will be included in the project manual.

<u>Building Product Disclosure & Optimization: Materials Ingredients:</u> The Project will specify and install at least 20 different permanently installed products from at least five different manufacturers with compliant Health Product Declarations or similar disclosure documentation. Requirements for the CM to procure compliant materials will be included in the project manual.

Construction and Demolition Waste Management: Prior to the start of construction, the Construction Manager will be required to develop and implement a compliant construction and demolition waste management plan that establishes waste diversion goals, specifies commingled versus separated strategies, and enables the project to divert a minimum of four waste streams comprising 75% of the onsite generated construction and demolition waste, from area landfills.

Indoor Environmental Quality:

The building will have a healthy interior environment generated through the use of low VOC-containing interior construction and finish materials and maintained through an efficient ventilation system in compliance with ASHRAE 62.1-2010. In compliance with local regulations, the building will be non-smoking, and no smoking will be allowed within 25 feet of the building.

During construction the Construction Manager will develop and implement a compliant Indoor Air Quality Management Plan for the construction and pre-occupancy phases of the Project.

The building envelope design includes large areas of vision glazing with ample access to daylight and views for the anticipated regularly occupied spaces. The buildings thermal comfort systems and controls will be designed to meet the requirements of ASHRAE 55-2010 for all applicable mechanically ventilated regularly occupied spaces.

Minimum Indoor Air Quality Performance (prerequisite): Mechanical ventilation into the building is provided by AHU's ducted to the hotel rooms. The ventilation will meet ASHRAE 62.1 minimum ventilation rates in the breathing zone, as required.

Environmental Tobacco Smoke Control (prerequisite): No smoking will be permitted in the building or within 25 feet of the building. This policy will be made clear to all, guests, employees and retail transients.

Enhanced IAQ Strategies: The Project will include the following:

- 10' long entryway systems to capture dirt and particulates entering the building at regularly used exterior entrances;

- Sufficient exhausting of each space where hazardous gases or chemicals may be present or used (e.g., housekeeping, welding rooms, copying and printing rooms); and

- MERV 13 filtration (or better) on each ventilation system that supplies outdoor air to occupied spaces

Low Emitting Materials: The Project will meet the threshold level of compliance with emissions and content standards for a minimum of three product categories through specification of materials and products with compliant VOC content and emissions for paints and coatings, flooring and composite wood. The technical specifications will include requirements for products with compliant VOC content and general emissions evaluations where applicable.

Construction Indoor Air Quality Management Plan: The Construction Manager will develop and implement a compliant Indoor Air Quality Management Plan for the construction phase of the Project to meet or exceed the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied buildings Under Construction 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3). The permanently installed air handlers will not be operated during construction, and tobacco products will be prohibited within the building as well as within 25 feet of the building entrance.

Thermal Comfort: The heating, ventilating, and air-conditioning (HVAC) systems and the building envelope will be designed to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata.

Thermal comfort in each hotel room will be controlled via a thermostat. Individual thermal comfort controls will be provided for at least 50% of individual occupant spaces. Additionally, group thermal comfort controls are provided for all shared multi-occupant spaces. Thermal comfort controls allow occupants, whether in individual spaces or shared multi-occupant spaces, to adjust at least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

Interior Lighting: Wall switches will be provided in each hotel room to control lighting fixtures and/or switched outlets. Common area lighting will be controlled by local on/off switching. For at least 90% of individual occupant spaces, individual lighting controls will be provided that enable occupants to adjust the lighting to suit their individual tasks and preferences, with at least three lighting levels or scenes (on, off, midlevel).

All shared multi-occupant spaces will have lighting controls that enable occupants to adjust the lighting to meet group needs and preferences, with at least three lighting levels or scenes (on, off, midlevel).

Quality Views: The Project design will include large windows within the regularly occupied spaces within the hotel rooms providing ample access to views.

Innovation in Design

The Project team will explore innovative approaches to design and maintenance including green housekeeping & pest management programs and purchasing lighting with low-mercury content. Additionally, the Project is eligible to achieve one credit point due to several team members being certified LEED AP with the BD+C specialty.

4.2 Climate Change Resilience

4.2.1 Introduction

Projects subject to Article 80B, Large Project Review, are required to complete the Climate Resiliency Checklist. Climate change conditions considered by the Project team include sea-level rise, higher maximum and mean temperatures, more frequent and longer extreme heat events, more frequent and longer droughts, more severe freezing rain and heavy rainfall evets, and increased wind gusts.

A copy of the Climate Change Checklist is included in Appendix G. Given the preliminary level of design, the responses are also preliminary and may be updated as the Project design progresses.

4.2.2 Extreme Heat Events

The *Climate Ready Boston* report predicts that in Boston, there may be between 25 to 90 days with temperatures over 90 degrees by 2070, compared to an average of 11 days per year over 90 degrees between 1971 to 2000. To adapt to these conditions, the cooling systems will be engineered to be adaptable to hotter summer extreme temperatures and heat waves by running the cooling tower fans faster and ultimately replacing the cooling towers with larger ones to allow the air-conditioning to work at these higher temperatures. The direct digital control system will allow building operators to selectively shut down parts of the building that are not in use to "load shed" i.e. direct cooling capacity to the parts of the building with occupants. The Project will reduce the urban heat island effect by installing reflective roof materials.

4.2.3 Sea Level Rise and Future Storms

According to Climate Ready Boston, by 2030 sea level may be as much as eight inches higher than it was in 2000, and could be as high as seven feet higher by 2100. As described in "Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery" by MassDOT (MassDOT Report), "one of the challenges presented by the wide range of SLR projections is the inability to assign likelihood to any particular [SLR] scenario."[1] To be conservative, in the year 2070, SLR could be as high as approximately four feet.

The Project will take measures to minimize the impact of potential flooding at the site, including the following:

- The basement gravity out-falls will be protected by check-valves on the sewer and storm water lines existing the building, which will reduce the likelihood of surcharging these lines during a flood.
- Standard commercial equipment will be used, which can be replaced more rapidly than customized equipment, if damaged in an event. A modular approach will be used for boilers, hot water heaters and pumps whereby individual units can be replaced without taking down the entire heating / domestic hot water system.
- The Project will be designed to incorporate utility and critical systems protection.

4.2.4 Drought Conditions

Although more intense rain storms are predicted, extended periods of drought are also predicted due to climate change. Under the high emissions scenario, the occurrence of droughts lasting one to three months could go up by as much as 75% over existing conditions by the end of the century. To minimize the Project's susceptibility to drought conditions, aeration fixtures and appliances will be chosen for water conservation qualities, conserving potable water supplies.

[1] Massachusetts Department of Transportation, et al. "MassDOT-FHWA Pilot Project Report: Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery." November 2015.

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

Project Name: Hotel Alexandra
Date: November 20, 2018

Y	?	N			
1	**0**	**0**		**Integrative Process**	**1**
1			Credit	Integrative Process	1

Y	?	N			
11	**3**	**3**		**Location and Transportation**	**16**
		x	Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
1		1	Credit	<u>High Priority Site</u>	2
4		1	Credit	Surrounding Density and Diverse Uses	5
3	3		Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
		1	Credit	Green Vehicles	1

Y	?	N			
3	**3**	**4**		**Sustainable Sites**	**10**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	1	1	Credit	Site Development - Protect or Restore Habitat	2
		1	Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
1		1	Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1

Y	?	N			
6	**1**	**5**		**Water Efficiency**	**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
2	1	4	Credit	<u>Indoor Water Use Reduction</u>	6
1		1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

Y	?	N			
7	**6**	**20**		**Energy and Atmosphere**	**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
	3	3	Credit	Enhanced Commissioning	6
6	2	10	Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
	1		Credit	Enhanced Refrigerant Management	1
1		1	Credit	Green Power and Carbon Offsets	2

Y	?	N			
6	**0**	**7**		**Materials and Resources**	**13**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
2		3	Credit	Building Life-Cycle Impact Reduction	5
1		1	Credit	Building Product Disclosure & Optimization: Environmental Product Declarations	2
		2	Credit	Building Product Disclosure &Optimization: Sourcing of Raw Materials	2
1		1	Credit	Building Product Disclosure & Optimization: Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

Y	?	N			
7	**0**	**8**		**Indoor Environmental Quality**	**16**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
1		2	Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		2	Credit	Indoor Air Quality Assessment	2
1		1	Credit	Thermal Comfort	1
1		1	Credit	Interior Lighting	2
		1	Credit	Daylight	3
1			Credit	Quality Views	1
		1	Credit	Acoustic Performance	1

Y	?	N			
4	**2**	**0**		**Innovation**	**6**
3	2		Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

Y	?	N			
0	**1**	**3**		**Regional Priority (credit names have been underlined)**	**4**
		1	Credit	Regional Priority: EAc2 Optimize Energy Performance (17%/8 pts)	1
	1		Credit	Regional Priority: MRc1 Building Life-Cycle Impact Reduction (2 pts)	1
		1	Credit	Regional Priority: LTc3 High Priority Site (2 points)	1
		1	Credit	Regional Priority: SSc4 Rainwater Management (2 points)	1

Y	?	N		
45	**16**	**50**	**TOTALS**	Possible Points: **110**

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

Chapter 5.0

Urban Design

5.0 URBAN DESIGN

5.1 Neighborhood Context

The Project site is located at the corner of Washington Street and Massachusetts Avenue, within the South End Landmarks District and the Roxbury Neighborhood District. This neighborhood is considered a destination for dining with many active ground-floor uses. The Project site, however, currently contains a vacant parcel and the existing Hotel Alexandra building which has a ground floor retail shop, but otherwise has not been in use for many years and has experienced significant fire and water damage. Completed in 1875, the Alexandra Hotel building is one of the few remaining historic structures along Washington Street in the blocks immediately west of Massachusetts Avenue.

The proposed Project will retain and restore the façade of the existing building and will recreate and/or refurbish the original historic design elements. Due to the decades of neglect and extensive water infiltration, the existing structure is no longer viable and will accordingly be replaced. Behind the façade and on the adjacent vacant parcel, a new, twelve story boutique hotel will be constructed. The new addition will be contemporary in design and will be seen as a backdrop to the existing Alexandra Hotel façade (see Figures 5-1 to 5-3).

5.2 Urban Design Principles

The Project design is guided by the following principles.

Placemaking

The new hotel will complement the residential fabric of the South End by bringing a new use to this thriving neighborhood. The Project will continue the publicly activated vibrancy of the Washington Street corridor across Massachusetts Avenue and into Roxbury. The Project's first floor lobby, restaurant, and café will contribute to a vibrant pedestrian experience by replacing a dark, ground floor space with active uses.

Saving a Community Asset

The Project will restore the façade of the Hotel Alexandra building which has been vacant and subject to fire and water damage that could lead to permanent loss if the current state of neglect were to continue. The ground floor restaurant and rooftop bar/terrace will allow the public to visit and enjoy the new building.

Incorporating Business Uses

The South End has become home to some of Boston's most exciting restaurants, cafes, boutiques, and shops. Continuing that tradition with a new café, restaurant, and rooftop bar will help to knit this corner into the existing fabric of the neighborhood.

Activating the Sidewalk

The wide sidewalk wide along Washington Street allows for a mix of uses and allows pedestrians to walk to the Silver Line, local destinations, arrive at the hotel, visit the restaurant, or pick up a cup of coffee. The Project will feature a high ground floor ceiling with visual access to the publicly accessible lobby and lounges. The main reception area will be located along Washington Street; food and beverage use, and lounges will be visible from Massachusetts Avenue to activate the lower floors. The entrance will align with the street wall created by the adjacent buildings, filling in the ‘missing tooth’ at the currently vacant parcel. The pedestrians coming and going from the hotel and various publicly accessible spaces on site will further bolster the overall activity along this stretch of Washington Street and create a strong pedestrian presence at its edge.

Hotel Alexandra **Boston, Massachusetts**

cbt

Figure 5-1
View from Washington Street

Hotel Alexandra **Boston, Massachusetts**

cbt

Figure 5-2

View from Massachusetts Avenue

Hotel Alexandra Boston, Massachusetts

cbt

Figure 5-3

View from Washington Street and Massachusetts Avenue Intersection

Hotel Alexandra **Boston, Massachusetts**

cbt

Figure 5-4
View from Washington Street

Chapter 6.0

Historic and Archaeological Resources

6.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section describes the historic and archaeological resources within and in the vicinity of the Project site and discusses potential Project-related impacts to significant historic resources.

6.1 Existing Conditions

The Project site is located within the South End Landmark District, a local historic district designated by the Boston Landmarks Commission (BLC) in 1983. The Project site is also located within the South End District, which was included in the National Register of Historic Places in 1973.

The South End of Boston was developed predominately between 1848 and 1930. The neighborhood's oldest thoroughfare, Washington Street, was laid out on the original "neck" connecting Boston's originally peninsular landmass with the Roxbury mainland. The City of Boston eventually filled the tidal marshes lining Washington Street, and in 1848 began to auction off parcels to speculative developers. As a result of this initiative, the South End became one of the most fashionable residential neighborhoods of mid-nineteenth century Boston.

Although its earliest buildings are conservative flat-fronted, gable-roofed Greek Revival rowhouses, the South End is better known for its harmonious blocks of speculator-built houses whose bow-fronted façades and mansard roofs reflect the later and more florid Italianate and Second Empire styles. Many of these line ornamental squares of varying proportions featuring cast-iron fences and fountains.

Despite changes in use and alterations to many of its buildings, the South End is today the largest remaining urban Victorian residential neighborhood in the U.S. East of its residential streets and adjacent to major rail lines, an industrial area dominated by warehouses and factory buildings was developed in the later nineteenth and early twentieth centuries; this is now a locally designated sub-district known as the South End Protection Area.

6.1.1 Historic Resources within the Project Site

A five-story building organized as four residential floors above paired ground-floor storefronts flanking a central tenant entry on the Washington Street elevation, the Hotel Alexandra's exterior is heavily detailed and, though long neglected, largely intact. Exemplifying the richly decorated, Venetian-inflected Ruskinian subtype of the High Victorian Gothic style, its façades are ornamented with pointed arches and colonettes as well as dogtooth and rosette-carved banding. At the second through fourth stories of the Washington Street elevation, box bays rest on the semi-octagonal cast-iron storefront projections of the ground floor. The roof of the right-hand bay retains its historic iron cresting; that at the left has been missing since at least 1899. The Washington Street elevation's bays are answered on the Massachusetts Avenue façade by semi-octagonal oriels, also of cast iron, at the same levels. Long boarded over with plywood, four large storefront windows appear along Massachusetts Avenue, set flush with the elevation.

Completed in 1875 to the designs of an unknown architect, the Hotel Alexandra was built by Canaan, New Hampshire natives James and Caleb Walworth of the Walworth Manufacturing Company. As reflected by an illustrated catalogue published in 1878, this enterprise produced a vast array of wrought- and cast-iron pipes, steam and gas fittings as well as tools and supplies relating to steam and gas engineering. Founded by James Jones Walworth (1808-1896), the firm expanded in 1846 to include his younger brother Caleb Clark Walworth (1815-1894).

A gifted inventor, Caleb in 1875 received a lucrative patent for a steam radiator that eventually became the standard type in use throughout the United States. The firm occupied offices at 69 Kilby Street in downtown Boston's financial district, while its substantial manufacturing plant (or "works") was located in Cambridgeport, then a thriving industrial area. Heating technology having wide application throughout the late nineteenth century economy, the Walworths' business apparently met with great success; by the 1890s it was producing between six and seven million feet of pipe annually.

With their partnership a demonstrably profitable one, the brothers may have embarked upon the Alexandra project as an investment vehicle in a familiar setting: Caleb was for many years a resident of nearby West Newton Street while James took one of the Alexandra's eight suites. Caleb's death in 1894 was marked by the publication of his portrait on the cover of *Fibre & Fabric*, a Boston-based trade weekly, accompanied by an obituary praising his contributions to industry, his strong moral character and personal amiability. James died, at the Alexandra, two years later.

The Walworth genealogy including no female members by the name Alexandra, the building is believed to have been named for Alexandra of Denmark (1844-1925), then Princess of Wales. Although it is unknown why the Walworths chose to name their building after her, Alexandra was an internationally popular figure, admired both as a beauty and as the wife and mother of future British monarchs. By appropriating Alexandra's name, the brothers may have hoped to cast a measure of her glamour and prestige onto their property and even, perhaps, themselves. Now heavily deteriorated and barely discernible, a circular plaque below the peak of the building's Washington Street parapet is marked with the intertwined initials W, H and A, presumably for "Walworth" and "Hotel Alexandra."

In late nineteenth-century Boston, the noun 'hotel' was as often applied to buildings of multiple dwelling units as to those offering temporary lodgings to travelers. Whereas apartments had been familiar on the European continent since Roman antiquity, they were slow to find favor in an English-speaking world discomfited by the idea of multiple households cohabitating beneath a common roof. Despite such initial uneasiness, the economic advantages of apartments offering the social equivalence of private, single-family dwellings gradually became too great to dismiss. Thus a few buildings of this kind (called 'hotels' for propriety's sake) began to appear, even in Boston.

Indeed, the first purpose-built apartment house in the U.S. was erected not in New York or Philadelphia but at the southwest corner of Boylston and Tremont streets, opposite the Common, in 1857. Known as the Hotel Pelham, this was followed in 1870 by Cummings & Sears' Hotel Boylston at the Common's southeast corner, and a year later by the Hotel Vendome at Commonwealth Avenue and Dartmouth Street in the Back Bay. Although many more such establishments were erected in the coming decades, the Hotel Alexandra remains an unusually early example of its once-pioneering type.

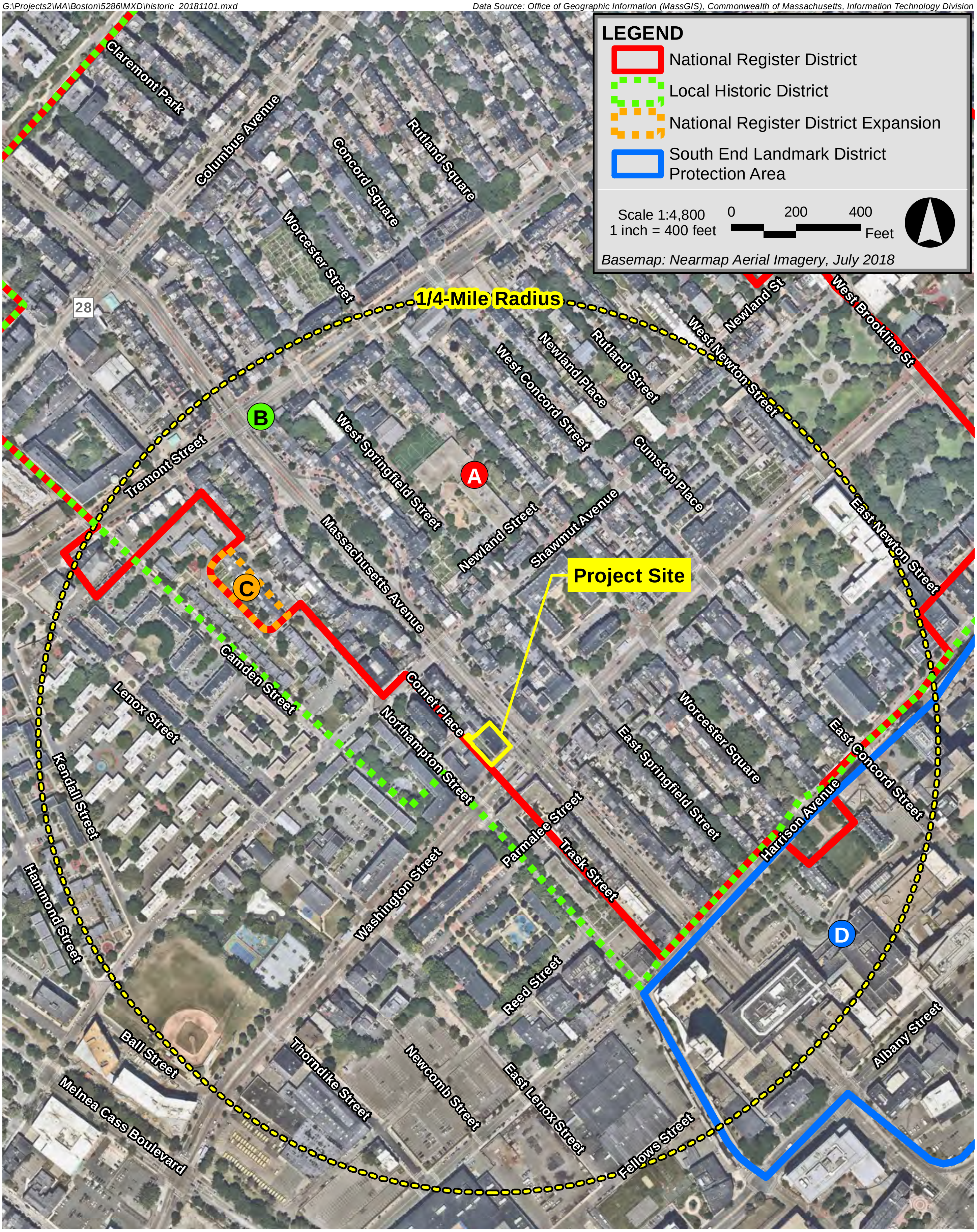
Particularly popular with childless households, including both young couples only recently married and older ones with grown children whom we might today term 'empty nesters,' Boston's residential hotels were jocularly known as homes for the "newly wed and the nearly dead." As a euphemism for apartment building, the term 'hotel' lingered until about the turn of the twentieth century, by which time any residual concerns about the inherent respectability of such dwellings had presumably evaporated.

Soon after the Walworth brothers' deaths, their former property would suffer from the construction of an elevated railway above Washington Street. A precursor of the present-day MBTA Orange Line, this line would block light and views of buildings along its route until its removal in the late 1980s. Cast, like its equally unfortunate neighbors, into permanent shadow and subjected to regular bursts of ear-splitting track noise, the Alexandra could no longer function as a desirable place of residence. As a consequence, the formerly fashionable property lapsed into more than a century of neglect from which it is only now poised to emerge.

Also within the Project site, immediately to the west of the Alexandra along Washington Street, is a vacant lot. This was occupied by a mid-nineteenth century, three-and-one-half story, bow-fronted brick rowhouse. Known as the Ivory Bean house for its original owner, the building was demolished in 2011.

6.1.2 Historic Resources in the Vicinity of the Project Site

Historic resources in the vicinity of the Project site include several historic districts, list in Table 6-1 and depicted in Figure 6-1.



Hotel Alexandra **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 6-1
Historic Resources

Table 6-1 Historic Resources

Label	Historic Resource	Designation
A	South End District	NRDIS
B	South End Landmark District	LHD
C	South End District Boundary Expansion	NRDIS
D	South End Landmark District Protection Area	LHD
Designation Legend:		
NRDIS	National Register of Historic Places district	
LHD	Local Historic District	

6.1.3 Archaeological Resources on the Project Site

The Project site is a previously developed urban parcel. As confirmed on November 19, 2018, there are no known archaeological resources listed in the State and National Registers of Historic Places or included in the Inventory within the Project site.

6.2 Impacts to Historic Resources

Potential urban design and shadow impacts of the new construction on nearby historic resources were considered and are summarized below.

6.2.1 Demolition of Historic Resources

The Project involves the replacement of the Alexandra's compromised interior structural members but includes no demolition of historic resources.

6.2.2 Urban Design

The Project will save a long-threatened community asset, the historic Hotel Alexandra, which will be enlarged to include a 12-story addition. The latter will be set back from the former's original façade to underscore each structure's distinctive yet complementary architectural qualities. Juxtaposing the aesthetics of the nineteenth and twenty-first centuries, the Project will embody a virtual microcosm of the historic South End in its ongoing evolution as both a neighborhood and a hospitality district. Operating as a limited-service hotel, this will welcome visitors to its 150 guest rooms while inviting restaurant patrons to its ground-floor and rooftop restaurants.

Public-realm improvements will include the potential relocation of the Silver Line stop whose shelter now stands directly in the foreground of the Alexandra, relieving a chronic bottleneck at Washington Street's busy intersection with Massachusetts Avenue. The augmentation of street lighting and the planting of street trees along the Washington Street and Massachusetts Avenue sidewalks represent further enhancements.

6.3 Shadow Impacts

Shadow impact analyses were conducted to demonstrate the anticipated impacts from the Project. These consisted of standard shadow studies done for March 21, June 21, September 21 and December 21 at 9:00 a.m., 12:00 p.m., and 3:00 p.m., as well as at 6:00 p.m. on June 21 and September 21.

As discussed in Section 3.2, the shadow analysis for the Project demonstrates that net new shadow is limited in extent and duration, typically cast in the block containing the Project site, which is bounded by Washington Street, Massachusetts Avenue, Shawmut Avenue and Northampton Street. Shadows at 6:00 p.m. extend modestly beyond this block in a southeasterly direction and, at 3:00 p.m. on December 21, due east.

The results of these shadow studies are included in Section 3.2 and shown in Figures3.2-1 through 3.2-14.

6.4 Wind Impacts

The Project entails the construction of a 12-story development as well as the retention of the Hotel Alexandra's historic Washington Street and Massachusetts Avenue elevations. In addition, outdoor dining installations are proposed both at grade, along the building's Washington Street frontage, and at roof level. Pedestrian wind safety and comfort studies demonstrate that the Project will exert no significant wind impacts to the South End Landmark District.

Within the surrounding area, wind conditions at pedestrian level will be substantially unchanged. A modest increase in wind speeds will result in the immediate vicinity of the Project but conditions are predicted to remain suitable for a pedestrian environment. Wind conditions are anticipated to be comfortable for walking, standing and sitting along the sidewalks, benefiting both outdoor dining patrons and Silver Line passengers waiting at or alighting from the nearby bus shelter. At the Project's roof terrace, wind conditions are expected to be comfortable for sitting and standing. Walking will also be comfortable at most of the roof but for its northerly end; in that location, screening partitions or container plantings may be introduced to mitigate wind discomfort.

Chapter 7.0

Infrastructure

7.0 INFRASTRUCTURE

The existing infrastructure in the vicinity of the Project site is sufficient to service the needs of the Project. The following sections describe the existing sewer, water, and drainage systems and explain how these systems will service the Project. The analysis also discusses any anticipated Project-related impacts on area utilities and identifies mitigation measures to address these potential impacts.

A detailed infrastructure analysis will be performed as the design progresses. The Project team will coordinate with the appropriate utilities to address the capacity of the area to provide services for the building. A Boston Water and Sewer Commission (BWSC) Site Plan and General Service Application will be submitted for the new water, sanitary sewer, and storm drain connections.

A Drainage Discharge Permit Application will be required from BWSC for any construction dewatering. The appropriate approvals from MassDEP and the United States Environmental Protection Agency (EPA) will also be sought if required.

7.1 Sanitary Sewer System

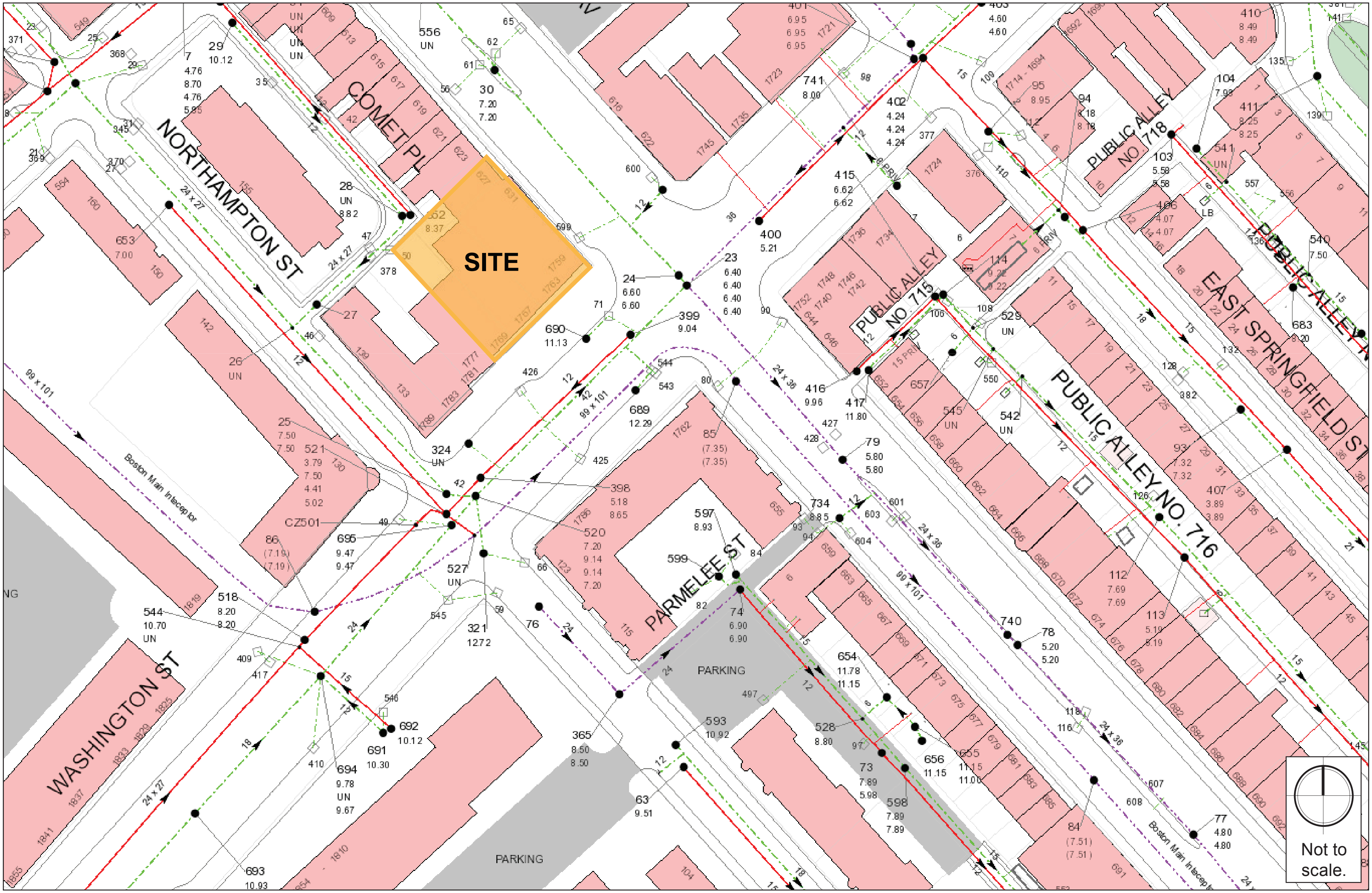
7.1.1 Existing Sanitary Sewer System

Record drawings indicate that the sanitary sewer system in the Project area (See Figure 7-1) is owned and maintained by BWSC. BWSC record drawings indicate an existing 12-inch sanitary sewer line that runs along Washington Street to the southeast of the Project. BWSC record drawings also indicate an existing 12-inch sanitary sewer line that runs along Comet Place to the northwest of the Project. It is anticipated the existing sanitary sewer mains in Washington Street and Comet Place will provide adequate capacity to serve the needs of the Project.

7.1.2 Estimated Project Wastewater Generation

The Project will generate an estimated 25,325 gallons per day (gpd) based on design sewer flows provided in 310 CMR 15.000-The State Environmental Code, Title 5: Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-Site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage and the proposed building program as summarized in Table 7-1. With the exception of a small beauty supply store, the Project site is currently vacant and has minimal amounts of wastewater generation.

Based on the proposed estimated sanitary flow, which is greater than 15,000 gpd, BWSC will require the removal of infiltration/inflow (I/I) at a minimum 4:1 ratio of I/I removed to wastewater generated.



Hotel Alexandra **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 7-1
Sanitary Wastewater System

Table 7-1 Project Wastewater Generation

Use	Number	Sewage Generation Rate	Total gpd
Hotel	150 rooms	110 gpd/bedroom	16,500
Restaurant	151 seats	35 gpd seat	5,285
Level 12 Bar	177 seats	20 gpd/seat	3,540
Total Estimated Project Sewage Generation			**25,325 gpd**

7.1.3 Sanitary Sewer Connection

The proposed sanitary sewer line from the Project will likely connect to the BWSC's sewer line in Washington Street.

7.2 Water System

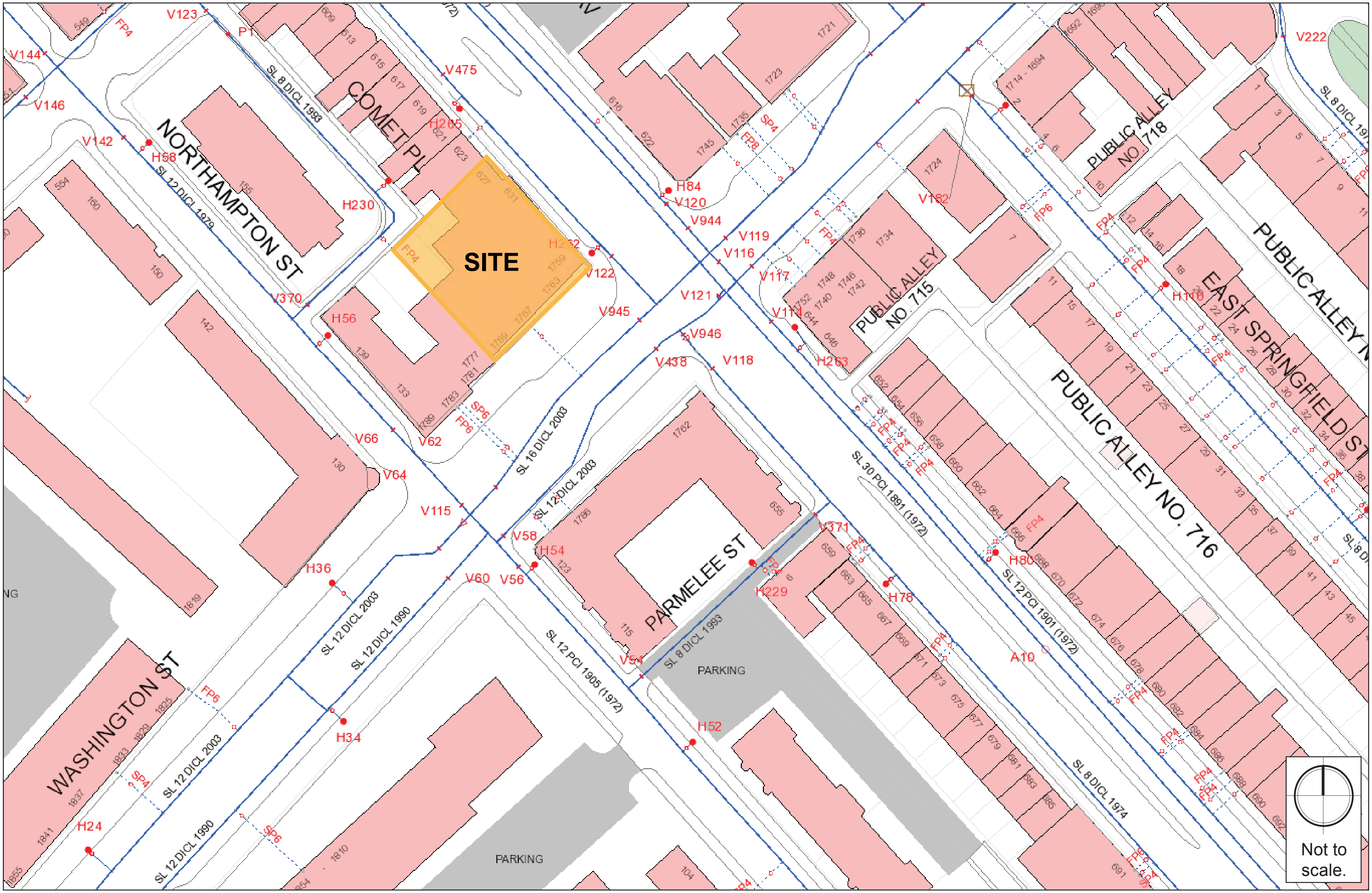
7.2.1 Existing Water Service

The water distribution system near the Project area is owned and maintained by BWSC (see Figure 7-2). BWSC record drawings indicate there is an existing 16-inch and 12-inch ductile iron water main in Washington Street, cement lined in 2003. There are three existing water mains in Massachusetts Avenue; a 12-inch ductile iron water main, cement lined in 1976, a 30-inch pit cast iron (PCI) water main installed in 1892 and cleaned in 1972, and a 12-inch PCI water main installed in 1908 and cleaned in 1977. There is an existing 8-inch ductile iron water main installed in Comet Place, cement-lined in 1993. All water mains contained within Washington Street, Massachusetts Avenue and Comet Place, adjacent to the Project site, are part of the Southern Low Service Network and are anticipated to be of adequate capacity to serve the needs of the Project.

Fire hydrants are located in Washington Street, Massachusetts Avenue, Northampton Street and Comet Place to the northeast, southeast, southwest, and northwest of the Project area. It is anticipated that these hydrants will provide sufficient coverage for the Project. The Proponent will design appropriate domestic and fire protection lines and confirm the fire hydrant coverage for the Project with the consultation of BWSC and the Boston Fire Department (BFD) as the design progresses.

7.2.2 Proposed Water Service

It is anticipated that the Project will be serviced via the existing 12-inch ductile iron, cement-lined (DICL) water main in Washington Street. Separate new domestic water and fire protection services will be required. The fire protection service will be provided with a backflow prevention device that will be approved though BWSC's Enforcement Section. Water meters will be of a type approved by BWSC and tied into the BWSC's Automatic Meter Reading (AMR) System.



Hotel Alexandra **Boston, Massachusetts**

HOWARD STEIN HUDSON
Engineers + Planners

Figure 7-2
Water Supply System

7.2.3 Anticipated Water Consumption

The Project's estimated water consumption is based on the Project's estimated sewage generation, plus a factor of 10% to account for consumption, system losses, and other usages. The total estimated water demand is 22,963 gpd. The water for the Project will be supplied by BWSC. More detailed water use and meter sizing calculations will be submitted to BWSC as part of the Site Plan approval process.

7.3 Storm Drainage System

7.3.1 Existing Storm Drainage System

According to record drawings, the storm drainage system in the vicinity of the Project site is owned and maintained by BWSC. There is an existing 42-inch storm drain and 99-inch x 101-inch Boston Main Interceptor installed in Washington Street, a 24-inch x 27-inch storm drain installed in Comet Place, and an 18-inch x 22-inch storm drain in Massachusetts Avenue (see Figure 7-1).

Stormwater runoff from the rooftop of the existing building is likely conveyed by building service pipes to the surrounding municipal storm drain system. Runoff from the vacant parcel, adjacent to the building, flows towards the middle of the parcel and infiltrates through the ground surface.

7.3.2 Proposed Stormwater Drainage System

The proposed stormwater management system will connect to the 42-inch BWSC owned drain line in Washington Street. The stormwater management system will provide pretreatment and infiltration, if feasible, prior to discharging stormwater to the drainage system.

7.3.3 Groundwater Conservation Overlay District

The Project site is not located within the City of Boston Groundwater Conservation Overlay District.

7.4 Electrical Service

Eversource owns and maintains the electrical transmission system in the vicinity of the Project site. The electrical power supply design and loads for the building will be coordinated with Eversource during the design phase. The Proponent is investigating energy conservation measures, including energy efficient lighting and heating and cooling systems for the Project.

7.5 Telecommunication Systems

Verizon, Comcast, and RCN provide cable and telephone services in the Project area. It is anticipated that cable service to the Project will be underground from Washington Street.

7.6 Gas Systems

National Grid provides natural gas in the Project area. National Grid owns and maintains a 16-inch, 8-inch, and 10-inch gas main in Washington Street as well as two 6-inch gas mains and a 30-inch gas main in Massachusetts Avenue. The actual size and location of the building services will be coordinated with National Grid.

7.7 Utility Protection During Construction

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

Chapter 8.0

Coordination with other Governmental Agencies

8.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

8.1 Architectural Access Board Requirements

The Project will comply with the requirements of the Massachusetts Architectural Access Board and will be designated to comply with the standards of the Americans with Disabilities Act. An Accessibility Checklist is provided in Appendix H.

8.2 Massachusetts Environmental Policy Act (MEPA)

The Proponent does not expect that the Project will require review by the Massachusetts Environmental Policy Act (MEPA) Office of the Massachusetts Executive Office of Energy and Environmental Affairs. Current plans do not call for the Project to receive any state permits, state funding or involve any state land transfers.

8.3 Massachusetts Historical Commission

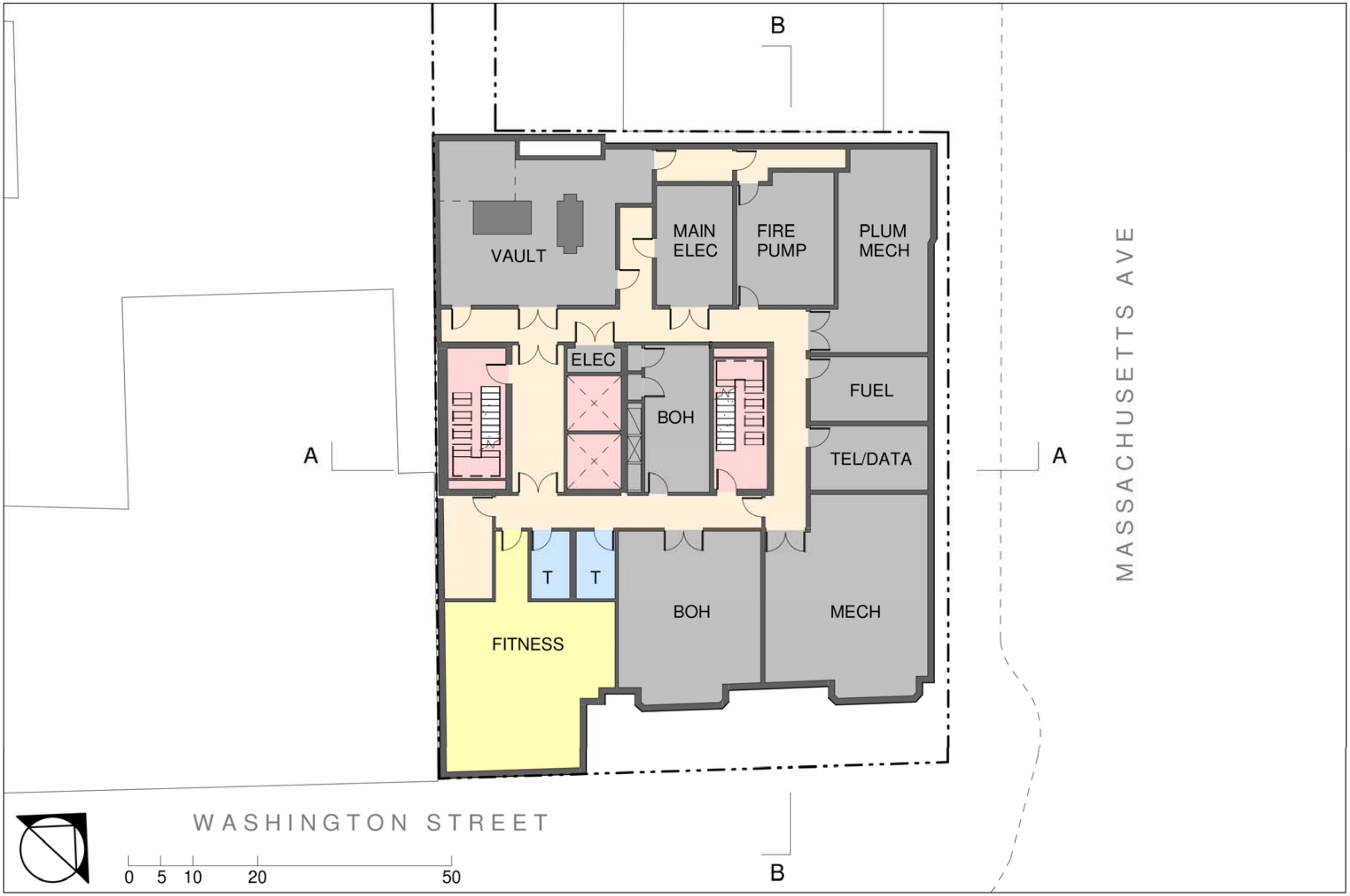
The Proponent does not anticipate that the Project will require any state or federal licenses, permits or approvals, and does not anticipate utilizing any state or federal funds. Therefore, review by the Massachusetts Historical Commission (MHC) is not anticipated at this time. In the event that state or federal licenses, permits, approvals or funding is involved, the Proponent will file an MHC Project Notification Form to initiate review of the Project.

8.4 Boston Civic Design Commission

The Project will comply with the provisions of Article 28 of the Boston Zoning Code. This PNF will be submitted to the Boston Civic Design Commission by the BPDA as part of the Article 80 process.

Appendix A

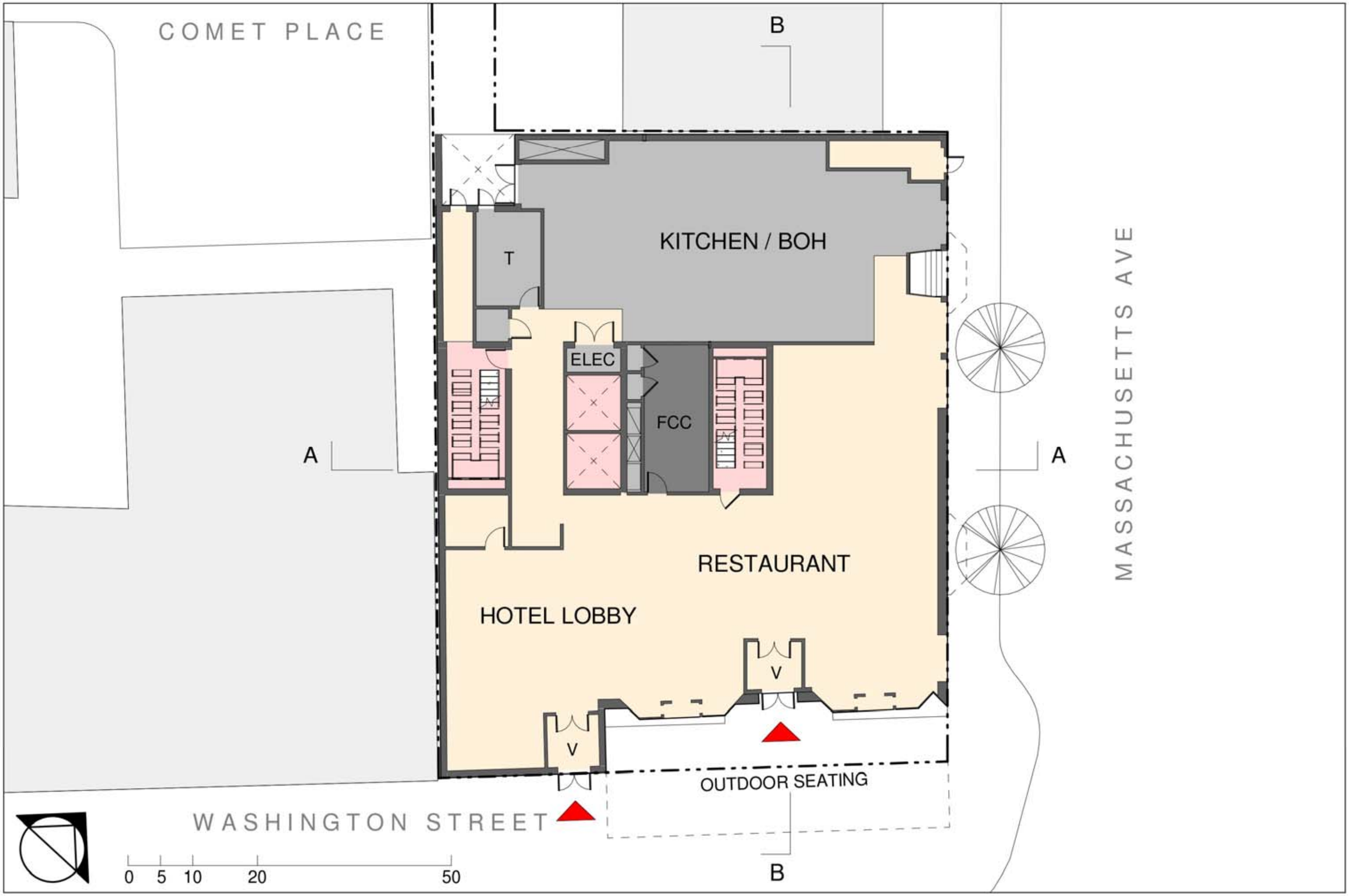
Floor Plans, Sections, and Elevations



Hotel Alexandra **Boston, Massachusetts**

cbt

Basement Plan



Hotel Alexandra **Boston, Massachusetts**

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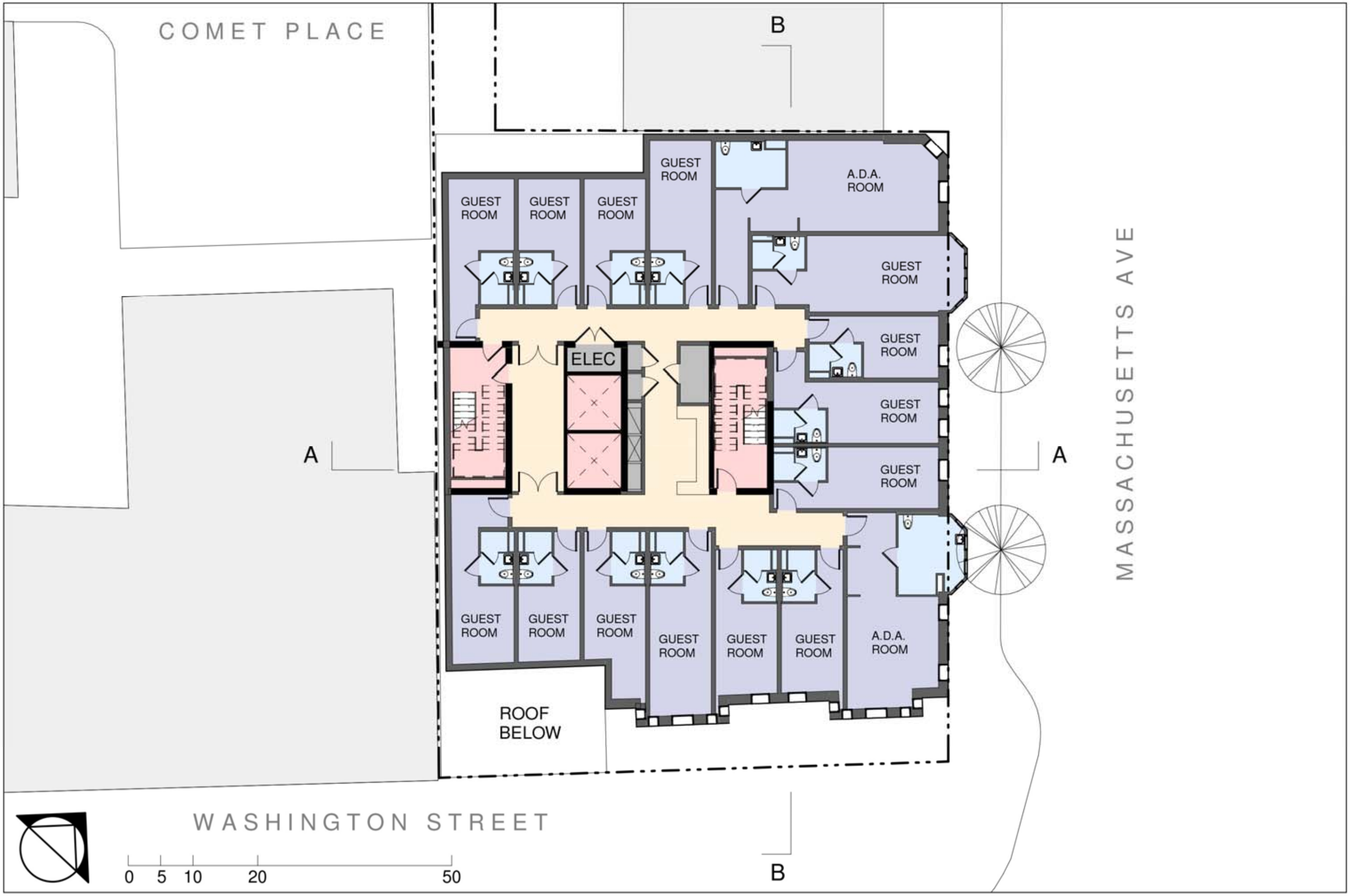
First Floor Plan



Hotel Alexandra **Boston, Massachusetts**

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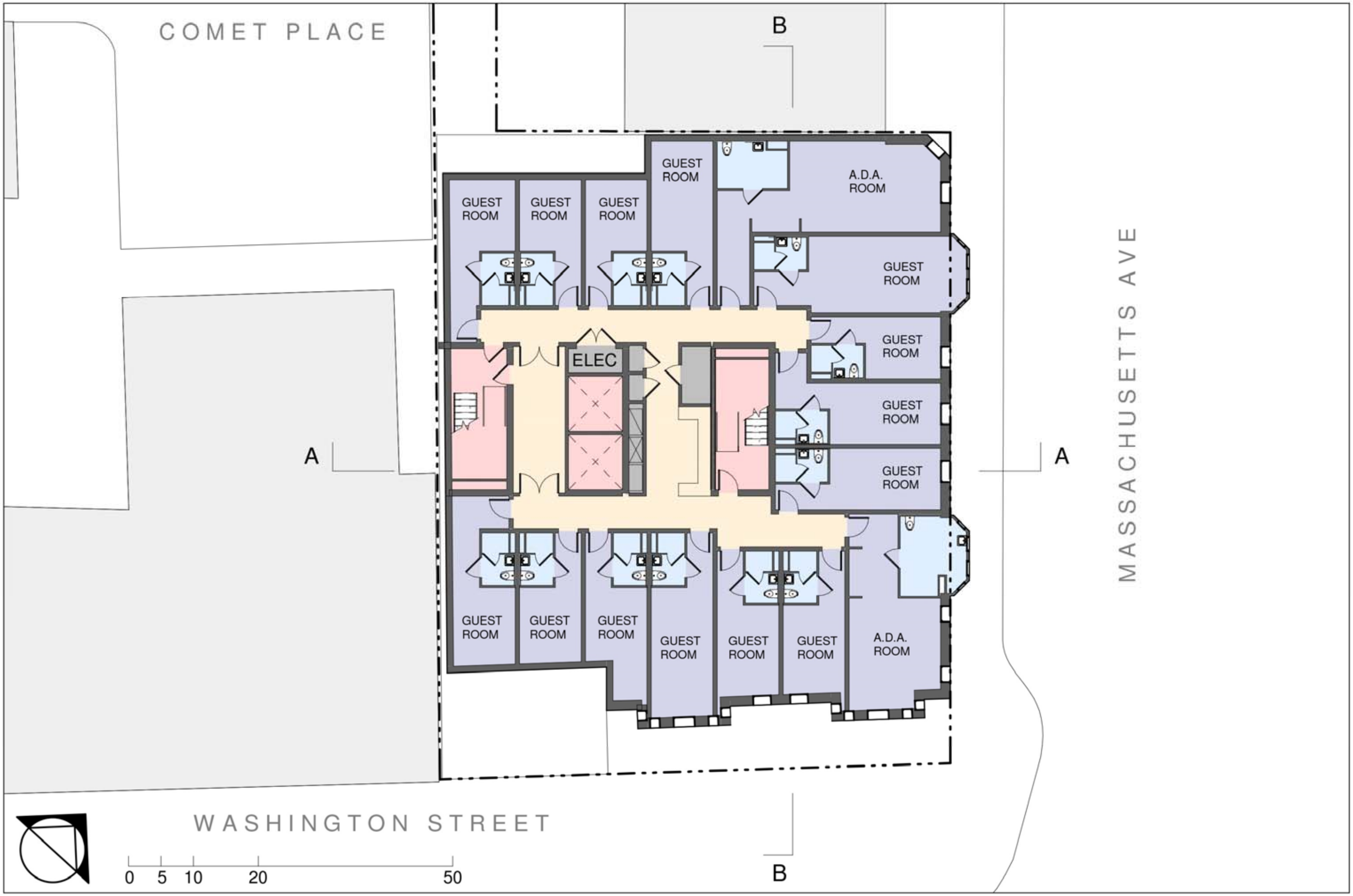
Second Floor Plan



Hotel Alexandra   Boston, Massachusetts

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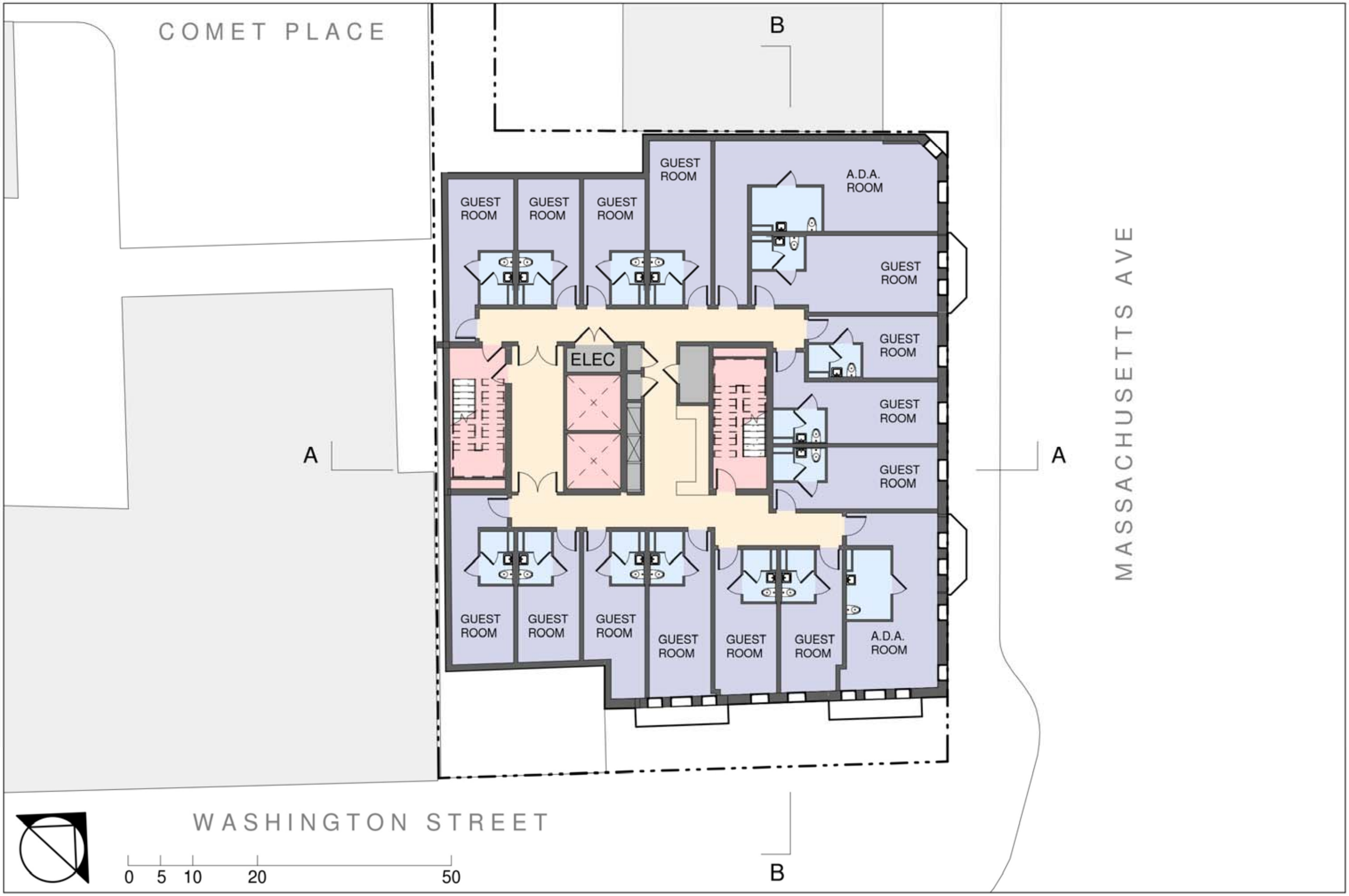
Third and Fourth Floor Plan



Hotel Alexandra **Boston, Massachusetts**

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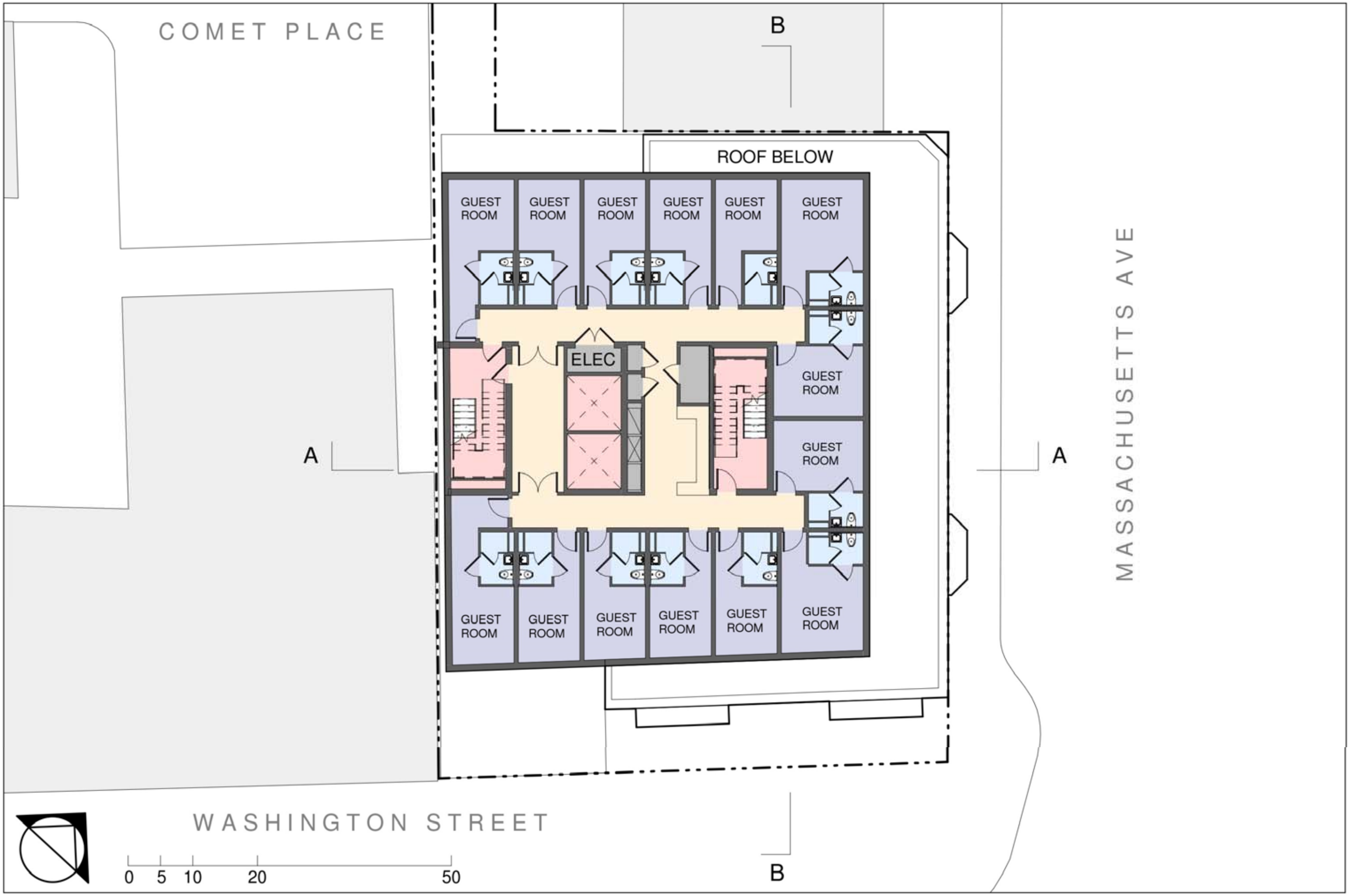
Fifth Floor Plan



Hotel Alexandra **Boston, Massachusetts**

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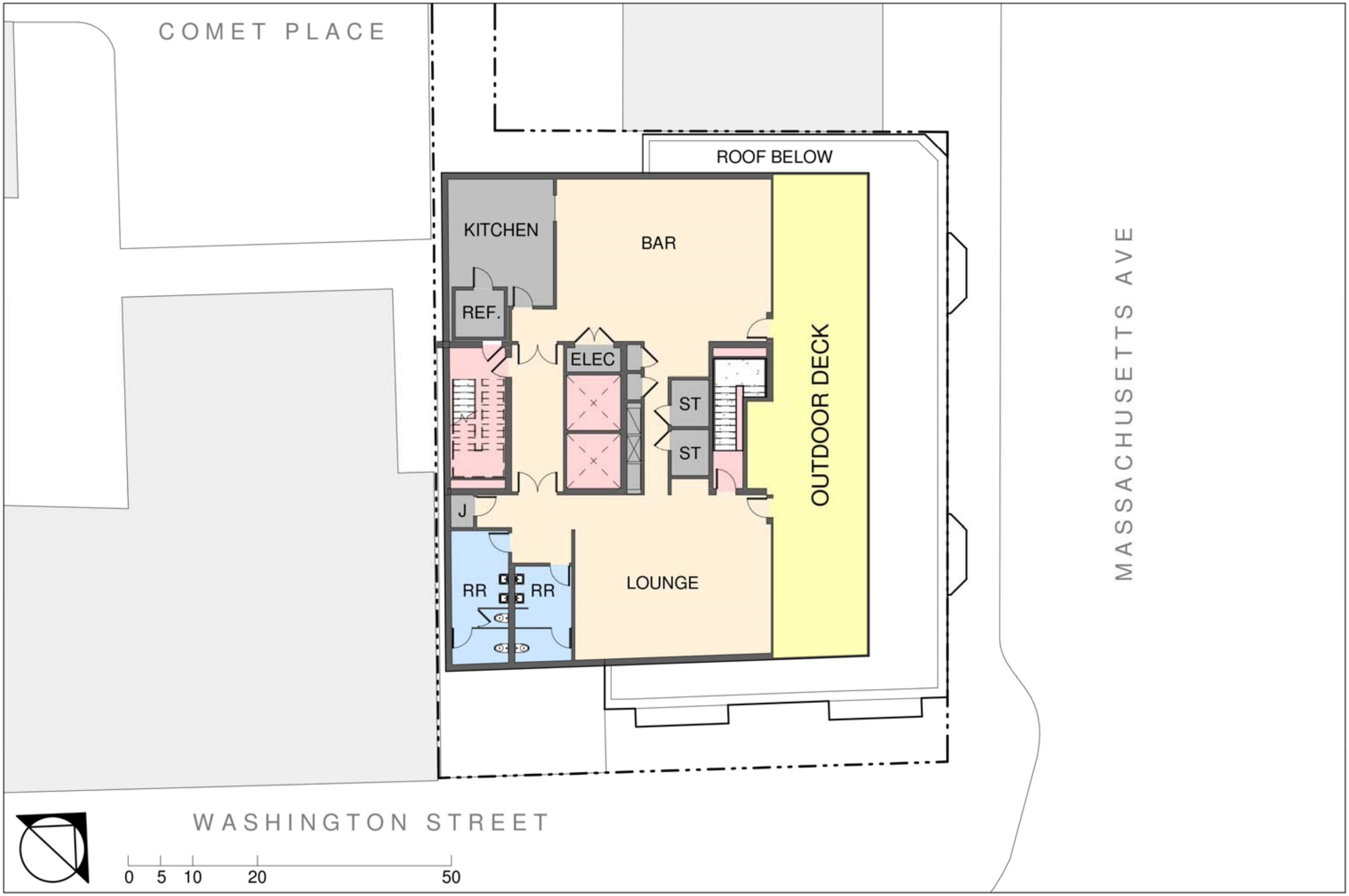
Sixth Through Eleventh Floor Plan

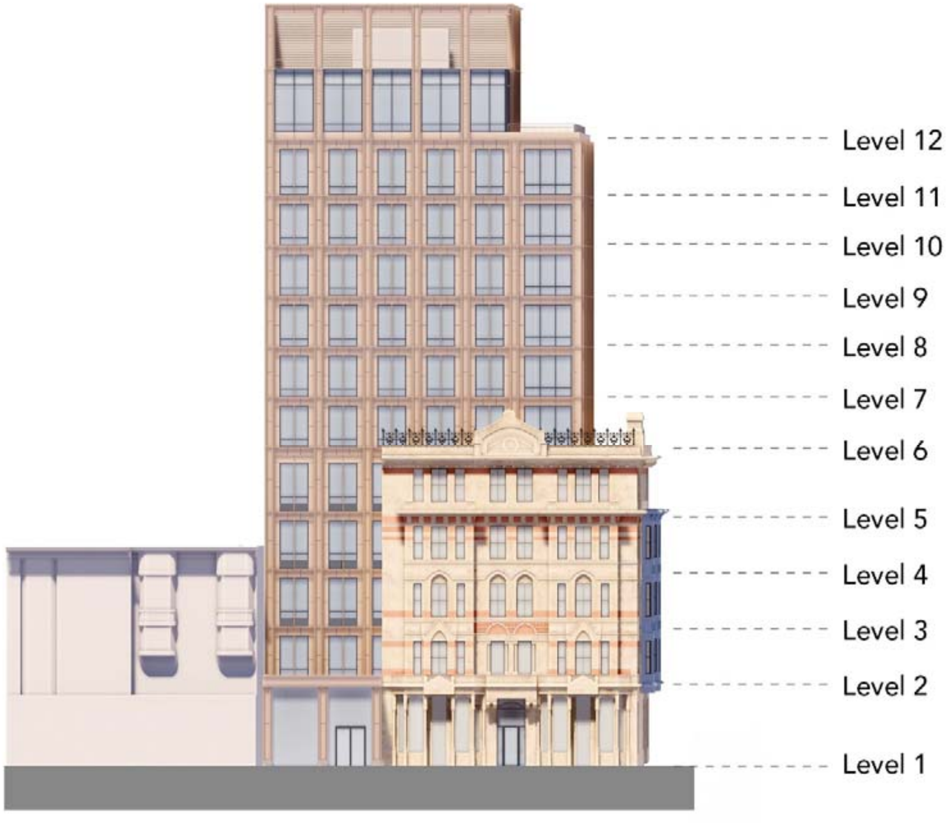


Hotel Alexandra Boston, Massachusetts

cbt

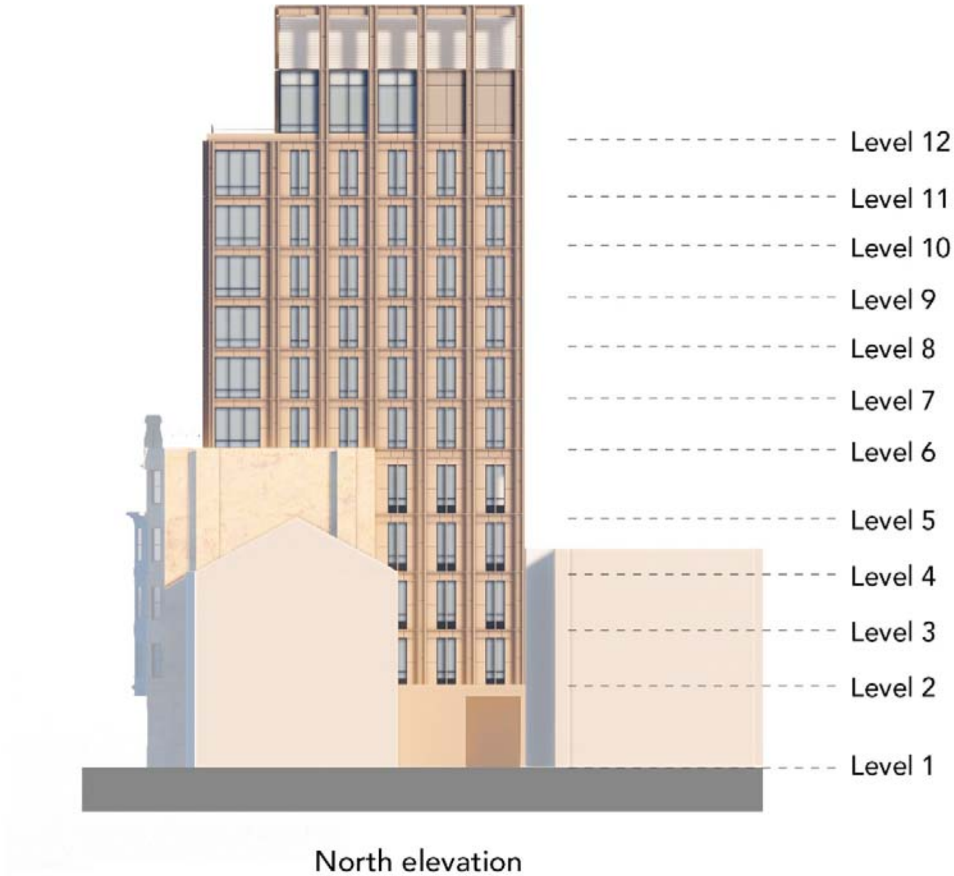
Twelfth Floor Plan


UPPER ROOF
MECH
Level 12
Level 11
Level 10
Level 9
Level 8
Level 7
Level 6
Level 5
Level 4
Level 3
Level 2
Level 1
BASEMENT
12'-0"
13'-2"
11'-8"
10'-6"
10'-6"
10'-6"
10'-6"
10'-6"
13'-6"
12'-0"
12'-0"
12'-0"
17'-2"
13'-0"
STAIR
CORR.
ELEV.
CORR.
OUTDOOR DECK
GUEST ROOM
BOH
RESTAURANT
MECH
MASS AVE.
SECTION A - E/W
OUTDOOR DECK
GUEST ROOM
WASH ST.
RESTAURANT
KITCHEN
MECH
CORRIDOR
FIRE PUMP
SECTION B - N/S

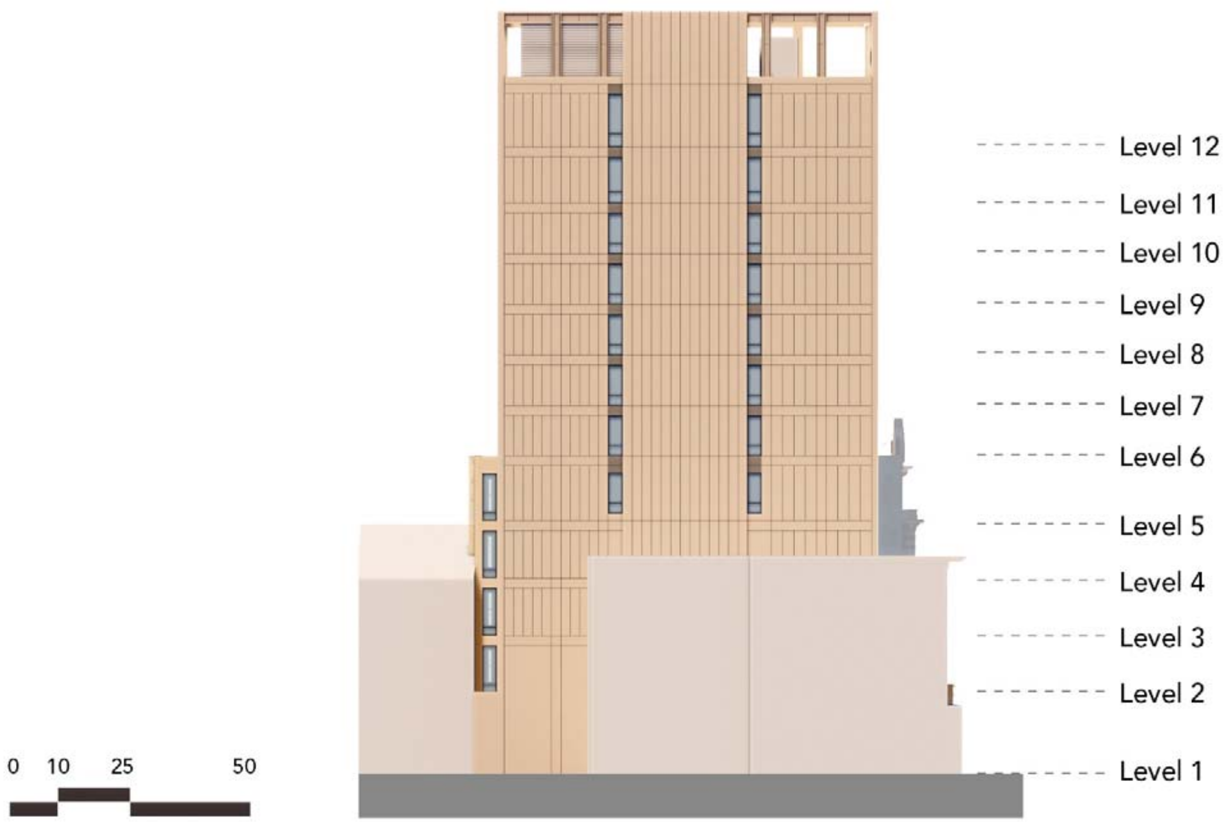


South elevation

East elevation



North elevation



West elevation

Hotel Alexandra **Boston, Massachusetts**

Appendix B

Site Survey

TITLE EXCEPTION NOTES-SCHEDULE B

THIS SURVEY IS BASED ON COMMITMENT FOR TITLE INSURANCE NO. NCS-325117-CHI2 ISSUED BY FIRST AMERICAN TITLE INSURANCE COMPANY, DATED NOVEMBER 12, 2007.

NOTE: EXCEPTION ITEMS NOT LISTED BELOW ARE STANDARD TITLE EXCEPTIONS AND/OR ARE NON-SURVEY MATTERS OR ISSUES AND CAN NOT BE GRAPHICALLY DEPICTED.

15. DECISION BY CITY OF BOSTON BOARD OF APPEALS, DATED JANUARY 29, 2002, RECORDED WITH SAID DEEDS BOOK 35430, PAGE 186. (DECISION IS RELATED TO A VARIANCE AND USE OF PROPERTY AND CAN NOT BE PLOTTED.)

16. DESIGNATION BY THE BOSTON LANDMARK'S COMMISSION, DATED NOVEMBER 14, 1983, RECORDED WITH SAID DEEDS, BOOK 11640, PAGE 62. (DESIGNATION RELATED TO USE OF LAND AND CAN NOT BE PLOTTED.)

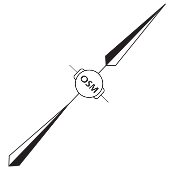
17. RIGHTS OF OTHERS IN AND ARISING FROM THE EXISTENCE OF PARTY WALLS, IF ANY. (PLOTTED-ABUTTING WALLS AS SHOWN ON SURVEY)

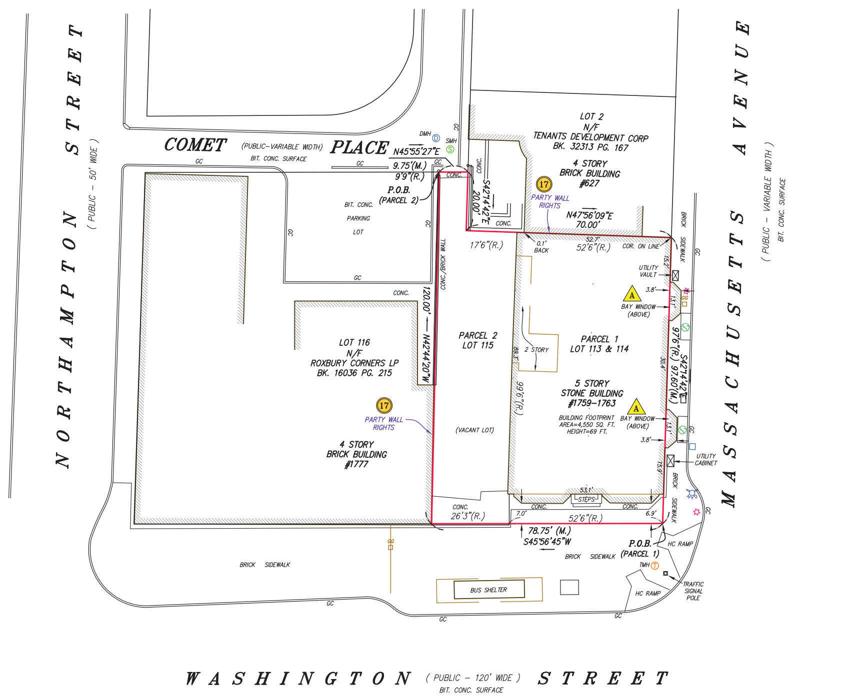
23. RESTRICTIONS AND CONDITIONS SET FORTH IN DEED FROM THE CITY OF BOSTON, DATED JULY 7, 1853, RECORDED WITH SAID DEEDS, BOOK 649, PAGE 240. (NOT PLOTTED-DOCUMENT PROVIDED IS NOT LEGIBLE)

24. DESIGNATION BY THE BOSTON LANDMARK'S COMMISSION, DATED NOVEMBER 14, 1983, RECORDED WITH SAID DEEDS, BOOK 11641, PAGE 62. (DESIGNATION RELATED TO USE OF LAND AND CAN NOT BE PLOTTED.)

STATEMENT OF ENCROACHMENTS

A BUILDINGS OVERHEAD BAY WINDOWS EXTEND IN TO LIMITS OF MASSACHUSETTS AVENUE BY 3.8 FEET FOR A LENGTH OF 13.1 FEET AS SHOWN.





LEGEND

	BUILDING
	EASEMENT LINE
	LOCUS BOUNDARY LINE
	CHAIN LINK FENCE
D	DRAIN MANHOLE
S	SEWER MANHOLE
GG	GAS GATE VALVE
	LIGHT POLE
A	ENCROACHMENT SYMBOL
6	SCHEDULE B EXCEPTION ITEM
BK. PG.	DEED BOOK/PAGE
BIT. CONC.	BITUMINOUS CONCRETE
C.L.F.	CHAIN LINK FENCE
CONC.	CONCRETE SURFACE
FND.	FOUND
GC	GRANITE CURB
N/F	NOW OR FORMERLY
(M.)	MEASURED
(R.)	RECORD DIMENSION

SCALE: 1 INCH = 20 FEET

VICINITY MAP ~ NOT TO SCALE

GENERAL NOTES

1. CURRENT OWNER OF RECORD:
THE CHURCH OF SCIENTOLOGY OF BOSTON, INC.
DEED REFERENCE: BOOK 43025 PAGE 119
PLAN REFERENCE: BOOK 615, END OF BOOK

2. THIS PLAN IS THE RESULT OF AN ON-THE-GROUND SURVEY PERFORMED BY ODONE SURVEY & MAPPING ON NOVEMBER 20, 2007 AND DECEMBER 20, 2013. THIS PLAN HAS BEEN PREPARED FOR TITLE PURPOSES ONLY. SURVEY BY TRIMBLE S6 TOTAL STATION.

3. AS OF DECEMBER 20, 2013 (LAST SITE VISIT) NO RECENT EARTHWORK OR BUILDING CONSTRUCTION WAS OBSERVED ON THE SUBJECT PREMISES, NO RECENT CHANGES IN STREET RIGHT-OF-WAY LINES WAS OBSERVED OR PROPOSED TO BE ALTERED, NO EVIDENCE WAS OBSERVED THAT THE SUBJECT PREMISES WERE BEING USED AS A SOLID WASTE DUMP OR SANITARY LANDFILL, AND NO EVIDENCE WAS OBSERVED OF CEMETERIES LOCATED ON THE SUBJECT PREMISES.

4. UTILITY NOTE: LOCATION OF UTILITIES SHOWN HEREON WERE DETERMINED BY OBSERVATION OF ABOVE GROUND EVIDENCE.

5. BASIS OF BEARINGS: BOOK 8653 PAGE 43.

6. TOTAL LAND AREA = 8,025 SQ. FT. 0.184 ACRES

7. THE LOCATION OF THE ORIGINAL STRUCTURE'S SHOWN HEREON EITHER WAS IN COMPLIANCE WITH THE LOCAL APPLICABLE ZONING BY-LAWS IN EFFECT WHEN CONSTRUCTED OR IS (ARE) EXEMPT FROM VIOLATION ENFORCEMENT ACTION UNDER MA G.L. TITLE VII, CHAPTER 40A, SECTION 7.

8. FLOOD NOTE: BY GRAPHIC PLOTTING THIS PROPERTY IS IN ZONE X OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 250286 0079 G, WHICH BEARS AN EFFECTIVE DATE OF SEPTEMBER 25, 2009 AND IS NOT IN A SPECIAL FLOOD HAZARD AREA. NO FIELD SURVEYING WAS PERFORMED TO DETERMINE THIS ZONE AND AN ELEVATION CERTIFICATE MAY BE NEEDED TO VERIFY THIS DETERMINATION OR APPLY FOR A VARIANCE FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY.

ZONING INFORMATION

Source of Information: CITY OF BOSTON ZONING ORDINANCE

Zoning District: ROXBURY NEIGHBORHOOD DISTRICT - MAP 6A/6B

MULTIFAMILY RESIDENTIAL/LOCAL SERVICES SUBDISTRICT (MFR/LS)

Setback Requirements	Required	Notes
Front Yard Setback	20 Ft.	
Side Yard Setback	10 Ft.	
Rear Yard Setback	20 Ft.	

Parking Tabulation	Observed	Notes
Regular Spaces	0	There is currently no area reserved for parking
Handicapped Spaces	0	
Total Parking Spaces	0	

Height Restrictions	Max. Allowed	Notes
Building Height	4 Stories or 45 Feet	

Bulk Restrictions	Required	Notes
Min. Lot Area	4000 Sq. Ft.	
Max. Floor Area Ratio	1.0	

NOTE: Because there may be a need for further interpretation of the applicable zoning codes, we refer you to the above referenced municipality and the applicable zoning codes.

LEGAL DESCRIPTION PER TITLE COMMITMENT

PARCEL ONE
A CERTAIN PARCEL OF LAND WITH THE BUILDINGS THEREON SITUATED IN BOSTON, SUFFOLK COUNTY, MASSACHUSETTS, COMPRISING LOTS 113 AND 114 ON A PLAN BY EZRA LINCOLN, DATED OCTOBER 30, 1985, AND RECORDED WITH SUFFOLK DEEDS, END BOOK 615, AND BOUNDED AND DESCRIBED AS FOLLOWS:
SOUTHEASTERLY ON WASHINGTON STREET, FIFTY-TWO FEET SIX INCHES; SOUTHWESTERLY BY LOT 115 ON SAID PLAN, NINETY-NINE FEET SIX INCHES; NORTHWESTERLY BY LOT 2 ON SAID PLAN, FIFTY-TWO FEET SIX INCHES;
NORTHEASTERLY BY MASSACHUSETTS AVENUE FORMERLY CHESTER SQUARE OR STREET, NINETY-SEVEN FEET SIX INCHES.
ESTIMATED TO CONTAIN ACCORDING TO SAID PLAN ABOUT 5,167 SQUARE FEET; OR HOWEVER OTHERWISE SAID PREMISES MAY BE BOUNDED, MEASURED OR DESCRIBED.

PARCEL TWO
THE LAND IN BOSTON, SUFFOLK COUNTY, MASSACHUSETTS, AND THE BUILDING THEREON, BOUNDED AND DESCRIBED AS FOLLOWS:
BEGINNING AT THE NORTHERLY CORNER OF LOT #116 ON PLAN ENTITLED "A PLAN OF CITY LANDS TO BE SOLD OCTOBER 30, 1850", AND RECORDED WITH SUFFOLK COUNTY DEEDS AT THE END OF BOOK 615, NINE (9) FEET AND NINE (9) INCHES FROM LOT #2 ON SAID PLAN; THENCE RUNNING
NORTHEASTERLY ALONG A PASSAGEWAY TWENTY (20) FEET IN WIDTH, KNOWN AS CHESTER PLACE, NINE (9) FEET AND NINE (9) INCHES TO SAID LOT #2; THENCE TURNING AND RUNNING
SOUTHEASTERLY ALONG SAID LOT #2 TWENTY (20) FEET, THENCE TURNING AND RUNNING
NORTHEASTERLY ALONG SAID LOT #2 SEVENTEEN (17) FEET AND SIX (6) INCHES, THENCE TURNING AND RUNNING
SOUTHEASTERLY ALONG LOT #114 ON SAID PLAN NINETY-NINE (99) FEET AND SIX (6) INCHES; THENCE TURNING AND RUNNING
SOUTHWESTERLY ALONG WASHINGTON STREET TWENTY-SIX (26) FEET AND THREE (3) INCHES; AND THENCE TURNING AND RUNNING
NORTHWESTERLY ALONG LOT #116 ON SAID PLAN TO THE POINT OF BEGINNING ONE HUNDRED TWENTY (120) FEET;
CONTAINING TWENTY-EIGHT HUNDRED FIFTY-EIGHT (2,858) SQUARE FEET MORE OR LESS, AND BEING LOT #115 ON SAID PLAN.

BEING THE SAME TRACT OF LAND DESCRIBED IN COMMITMENT FOR TITLE INSURANCE ISSUED BY FIRST AMERICAN TITLE INSURANCE COMPANY, COMMITMENT NO. NCS-325117-CHI2 DATED NOVEMBER 12, 2007.

ALTA/ACSM LAND TITLE SURVEY

CHURCH OF SCIENTOLOGY OF BOSTON, INC.

1759-1769 WASHINGTON STREET
BOSTON, MA

SURVEYOR'S CERTIFICATE

TO: THE CHURCH OF SCIENTOLOGY OF BOSTON, INC. AND FIRST AMERICAN TITLE INSURANCE COMPANY

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 6b, 7a, 7b1, 7c, 8, 9, 11a, 14, 16, 17, 18, AND 20 OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON DECEMBER 20, 2013.

DATE OF SURVEY: DECEMBER 29, 2013

DATE OF LAST REVISION: ______________

COMMONWEALTH OF MASSACHUSETTS
GLENN D. ODONE JR.
No. 45068
REGISTERED LAND SURVEYOR

GLENN D. ODONE JR.
REGISTERED LAND SURVEYOR NO. 45068
COMMONWEALTH OF MASSACHUSETTS

FOR INQUIRIES CONCERNING THIS SURVEY CONTACT:

ODONE SURVEY & MAPPING

SURVEYING ~ MAPPING ~ PLANNING & CONSULTING

291 Main Street, Suite 5
Northborough, MA 01532

Tel.: 508-351-6022
Fax: 508-351-6633

PREPARED FOR:

THE CHURCH OF SCIENTOLOGY OF BOSTON, INC.
448 BEACON STREET
BOSTON, MA 02115

FILE:	0360-01B.DWG	JOB NO:	20070360.01

Appendix C

Transportation

Client: Andrew Fabiszewski
Project #: 261_088_HSH
BTD #: Location 1
Location: South End, Boston, MA
Street 1: Washington Street
Street 2: Massachusetts Ave
Count Date: 10/3/2018
Day of Week: Wednesday
Weather: Cloudy

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

TOTAL (CARS & TRUCKS)

	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	6	145	14	0	12	137	8	0	35	85	10	0	19	55	25
7:15 AM	0	7	164	24	1	13	168	10	0	38	97	12	0	20	58	21
7:30 AM	0	8	175	28	0	12	172	11	0	41	101	20	0	20	60	15
7:45 AM	1	10	170	25	0	14	169	12	0	40	104	20	0	22	59	13
8:00 AM	0	11	159	18	0	16	170	14	0	38	100	17	1	25	41	14
8:15 AM	0	10	168	22	0	17	165	13	0	35	98	12	0	24	55	12
8:30 AM	1	8	175	24	1	16	148	8	0	31	89	12	0	22	57	11
8:45 AM	0	9	160	20	0	15	145	9	0	22	87	10	1	22	56	10

	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
4:00 PM	0	10	152	18	0	12	187	10	0	23	90	20	0	29	79	22
4:15 PM	0	8	165	19	0	13	188	16	0	32	87	19	0	33	74	23
4:30 PM	0	11	170	20	0	14	186	19	0	36	75	19	0	30	65	25
4:45 PM	0	11	172	19	0	15	204	15	0	41	76	22	0	26	75	26
5:00 PM	0	12	170	21	0	14	214	10	0	47	78	21	0	30	79	29
5:15 PM	0	12	189	22	0	16	203	11	0	40	80	20	0	30	76	30
5:30 PM	0	17	191	22	0	17	190	10	0	21	83	20	0	26	72	25
5:45 PM	0	20	185	23	0	16	188	11	0	20	78	18	0	21	68	15

AM PEAK HOUR 7:15 AM to 8:15 AM	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	1	**36**	**668**	**95**	**1**	**55**	**679**	**47**	**0**	**157**	**402**	**69**	**1**	**87**	**218**	**63**
PHF	**0.95**				**0.98**				**0.96**				**0.93**			
HV %	**0.0%**	**2.8%**	**2.5%**	**10.5%**	**0.0%**	**0.0%**	**2.2%**	**4.3%**	**0.0%**	**0.0%**	**4.5%**	**2.9%**	**0.0%**	**2.3%**	**5.5%**	**3.2%**

PM PEAK HOUR 4:45 PM to 5:45 PM	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**52**	**722**	**84**	**0**	**62**	**811**	**46**	**0**	**149**	**317**	**83**	**0**	**112**	**302**	**110**
PHF	**0.93**				**0.97**				**0.94**				**0.95**			
HV %	**0.0%**	**0.0%**	**0.3%**	**0.0%**	**0.0%**	**0.0%**	**0.5%**	**2.2%**	**0.0%**	**0.0%**	**3.2%**	**0.0%**	**0.0%**	**0.0%**	**3.3%**	**1.8%**

Client: Andrew Fabiszewski
Project #: 261_088_HSH
BTD #: Location 1
Location: South End, Boston, MA
Street 1: Washington Street
Street 2: Massachusetts Ave
Count Date: 10/3/2018
Day of Week: Wednesday
Weather: Cloudy

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

TRUCKS

	Mass Ave Northbound			Mass Ave Southbound			Washington St Eastbound			Washington St Westbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
7:00 AM	0	5	3	0	4	0	0	5	0	1	3	0
7:15 AM	0	4	3	0	4	1	0	4	0	0	3	1
7:30 AM	1	4	2	0	4	0	0	6	1	1	3	0
7:45 AM	0	5	2	0	4	1	0	4	0	0	3	1
8:00 AM	0	4	3	0	3	0	0	4	1	1	3	0
8:15 AM	0	5	2	0	6	1	0	6	0	2	5	0
8:30 AM	0	6	3	0	7	0	0	6	0	1	6	1
8:45 AM	0	7	3	0	6	0	0	5	0	2	5	0

	Mass Ave Northbound			Mass Ave Southbound			Washington St Eastbound			Washington St Westbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
4:00 PM	0	1	1	0	1	1	0	3	0	0	3	0
4:15 PM	0	1	0	0	1	0	0	2	0	0	2	1
4:30 PM	0	1	0	0	0	0	0	2	0	0	2	0
4:45 PM	0	1	0	0	1	1	0	3	0	0	2	0
5:00 PM	0	1	0	0	2	0	0	2	0	0	3	1
5:15 PM	0	0	0	0	1	0	0	3	0	0	2	1
5:30 PM	0	0	0	0	0	0	0	2	0	0	3	0
5:45 PM	0	1	0	0	0	0	0	3	0	0	2	0

AM PEAK HOUR 8:00 AM to 9:00 AM	Mass Ave Northbound			Mass Ave Southbound			Washington St Eastbound			Washington St Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	0	**22**	**11**	**0**	**22**	**1**	**0**	**21**	**1**	**6**	**19**	**1**
PHF		**0.83**			**0.82**			**0.92**			**0.81**	

PM PEAK HOUR 4:00 PM to 5:00 PM	Mass Ave Northbound			Mass Ave Southbound			Washington St Eastbound			Washington St Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	0	**4**	**1**	**0**	**3**	**2**	**0**	**10**	**0**	**0**	**9**	**1**
PHF		**0.63**			**0.63**			**0.83**			**0.83**	

Client:	Andrew Fabiszewski
Project #:	261_088_HSH
BTD #:	Location 1
Location:	South End, Boston, MA
Street 1:	Washington Street
Street 2:	Massachusetts Ave
Count Date:	10/3/2018
Day of Week:	Wednesday
Weather:	Cloudy

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
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PEDESTRIANS & BICYCLES

	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	5	0	15	0	3	0	13	0	1	0	16	0	1	0	21
7:15 AM	0	6	1	16	1	5	0	14	0	3	0	19	0	1	0	27
7:30 AM	0	5	0	15	0	6	0	14	0	4	0	21	0	2	1	28
7:45 AM	0	7	0	21	2	6	0	19	0	4	0	24	0	2	0	35
8:00 AM	0	9	1	22	1	5	0	20	0	2	0	25	0	1	1	39
8:15 AM	0	11	0	22	1	15	0	21	0	4	0	26	0	1	0	40
8:30 AM	0	12	1	20	1	12	0	22	0	2	0	24	0	2	1	37
8:45 AM	0	10	0	21	0	11	0	19	1	4	0	23	0	3	0	35

	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
4:00 PM	0	7	1	22	1	8	0	18	0	3	0	19	0	4	1	45
4:15 PM	0	6	1	26	2	6	1	23	0	3	0	22	0	3	2	46
4:30 PM	0	6	1	23	1	5	0	25	0	2	1	27	0	3	1	49
4:45 PM	0	8	2	26	1	9	1	27	0	4	0	23	0	4	2	52
5:00 PM	0	9	2	16	2	8	1	22	0	5	0	26	0	5	1	55
5:15 PM	0	9	1	25	1	10	1	27	0	6	2	21	0	5	2	43
5:30 PM	0	10	0	21	2	11	1	21	0	5	0	18	0	5	1	40
5:45 PM	0	9	0	25	2	10	0	16	0	5	0	22	0	6	1	42

AM PEAK HOUR[1]	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
7:15 AM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
8:15 AM	0	27	2	74	4	22	0	67	0	13	0	89	0	6	2	129

PM PEAK HOUR[1]	Mass Ave Northbound				Mass Ave Southbound				Washington St Eastbound				Washington St Westbound			
4:45 PM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
5:45 PM	0	36	5	88	6	38	4	97	0	20	2	88	0	19	6	190

[1] *Peak hours corresponds to vehicular peak hours.*

Client: Andrew Fabiszewski
Project #: 261_088_HSH
BTD #: Location 2
Location: South End, Boston, MA
Street 1: Washington Street
Street 2: Northampton Street
Count Date: 10/3/2018
Day of Week: Wednesday
Weather: Cloudy

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
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TOTAL (CARS & TRUCKS)

	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
7:00 AM	0	3	50	8	0	0	0	0	0	8	122	0	0	0	66	3
7:15 AM	0	8	47	10	0	0	0	0	0	11	137	0	0	0	69	6
7:30 AM	0	11	47	11	0	0	0	0	0	13	151	0	0	0	74	5
7:45 AM	0	8	44	15	0	0	0	0	0	12	149	0	0	0	75	6
8:00 AM	0	6	35	17	0	0	0	0	0	7	138	0	0	0	62	4
8:15 AM	0	7	34	17	0	0	0	0	0	9	128	0	0	0	70	8
8:30 AM	0	7	31	18	0	0	0	0	0	10	114	0	0	0	61	12
8:45 AM	0	6	30	16	0	0	0	0	0	9	103	0	0	0	65	9

	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
4:00 PM	0	9	27	17	0	0	0	0	1	6	116	0	0	0	97	2
4:15 PM	0	9	26	28	0	0	0	0	1	10	109	0	1	0	93	5
4:30 PM	0	7	26	31	0	0	0	0	2	12	97	0	2	0	89	6
4:45 PM	0	10	30	31	0	0	0	0	1	16	108	0	0	0	93	8
5:00 PM	0	11	31	29	0	0	0	0	1	18	117	0	0	0	93	8
5:15 PM	0	11	32	28	0	0	0	0	0	17	112	0	0	0	92	7
5:30 PM	0	12	32	22	0	0	0	0	0	12	102	0	0	0	94	5
5:45 PM	0	11	30	23	0	0	0	0	0	11	93	0	0	0	93	6

AM PEAK HOUR 7:15 AM to 8:15 AM	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**33**	**173**	**53**	**0**	**0**	**0**	**0**	**0**	**43**	**575**	**0**	**0**	**0**	**280**	**21**
PHF	**0.94**				**0.00**				**0.94**				**0.93**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**3.5%**	**0.0%**	**0.0%**	**0.0%**	**5.4%**	**0.0%**

PM PEAK HOUR 4:45 PM to 5:45 PM	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right
	0	**44**	**125**	**110**	**0**	**0**	**0**	**0**	**2**	**63**	**439**	**0**	**0**	**0**	**372**	**28**
PHF	**0.98**				**0.00**				**0.93**				**0.99**			
HV %	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**2.3%**	**0.0%**	**0.0%**	**0.0%**	**3.0%**	**0.0%**

NOTE: Queue back ups eastbound blocking the intersection along Washington Street starting at approximately 7:45AM.

Client: Andrew Fabiszewski
Project #: 261_088_HSH
BTD #: Location 2
Location: South End, Boston, MA
Street 1: Washington Street
Street 2: Northampton Street
Count Date: 10/3/2018
Day of Week: Wednesday
Weather: Cloudy

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
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www.BostonTrafficData.com

TRUCKS

	Northampton St Northbound			Northampton St Southbound			Washington St Eastbound			Washington St Westbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
7:00 AM	0	0	0	0	0	0	0	5	0	0	3	0
7:15 AM	0	0	0	0	0	0	0	4	0	0	4	0
7:30 AM	0	0	0	0	0	0	0	7	0	0	4	0
7:45 AM	0	0	0	0	0	0	0	4	0	0	4	0
8:00 AM	0	0	0	0	0	0	0	5	0	0	3	0
8:15 AM	0	0	0	0	0	0	0	6	0	0	6	0
8:30 AM	0	0	0	0	0	0	0	6	0	0	6	0
8:45 AM	0	0	0	0	0	0	0	5	0	0	5	0

	Northampton St Northbound			Northampton St Southbound			Washington St Eastbound			Washington St Westbound		
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
4:00 PM	0	0	0	0	0	0	0	3	0	0	4	0
4:15 PM	0	0	0	0	0	0	0	2	0	0	2	0
4:30 PM	0	0	0	0	0	0	0	2	0	0	2	0
4:45 PM	0	0	0	0	0	0	0	3	0	0	3	0
5:00 PM	0	0	0	0	0	0	0	2	0	0	3	0
5:15 PM	0	0	0	0	0	0	0	3	0	0	2	0
5:30 PM	0	0	0	0	0	0	0	2	0	0	3	0
5:45 PM	0	0	0	0	0	0	0	3	0	0	2	0

AM PEAK HOUR 8:00 AM to 9:00 AM	Northampton St Northbound			Northampton St Southbound			Washington St Eastbound			Washington St Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**0**	**0**	**22**	**0**	**0**	**20**	**0**
PHF		**0.00**			**0.00**			**0.92**			**0.83**	

PM PEAK HOUR 4:00 PM to 5:00 PM	Northampton St Northbound			Northampton St Southbound			Washington St Eastbound			Washington St Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	0	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**11**	**0**
PHF		**0.00**			**0.00**			**0.83**			**0.69**	

Client:	Andrew Fabiszewski
Project #:	261_088_HSH
BTD #:	Location 2
Location:	South End, Boston, MA
Street 1:	Washington Street
Street 2:	Northampton Street
Count Date:	10/3/2018
Day of Week:	Wednesday
Weather:	Cloudy

BOSTON
TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
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PEDESTRIANS & BICYCLES

	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
7:00 AM	0	1	0	9	0	1	0	8	0	1	0	2	0	1	0	8
7:15 AM	0	1	0	10	0	0	1	8	1	3	0	7	0	1	0	27
7:30 AM	0	0	0	12	0	1	0	6	0	4	0	10	0	2	0	31
7:45 AM	0	0	1	14	0	1	0	9	0	4	0	8	0	2	1	21
8:00 AM	0	1	0	9	0	0	0	10	1	2	0	0	0	1	0	17
8:15 AM	0	1	0	17	0	1	0	8	0	4	0	7	0	1	0	16
8:30 AM	1	2	0	7	0	1	0	12	0	2	1	11	0	2	0	21
8:45 AM	0	2	0	9	0	0	0	11	0	5	0	10	0	3	0	18

	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
Start Time	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
4:00 PM	0	0	0	17	0	2	0	7	0	3	0	8	0	4	0	18
4:15 PM	0	1	0	25	0	1	0	7	0	3	0	7	0	4	0	19
4:30 PM	0	1	0	24	0	1	0	8	0	3	0	9	0	3	0	24
4:45 PM	1	2	0	11	0	1	1	11	0	4	0	17	0	5	1	20
5:00 PM	0	1	0	10	0	2	0	12	0	5	0	19	0	6	0	22
5:15 PM	0	2	1	13	1	3	0	12	1	8	0	11	0	6	0	22
5:30 PM	0	3	0	13	0	2	0	10	0	5	0	8	0	6	0	27
5:45 PM	0	3	0	16	0	2	0	9	0	5	1	12	1	6	0	20

AM PEAK HOUR[1]	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
7:15 AM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
8:15 AM	0	2	1	45	0	2	1	33	2	13	0	25	0	6	1	96

PM PEAK HOUR[1]	Northampton St Northbound				Northampton St Southbound				Washington St Eastbound				Washington St Westbound			
4:45 PM to	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED	Left	Thru	Right	PED
5:45 PM	1	8	1	47	1	8	1	45	1	22	0	55	0	23	1	91

[1] *Peak hours corresponds to vehicular peak hours.*

NOTE: The pedestrians corssing the eastbound approach have no marked crosswalk.

MASSACHUSETTS HIGHWAY DEPARTMENT - STATEWIDE TRAFFIC DATA COLLECTION

2011 WEEKDAY SEASONAL FACTORS *

* Note: These are weekday factors. The average of the factors for the year will not equal 1, as weekend data are not considered.

FACTOR GROUP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GROUP **1** - WEST INTERSTATE	0.98	0.93	0.90	0.89	0.90	0.88	0.91	0.90	0.89	0.89	0.93	0.95
Use group 2 for R5, R6, & R0 GROUP **2** - **RURAL MAJOR COLLECTOR (R-5)**	1.12	1.12	1.07	0.99	0.91	0.90	0.86	0.86	0.92	0.93	1.01	1.05
GROUP **3A** - RECREATIONAL **(1-4) See below	1.26	1.25	1.20	1.06	0.96	0.89	0.76	0.76	0.92	0.99	1.08	1.14
GROUP **3B** - RECREATIONAL ***(5) See below	1.22	1.26	1.22	1.06	0.96	0.90	0.72	0.74	0.97	1.02	1.14	1.15
GROUP **4** - I-495 INTERSTATE	1.02	1.00	1.00	0.96	0.92	0.89	0.85	0.83	0.93	0.96	1.01	1.03
GROUP **5** - EAST INTERSTATE	1.04	1.00	0.96	0.93	0.92	0.91	0.91	0.89	0.93	0.93	0.96	1.01
GROUP **6**: Use group 6 for U2, U3, U5, U6, U0, R2, & R3 **URBAN ARTERIALS, COLLECTORS & RURAL ARTERIALS (R-2, R-3)**	1.03	1.01	0.96	0.92	0.91	0.90	0.92	0.92	0.93	0.92	0.97	0.97
GROUP **7** - I-84 PROXIMITY (STA. 17, 3921)	1.24	1.24	1.15	1.04	0.99	1.00	0.93	0.89	1.05	1.05	1.05	1.12
GROUP **8** - I-295 PROXIMITY (STA. 6590)	1.00	0.99	0.95	0.92	0.94	0.91	0.93	0.92	0.95	0.94	0.97	0.95
GROUP **9** - I-195 PROXIMITY (STA. 7)	1.13	1.05	1.03	0.95	0.89	0.87	0.86	0.79	0.88	0.91	0.99	1.03

RECREATIONAL: (ALL YEARS)

**GROUP 3A:

1. CAPE COD (ALL TOWNS)

2.PLYMOUTH(SOUTH OF RTE.3A)

7014, 7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108,7178

3.MARTHA'S VINEYARD

4.NANTUCKET

***GROUP 3B:

5.PERMANENTS 2 & 189

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,

1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,

1105,1106,1107,1108,1113,1114,1116,2196,2197,2198

2011 AXLE CORRECTION FACTORS

ROAD INVENTORY FUNCTIONAL CLASSIFICATION	AXLE CORRECTION FACTOR
RURAL	
1	0.95
2	0.97
3	0.98
0,5,6	0.98
URBAN	
1	0.96
2,3	0.98
5	0.98
0,6	0.99
I-84	0.90

ROUND OFF

0 - 999............10

> 1,000..........100

Apply I-84 factor to stations:

3290, 3921, 3929

Alexandra Hotel

Trip Generation Assessment

HOWARD STEIN HUDSON

10-Oct-2018

XXX Means Columns U, X, and AA do not sum to Column R; hard code adjustements are needed

XX HARD CODED TO BALANCE (Manually change formatting)

Land Use	Size	Category	Directional Split	Average Trip Rate	Unadjusted Vehicle Trips	Assumed National Vehicle Occupancy Rate[1]	Unadjusted Person-Trips	Transit Share[3]	Transit Person-Trips	Walk/Bike/ Other Share[3]	Walk/ Bike/ Other Trips	Auto Share[3]	Auto Person-Trips	% Taxi[4]	Private Auto Person-Trips	Taxi Person-Trips	Assumed Local Auto Occupancy Rate[5]	Assumed Local Auto Occupancy Rate for Taxis[6]	Total Adjusted Private Auto Trips	Total Adjusted Taxi Trips	Total Adjusted Auto (Private + Taxi) Trips
Daily Peak Hour																					
Hotel[7]	150	Total		8.360	1,254	1.84	**2,308**	12%	**276**	35%	**808**	53%	**1,224**	30%	856	368	1.84	1.20	**466**	**306**	**772**
	rooms	In	50%	4.180	627	1.84	**1,154**	12%	**138**	35%	**404**	53%	**612**	30%	428	184	1.84	1.20	**233**	**153**	**386**
		Out	50%	4.180	627	1.84	**1,154**	12%	**138**	35%	**404**	53%	**612**	30%	428	184	1.84	1.20	**233**	**153**	**386**
Total		Total			**1,254**		**2,308**		**276**		**808**		**1,224**		**856**	**368**			**466**	**306**	**772**
		In			**627**		**1,154**		**138**		**404**		**612**		**428**	**184**			**233**	**153**	**386**
		Out			**627**		**1,154**		**138**		**404**		**612**		**428**	**184**			**233**	**153**	**386**
AM Peak Hour																					
Hotel[7]	150	Total		0.47	71	1.84	**130**		**21**		**48**		**61**	30%	42	19	1.84	1.20	**23**	**16**	**39**
	rooms	In	59%	0.277	42	1.84	**77**	13%	**10**	36%	**28**	51%	**39**	30%	27	12	1.84	1.20	**15**	**10**	**25**
		Out	41%	0.193	29	1.84	**53**	21%	**11**	37%	**20**	42%	**22**	30%	15	7	1.84	1.20	**8**	**6**	**14**
Total		Total			**71**		**130**		**21**		**48**		**61**		**42**	**19**			**23**	**16**	**39**
		In			**42**		**77**		**10**		**28**		**39**		**27**	**12**			**15**	**10**	**25**
		Out			**29**		**53**		**11**		**20**		**22**		**15**	**7**			**8**	**6**	**14**
PM Peak Hour																					
Hotel[7]	150	Total		0.60	90	1.84	**166**		**29**		**60**		**77**	30%	54	23	1.84	1.20	**30**	**19**	**49**
	rooms	In	51%	0.306	46	1.84	**85**	21%	**18**	37%	**31**	42%	**36**	30%	25	11	1.84	1.20	**14**	**9**	**23**
		Out	49%	0.294	44	1.84	**81**	13%	**11**	36%	**29**	51%	**41**	30%	29	12	1.84	1.20	**16**	**10**	**26**
Total		Total			**90**		**166**		**29**		**60**		**77**		**54**	**23**			**30**	**19**	**49**
		In			**46**		**85**		**18**		**31**		**36**		**25**	**11**			**14**	**9**	**23**
		Out			**44**		**81**		**11**		**29**		**41**		**29**	**12**			**16**	**10**	**26**

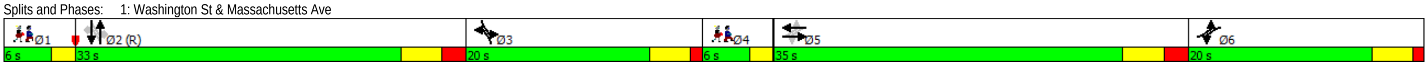
1. 2017 National vehicle occupancy rates - 1.18:home to work; 1.82: family/personal business; 1.82: shopping; 2.1 social/recreational
2. Based on ITE Trip Generation Handbook, 3rd Edition method
3. Mode shares based on peak-hour BTD Data for Area 1
4. Vehicle Trips = 70% Private Auto and 30% Taxi. Taxi trip rate based on CTPS Taxi activity rates for Hotel lane use, as adopted by Central Artery/Tunnel Project
5. Local vehicle occupancy rates based on 2009 National vehicle occupancy rates
6. For taxi cabs, 1.2 passengers per cab. (2.2 minus 1 driver equals 1.2)
7. ITE Trip Generation Manual, 10th Edition, LUC 310 (Hotel), average rate

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø4
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑	↱	↰	↑	↱		
Traffic Volume (vph)	55	679	47	36	668	95	157	402	69	87	218	63		
Future Volume (vph)	55	679	47	36	668	95	157	402	69	87	218	63		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	100		0	100		0	100		150	175		175		
Storage Lanes	1		0	1		0	1		1	1		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor	0.94	0.98		0.95	0.95		0.94		0.87	0.97		0.89		
Frt		0.990			0.981				0.850			0.850		
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1805	3437	0	1752	3246	0	1805	1810	1180	1770	1792	1411		
Flt Permitted	0.153			0.189			0.497			0.240				
Satd. Flow (perm)	274	3437	0	332	3246	0	889	1810	1030	432	1792	1254		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		6			12				141			141		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		989			747			248			797			
Travel Time (s)		22.5			17.0			5.6			18.1			
Confl. Peds. (#/hr)	129		89	89		129	67		74	74		67		
Confl. Bikes (#/hr)			22			27			13			6		
Peak Hour Factor	0.98	0.98	0.98	0.95	0.95	0.95	0.96	0.96	0.96	0.93	0.93	0.93		
Heavy Vehicles (%)	0%	2%	4%	3%	3%	11%	0%	5%	3%	2%	6%	3%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	41	0	0	0		
Parking (#/hr)			0			0			0			0		
Adj. Flow (vph)	56	693	48	38	703	100	164	419	72	94	234	68		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	56	741	0	38	803	0	164	419	72	94	234	68		
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm		
Protected Phases	6	5		6	5		3	2		3	2		1	4
Permitted Phases	5			5			2		2	2		2		
Detector Phase	6	5		6	5		3	2	2	3	2	2		
Switch Phase														
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	1.0	1.0
Minimum Split (s)	12.5	28.5		12.5	28.5		12.5	33.0	33.0	12.5	33.0	33.0	6.0	6.0
Total Split (s)	20.0	35.0		20.0	35.0		20.0	33.0	33.0	20.0	33.0	33.0	6.0	6.0
Total Split (%)	16.7%	29.2%		16.7%	29.2%		16.7%	27.5%	27.5%	16.7%	27.5%	27.5%	5%	5%
Maximum Green (s)	15.5	29.5		15.5	29.5		15.5	27.5	27.5	15.5	27.5	27.5	4.0	4.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	2.0	2.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	4.5	5.5		4.5	5.5		4.5	5.5	5.5	4.5	5.5	5.5		
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?														
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Ped		None	Ped		None	C-Max	C-Max	None	C-Max	C-Max	Ped	Ped
Walk Time (s)		7.0			7.0			13.0	13.0		13.0	13.0	4.0	4.0
Flash Dont Walk (s)		16.0			16.0			12.0	12.0		12.0	12.0	0.0	0.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0	0	0
Act Effct Green (s)	45.1	36.1		45.1	36.1		47.4	37.7	37.7	47.4	37.7	37.7		
Actuated g/C Ratio	0.38	0.30		0.38	0.30		0.40	0.31	0.31	0.40	0.31	0.31		
v/c Ratio	0.27	0.71		0.17	0.82		0.39	0.74	0.17	0.35	0.42	0.14		
Control Delay	33.5	41.8		27.5	46.3		28.4	46.9	0.9	31.9	36.4	0.6		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	33.5	41.8		27.5	46.3		28.4	46.9	0.9	31.9	36.4	0.6		
LOS	C	D		C	D		C	D	A	C	D	A		
Approach Delay		41.2			45.4			37.2			29.2			
Approach LOS		D			D			D			C			
Queue Length 50th (ft)	26	263		17	295		82	299	0	45	148	0		
Queue Length 95th (ft)	55	347		41	#411		127	#450	0	78	226	0		
Internal Link Dist (ft)		909			667			168			717			
Turn Bay Length (ft)	100			100			100		150	175		175		
Base Capacity (vph)	317	1037		328	984		519	568	420	368	563	490		
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Reduced v/c Ratio	0.18	0.71		0.12	0.82		0.32	0.74	0.17	0.26	0.42	0.14		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 56 (47%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 39.8 — Intersection LOS: D
Intersection Capacity Utilization 75.2% — 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: 1: Washington St & Massachusetts Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	33	173	53	43	575	0	0	280	21
Future Volume (Veh/h)	0	0	0	33	173	53	43	575	0	0	280	21
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	35	184	56	46	612	0	0	301	23
Pedestrians		33			45			25			96	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			4			2			9	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											248	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	1294	1094	370	1086	1106	753	357			657		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1270	1047	239	1039	1060	753	224			657		
tC, single (s)	7.1	6.5	6.2	*6.0	*5.0	*5.0	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	100	100	85	37	88	96			100		
cM capacity (veh/h)	48	188	699	228	290	462	1215			900		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	275	46	612	324
Volume Left	35	46	0	0
Volume Right	56	0	0	23
cSH	302	1215	1700	1700
Volume to Capacity	0.91	0.04	0.36	0.19
Queue Length 95th (ft)	215	3	0	0
Control Delay (s)	69.3	8.1	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	69.3	0.6		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	15.5		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

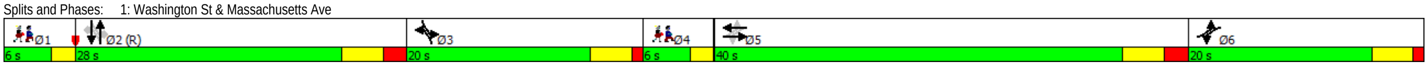
* User Entered Value

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø4
Lane Configurations														
Traffic Volume (vph)	62	811	46	52	722	84	149	317	83	112	302	110		
Future Volume (vph)	62	811	46	52	722	84	149	317	83	112	302	110		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	100		0	100		0	100		150	175		175		
Storage Lanes	1		0	1		0	1		1	1		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor		0.98			0.95		0.93		0.83	0.94		0.82		
Frt		0.992			0.984				0.850			0.850		
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1805	3490	0	1805	3357	0	1805	1845	1215	1805	1845	1425		
Flt Permitted	0.121			0.112			0.352			0.324				
Satd. Flow (perm)	230	3490	0	213	3357	0	624	1845	1007	581	1845	1163		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		5			10				141			141		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		989			747			248			797			
Travel Time (s)		22.5			17.0			5.6			18.1			
Confl. Peds. (#/hr)	190		88	88		190	97		88	88		97		
Confl. Bikes (#/hr)			38			36			20			19		
Peak Hour Factor	0.97	0.97	0.97	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95		
Heavy Vehicles (%)	0%	1%	2%	0%	0%	0%	0%	3%	0%	0%	3%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	41	0	0	0		
Parking (#/hr)			0			0			0			0		
Adj. Flow (vph)	64	836	47	56	776	90	159	337	88	118	318	116		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	64	883	0	56	866	0	159	337	88	118	318	116		
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm		
Protected Phases	6	5		6	5		3	2		3	2		1	4
Permitted Phases	5			5			2		2	2		2		
Detector Phase	6	5		6	5		3	2	2	3	2	2		
Switch Phase														
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	1.0	1.0
Minimum Split (s)	12.5	28.5		12.5	28.5		12.5	28.0	28.0	12.5	28.0	28.0	6.0	6.0
Total Split (s)	20.0	40.0		20.0	40.0		20.0	28.0	28.0	20.0	28.0	28.0	6.0	6.0
Total Split (%)	16.7%	33.3%		16.7%	33.3%		16.7%	23.3%	23.3%	16.7%	23.3%	23.3%	5%	5%
Maximum Green (s)	15.5	34.5		15.5	34.5		15.5	22.5	22.5	15.5	22.5	22.5	4.0	4.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	2.0	2.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	4.5	5.5		4.5	5.5		4.5	5.5	5.5	4.5	5.5	5.5		
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?														
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Ped		None	Ped		None	C-Max	C-Max	None	C-Max	C-Max	Ped	Ped
Walk Time (s)		7.0			7.0			12.0	12.0		12.0	12.0	4.0	4.0
Flash Dont Walk (s)		16.0			16.0			10.0	10.0		10.0	10.0	0.0	0.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0	0	0
Act Effct Green (s)	45.3	36.3		45.3	36.3		47.2	35.0	35.0	47.2	35.0	35.0		
Actuated g/C Ratio	0.38	0.30		0.38	0.30		0.39	0.29	0.29	0.39	0.29	0.29		
v/c Ratio	0.34	0.83		0.30	0.85		0.45	0.63	0.22	0.35	0.59	0.26		
Control Delay	37.5	46.9		36.8	47.8		33.6	45.0	2.3	30.4	43.8	4.9		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	37.5	46.9		36.8	47.8		33.6	45.0	2.3	30.4	43.8	4.9		
LOS	D	D		D	D		C	D	A	C	D	A		
Approach Delay		46.3			47.2			35.5			32.8			
Approach LOS		D			D			D			C			
Queue Length 50th (ft)	28	321		25	314		82	241	0	59	224	0		
Queue Length 95th (ft)	60	#450		54	#448		125	350	9	95	328	31		
Internal Link Dist (ft)		909			667			168			717			
Turn Bay Length (ft)	100			100			100		150	175		175		
Base Capacity (vph)	304	1070		299	1033		420	538	393	407	538	439		
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Reduced v/c Ratio	0.21	0.83		0.19	0.84		0.38	0.63	0.22	0.29	0.59	0.26		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 86 (72%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 42.0 Intersection LOS: D
Intersection Capacity Utilization 74.1% 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: 1: Washington St & Massachusetts Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	44	125	110	63	439	0	0	374	26
Future Volume (Veh/h)	0	0	0	44	125	110	63	439	0	0	374	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	47	133	117	67	467	0	0	402	28
Pedestrians		45			47			55			91	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			4			5			9	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											248	
pX, platoon unblocked	0.84	0.84	0.84	0.84	0.84		0.84					
vC, conflicting volume	1336	1109	516	1119	1123	605	475			514		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1305	1033	325	1045	1050	605	276			514		
tC, single (s)	7.1	6.5	6.2	*6.0	*5.0	*5.0	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	100	100	77	50	78	94			100		
cM capacity (veh/h)	47	176	572	200	266	535	1087			1014		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	297	67	467	430
Volume Left	47	67	0	0
Volume Right	117	0	0	28
cSH	312	1087	1700	1700
Volume to Capacity	0.95	0.06	0.27	0.25
Queue Length 95th (ft)	242	5	0	0
Control Delay (s)	77.1	8.5	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	77.1	1.1		0.0
Approach LOS	F			

Intersection Summary				
Average Delay	18.6			
Intersection Capacity Utilization	59.6%	ICU Level of Service		B
Analysis Period (min)	15			

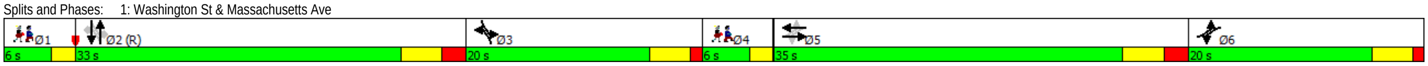
* User Entered Value

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø4
Lane Configurations														
Traffic Volume (vph)	57	703	49	37	695	98	163	416	72	90	226	65		
Future Volume (vph)	57	703	49	37	695	98	163	416	72	90	226	65		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	100		0	100		0	100		150	175		175		
Storage Lanes	1		0	1		0	1		1	1		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor		0.98		0.96	0.95		0.94		0.87	0.97		0.89		
Frt		0.990			0.981				0.850			0.850		
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1805	3437	0	1752	3247	0	1805	1810	1180	1770	1792	1411		
Flt Permitted	0.136			0.174			0.483			0.219				
Satd. Flow (perm)	258	3437	0	307	3247	0	866	1810	1030	395	1792	1254		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		6			12				141			141		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		989			747			248			797			
Travel Time (s)		22.5			17.0			5.6			18.1			
Confl. Peds. (#/hr)	129		89	89		129	67		74	74		67		
Confl. Bikes (#/hr)			22			27			13			6		
Peak Hour Factor	0.98	0.98	0.98	0.95	0.95	0.95	0.96	0.96	0.96	0.93	0.93	0.93		
Heavy Vehicles (%)	0%	2%	4%	3%	3%	11%	0%	5%	3%	2%	6%	3%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	41	0	0	0		
Parking (#/hr)			0			0			0			0		
Adj. Flow (vph)	58	717	50	39	732	103	170	433	75	97	243	70		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	58	767	0	39	835	0	170	433	75	97	243	70		
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm		
Protected Phases	6	5		6	5		3	2		3	2		1	4
Permitted Phases	5			5			2		2	2		2		
Detector Phase	6	5		6	5		3	2	2	3	2	2		
Switch Phase														
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	1.0	1.0
Minimum Split (s)	12.5	28.5		12.5	28.5		12.5	33.0	33.0	12.5	33.0	33.0	6.0	6.0
Total Split (s)	20.0	35.0		20.0	35.0		20.0	33.0	33.0	20.0	33.0	33.0	6.0	6.0
Total Split (%)	16.7%	29.2%		16.7%	29.2%		16.7%	27.5%	27.5%	16.7%	27.5%	27.5%	5%	5%
Maximum Green (s)	15.5	29.5		15.5	29.5		15.5	27.5	27.5	15.5	27.5	27.5	4.0	4.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	2.0	2.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	4.5	5.5		4.5	5.5		4.5	5.5	5.5	4.5	5.5	5.5		
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?														
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Ped		None	Ped		None	C-Max	C-Max	None	C-Max	C-Max	Ped	Ped
Walk Time (s)		7.0			7.0			13.0	13.0		13.0	13.0	4.0	4.0
Flash Dont Walk (s)		16.0			16.0			12.0	12.0		12.0	12.0	0.0	0.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0	0	0
Act Effct Green (s)	45.2	36.2		45.2	36.2		47.3	37.5	37.5	47.3	37.5	37.5		
Actuated g/C Ratio	0.38	0.30		0.38	0.30		0.39	0.31	0.31	0.39	0.31	0.31		
v/c Ratio	0.29	0.74		0.18	0.85		0.41	0.77	0.18	0.38	0.43	0.14		
Control Delay	34.8	42.6		28.5	48.1		29.1	48.7	0.9	33.8	36.9	0.6		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	34.8	42.6		28.5	48.1		29.1	48.7	0.9	33.8	36.9	0.6		
LOS	C	D		C	D		C	D	A	C	D	A		
Approach Delay		42.0			47.2			38.5			30.0			
Approach LOS		D			D			D			C			
Queue Length 50th (ft)	26	275		18	311		85	312	0	47	154	0		
Queue Length 95th (ft)	57	363		42	#443		130	#474	0	80	234	0		
Internal Link Dist (ft)		909			667			168			717			
Turn Bay Length (ft)	100			100			100		150	175		175		
Base Capacity (vph)	312	1041		321	988		510	565	418	355	559	488		
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Reduced v/c Ratio	0.19	0.74		0.12	0.85		0.33	0.77	0.18	0.27	0.43	0.14		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 56 (47%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 41.0 Intersection LOS: D
Intersection Capacity Utilization 76.4% 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: 1: Washington St & Massachusetts Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	34	179	55	45	596	0	0	290	22
Future Volume (Veh/h)	0	0	0	34	179	55	45	596	0	0	290	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	36	190	59	48	634	0	0	312	24
Pedestrians		33			45			25			96	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			4			2			9	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											248	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	1337	1132	382	1124	1144	775	369			679		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1317	1087	244	1078	1100	775	230			679		
tC, single (s)	7.1	6.5	6.2	*6.0	*5.0	*5.0	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	100	100	83	31	87	96			100		
cM capacity (veh/h)	40	177	691	215	277	452	1202			883		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	285	48	634	336
Volume Left	36	48	0	0
Volume Right	59	0	0	24
cSH	289	1202	1700	1700
Volume to Capacity	0.98	0.04	0.37	0.20
Queue Length 95th (ft)	252	3	0	0
Control Delay (s)	88.2	8.1	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	88.2	0.6		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	19.6		
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

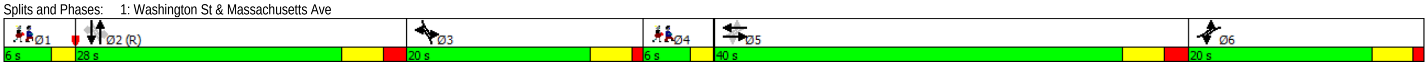
* User Entered Value

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø4
Lane Configurations														
Traffic Volume (vph)	64	840	48	54	752	87	154	328	88	116	313	114		
Future Volume (vph)	64	840	48	54	752	87	154	328	88	116	313	114		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	100		0	100		0	100		150	175		175		
Storage Lanes	1		0	1		0	1		1	1		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor		0.98			0.94		0.94		0.83	0.95		0.82		
Frt		0.992			0.984				0.850			0.850		
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1805	3490	0	1805	3357	0	1805	1845	1215	1805	1845	1425		
Flt Permitted	0.111			0.107			0.323			0.293				
Satd. Flow (perm)	211	3490	0	203	3357	0	575	1845	1007	527	1845	1163		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		5			10				141			141		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		989			747			248			797			
Travel Time (s)		22.5			17.0			5.6			18.1			
Confl. Peds. (#/hr)	190		88	88		190	97		88	88		97		
Confl. Bikes (#/hr)			38			36			20			19		
Peak Hour Factor	0.97	0.97	0.97	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95		
Heavy Vehicles (%)	0%	1%	2%	0%	0%	0%	0%	3%	0%	0%	3%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	41	0	0	0		
Parking (#/hr)			0			0			0			0		
Adj. Flow (vph)	66	866	49	58	809	94	164	349	94	122	329	120		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	66	915	0	58	903	0	164	349	94	122	329	120		
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm		
Protected Phases	6	5		6	5		3	2		3	2		1	4
Permitted Phases	5			5			2		2	2		2		
Detector Phase	6	5		6	5		3	2	2	3	2	2		
Switch Phase														
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	1.0	1.0
Minimum Split (s)	12.5	28.5		12.5	28.5		12.5	28.0	28.0	12.5	28.0	28.0	6.0	6.0
Total Split (s)	20.0	40.0		20.0	40.0		20.0	28.0	28.0	20.0	28.0	28.0	6.0	6.0
Total Split (%)	16.7%	33.3%		16.7%	33.3%		16.7%	23.3%	23.3%	16.7%	23.3%	23.3%	5%	5%
Maximum Green (s)	15.5	34.5		15.5	34.5		15.5	22.5	22.5	15.5	22.5	22.5	4.0	4.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	2.0	2.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	4.5	5.5		4.5	5.5		4.5	5.5	5.5	4.5	5.5	5.5		
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?														
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Ped		None	Ped		None	C-Max	C-Max	None	C-Max	C-Max	Ped	Ped
Walk Time (s)		7.0			7.0			12.0	12.0		12.0	12.0	4.0	4.0
Flash Dont Walk (s)		16.0			16.0			10.0	10.0		10.0	10.0	0.0	0.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0	0	0
Act Effct Green (s)	46.3	37.3		46.3	37.3		46.2	33.8	33.8	46.2	33.8	33.8		
Actuated g/C Ratio	0.39	0.31		0.39	0.31		0.38	0.28	0.28	0.38	0.28	0.28		
v/c Ratio	0.35	0.84		0.31	0.86		0.49	0.67	0.24	0.38	0.63	0.28		
Control Delay	39.2	46.9		37.7	48.3		36.2	47.4	3.1	32.6	45.8	5.5		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	39.2	46.9		37.7	48.3		36.2	47.4	3.1	32.6	45.8	5.5		
LOS	D	D		D	D		D	D	A	C	D	A		
Approach Delay		46.4			47.7			37.5			34.6			
Approach LOS		D			D			D			C			
Queue Length 50th (ft)	29	338		26	335		84	251	0	61	234	0		
Queue Length 95th (ft)	61	#478		56	#482		128	#371	13	99	341	34		
Internal Link Dist (ft)		909			667			168			717			
Turn Bay Length (ft)	100			100			100		150	175		175		
Base Capacity (vph)	300	1087		297	1049		399	520	385	386	520	429		
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Reduced v/c Ratio	0.22	0.84		0.20	0.86		0.41	0.67	0.24	0.32	0.63	0.28		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 86 (72%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 42.9 Intersection LOS: D
Intersection Capacity Utilization 75.2% 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: 1: Washington St & Massachusetts Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	46	129	114	65	457	0	0	387	27
Future Volume (Veh/h)	0	0	0	46	129	114	65	457	0	0	387	27
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	49	137	121	69	486	0	0	416	29
Pedestrians		45			47			55			91	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			4			5			9	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											248	
pX, platoon unblocked	0.83	0.83	0.83	0.83	0.83		0.83					
vC, conflicting volume	1380	1146	530	1156	1161	624	490			533		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1355	1073	329	1085	1090	624	280			533		
tC, single (s)	7.1	6.5	6.2	*6.0	*5.0	*5.0	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	100	100	74	46	77	94			100		
cM capacity (veh/h)	39	164	563	188	253	525	1071			998		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	307	69	486	445
Volume Left	49	69	0	0
Volume Right	121	0	0	29
cSH	297	1071	1700	1700
Volume to Capacity	1.03	0.06	0.29	0.26
Queue Length 95th (ft)	284	5	0	0
Control Delay (s)	100.1	8.6	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	100.1	1.1		0.0
Approach LOS	F			

Intersection Summary				
Average Delay	24.0			
Intersection Capacity Utilization	61.1%	ICU Level of Service		B
Analysis Period (min)	15			

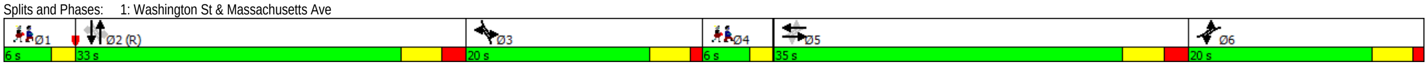
* User Entered Value

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø4
Lane Configurations														
Traffic Volume (vph)	57	718	54	55	695	98	166	417	77	90	228	65		
Future Volume (vph)	57	718	54	55	695	98	166	417	77	90	228	65		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	100		0	100		0	100		150	175		175		
Storage Lanes	1		0	1		0	1		1	1		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor		0.98		0.96	0.95		0.94		0.87	0.97		0.89		
Frt		0.990			0.981				0.850			0.850		
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1805	3432	0	1752	3247	0	1805	1810	1180	1770	1792	1411		
Flt Permitted	0.136			0.162			0.480			0.218				
Satd. Flow (perm)	258	3432	0	287	3247	0	861	1810	1030	394	1792	1254		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		6			12				141			141		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		989			747			248			797			
Travel Time (s)		22.5			17.0			5.6			18.1			
Confl. Peds. (#/hr)	129		89	89		129	67		74	74		67		
Confl. Bikes (#/hr)			22			27			13			6		
Peak Hour Factor	0.98	0.98	0.98	0.95	0.95	0.95	0.96	0.96	0.96	0.93	0.93	0.93		
Heavy Vehicles (%)	0%	2%	4%	3%	3%	11%	0%	5%	3%	2%	6%	3%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	41	0	0	0		
Parking (#/hr)			0			0			0			0		
Adj. Flow (vph)	58	733	55	58	732	103	173	434	80	97	245	70		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	58	788	0	58	835	0	173	434	80	97	245	70		
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm		
Protected Phases	6	5		6	5		3	2		3	2		1	4
Permitted Phases	5			5			2		2	2		2		
Detector Phase	6	5		6	5		3	2	2	3	2	2		
Switch Phase														
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	1.0	1.0
Minimum Split (s)	12.5	28.5		12.5	28.5		12.5	33.0	33.0	12.5	33.0	33.0	6.0	6.0
Total Split (s)	20.0	35.0		20.0	35.0		20.0	33.0	33.0	20.0	33.0	33.0	6.0	6.0
Total Split (%)	16.7%	29.2%		16.7%	29.2%		16.7%	27.5%	27.5%	16.7%	27.5%	27.5%	5%	5%
Maximum Green (s)	15.5	29.5		15.5	29.5		15.5	27.5	27.5	15.5	27.5	27.5	4.0	4.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	2.0	2.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	4.5	5.5		4.5	5.5		4.5	5.5	5.5	4.5	5.5	5.5		
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?														
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Ped		None	Ped		None	C-Max	C-Max	None	C-Max	C-Max	Ped	Ped
Walk Time (s)		7.0			7.0			13.0	13.0		13.0	13.0	4.0	4.0
Flash Dont Walk (s)		16.0			16.0			12.0	12.0		12.0	12.0	0.0	0.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0	0	0
Act Effct Green (s)	45.2	36.2		45.2	36.2		47.3	37.5	37.5	47.3	37.5	37.5		
Actuated g/C Ratio	0.38	0.30		0.38	0.30		0.39	0.31	0.31	0.39	0.31	0.31		
v/c Ratio	0.29	0.76		0.28	0.85		0.42	0.77	0.19	0.38	0.44	0.14		
Control Delay	34.8	43.4		33.4	48.1		29.4	48.8	1.2	33.9	37.0	0.6		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	34.8	43.4		33.4	48.1		29.4	48.8	1.2	33.9	37.0	0.6		
LOS	C	D		C	D		C	D	A	C	D	A		
Approach Delay		42.8			47.2			38.4			30.1			
Approach LOS		D			D			D			C			
Queue Length 50th (ft)	26	285		26	311		87	313	0	47	156	0		
Queue Length 95th (ft)	57	375		57	#443		133	#477	2	80	236	0		
Internal Link Dist (ft)		909			667			168			717			
Turn Bay Length (ft)	100			100			100		150	175		175		
Base Capacity (vph)	312	1040		315	988		509	565	418	354	559	488		
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Reduced v/c Ratio	0.19	0.76		0.18	0.85		0.34	0.77	0.19	0.27	0.44	0.14		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 56 (47%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 41.3 Intersection LOS: D
Intersection Capacity Utilization 76.5% 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: 1: Washington St & Massachusetts Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	34	179	55	45	610	0	0	305	37
Future Volume (Veh/h)	0	0	0	34	179	55	45	610	0	0	305	37
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	36	190	59	48	649	0	0	328	40
Pedestrians		33			45			25			96	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			4			2			9	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											248	
pX, platoon unblocked	0.88	0.88	0.88	0.88	0.88		0.88					
vC, conflicting volume	1376	1171	406	1163	1191	790	401			694		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1359	1125	253	1116	1148	790	247			694		
tC, single (s)	7.1	6.5	6.2	*6.0	*5.0	*5.0	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	100	100	82	27	87	96			100		
cM capacity (veh/h)	33	165	673	202	260	445	1167			872		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	285	48	649	368
Volume Left	36	48	0	0
Volume Right	59	0	0	40
cSH	274	1167	1700	1700
Volume to Capacity	1.04	0.04	0.38	0.22
Queue Length 95th (ft)	276	3	0	0
Control Delay (s)	106.3	8.2	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	106.3	0.6		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	22.7		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø4
Lane Configurations														
Traffic Volume (vph)	64	854	54	81	752	87	159	329	97	116	316	114		
Future Volume (vph)	64	854	54	81	752	87	159	329	97	116	316	114		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	100		0	100		0	100		150	175		175		
Storage Lanes	1		0	1		0	1		1	1		1		
Taper Length (ft)	25			25			25			25				
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		
Ped Bike Factor		0.98			0.94		0.94		0.83	0.95		0.82		
Frt		0.991			0.984				0.850			0.850		
Flt Protected	0.950			0.950			0.950			0.950				
Satd. Flow (prot)	1805	3480	0	1805	3357	0	1805	1845	1215	1805	1845	1425		
Flt Permitted	0.109			0.108			0.294			0.267				
Satd. Flow (perm)	207	3480	0	205	3357	0	524	1845	1007	481	1845	1163		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)		5			10				141			141		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		989			747			248			797			
Travel Time (s)		22.5			17.0			5.6			18.1			
Confl. Peds. (#/hr)	190		88	88		190	97		88	88		97		
Confl. Bikes (#/hr)			38			36			20			19		
Peak Hour Factor	0.97	0.97	0.97	0.93	0.93	0.93	0.94	0.94	0.94	0.95	0.95	0.95		
Heavy Vehicles (%)	0%	1%	2%	0%	0%	0%	0%	3%	0%	0%	3%	2%		
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	41	0	0	0		
Parking (#/hr)			0			0			0			0		
Adj. Flow (vph)	66	880	56	87	809	94	169	350	103	122	333	120		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	66	936	0	87	903	0	169	350	103	122	333	120		
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm		
Protected Phases	6	5		6	5		3	2		3	2		1	4
Permitted Phases	5			5			2		2	2		2		
Detector Phase	6	5		6	5		3	2	2	3	2	2		
Switch Phase														
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0	8.0	8.0	8.0	8.0	1.0	1.0
Minimum Split (s)	12.5	28.5		12.5	28.5		12.5	28.0	28.0	12.5	28.0	28.0	6.0	6.0
Total Split (s)	20.0	40.0		20.0	40.0		20.0	28.0	28.0	20.0	28.0	28.0	6.0	6.0
Total Split (%)	16.7%	33.3%		16.7%	33.3%		16.7%	23.3%	23.3%	16.7%	23.3%	23.3%	5%	5%
Maximum Green (s)	15.5	34.5		15.5	34.5		15.5	22.5	22.5	15.5	22.5	22.5	4.0	4.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	2.0	2.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	4.5	5.5		4.5	5.5		4.5	5.5	5.5	4.5	5.5	5.5		
Lead/Lag	Lag	Lead		Lag	Lead		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?														
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Ped		None	Ped		None	C-Max	C-Max	None	C-Max	C-Max	Ped	Ped
Walk Time (s)		7.0			7.0			12.0	12.0		12.0	12.0	4.0	4.0
Flash Dont Walk (s)		16.0			16.0			10.0	10.0		10.0	10.0	0.0	0.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0	0	0
Act Effct Green (s)	46.6	37.1		46.6	37.1		43.4	30.9	30.9	43.4	30.9	30.9		
Actuated g/C Ratio	0.39	0.31		0.39	0.31		0.36	0.26	0.26	0.36	0.26	0.26		
v/c Ratio	0.34	0.87		0.46	0.86		0.54	0.74	0.28	0.41	0.70	0.30		
Control Delay	38.6	48.8		44.5	48.6		40.4	52.1	4.3	35.3	50.2	5.9		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	38.6	48.8		44.5	48.6		40.4	52.1	4.3	35.3	50.2	5.9		
LOS	D	D		D	D		D	D	A	D	D	A		
Approach Delay		48.1			48.3			41.0			37.8			
Approach LOS		D			D			D			D			
Queue Length 50th (ft)	29	350		39	336		87	252	0	61	237	0		
Queue Length 95th (ft)	60	#499		75	#482		136	#407	21	102	#375	35		
Internal Link Dist (ft)		909			667			168			717			
Turn Bay Length (ft)	100			100			100		150	175		175		
Base Capacity (vph)	298	1080		298	1045		372	475	364	360	475	404		
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0		
Reduced v/c Ratio	0.22	0.87		0.29	0.86		0.45	0.74	0.28	0.34	0.70	0.30		

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 86 (72%), Referenced to phase 2:NBSB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 44.9 Intersection LOS: D
Intersection Capacity Utilization 76.1% 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: 1: Washington St & Massachusetts Ave

Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6
6 s	28 s	20 s	6 s	40 s	20 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	46	129	114	65	470	0	0	407	41
Future Volume (Veh/h)	0	0	0	46	129	114	65	470	0	0	407	41
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.94	0.94	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	49	137	121	69	500	0	0	438	44
Pedestrians		45			47			55			91	
Lane Width (ft)		0.0			12.0			12.0			12.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			4			5			9	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											248	
pX, platoon unblocked	0.81	0.81	0.81	0.81	0.81		0.81					
vC, conflicting volume	1424	1190	560	1200	1212	638	527			547		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1405	1116	335	1128	1143	638	294			547		
tC, single (s)	7.1	6.5	6.2	*6.0	*5.0	*5.0	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	100	100	72	41	77	93			100		
cM capacity (veh/h)	33	151	544	173	234	518	1032			986		

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	307	69	500	482
Volume Left	49	69	0	0
Volume Right	121	0	0	44
cSH	278	1032	1700	1700
Volume to Capacity	1.10	0.07	0.29	0.28
Queue Length 95th (ft)	317	5	0	0
Control Delay (s)	124.6	8.7	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	124.6	1.1		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	28.6		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

Appendix D

Wind

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
1	A	Annual	11		Sitting	16		Acceptable
	B	Annual	15	36%	Standing	20	25%	Acceptable
2	A	Annual	11		Sitting	16		Acceptable
	B	Annual	12		Sitting	17		Acceptable
3	A	Annual	9		Sitting	13		Acceptable
	B	Annual	9		Sitting	14		Acceptable
4	A	Annual	10		Sitting	15		Acceptable
	B	Annual	13	30%	Standing	20	33%	Acceptable
5	A	Annual	4		Sitting	7		Acceptable
	B	Annual	6	50%	Sitting	9	29%	Acceptable
6	A	Annual	8		Sitting	12		Acceptable
	B	Annual	11	38%	Sitting	17	42%	Acceptable
7	A	Annual	11		Sitting	15		Acceptable
	B	Annual	13	18%	Standing	19	27%	Acceptable
8	A	Annual	15		Standing	19		Acceptable
	B	Annual	16		Walking	20		Acceptable
9	A	Annual	12		Sitting	17		Acceptable
	B	Annual	13		Standing	18		Acceptable
10	A	Annual	13		Standing	18		Acceptable
	B	Annual	15	15%	Standing	19		Acceptable
11	A	Annual	10		Sitting	15		Acceptable
	B	Annual	11		Sitting	15		Acceptable
12	A	Annual	10		Sitting	15		Acceptable
	B	Annual	11		Sitting	17	13%	Acceptable
13	A	Annual	12		Sitting	17		Acceptable
	B	Annual	11		Sitting	17		Acceptable
14	A	Annual	12		Sitting	17		Acceptable
	B	Annual	11		Sitting	17		Acceptable
15	A	Annual	17		Walking	23		Acceptable
	B	Annual	15	-12%	Standing	22		Acceptable
16	A	Annual	14		Standing	21		Acceptable
	B	Annual	14		Standing	21		Acceptable
17	A	Annual	12		Sitting	18		Acceptable
	B	Annual	11		Sitting	17		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
18	A	Annual	14		Standing	20		Acceptable
	B	Annual	13		Standing	19		Acceptable
19	A	Annual	15		Standing	22		Acceptable
	B	Annual	15		Standing	22		Acceptable
20	A	Annual	8		Sitting	14		Acceptable
	B	Annual	8		Sitting	12	-14%	Acceptable
21	A	Annual	13		Standing	19		Acceptable
	B	Annual	16	23%	Walking	22	16%	Acceptable
22	A	Annual	11		Sitting	16		Acceptable
	B	Annual	11		Sitting	17		Acceptable
23	A	Annual	12		Sitting	17		Acceptable
	B	Annual	15	25%	Standing	21	24%	Acceptable
24	A	Annual	9		Sitting	13		Acceptable
	B	Annual	9		Sitting	13		Acceptable
25	A	Annual	9		Sitting	13		Acceptable
	B	Annual	10	11%	Sitting	16	23%	Acceptable
26	A	Annual	8		Sitting	13		Acceptable
	B	Annual	11	38%	Sitting	17	31%	Acceptable
27	A	Annual	15		Standing	23		Acceptable
	B	Annual	13	-13%	Standing	21		Acceptable
28	A	Annual	14		Standing	21		Acceptable
	B	Annual	16	14%	Walking	22		Acceptable
29	A	Annual	10		Sitting	14		Acceptable
	B	Annual	10		Sitting	14		Acceptable
30	A	Annual	15		Standing	21		Acceptable
	B	Annual	13	-13%	Standing	19		Acceptable
31	A	Annual	15		Standing	22		Acceptable
	B	Annual	14		Standing	21		Acceptable
32	A	Annual	10		Sitting	15		Acceptable
	B	Annual	10		Sitting	15		Acceptable
33	A	Annual	12		Sitting	18		Acceptable
	B	Annual	12		Sitting	17		Acceptable
34	A	Annual	12		Sitting	18		Acceptable
	B	Annual	12		Sitting	17		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
35	A	Annual	7		Sitting	12		Acceptable
	B	Annual	6	-14%	Sitting	12		Acceptable
36	A	Annual	11		Sitting	20		Acceptable
	B	Annual	11		Sitting	19		Acceptable
37	A	Annual	11		Sitting	18		Acceptable
	B	Annual	11		Sitting	18		Acceptable
38	A	Annual	12		Sitting	19		Acceptable
	B	Annual	13		Standing	20		Acceptable
39	A	Annual	10		Sitting	16		Acceptable
	B	Annual	10		Sitting	16		Acceptable
40	A	Annual	12		Sitting	17		Acceptable
	B	Annual	10	-17%	Sitting	16		Acceptable
41	A	Annual	13		Standing	20		Acceptable
	B	Annual	14		Standing	21		Acceptable
42	A	Annual	12		Sitting	18		Acceptable
	B	Annual	11		Sitting	18		Acceptable
43	A	Annual	12		Sitting	18		Acceptable
	B	Annual	13		Standing	19		Acceptable
44	A	Annual	10		Sitting	17		Acceptable
	B	Annual	11		Sitting	17		Acceptable
45	A	Annual	13		Standing	19		Acceptable
	B	Annual	17	31%	Walking	23	21%	Acceptable
46	A	Annual	15		Standing	21		Acceptable
	B	Annual	17	13%	Walking	24	14%	Acceptable
47	A	Annual	12		Sitting	18		Acceptable
	B	Annual	13		Standing	19		Acceptable
48	A	Annual	15		Standing	22		Acceptable
	B	Annual	13	-13%	Standing	19	-14%	Acceptable
49	A	Annual	13		Standing	18		Acceptable
	B	Annual	12		Sitting	17		Acceptable
50	A	Annual	12		Sitting	16		Acceptable
	B	Annual	12		Sitting	16		Acceptable
51	A	Annual	13		Standing	18		Acceptable
	B	Annual	13		Standing	18		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
52	A B	Annual Annual	13 12		Standing Sitting	20 19		Acceptable Acceptable
53	A B	Annual Annual	10 9		Sitting Sitting	15 15		Acceptable Acceptable
54	A B	Annual Annual	11 11		Sitting Sitting	16 16		Acceptable Acceptable
55	A B	Annual Annual	9 9		Sitting Sitting	15 15		Acceptable Acceptable
56	A B	Annual Annual	10 10		Sitting Sitting	15 15		Acceptable Acceptable
57	A B	Annual Annual	11 10		Sitting Sitting	17 16		Acceptable Acceptable
58	A B	Annual Annual	8 8		Sitting Sitting	14 14		Acceptable Acceptable
59	A B	Annual Annual	12 12		Sitting Sitting	18 18		Acceptable Acceptable
60	A B	Annual Annual	11 11		Sitting Sitting	17 16		Acceptable Acceptable
61	A B	Annual Annual	7 7		Sitting Sitting	12 11		Acceptable Acceptable
62	A B	Annual Annual	15 14		Standing Standing	22 22		Acceptable Acceptable
63	A B	Annual Annual	5 6	 20%	Sitting Sitting	9 9		Acceptable Acceptable
64	A B	Annual Annual	11 11		Sitting Sitting	18 18		Acceptable Acceptable
65	A B	Annual Annual	12 11		Sitting Sitting	17 17		Acceptable Acceptable
66	A B	Annual Annual	10 10		Sitting Sitting	16 15		Acceptable Acceptable
67	A B	Annual Annual	11 11		Sitting Sitting	19 18		Acceptable Acceptable
68	A B	Annual Annual	10 10		Sitting Sitting	16 16		Acceptable Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
69	A	Annual	10		Sitting	17		Acceptable
	B	Annual	10		Sitting	16		Acceptable
70	A	Annual	10		Sitting	15		Acceptable
	B	Annual	9		Sitting	15		Acceptable
71	A	Annual	11		Sitting	17		Acceptable
	B	Annual	11		Sitting	17		Acceptable
72	A	Annual	10		Sitting	15		Acceptable
	B	Annual	9		Sitting	14		Acceptable
73	A	Annual	8		Sitting	13		Acceptable
	B	Annual	8		Sitting	12		Acceptable
74	A	Annual	10		Sitting	17		Acceptable
	B	Annual	10		Sitting	16		Acceptable
75	A	Annual	17		Walking	25		Acceptable
	B	Annual	14	-18%	Standing	22	-12%	Acceptable
76	A	Annual	16		Walking	23		Acceptable
	B	Annual	16		Walking	23		Acceptable
77	A	Annual	10		Sitting	15		Acceptable
	B	Annual	10		Sitting	15		Acceptable
78	A	Annual	12		Sitting	18		Acceptable
	B	Annual	13		Standing	19		Acceptable
79	A	Annual	12		Sitting	17		Acceptable
	B	Annual	11		Sitting	17		Acceptable
80	A	Annual	12		Sitting	18		Acceptable
	B	Annual	11		Sitting	18		Acceptable
81	A	Annual	10		Sitting	15		Acceptable
	B	Annual	9		Sitting	15		Acceptable
82	A	Annual	9		Sitting	14		Acceptable
	B	Annual	9		Sitting	14		Acceptable
83	A	Annual	8		Sitting	13		Acceptable
	B	Annual	8		Sitting	13		Acceptable
84	A	Annual	11		Sitting	16		Acceptable
	B	Annual	11		Sitting	16		Acceptable
85	A	Annual	9		Sitting	16		Acceptable
	B	Annual	10	11%	Sitting	17		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed: Speed (mph)	Mean Wind Speed: % Change	Mean Wind Speed: Rating	Effective Gust Wind Speed: Speed (mph)	Effective Gust Wind Speed: % Change	Effective Gust Wind Speed: Rating
86	A	Annual	9		Sitting	15		Acceptable
	B	Annual	9		Sitting	15		Acceptable
87	A	Annual	12		Sitting	18		Acceptable
	B	Annual	13		Standing	21	17%	Acceptable
88	A	Annual	5		Sitting	8		Acceptable
	B	Annual	6	20%	Sitting	10	25%	Acceptable
89	A	Annual	9		Sitting	14		Acceptable
	B	Annual	11	22%	Sitting	17	21%	Acceptable
90	A	Annual	10		Sitting	15		Acceptable
	B	Annual	11		Sitting	17	13%	Acceptable
91	A	Annual	16		Walking	23		Acceptable
	B	Annual	15		Standing	22		Acceptable
92	A	Annual	13		Standing	20		Acceptable
	B	Annual	13		Standing	20		Acceptable
93	A	Annual	12		Sitting	18		Acceptable
	B	Annual	12		Sitting	19		Acceptable
94	A	Annual	10		Sitting	15		Acceptable
	B	Annual	10		Sitting	15		Acceptable
95	A	Annual	10		Sitting	17		Acceptable
	B	Annual	10		Sitting	16		Acceptable
96	A	Annual	10		Sitting	17		Acceptable
	B	Annual	10		Sitting	16		Acceptable
97	A	Annual	12		Sitting	18		Acceptable
	B	Annual	12		Sitting	18		Acceptable
98	A	Annual	8		Sitting	13		Acceptable
	B	Annual	8		Sitting	13		Acceptable
99	A	Annual	13		Standing	20		Acceptable
	B	Annual	13		Standing	20		Acceptable
100	A	Annual	14		Standing	22		Acceptable
	B	Annual	15		Standing	22		Acceptable
101	A	Annual	13		Standing	21		Acceptable
	B	Annual	12		Sitting	20		Acceptable
102	A	Annual	15		Standing	24		Acceptable
	B	Annual	14		Standing	22		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
103	A	Annual	14		Standing	23		Acceptable
	B	Annual	14		Standing	22		Acceptable
104	A	Annual	14		Standing	23		Acceptable
	B	Annual	14		Standing	22		Acceptable
105	A	Annual	14		Standing	22		Acceptable
	B	Annual	14		Standing	22		Acceptable
106	A	Annual	6		Sitting	10		Acceptable
	B	Annual	6		Sitting	10		Acceptable
107	A	Annual	21		Uncomfortable	29		Acceptable
	B	Annual	20		Uncomfortable	28		Acceptable
108	A	Annual	13		Standing	20		Acceptable
	B	Annual	12		Sitting	19		Acceptable
109	A	Annual	13		Standing	21		Acceptable
	B	Annual	14		Standing	21		Acceptable
110	A	Annual	14		Standing	22		Acceptable
	B	Annual	13		Standing	21		Acceptable
111	A	Annual	14		Standing	20		Acceptable
	B	Annual	14		Standing	21		Acceptable
112	A	Annual	10		Sitting	16		Acceptable
	B	Annual	11		Sitting	16		Acceptable
113	A	Annual	10		Sitting	16		Acceptable
	B	Annual	9		Sitting	15		Acceptable
114	A	Annual	10		Sitting	16		Acceptable
	B	Annual	12	20%	Sitting	17		Acceptable
115	A	Annual	10		Sitting	16		Acceptable
	B	Annual	10		Sitting	17		Acceptable
116	A	Annual	9		Sitting	14		Acceptable
	B	Annual	9		Sitting	14		Acceptable
117	A	Annual	11		Sitting	17		Acceptable
	B	Annual	10		Sitting	16		Acceptable
118	A	Annual	11		Sitting	17		Acceptable
	B	Annual	10		Sitting	16		Acceptable
119	A	Annual	9		Sitting	14		Acceptable
	B	Annual	9		Sitting	14		Acceptable

Table 1: Mean Speed and Effective Gust Categories - Annual

Location	Configuration	Season	Mean Wind Speed			Effective Gust Wind Speed		
			Speed (mph)	% Change	Rating	Speed (mph)	% Change	Rating
120	A B	Annual Annual	11 11		Sitting Sitting	17 16		Acceptable Acceptable
121	A B	Annual Annual	11 11		Sitting Sitting	17 17		Acceptable Acceptable
122	A B	Annual Annual	10 10		Sitting Sitting	17 17		Acceptable Acceptable
123	A B	Annual Annual	11 11		Sitting Sitting	17 18		Acceptable Acceptable
124	A B	Annual Annual	11 11		Sitting Sitting	17 16		Acceptable Acceptable
125	A B	Annual Annual	15 14		Standing Standing	20 19		Acceptable Acceptable
126	A B	Annual Annual	14 14		Standing Standing	21 21		Acceptable Acceptable
127	A B	N/A Annual	-- 20		-- Uncomfortable	-- 28		-- Acceptable
128	A B	N/A Annual	-- 12		-- Sitting	-- 19		-- Acceptable
129	A B	N/A Annual	-- 18		-- Walking	-- 26		-- Acceptable
130	A B	N/A Annual	-- 18		-- Walking	-- 25		-- Acceptable
131	A B	N/A Annual	-- 18		-- Walking	-- 26		-- Acceptable
132	A B	N/A Annual	-- 13		-- Standing	-- 20		-- Acceptable

Configurations	Mean Wind Criteria Speed (mph)		Effective Gust Criteria (mph)	
No Build	≤ 12	Comfortable for Sitting	≤ 31	Acceptable
	13 - 15	Comfortable for Standing	> 31	Unacceptable
Build	16 - 19	Comfortable for Walking		
	20 - 27	Uncomfortable for Walking		
	> 27	Dangerous Conditions		

Notes
1) Wind Speeds are for a 1% probability of exceedance
2) % Change is based on comparison with Configuration A
3) % changes less than 10% are excluded

Appendix E

Air Quality

AIR QUALITY APPENDIX

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 3.5 of the report. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the microscale air quality analysis.

Motor Vehicle Emissions

The EPA MOVES computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2018 and 2025 for speed limits of idle, 10, 15, and 25 mph for use in the microscale analyses.

MOVES CO Emission Factor Summary

Carbon Monoxide Only

		2018	2025
Free Flow	25 mph	2.488	1.658
Right Turns	10 mph	3.788	2.541
Left Turns	15 mph	3.288	2.237
Queues	Idle	6.673	3.039

Notes: Winter CO emission factors are higher than Summer and are conservatively used
Urban Unrestricted Roadway type used

CAL3QHC

For the intersection studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOVES. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 321 cm was used for the intersection. Idle emission rates for queue links were based on 0 mph emission rates derived in MOVES. Emission rates for speeds of 10, 15, and 25 mph were used for right turn, left turn, and free flow links, respectively.

Background Concentrations

POLLUTANT	AVERAGING TIME	Form	2014	2015	2016	Units	ppm/ppb to $\mu g/m^3$ Conversion Factor	2014-2016 Background Concentration ($\mu g/m^3$)	Location
SO_2 (1)(6)	1-Hour (5)	99th %	12.3	9.4	4.7	ppb	2.62	23.1	Harrison Ave., Boston
	3-Hour	H2H	21.5	8.7	5.1	ppb	2.62	56.3	Harrison Ave., Boston
	24-Hour	H2H	5.1	4.3	1.9	ppb	2.62	13.4	Harrison Ave., Boston
	Annual	H	1.1	0.8	0.5	ppb	2.62	2.8	Harrison Ave., Boston
PM-10	24-Hour	H2H	61	28	29	$\mu g/m^3$	1	61	Harrison Ave., Boston
	Annual	H	13.9	12.4	11.8	$\mu g/m^3$	1	13.9	Harrison Ave., Boston
PM-2.5	24-Hour (5)	98th %	12.7	19.0	16.3	$\mu g/m^3$	1	16.0	Harrison Ave., Boston
	Annual (5)	H	6.0	8.8	6.2	$\mu g/m^3$	1	7.0	Harrison Ave., Boston
NO_2 (3)	1-Hour (5)	98th %	51	53	49	ppb	1.88	95.9	Harrison Ave., Boston
	Annual	H	15.8	15.0	13.2	ppb	1.88	29.6	Harrison Ave., Boston
CO (2)	1-Hour	H2H	1.7	1.4	2.4	ppm	1146	2750.4	Harrison Ave., Boston
	8-Hour	H2H	1.3	0.9	1.8	ppm	1146	2062.8	Harrison Ave., Boston
Ozone (4)	8-Hour	H4H	0.054	0.056	0.058	ppm	1963	113.9	Harrison Ave., Boston
Lead	Rolling 3-Month	H	0.014	0.016	0.017	$\mu g/m^3$	1	0.017	Harrison Ave., Boston

Notes:
From 2014-2016 EPA's AirData Website
[1] SO_2 reported ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 2.62 $\mu g/m^3$.
[2] CO reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1146 $\mu g/m^3$.
[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1.88 $\mu g/m^3$.
[4] O_3 reported in ppm. Converted to $\mu g/m^3$ using factor of 1 ppm = 1963 $\mu g/m^3$.
[5] Background level is the average concentration of the three years.
[6] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

Model Input/Output Files

Due to excessive size CAL3QHC, and MOVES input and output files are available on digital media upon request.

Appendix F

Preliminary Energy Model Results

ENERGY MODEL REPORT

Alexandra Hotel | Boston, MA

An Energy Evaluation by R. G. Vanderweil's Building Performance Group
October 23, 2018

VANDERWEIL

DESIGN PHASE	Conceptual Development
BUILDING TYPE	Hotel
PROJECT SQUARE FOOTAGE	65,000 ft^2

LEED RATING SYSTEM	LEED Version 4
LEED BASELINE	ASHRAE 90.1 2010

27% Energy Savings
16% Energy Cost Savings
23% GHG Savings
6 LEED EAc1 Points

ENERGY CODE	Stretch Energy Code
CODE BASELINE	ASHRAE 90.1 2013 with enhancement

21% Energy Savings

MODELING PROCESS

Vanderweil has performed conceptual level energy modeling for the Alexandra Hotel to help comply with the Green Building Review Procedures and the initial project filing. The modeling software eQuest 3.64 was used for the analysis. The model is based on the October 2018 concept programming information received from CBT.

Article 37 requires that the project earn enough credit points to achieve the minimum level for LEED Version 4 certification. The minimum Energy Performance prerequisite (EAp2) is a mandatory credit that must be achieved in order to be LEED certifiable.

The modeling estimates an annual site energy use for the proposed design that is approximately **16%** below the standard reference design (cost basis) as per ASHRAE 90.1- 2010. The total Green House Gas (GHG) reductions are **23%** when the design is compared to the LEED Baseline.

Massachusetts Energy Code compliance is addressed in this process via the Stretch Energy Code which requires a demonstration of energy use per square foot at least ten percent (10%) below the energy requirements of ANSI/ASHRAE/IESNA 90.1-2013 APPENDIX G Performance Rating Method on either a site or source energy basis. Also required under the latest code revision is the requirement of two additional efficiency package options; "More efficient HVAC equipment performance" and "Reduced lighting power density". When compared to the Stretch Code Baseline the modeling estimates an annual site energy use for the proposed design that is approximately **21%** below the standard reference design (energy basis) as per ASHRAE 90.1- 2013.

PROJECT OVERVIEW

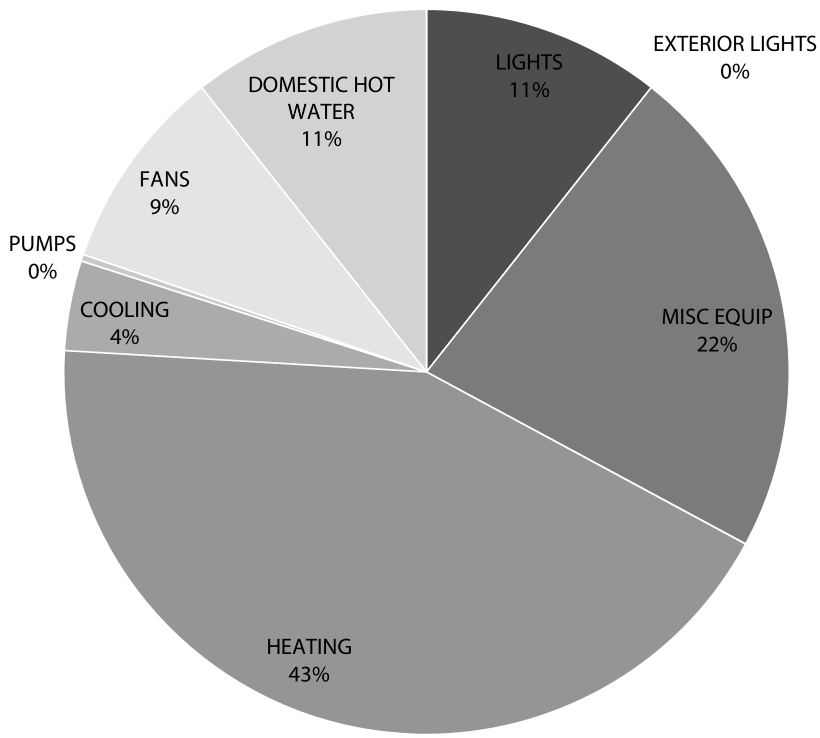
The Alexandra Hotel will be an eleven story building (approximately 65,000 sf) in Boston Ma. The facility's HVAC system will consist of water-source heat pumps equipped with ECM motors connected to the building condenser loop with condensing boilers and cooling towers. Ventilation will be provided by a dedicated outside air unit (DOAS) equipped with heat recovery. The United States Green Building Council (USGBC) requires all buildings pursuing LEED® Certification to be 5% more energy cost efficient than an equivalent ASHRAE 90.1-2010 Appendix G building. Evaluating a building's performance based on energy cost can result in savings that are significantly different than the actual energy savings in kBTU, depending on local utility rates. The annual energy cost estimates are based on EIA utility rates for Massachusetts 2018 of $ .16/ kWh for electricity and $ 1.058/therm for natural gas.

LEED V4 BASELINE MODEL

In order to evaluate the energy performance of the facility design, a Baseline energy model was developed to serve as a basis of comparison. The ASHRAE 90.1-2010 Appendix G Performance Rating Method was followed as this is the basis of comparison for LEED v4. A detail of model inputs is contained in the Appendix.

ASHRAE 90.1 BUILDING TYPE	Residential (Hotel)
ASHRAE 90.1 HVAC SYSTEM TYPE	Packaged terminal air conditioner
ASHRAE 90.1 COOLING TYPE	Direct expansion (DX)
ASHRAE 90.1 HEATING TYPE	Hot water fossil fuel boiler

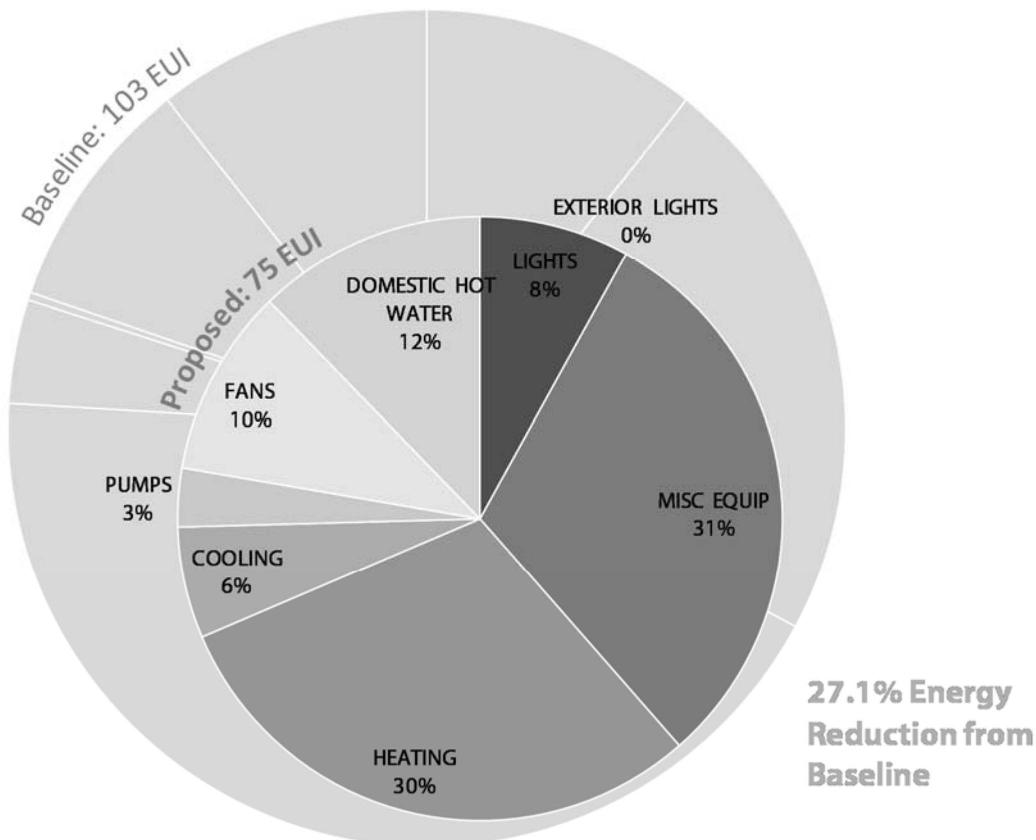
To further understand how the design decisions are impacting the energy performance of the building, it is useful to view the Baseline model's annual energy consumption (kBTU) broken down by major end-use components.



DESIGN MODEL

The Design model has Water Source Heat Pumps (WSHP) serving all guest rooms in the building. Heating and cooling is provided by these units which draw or reject heat to a common condenser water system as the units call for heating or cooling. This common condenser water system allows for heat recovery where simultaneous heating and cooling are present in the building. Heating for the condenser water system is provided by condensing boilers and heat rejection is provided by cooling towers.

Ventilation for the design model is provided by Energy Recovery Units (ERU) equipped with enthalpy wheels for energy recovery. Heating is provided by a natural gas furnace in the ERU. Cooling is provided via a DX cooling coil. Common spaces have an overall LPD reduction from Appendix G values. The Design model's annual energy consumption (kBTU) broken down by major end-use components:



In summary, key energy conservation measures (ECMs) typically associated with energy savings currently include:

1. Energy Efficient Lighting Upgrades
   - Guest Rooms: 1. W/ft^2 upgraded to .55 W/ft^2
2. Condensing Hot water Boilers with a thermal efficiency of 93% to 95%
3. High Efficiency Water Source Heat Pumps with a weighted average cooling efficiency of 14. EER and 4.2 COP heating efficiency.
4. Water Source Heat Pumps with ECM motors
5. Enthalpy Wheel heat recovery with performance effectiveness of sixty-two percent (62%).

End Use	Proposed Design WSHPs w/ OA provided by ERUs ELEC (kWh)	NAT GAS (therms)	STEAM (MBTU)	CHW (MBTU)	Total Energy (kBTU)	% of Total	Baseline PTACs ELEC (kWh)	NAT GAS (therms)	STEAM (MBTU)	CHW (MBTU)	Total Energy (kBTU)	% of Total	Energy Savings (%)
Lights	115,980				395,724	8%	210,873				719,499	11%	45%
Exterior Lights						0%						0%	
Misc. Equipment	257,285	6,263			1,504,156	31%	257,285	6,263			1,504,156	22%	0%
Space Heating	32,402	13,690			1,479,556	30%		29,134			2,913,425	43%	49%
Space Cooling	86,731				295,926	6%	79,376				270,831	4%	-9%
Heat Rejection	147				502	0%						0%	
Pumps & Aux	41,583	130			154,881	3%	2,193	130			20,481	0%	-656%
Ventilation & Fans	144,990				494,706	10%	180,615				616,258	9%	20%
Heat Pump Supplement						0%						0%	
Domestic Hot Water		6,041			604,100	12%		7,192			719,200	11%	16%
Total Energy by Type	679,118	26,124	-	-	4,929,551	100%	730,342	42,719	-	-	6,763,850	100%	
Site Energy (kBTU)	2,317,151	2,612,400	-	-	4,929,551		2,491,925	4,271,925	-	-	6,763,850		**Site Energy Savings**
Site EUI (kBTU/SF)						**75**						**103**	**27%**
Total Cost by Type	$ 108,659	$ 27,639	$ -	$ -			$ 116,855	$ 45,197	$ -	$ -			**Total Cost Savings**
Total Energy Cost	**$**					**136,298**	**$**					**162,052**	**15.9%**

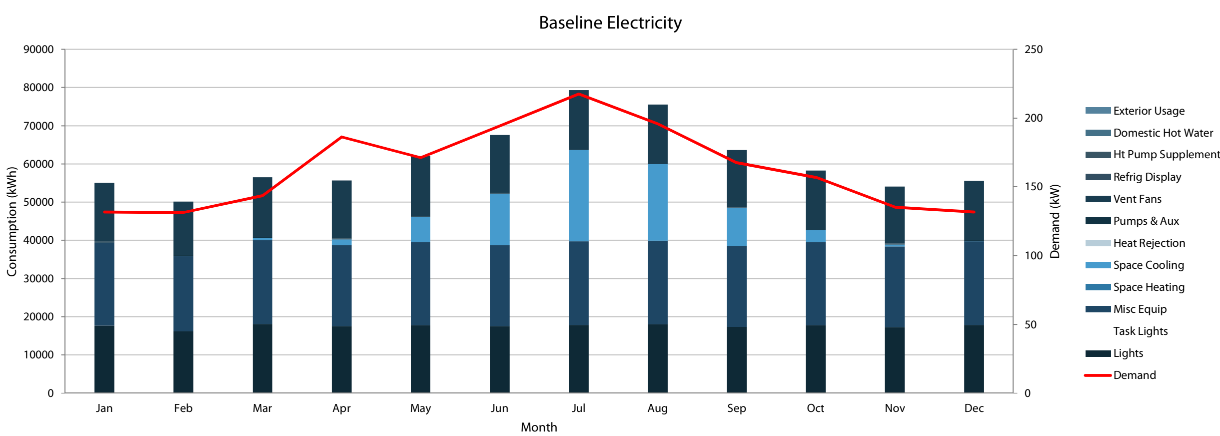
GHG Emissions CO2		
Baseline (LEED v4)	509	tons/ yr
Design	394	tons/ yr
GHG Savings	23%	

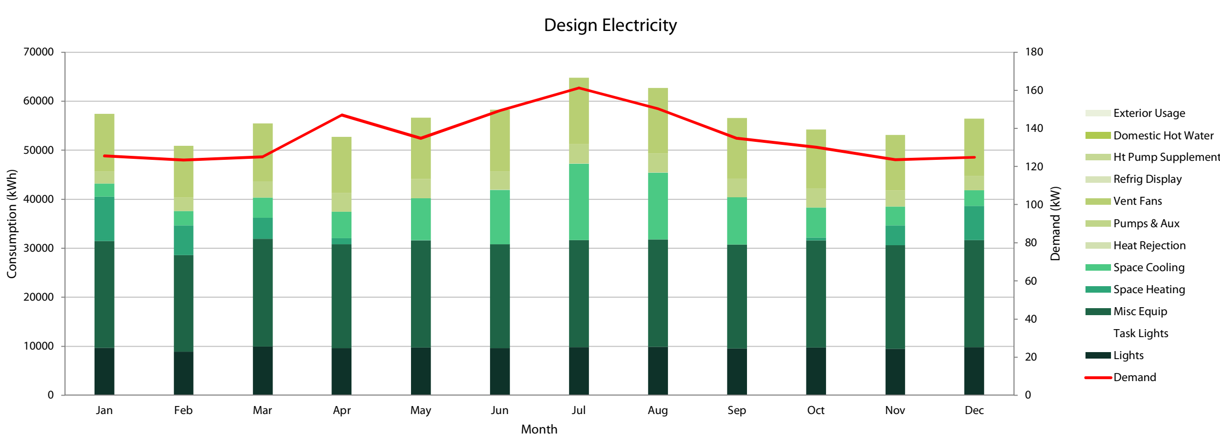
Electricity: 2016 ISO-NE Electric Generator Air Emissions Reports (710 lbs/MWh)
Natural Gas: EIA Fuel Emissions Service National Average 117 lbs/ MMBTU

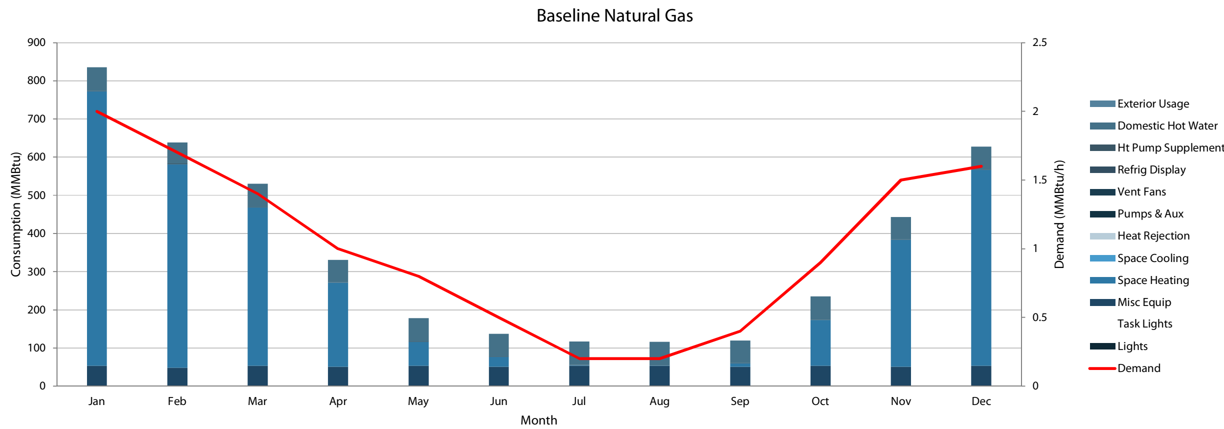
Rating Method	LEED NC 2009
Building Area	65,700 ft²

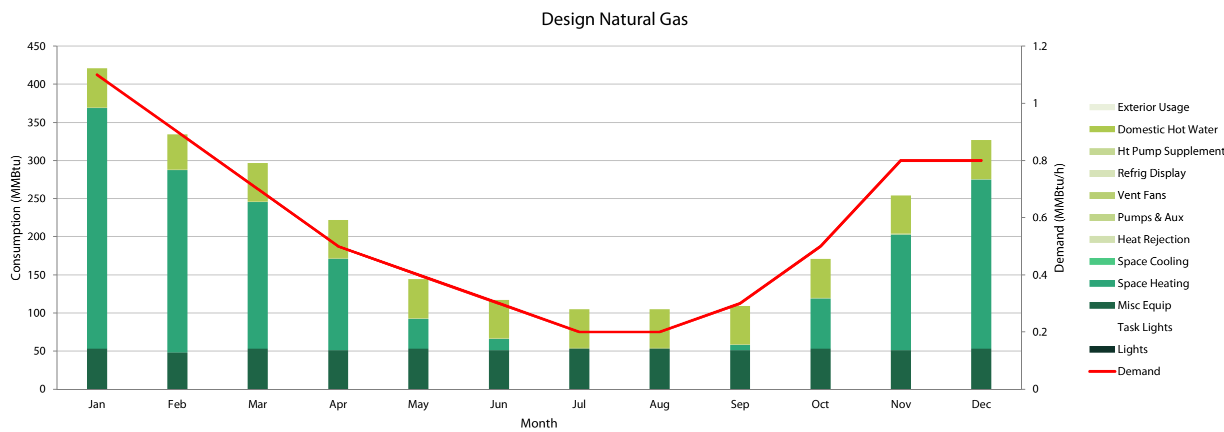
Fuel Type	**Utility Rate**
Electricity	$ 0.160 /kWh
Natural Gas	$ 1.058 /therm
Steam	$ 19.630 /MBTU
Chilled Water	$ 11.360 /MBTU

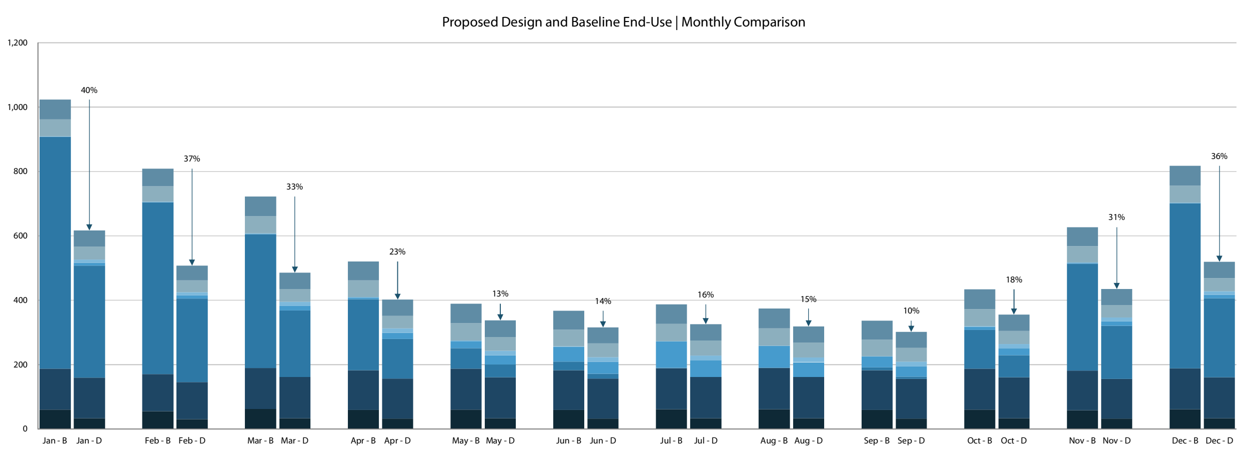
Percent Process **22%**






Baseline Natural Gas
Consumption (MMBtu)
Demand (MMBtu/h)
900
800
700
600
500
400
300
200
100
0
2.5
2
1.5
1
0.5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Exterior Usage
Domestic Hot Water
Ht Pump Supplement
Refrig Display
Vent Fans
Pumps & Aux
Heat Rejection
Space Cooling
Space Heating
Misc Equip
Task Lights
Lights
Demand


Design Natural Gas
Consumption (MMBtu)
Demand (MMBtu/h)
450
400
350
300
250
200
150
100
50
0
1.2
1
0.8
0.6
0.4
0.2
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Exterior Usage
Domestic Hot Water
Ht Pump Supplement
Refrig Display
Vent Fans
Pumps & Aux
Heat Rejection
Space Cooling
Space Heating
Misc Equip
Task Lights
Lights
Demand

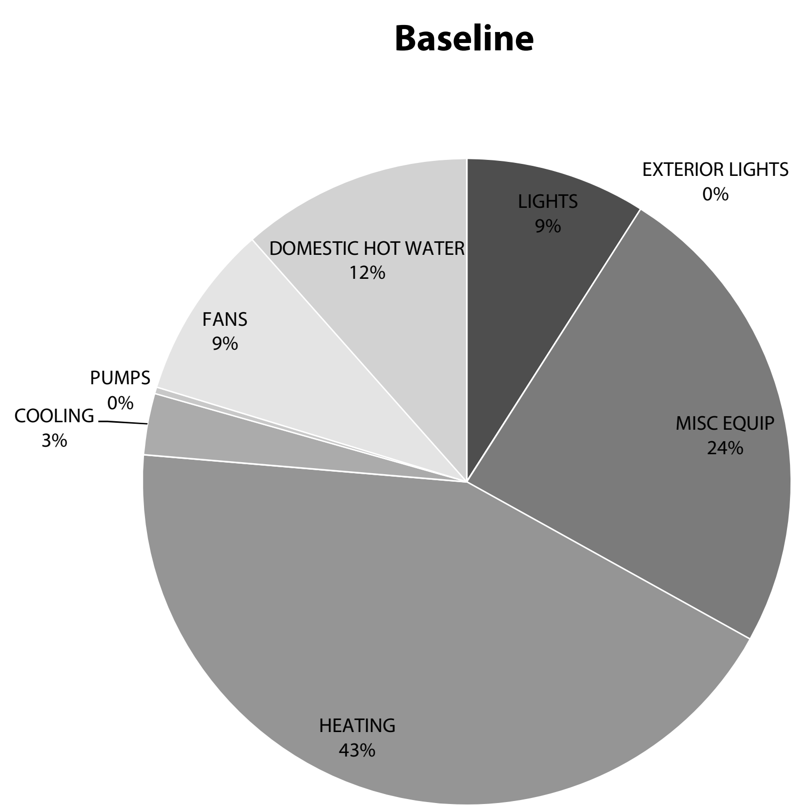

Proposed Design and Baseline End-Use | Monthly Comparison
1,200
1,000
800
600
400
200
0
40%
37%
33%
23%
13%
14%
16%
15%
10%
18%
31%
36%
Jan - B
Jan - D
Feb - B
Feb - D
Mar - B
Mar - D
Apr - B
Apr - D
May - B
May - D
Jun - B
Jun - D
Jul - B
Jul - D
Aug - B
Aug - D
Sep - B
Sep - D
Oct - B
Oct - D
Nov - B
Nov - D
Dec - B
Dec - D
Lights
Task Lights
Misc Equip
Space Heating
Space Cooling
Heat Reject
Pumps & Aux
Vent Fans
Refrig Display
Ht Pump Supplem
Domest Hot Wtr
Ext Usage

STRETCH CODE BASELINE MODEL

In order to evaluate the energy performance of the facility design, a Baseline energy model was developed to serve as a basis of comparison. The ASHRAE 90.1-2013 Appendix G Performance Rating Method with two additional efficiency package options (more efficient HVAC equipment performance and reduced lighting power density) was followed. A detail of model inputs is contained in the Appendix.

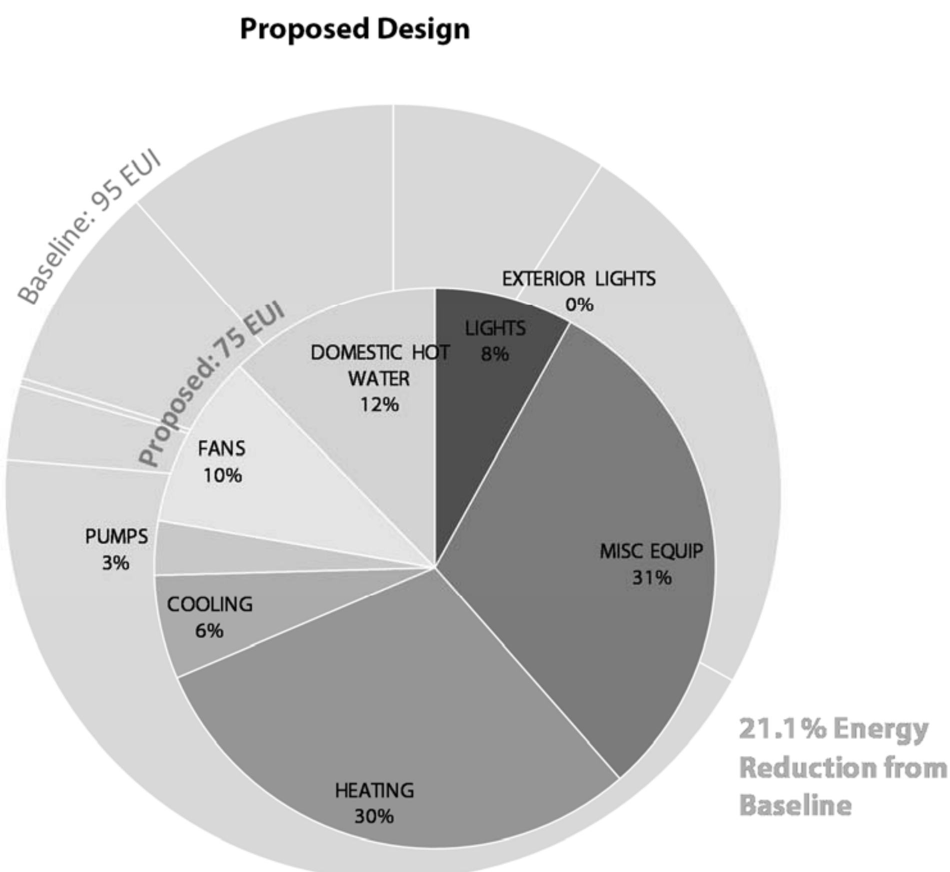
ASHRAE 90.1 BUILDING TYPE	Residential (Hotel)
ASHRAE 90.1 HVAC SYSTEM TYPE	Packaged terminal air conditioner
ASHRAE 90.1 COOLING TYPE	Direct expansion (DX)
ASHRAE 90.1 HEATING TYPE	Hot water fossil fuel boiler

To further understand how the design decisions are impacting the energy performance of the building, it is useful to view the Baseline model's annual energy consumption (kBTU) broken down by major end-use components.

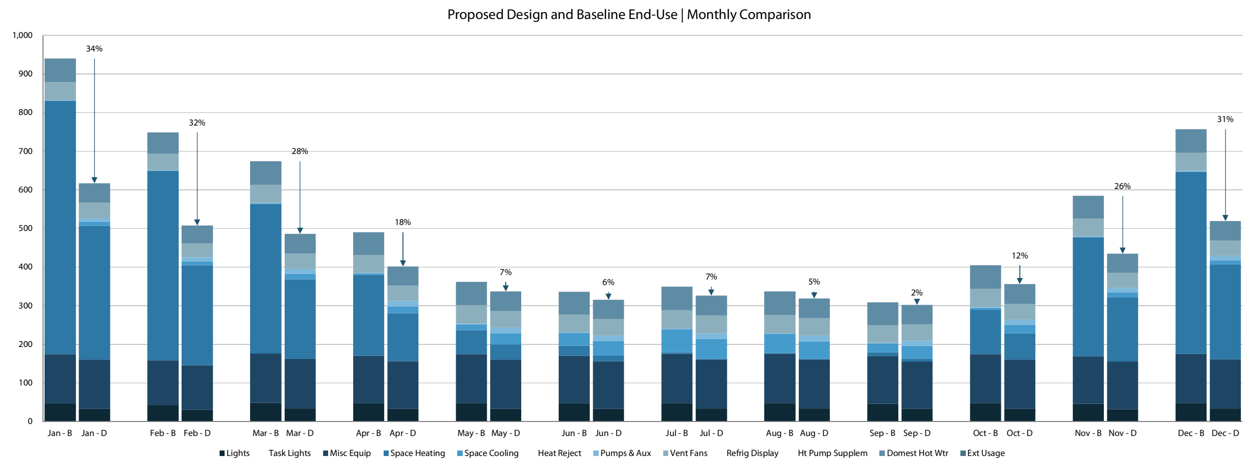


DESIGN MODEL

The Design Model for both cases is the same. The Design model's annual energy consumption (kBTU) broken down by major end-use components:



Proposed Design WSHPs w/ OA provided by ERUs						Baseline PTACs						
ELEC (kWh)	**NAT GAS** (therms)	**STEAM** (MBTU)	**CHW** (MBTU)	**Total Energy** (kBTU)	**% of Total**	**ELEC** (kWh)	**NAT GAS** (therms)	**STEAM** (MBTU)	**CHW** (MBTU)	**Total Energy** (kBTU)	**% of Total**	**Energy Savings (%)**
115,980				395,724	8%	165,114				563,369	9%	30%
					0%						0%	
257,285	6,263			1,504,156	31%	257,285	6,263			1,504,156	24%	0%
32,402	13,690			1,479,556	30%		27,027			2,702,675	43%	45%
86,731				295,926	6%	56,229				191,854	3%	-54%
147				502	0%						0%	
41,583	130			154,881	3%	2,186	130			20,457	0%	-657%
144,990				494,706	10%	160,401				547,287	9%	10%
					0%						0%	
	6,041			604,100	12%		7,192			719,200	12%	16%
679,118	26,124	-	-	4,929,551	100%	641,214	40,612	-	-	6,248,998	100%	
2,317,151	2,612,400	-	-	4,929,551		2,187,823	4,061,175	-	-	6,248,998		**Site Energy Savings**
					75						**95**	**21.11%**



METHODOLOGY

Vanderweil models energy performance using eQUEST 3.64, a software program that utilizes DOE-2.2 to simulate the hourly energy consumption and demand load shapes for a given building. To develop a model, a graphic representation of the building is created using floor plans, floor heights, and window configurations. Mechanical systems and building envelope are defined, and operating parameters such as lighting power density, airflow rates, and occupancy schedules are included. The simulation uses 30-year average hourly weather data to estimate the energy consumption of the building for each hour of the year.

LIMITATIONS

In order to estimate energy consumption profiles, Vanderweil utilizes traditional computer based simulation programs such as Trane Trace®, DOE-2, and/or our own in-house calculations and/or programs based on industry standard methods. Vanderweil neither has control of nor assumes control of the actual building and equipment operation and climatic conditions. Accordingly, Vanderweil does not expressly or implicitly warrant or represent that Vanderweil's energy and associated cost estimates of the building or equipment operation will be the actual operation energy and cost.

CODES & INDUSTRY STANDARDS

U.S. Green Building Council LEED for New Construction (LEED-NC) v4
ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Standard 62.1-2007 Ventilation for Acceptable Indoor Air Quality
2013 ASHRAE Handbook-Fundamentals

APPENDIX: Model Inputs

LEED Baseline vs Design

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
	LEED v4 (ASHRAE 90.1 2010)		
GENERAL INFORMATION Alexandra Hotel			
	Gross Area: 65,000 sf		
CLIMATE ZONE	5		ASHRAE 90.1 2010 Appendix G
WEATHER STATION	Boston, MA		DOE 2.2
BUILDING ORIENTATION	0		
OUTDOOR DESIGN CONDITIONS	7 °F HDD 91°F CDD Dry-Bulb 73°F CDD Wet-Bulb Range 15		
INDOOR DESIGN CONDITIONS	Summer 75F , Winter 70F		Assumed
PEAK OCCUPANT DENSITY	Hotel: 300 ft^2/person		Assumed
UTILITY RATES			
ELECTRICITY UTILITY RATE	16¢/kWh		EIA 2018 commercial average for MA
NATURAL GAS UTILITY RATE	$1.058/therm		EIA 2018 commercial average for MA
SUMMARY OF CONSTRUCTION MATERIALS			
ROOF CONSTRUCTION	Insulation Entirely Above Deck U-0.048	Insulation Entirely Above Deck U-0.032	Baseline: ASHRAE 90.1 2010 Table 5.5-5

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
WALL CONSTRUCTION	Steel-Framed U-0.064	Steel-Framed U-0.055	Baseline: ASHRAE 90.1 2010 Table 5.5-5
SLAB CONSTRUCTION	Uninsulated Slab F-0.73	Uninsulated Slab F-0.52	ASHRAE 90.1 2010 Table 5.5-5
INFILTRATION	A-C Infiltration .0139 cfm/SF	Same as Baseline	ASHRAE 90.1 G3.1.1.4
GLAZING DESCRIPTION (ASSEMBLY)	Metal framing (curtainwall/storefront) U=0.45 Conductance =.49 SHGC=0.40 SC=.465	Metal framing (curtainwall/storefront) U=0.35 Conductance =.37 SHGC=0.40 SC=.465	ASHRAE 90.1 2010 Table 5.5-5
WINDOW-TO-WALL RATIO	40% Combination of Curtain Wall and Punched Windows.	45% Combination of Curtain Wall and Punched Windows.	ASHRAE 90.1 2010
PLUG LOADS & LIGHTING			
EQUIPMENT POWER DENSITY	Hotel: .5 W/ft²	Same as Baseline	
Restaurant Process	Kitchen Make-up 3,500 cfm OA Gas Usage 202 kBtus/sf/yr	Same as Baseline	CEC Commercial End-Use Survey
LIGHTING POWER DENSITY	Hotel: 1. W/ft²	Hotel: .55 W/ft²	Baseline ASHRAE 90.1 2010 Table 9.5.1
LIGHTING CONTROLS	Time of day schedule Occupancy sensors in appropriate rooms	Same as Baseline	ASHRAE 90.1 2010 App. G
HVAC AIR SIDE SYSTEM SUMMARY			
HVAC SYSTEM - PRIMARY	Guest Rooms System 1 – PTAC Other System 5 – VAV with Reheat	Water-source heat pumps w/ ECM motors connected to the building condenser loop with condensing	ASHRAE 90.1 2010 App. G

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
		boiler and cooling tower Ventilation via DOAS with DX coil & gas furnace	
COOLING PERFORMANCE	PTACs: 9.3 EER .312 EIR PVAVs: 11 EER .2589 EIR	ERU: 11.4 EER 0.2475 EIR WLHP: 14 EER 0.2332 EIR	ASHRAE 90.1 2010 App. G
HEATING PERFORMANCE	Hot Water Boiler Design Efficiency 80%	WLHP: 4. COP	ASHRAE 90.1 2010 App. G
FAN CONTROL	Operate continuously for residential spaces, operate according to schedule for retail spaces	DOAS: Variable speed WSHPs: ECM motors	
MINIMUM FLOW	VAV: 30%	VAV: 30%	ASHRAE 90.1 2010 App. G
VENTILATION	11,800 CFM	11,800 CFM	
AIR-SIDE ECONOMIZER	OA Temp High-limit shutoff of 70°F	n/a	ASHRAE 90.1 2010 App. G
FAN POWER	PTAC Supply .0003 kW/cfm PVAV Supply .000950 W/cfm Return .000317 kW/cfm	WLHP Supply .0002 kW/cfm Return .000343 ERU Supply 4.5 in SP Return 2 in SP	ASHRAE 90.1 2010 App. G Fully ducted, return exhaust, Merv 13 filter, sound attenuation (SP allowance 1.15)
ENERGY RECOVERY (TYPE AND EFFECTIVENESS)	None	DOAS: Enthalpy Wheel Summer: 62% Winter: 62%	ASHRAE 90.1 2010
HVAC WATER SIDE SYSTEM SUMMARY			

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
CONDENSER WATER (CW) PLANT TYPE	N/A	Open circuit cooling towers with VFDs	ASHRAE 90.1 2010 App. G
CW SUPPLY TEMP	N/A	85°F	Assumed
CW RETURN TEMP	N/A	70°F	ASHRAE 90.1 2010 App. G
CW PUMP CONTROLS	N/A	VFD	ASHRAE 90.1 2010 App. G
HEATING PLANT TYPE	Gas-fired Boilers: 80% efficient	Condensing Boilers 93.4% efficient	
HEATING HOT WATER (HHW) SUPPLY TEMP (°F)	180°F	180°F	Best Practice
HHW LOOP DELTA T	50°F	50°F	Assumed
HHW SETPOINT CONTROL	180°F at 20°F and below, 150°F at 50°F and above, ramped linearly between 180°F and 150°F at temperatures between 20°F and 50°F.	180°F at 20°F and below, 150°F at 50°F and above, ramped linearly between 180°F and 150°F at temperatures between 20°F and 50°F.	ASHRAE 90.1 2010 App. G
PRIMARY HHW PUMP SPEED CONTROL	Variable-speed drives	Variable-speed drives	ASHRAE 90.1 2010 App. G
DOMESTIC HOT WATER	NG DHW heater, 15. GPM	NG DHW heater, 15. GPM	ASHRAE 90.1 2010 App. G

Stretch Code Baseline vs Design

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
	Stretch Code (ASHRAE 90.1 2013)		
GENERAL INFORMATION Alexandra Hotel			
	Gross Area: 65,000 sf		
CLIMATE ZONE	5		ASHRAE 90.1 2010 Appendix G
WEATHER STATION	Boston, MA		DOE 2.2
BUILDING ORIENTATION	0		
OUTDOOR DESIGN CONDITIONS	7 °F HDD 91°F CDD Dry-Bulb 73°F CDD Wet-Bulb Range 15		
INDOOR DESIGN CONDITIONS	Summer 75F , Winter 70F		Assumed
PEAK OCCUPANT DENSITY	Hotel: 300 ft^2/person		Assumed
UTILITY RATES			
ELECTRICITY UTILITY RATE	16¢/kWh		EIA 2018 commercial average for MA
NATURAL GAS UTILITY RATE	$1.058/therm		EIA 2018 commercial average for MA
SUMMARY OF CONSTRUCTION MATERIALS			
ROOF CONSTRUCTION	Insulation Entirely Above Deck U-0.032	Insulation Entirely Above Deck U-0.032	Baseline: ASHRAE 90.1 2013 Table 5.5-5
WALL CONSTRUCTION	Steel-Framed U-0.055	Steel-Framed U-0.055	Baseline: ASHRAE 90.1 2013 Table 5.5-5

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
SLAB CONSTRUCTION	Uninsulated Slab F-0.52	Same as Baseline	ASHRAE 90.1 2013 Table 5.5-5
INFILTRATION	A-C Infiltration .0139 cfm/SF	Same as Baseline	ASHRAE 90.1 G3.1.1.4
GLAZING DESCRIPTION (ASSEMBLY)	Metal framing (curtainwall/storefront) U=0.42 Conductance =.45 SHGC=0.40 SC=.465	Metal framing (curtainwall/storefront) U=0.35 Conductance =.37 SHGC=0.40 SC=.465	ASHRAE 90.1 2013 Table 5.5-5
WINDOW-TO-WALL RATIO	34% Combination of Curtain Wall and Punched Windows.	45% Combination of Curtain Wall and Punched Windows.	ASHRAE 90.1 2010
PLUG LOADS & LIGHTING			
EQUIPMENT POWER DENSITY	Hotel: .5 W/ft^2	Same as Baseline	
Restaurant Process	Kitchen Make-up 3,500 cfm OA Gas Usage 202 kBtus/sf/yr	Same as Baseline	CEC Commercial End-Use Survey
LIGHTING POWER DENSITY	Hotel: .783 W/ft^2	Hotel: .55 W/ft^2	ASHRAE 90.1 2013 Table 9.5.1 With Stretch Code 10% upgrade
LIGHTING CONTROLS	Time of day schedule Occupancy sensors in appropriate rooms	Same as Baseline	ASHRAE 90.1 2013 App. G
HVAC AIR SIDE SYSTEM SUMMARY			
HVAC SYSTEM - PRIMARY	Guest Rooms System 1 – PTAC Other System 5 – VAV with Reheat	Water-source heat pumps w/ ECM motors connected to the building condenser loop with condensing boiler and cooling tower	ASHRAE 90.1 2013 App. G

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
		Ventilation via DOAS with DX coil & gas furnace	
COOLING PERFORMANCE	PTACs: 10.5 EER .2722 EIR PVAVs: 13.4 EER .2047 EIR	ERU: 11.4 EER 0.2475 EIR WLHP: 14 EER 0.2332 EIR	ASHRAE 90.1 2013 Table 6.8.7-4 With Stretch Code 10% upgrade
HEATING PERFORMANCE	Hot Water Boiler Design Efficiency 88%	WLHP: 4 COP	ASHRAE 90.1 2013 Table 6.8.7-4 With Stretch Code 10% upgrade
FAN CONTROL	Operate continuously for residential spaces, operate according to schedule for retail spaces	DOAS: Variable speed WSHPs: ECM motors	ASHRAE 90.1 2013 App. G
MINIMUM FLOW	VAV: 30%	VAV: 30%	ASHRAE 90.1 2013 App. G
VENTILATION	11,800 CFM	11,800 CFM	ASHRAE 90.1 2013 App. G
AIR-SIDE ECONOMIZER	OA Temp High-limit shutoff of 70°F	n/a	ASHRAE 90.1 2013 App. G
FAN POWER	PTAC Supply .0003 kW/cfm PVAV Supply .000950 W/cfm Return .000317 kW/cfm	WLHP Supply .0002 kW/cfm Return .000343 ERU Supply 4.5 in SP Return 2 in SP	ASHRAE 90.1 2013 App. G Fully ducted, return exhaust, Merv 13 filter, sound attenuation (SP allowance 1.15)
ENERGY RECOVERY (TYPE AND EFFECTIVENESS)	None	DOAS: Enthalpy Wheel Summer: 62% Winter: 62%	ASHRAE 90.1 2013 App. G

HVAC WATER SIDE SYSTEM SUMMARY

INPUT PARAMETER	BASELINE	PROPOSED DESIGN	INPUT SOURCE(S) Baseline/Design
CONDENSER WATER (CW) PLANT TYPE	N/A	Open circuit cooling towers with VFDs	ASHRAE 90.1 2013 App. G
CW SUPPLY TEMP	N/A	85°F	Assumed
CW RETURN TEMP	N/A	70°F	ASHRAE 90.1 2013 App. G
CW PUMP CONTROLS	N/A	VFD	ASHRAE 90.1 2010 App. G
HEATING PLANT TYPE	Gas-fired Boilers: 88% efficient	Condensing Boilers 93.4% efficient	ASHRAE 90.1 2013 Table 6.8.7-4 With Stretch Code 10% upgrade
HEATING HOT WATER (HHW) SUPPLY TEMP (°F)	180°F	14°F	Best Practice
HHW LOOP DELTA T	50°F	50°F	Assumed
HHW SETPOINT CONTROL	180°F at 20°F and below, 150°F at 50°F and above, ramped linearly between 180°F and 150°F at temperatures between 20°F and 50°F.	180°F at 20°F and below, 150°F at 50°F and above, ramped linearly between 180°F and 150°F at temperatures between 20°F and 50°F.	ASHRAE 90.1 2010 App. G
PRIMARY HHW PUMP SPEED CONTROL	Variable-speed drives	Variable-speed drives	ASHRAE 90.1 2010 App. G
DOMESTIC HOT WATER	NG DHW heater, 1.75. GPM	NG DHW heater, 1.75. GPM	ASHRAE 90.1 2010 App. G

VANDERWEIL

BUILDING PERFORMANCE GROUP

Sustainable Design & Performance Analysis
Post-Occupancy Energy Evaluation
Sustainability Project Management
Building Physics & Analysis
Sustainability Education
LEED Services

INNOVATE INVESTIGATE INFORM

Appendix G

Climate Resiliency Checklist

Boston Planning & Development Agency
Climate Resiliency Report Summary

boston planning & development agency

Submitted: 11/29/2018 13:43:22

A.1 - Project Information

Project Name:	Hotel Alexandra			
Project Address:	1767-1769 Washington Street			
Filing Type:	Initial (PNF, EPNF, NPC or other substantial filing)			
Filing Contact:	Talya Moked	Epsilon Associates	tmoked@epsilonassociates.com	9784616223
Is MEPA approval required?	No	MEPA date:		

A.2 - Project Team

Owner / Developer:	Alexandra Partners, LLC
Architect:	CBT Architects
Engineer:	Vanderweil Engineers
Sustainability / LEED:	The Green Engineer
Permitting:	Epsilon Associates, Inc
Construction Management:	TBD

A.3 - Project Description and Design Conditions

List the principal Building Uses:	Hotel
List the First Floor Uses:	Hotel lobby, cafe, restaurant
List any Critical Site Infrastructure and or Building Uses:	

Site and Building:

Site Area (SF):	8025	Building Area (SF):	66000
Building Height (Ft):	144	Building Height (Stories):	12
Existing Site Elevation – Low (Ft BCB):	16.6	Existing Site Elevation – High (Ft BCB):	16.9
Proposed Site Elevation – Low (Ft BCB):	16.6	Proposed Site Elevation – High (Ft BCB):	16.9
Proposed First Floor Elevation (Ft BCB):	16.9	Below grade spaces/levels (#):	1

Article 37 Green Building:

LEED Version - Rating System:	LEED V4	LEED Certification:	
Proposed LEED rating:	Certified	Proposed LEED point score (Pts.):	45

Building Envelope:

When reporting R values, differentiate between R discontinuous and R continuous. For example, use “R13” to show R13 discontinuous and use R10c.i. to show R10 continuous. When reporting U value, report total assembly U value including supports and structural elements.

Roof:	00.32 c.i.	Exposed Floor :	
Foundation Wall:		Slab Edge (at or below grade):	0.52 F

Vertical Above-grade Assemblies (%'s are of total vertical area and together should total 100%):

Area of Opaque Curtain Wall & Spandrel Assembly:		Wall & Spandrel Assembly Value:	
Area of Framed & Insulated / Standard Wall:	55	Wall Value:	0.055 U
Area of Vision Window:	45	Window Glazing Assembly Value:	0.35
		Window Glazing SHGC:	0.40
Area of Doors:	1	Door Assembly Value :	0.29

Energy Loads and Performance

For this filing – describe how energy loads & performance were determined	An energy model using DOE software was run		
Annual Electric (kWh):	564000	Peak Electric (kW):	720
Annual Heating (MMbtu/hr):	1464	Peak Heating (MMbtu):	5500
Annual Cooling (Tons/hr):	21600	Peak Cooling (Tons):	245
Energy Use - Below ASHRAE 90.1 - 2013 (%):	21	Have the local utilities reviewed the building energy performance?:	No
Energy Use - Below Mass. Code (%):	11	Energy Use Intensity (kBtu/SF):	56

Back-up / Emergency Power System

Electrical Generation Output (kW):	300	Number of Power Units:	1
System Type (kW):	Diesel Generator	Fuel Source:	Diesel

Emergency and Critical System Loads (in the event of a service interruption)

Electric (kW):	300	Heating (MMbtu/hr):	1500
		Cooling (Tons/hr):	0

B – Greenhouse Gas Reduction and Net Zero / Net Positive Carbon Building Performance

Boston Planning & Development Agency
Climate Resiliency Report Summary

Reducing greenhouse gas emissions is critical to avoiding more extreme climate change conditions. To achieve the City's goal of carbon-neutrality by 2050 the performance of new buildings will need to progressively improve to carbon net zero and net positive.

B.1 – GHG Emissions - Design Conditions

For this filing - Annual Building GHG Emissions (Tons): 313

For this filing - describe how building energy performance has been integrated into project planning, design, and engineering and any supporting analysis or modeling:

Sustainable design and energy efficiency goals and strategies were discussed as team early in the design process, and a preliminary energy model has been conducted.

Describe building specific passive energy efficiency measures including orientation, massing, building envelop, and systems:

Describe building specific active energy efficiency measures including high performance equipment, controls, fixtures, and systems:

Energy efficiency measures will include: efficient mechanical equipment (condensing boilers/water heater heaters, efficient water source heat pumps with electrically commutated motors, over-sized cooling towers), low flow shower fixtures (1.75 gpm anticipated), a direct digital control system to enhance monitoring of energy usage systems, high performance lighting (lower lighting power density than code) and automatic lighting controls in public areas.

An automated guestroom climate control system (whereby the heating/cooling is automatically set-back when guestrooms are unoccupied) will be considered.

Describe building specific load reduction strategies including on-site renewable energy, clean energy, and storage systems:

Describe any area or district scale emission reduction strategies including renewable energy, central energy plants, distributed energy systems, and smart grid infrastructure:

Describe any energy efficiency assistance or support provided or to be provided to the project:

As the design progresses, the design team will reach out to the utility companies to discuss available energy efficiency incentives.

B.2 - GHG Reduction - Adaptation Strategies

Describe how the building and its systems will evolve to further reduce GHG emissions and achieve annual carbon net zero and net positive performance (e.g. added efficiency measures, renewable energy, energy storage, etc.) and the timeline for meeting that goal (by 2050):

The building will be engineered to be convertible to all-electric fuel sources by 2050 when the utility electric grid is de-carbonized. The building will be engineered to allow the future replacement of natural-gas fired boilers/hot water heaters with electric boilers/hot water heaters in the future. The cooling system will be electric from 'Day One'.

C - Extreme Heat Events

Annual average temperature in Boston increased by about 2˚F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.

C.1 – Extreme Heat - Design Conditions

Temperature Range - Low (Deg.):	8	Temperature Range - High (Deg.):	81
Annual Heating Degree Days:		Annual Cooling Degree Days	

What Extreme Heat Event characteristics will be / have been used for project planning

Days - Above 90° (#):	60	Days - Above 100° (#):	30
Number of Heatwaves / Year (#):	6	Average Duration of Heatwave (Days):	5

Describe all building and site measures to reduce heat-island effect at the site and in the surrounding area:

The heat island effect will be reduced by specifying light colored roof and hardscape materials, to the extent possible.

C.2 - Extreme Heat – Adaptation Strategies

Describe how the building and its systems will be adapted to efficiently manage future higher average temperatures, higher extreme temperatures, additional annual heatwaves, and longer heatwaves:

The building heating system will be engineered to be modular – so additional heating capacity can be added in the future as lower extreme cold temperatures materialize. The cooling systems will be engineered to be adaptable to hotter summer extreme temperatures and heat waves by running the cooling tower fans faster and ultimately replacing the cooling towers with larger ones to allow the air-conditioning to work at these higher temperatures.

The direct digital control system will allow building operators to selectively shut down parts of the building that are not in use to "load shed" i.e. direct cooling capacity to the parts of the building with occupants.

Describe all mechanical and non-mechanical strategies that will support building functionality and use during extended interruptions of utility services and infrastructure including proposed and future adaptations:

A boiler and associated pump will be on generator power, to provide freeze protection in an electrical outage. The domestic hot water generator and associated circulation system may also be put on generator to provide domestic hot water to building occupants during a power outage. Life safety systems will be provided with generator back up. The optional standby power branch of the generator power distribution system will be designed to allow additional building systems to be put on generator in the future – such as receptacles in public areas to allow food preparation in an emergency.

Non-mechanical strategies include operable windows in the guestrooms which will allow occupants to get limited natural ventilation during an outage.

D - Extreme Precipitation Events

From 1958 to 2010, there was a 70 percent increase in the amount of precipitation that fell on the days with the heaviest precipitation. Currently, the 10-Year, 24-Hour Design Storm precipitation level is 5.25”. There is a significant probability that this will increase to at least 6” by the end of the century. Additionally, fewer, larger storms are likely to be accompanied by more frequent droughts.

D.1 – Extreme Precipitation - Design Conditions

What is the project design precipitation level? (In. / 24 Hours)	6

Describe all building and site measures for reducing storm water run-off:

The Project will incorporate an infiltration system and other storm water best management practices to the greatest extent practicable in an effort to reduce storm water run-off and improve run-off quality.

D.2 - Extreme Precipitation - Adaptation Strategies

Describe how site and building systems will be adapted to efficiently accommodate future more significant rain events (e.g. rainwater harvesting, on-site storm water retention, bio swales, green roofs):

Design adaptations to efficiently accommodate extreme precipitation events will be discussed with the Project team, viable solutions will be incorporated into the design. Possible design adaptations include but are not limited to permeable pavement, landscape features, backflow prevention equipment, an emergency power system and elevated mechanical systems.

E – Sea Level Rise and Storms

Boston Planning & Development Agency
Climate Resiliency Report Summary

Under any plausible greenhouse gas emissions scenario, the sea level in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.

Is any portion of the site in a FEMA Special Flood Hazard Area?	No	What Zone:	
		What is the current FEMA SFHA Zone Base Flood Elevation for the site (Ft BCB)?	
Is any portion of the site in the BPDA Sea Level Rise Flood Hazard Area (see SLR-FHA online map)?	Yes		

If you answered YES to either of the above questions, please complete the following questions.
Otherwise you have completed the questionnaire; thank you!

E.1 – Sea Level Rise and Storms – Design Conditions

Proposed projects should identify immediate and future adaptation strategies for managing the flooding scenario represented by the Sea Level Rise Flood Hazard Area (SLR-FHA), which includes 3.2' of sea level rise above 2013 tide levels, an additional 2.5" to account for subsidence, and the 1% Annual Chance Flood. After using the SLR-FHA to identify a project's Sea Level Rise Base Flood Elevation, proponents should calculate the Sea Level Rise Design Flood Elevation by adding 12" of freeboard for buildings, and 24" of freeboard for critical facilities and infrastructure and any ground floor residential units.

What is the Sea Level Rise - Base Flood Elevation for the site (Ft BCB)?	17.9		
What is the Sea Level Rise - Design Flood Elevation for the site (Ft BCB)?	19.9	First Floor Elevation (Ft BCB):	16.9
What are the Site Elevations at Building (Ft BCB)?		What is the Accessible Route Elevation (Ft BCB)?	

Describe site design strategies for adapting to sea level rise including building access during flood events, elevated site areas, hard and soft barriers, wave / velocity breaks, storm water systems, utility services, etc.:

> The project site will be designed with storm water BMPs that mitigate the impacts of extreme precipitation events and ensure the building is accessible during emergency storm and flood events.

Describe how the proposed Building Design Flood Elevation will be achieved including dry / wet flood proofing, critical systems protection, utility service protection, temporary flood barriers, waste and drain water back flow prevention, etc.:

> Design measures to achieve the proposed Building Design Flood Elevation will be discussed with the Project team and applied where feasible, hotel spaces will be above the design flood elevation. The implementation of backflow prevention to the sanitary and storm

drainage systems, critical systems protection and utility service protection will be considered.

Describe how occupants might shelter in place during a flooding event including any emergency power, water, and waste water provisions and the expected availability of any such measures:

The basement gravity out-falls will be protected by check-valves on the sewer and storm water lines existing the building, which will reduce the likelihood of surcharging these lines during a flood.

Emergency power generation will be done on the roof, protected from flooding. A water proof fuel oil tank and pump (located in the basement) will feed the generator. This should help the building life safety systems (emergency lighting, fire alarm, stair pressurization) continue operating during a flood.

The potable water system should continue to operate during a flood, so water will be available in rooms.

The building sanitary system will largely be gravity drained (no pump) so this should work unless and until there is a surcharge of the system.

Describe any strategies that would support rapid recovery after a weather event:

Standard commercial equipment will be used, which can be replaced more rapidly than customized equipment, if damaged in an event. A modular approach will be used for boilers, hot water heaters and pumps whereby individual units can be replaced without taking down the entire heating / domestic hot water system.

E.2 – Sea Level Rise and Storms – Adaptation Strategies

Describe future site design and or infrastructure adaptation strategies for responding to sea level rise including future elevating of site areas and access routes, barriers, wave / velocity breaks, storm water systems, utility services, etc.:

The project will be designed to incorporate utility and critical systems protection. Further design adaptations to respond to sea level rise will be explored.

Describe future building adaptation strategies for raising the Sea Level Rise Design Flood Elevation and further protecting critical systems, including permanent and temporary measures:

Building adaptation strategies for raising the Sea Level Rise Design Flood Elevation will be explored by Project team and applied where feasible.

Thank you for completing the Boston Climate Change Checklist!

For questions or comments about this checklist or Climate Change best practices, please contact: John.Dalzell@boston.gov

Appendix H

Accessibility Checklist

Article 80 – Accessibility Checklist

A requirement of the Boston Planning & Development Agency (BPDA)
Article 80 Development Review Process

The Mayor's Commission for Persons with Disabilities strives to reduce architectural, procedural, attitudinal, and communication barriers that affect persons with disabilities in the City of Boston. In 2009, a Disability Advisory Board was appointed by the Mayor to work alongside the Commission in creating universal access throughout the city's built environment. The Disability Advisory Board is made up of 13 volunteer Boston residents with disabilities who have been tasked with representing the accessibility needs of their neighborhoods and increasing inclusion of people with disabilities.

In conformance with this directive, the BDPA has instituted this Accessibility Checklist as a tool to encourage developers to begin thinking about access and inclusion at the beginning of development projects, and strive to go beyond meeting only minimum MAAB / ADAAG compliance requirements. Instead, our goal is for developers to create ideal design for accessibility which will ensure that the built environment provides equitable experiences for all people, regardless of their abilities. As such, any project subject to Boston Zoning Article 80 Small or Large Project Review, including Institutional Master Plan modifications and updates, must complete this Accessibility Checklist thoroughly to provide specific detail about accessibility and inclusion, including descriptions, diagrams, and data.

For more information on compliance requirements, advancing best practices, and learning about progressive approaches to expand accessibility throughout Boston's built environment. Proponents are highly encouraged to meet with Commission staff, prior to filing.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
   http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Massachusetts State Building Code 780 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/building-codebbrs.html
4. Massachusetts Office of Disability – Disabled Parking Regulations
   http://www.mass.gov/anf/docs/mod/hp-parking-regulations-summary-mod.pdf
5. MBTA Fixed Route Accessible Transit Stations
   http://www.mbta.com/riding_the_t/accessible_services/
6. City of Boston – Complete Street Guidelines
   http://bostoncompletestreets.org/
7. City of Boston – Mayor's Commission for Persons with Disabilities Advisory Board
   www.boston.gov/disability
8. City of Boston – Public Works Sidewalk Reconstruction Policy
   http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
9. City of Boston – Public Improvement Commission Sidewalk Café Policy
   http://www.cityofboston.gov/images_documents/Sidewalk_cafes_tcm3-1845.pdf

Glossary of Terms:

1. ***Accessible Route*** – A continuous and unobstructed path of travel that meets or exceeds the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 20
2. ***Accessible Group 2 Units*** – Residential units with additional floor space that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 9.4
3. ***Accessible Guestrooms*** – Guestrooms with additional floor space, that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 8.4
4. ***Inclusionary Development Policy (IDP)*** – Program run by the BPDA that preserves access to affordable housing opportunities, in the City. For more information visit: http://www.bostonplans.org/housing/overview
5. ***Public Improvement Commission (PIC)*** – The regulatory body in charge of managing the public right of way. For more information visit: https://www.boston.gov/pic
6. ***Visitability*** – A place's ability to be accessed and visited by persons with disabilities that cause functional limitations; where architectural barriers do not inhibit access to entrances/doors and bathrooms.

1. Project Information: *If this is a multi-phased or multi-building project, fill out a separate Checklist for each phase/building.*				
Project Name:	Hotel Alexandra			
Primary Project Address:	1767 Washington Street, Boston, MA 02118			
Total Number of Phases/Buildings:	1			
Primary Contact (Name / Title / Company / Email / Phone):				
Owner / Developer:	Alexandra Partners, LLC			
Architect:	CBT Architects			
Civil Engineer:	Howard Stein Hudson			
Landscape Architect:	Copley Wolff Design Group			
Permitting:	Epsilon Associates, Inc			
Construction Management:	TBD			
At what stage is the project at time of this questionnaire? Select below:				
	☑PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BPDA Board Approved	
	BPDA Design Approved	Under Construction	Construction Completed:	
Do you anticipate filing for any variances with the Massachusetts Architectural Access Board (MAAB)? ***If yes,*** identify and explain.				
2. Building Classification and Description: *This section identifies preliminary construction information about the project including size and uses.*				
What are the dimensions of the project?				
Site Area:	*8,025 SF*	Building Area:	*66,000 GSF*	
Building Height:	*144 FT.*	Number of Stories:	*12 Flrs.*	
First Floor Elevation:	16.9 BCB	Is there below grade space:	*Yes*	
What is the Construction Type? (Select most appropriate type)				
	Wood Frame	☑Masonry	Steel Frame	Concrete
What are the principal building uses? (IBC definitions are below – select all appropriate that apply)				
	Residential – One - Three Unit	Residential - Multi-unit, Four +	Institutional	Educational

	Business	Mercantile	Factory	☑Hospitality
	Laboratory / Medical	Storage, Utility and Other		
List street-level uses of the building:	*Hotel Lobby, Café, Restaurant*			

3. Assessment of Existing Infrastructure for Accessibility:

This section explores the proximity to accessible transit lines and institutions, such as (but not limited to) hospitals, elderly & disabled housing, and general neighborhood resources. Identify how the area surrounding the development is accessible for people with mobility impairments and analyze the existing condition of the accessible routes through sidewalk and pedestrian ramp reports.

Provide a description of the neighborhood where this development is located and its identifying topographical characteristics:	The project site has a strong presence at the southeast corner of the intersection of Washington Street and Massachusetts Avenue in the South End neighborhood of Boston. This neighborhood is characterized by Victorian era brick row houses and is topographically relatively flat.
List the surrounding accessible MBTA transit lines and their proximity to development site: commuter rail / subway stations, bus stops:	The MBTA Silver Line stops in front of the property on Washington Street. Numerous bus lines run on both Washington Street and Massachusetts Avenue.
List the surrounding institutions: hospitals, public housing, elderly and disabled housing developments, educational facilities, others:	**Affordable/Public Housing**: Boston Housing Authority on 155 Northampton Street **Hospital**: Boston Medical Center on 1 Boston Medical Center Place **Educational**: Boston University Medical School on 715 Albany Street
List the surrounding government buildings: libraries, community centers, recreational facilities, and other related facilities:	**Community**: Cooper Community Center on 1891 Washington Street

4. Surrounding Site Conditions – Existing:

This section identifies current condition of the sidewalks and pedestrian ramps at the development site.

Is the development site within a historic district? ***If yes,*** identify which district:	Yes. The Project site is within the South End Landmark District
Are there sidewalks and pedestrian ramps existing at the development site? ***If yes***, list the existing sidewalk and pedestrian ramp dimensions, slopes, materials, and physical condition at the development site:	Yes. Massachusetts Avenue sidewalks are approximately 8'-0" wide and sidewalks on Washington Street vary in width between approximately 31'-1" and 37'-6". Concrete ramps are 5'-0" wide with a slope of 4.7%. Existing sidewalks material are brick pavers with concrete ramps. Conditions of these elements are fair to good.

Are the sidewalks and pedestrian ramps existing-to-remain? ***If yes,*** have they been verified as ADA / MAAB compliant (with yellow composite detectable warning surfaces, cast in concrete)? ***If yes,*** provide description and photos:	No. The existing sidewalks are to be removed and replaced with new. Yes. The existing pedestrian ramps are to remain. No, the existing pedestrian ramps have not been verified as being in compliance at this time but will be verified during the project design.

5. Surrounding Site Conditions – Proposed

This section identifies the proposed condition of the walkways and pedestrian ramps around the development site. Sidewalk width contributes to the degree of comfort 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. Wider sidewalks allow people to walk side by side and pass each other comfortably walking alone, walking in pairs, or using a wheelchair.

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? ***If yes***, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, or Boulevard.	Yes. Washington Street [“Neighborhood Connector” – defined on page 9 of the “Street Types” in BCS Guidelines] Massachusetts Avenue [“Downtown Mixed Use” – as interpreted from page 7 in BCS Guidelines]
What are the total dimensions and slopes of the proposed sidewalks? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone:	Currently the two streets are not segmented into the BCS outline of Frontage, Pedestrian Zone, Greenscape/Furnishing Zone, and curb. WASHINGTON STREET: The proposed sidewalk widths on Washington Street within the public way will vary from the existing 30-feet at the intersection that is being retained, to 24’-3” at the proposed valet area. Washington Street does have the minimum widths to support the minimum and preferred dimensions outlined for Neighborhood Connector outlined in the BCS Guidelines. MASSACHUSETTS AVENUE: The existing sidewalk widths on Massachusetts Avenue will not change from the existing width of 7’-6”+. This existing condition is not wide enough to achieve the minimum dimensions outlined for Downtown Mixed-Use in the BCS Guidelines.
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?	This has not yet been determined. Frontage Zone [Specialty paver units to the project property line] Pedestrian Zone [Concrete pavement in the accessible path-of-travel] Greenscape/Furnishing Zone [permeable paver units except in areas requiring accessible surfacing]
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way? ***If yes,*** what are the proposed dimensions of the sidewalk café or furnishings and	Yes. Frontage Zone: Proposed sidewalk café would extend 8’-0” into the pedestrian right-of-way on Washington Street. The remaining right-of-way clearance varies between 16’-6” and 22’-6”.

what will the remaining right-of-way clearance be?	
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the Public Improvement Commission (PIC)?	The pedestrian right of way will not exist on private property. No easement is requested Frontage Zone is proposed at 8'-0". The Pedestrian Zone will be maintained at a minimum of 14'-6".
Will any portion of the Project be going through the PIC? ***If yes,*** identify PIC actions and provide details.	Yes – PIC, and CPD [Commission for Persons with Disabilities to review accessibility widths, materials and limits in the public way]
6. 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 – Disabled Parking Regulations*.	
What is the total number of parking spaces provided at the development site? Will these be in a parking lot or garage?	No parking spaces will be provided. A drop-off zone for hotel guests will be located on Washington Street.
What is the total number of accessible spaces provided at the development site? How many of these are "Van Accessible" spaces with an 8 foot access aisle?	No parking spaces are provided, but an accessible drop-off zone for hotel guests will be located on Washington Street.
Will any on-street accessible parking spaces be required? ***If yes,*** has the proponent contacted the Commission for Persons with Disabilities regarding this need?	No.
Where is the accessible visitor parking located?	Drop off zone for hotel guests will be located on Washington Street.
Has a drop-off area been identified? ***If yes,*** will it be accessible?	Yes. Drop off zone for hotel guests will be located on Washington Street.
7. Circulation and Accessible Routes: *The primary objective in designing smooth and continuous paths of travel is to create universal access to entryways and common spaces, which accommodates persons of all abilities and allows for visitability with neighbors*.	

Describe accessibility at each entryway: Example: Flush Condition, Stairs, Ramp, Lift or Elevator:	Flush Condition at all public entryways. The ground floor access will be flush with the sidewalk grade. This will enable access and promote "Visit-ability". The building is serviced by elevators and flush condition at the entryway. All common areas are accessible.
Are the accessible entrances and standard entrance integrated? ***If yes,*** *describe.* ***If no***, what is the reason?	Yes. The ground floor access will be flush with the sidewalk grade.
If project is subject to Large Project Review/Institutional Master Plan, describe the accessible routes way-finding / signage package.	All future way finding signage will be developed to meet Building Code and Accessibility Board Requirements.
8. Accessible Units (Group 2) and Guestrooms: (If applicable) *In order to facilitate access to housing and hospitality, this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing and hotel rooms.*	
What is the total number of proposed housing units or hotel rooms for the development?	150 hotel rooms.
If a residential development, how many units are for sale? How many are for rent? What is the breakdown of market value units vs. IDP (Inclusionary Development Policy) units?	Not applicable.
If a residential development, how many accessible Group 2 units are being proposed?	Not applicable.
If a residential development, how many accessible Group 2 units will also be IDP units? ***If none***, describe reason.	Not applicable.
If a hospitality development, how many accessible units will feature a wheel-in shower? Will accessible equipment be provided as well? ***If yes,*** provide amount and location of equipment.	8 accessible rooms will be provided including 2 with roll-in showers, planned for Levels 2 through 4.

Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs / thresholds at entry, step to balcony, others. *If yes*, provide reason.	No.
Are there interior elevators, ramps or lifts located in the development for access around architectural barriers and/or to separate floors? *If yes*, describe:	Yes, elevators are provided to access each floor.

9. **Community Impact:**
Accessibility and inclusion extend past required compliance with building codes. Providing an overall scheme that allows full and equal participation of persons with disabilities makes the development an asset to the surrounding community.

Is this project providing any funding or improvements to the surrounding neighborhood? Examples: adding extra street trees, building or refurbishing a local park, or supporting other community-based initiatives?	Yes. The proposed design intends to provide some street trees and discussions with the neighborhood for community-based initiatives are ongoing, including potentially moving the bus stop and kiosk.
What inclusion elements does this development provide for persons with disabilities in common social and open spaces? Example: Indoor seating and TVs in common rooms; outdoor seating and barbeque grills in yard. Will all of these spaces and features provide accessibility?	All guest and common public areas of the building are accessible including: fitness center on Level 0; lobby, lounge, café, restaurant, and bar areas on Level 1; and bar, lounge, and outdoor patio areas on Level 12. These areas will accommodate accessible access and seating.
Are any restrooms planned in common public spaces? *If yes,* will any be single-stall, ADA compliant and designated as “Family”/ “Companion” restrooms? *If no*, explain why not.	Yes. On Level 0 there will be two accessible single non-gender specific bathrooms. On Level 1 there will be accessible gender specific bathrooms. On Level 12 there will be accessible gender specific bathrooms.
Has the proponent reviewed the proposed plan with the City of Boston Disability Commissioner or with their Architectural Access staff?	Not at this time. This will be done during the review period for the PNF.

If yes, did they approve? *If no,* what were their comments?	
Has the proponent presented the proposed plan to the Disability Advisory Board at one of their monthly meetings? Did the Advisory Board vote to support this project? *If no,* what recommendations did the Advisory Board give to make this project more accessible?	Not at this time. This will be done during the review period for the PNF.

10. Attachments

Include a list of all documents you are submitting with this Checklist. This may include drawings, diagrams, photos, or any other material that describes the accessible and inclusive elements of this project.

Provide a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations, including route distances.
Provide a diagram of the accessible route connections through the site, including distances.
Provide a diagram the accessible route to any roof decks or outdoor courtyard space? (if applicable)
Provide a plan and diagram of the accessible Group 2 units, including locations and route from accessible entry.
Provide any additional drawings, diagrams, photos, or any other material that describes the inclusive and accessible elements of this project. • • • •

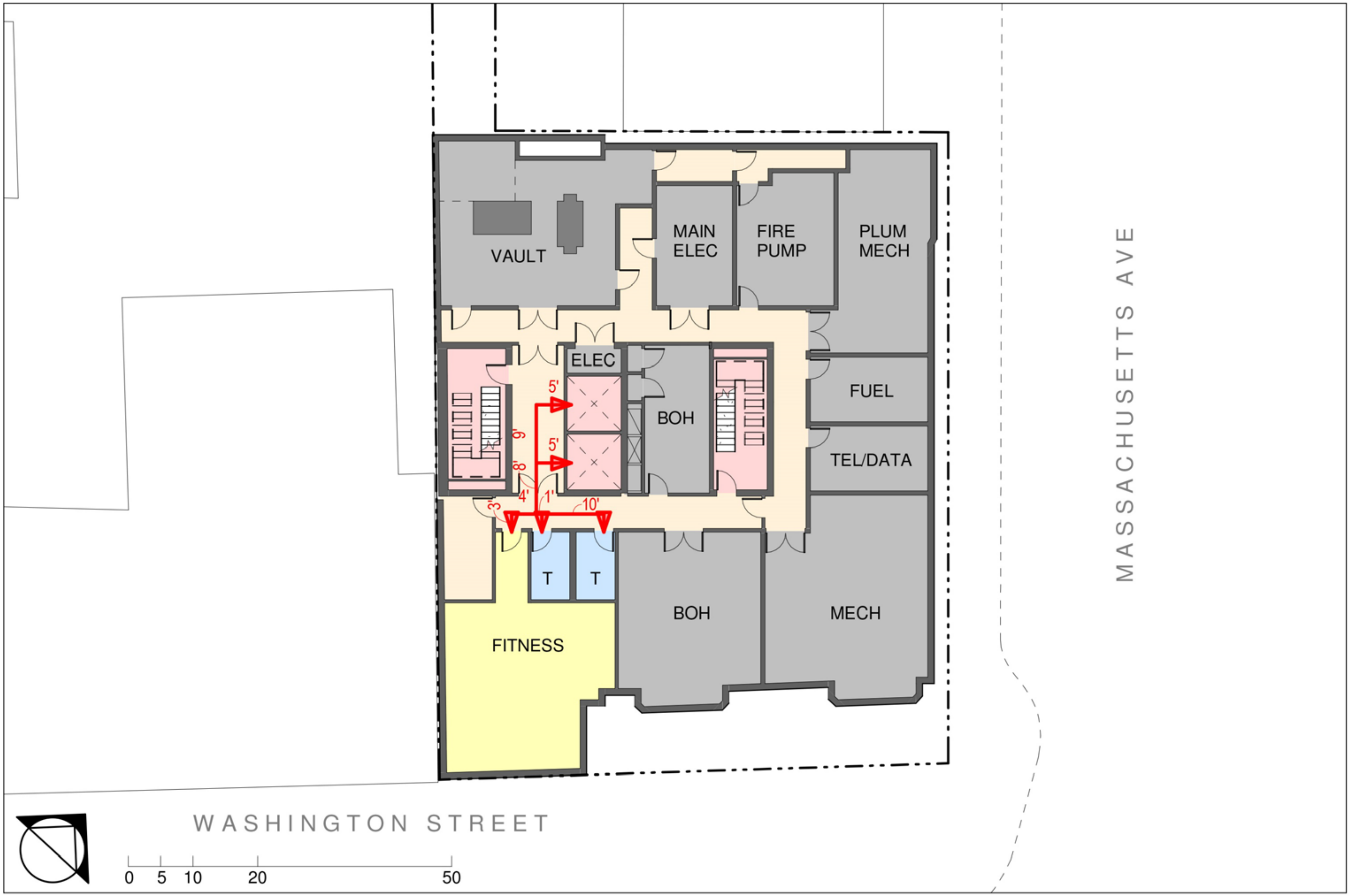
This completes the Article 80 Accessibility Checklist required for your project. Prior to and during the review process, Commission staff are able to provide technical assistance and design review, in order to help achieve ideal accessibility and to ensure that all buildings, sidewalks, parks, and open spaces are usable and welcoming to Boston's diverse residents and visitors, including those with physical, sensory, and other disabilities.

For questions or comments about this checklist, or for more information on best practices for improving accessibility and inclusion, visit www.boston.gov/disability, or our office:

The Mayor's Commission for Persons with Disabilities
1 City Hall Square, Room 967,
Boston MA 02201.

Architectural Access staff can be reached at:

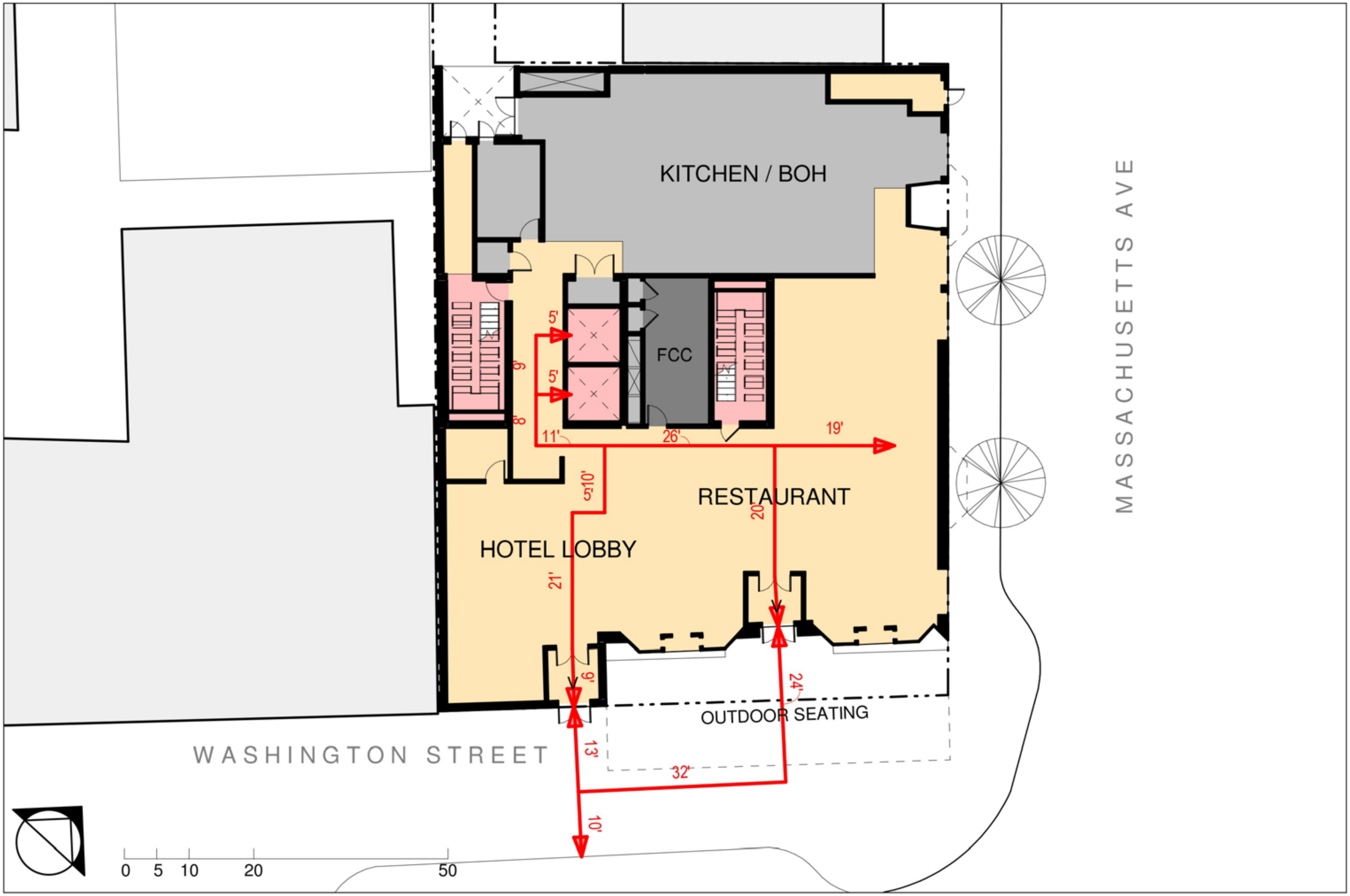
accessibility@boston.gov | patricia.mendez@boston.gov | sarah.leung@boston.gov | 617-635-3682



Hotel Alexandra Boston, Massachusetts

cbt

Basement Accessibility Plan



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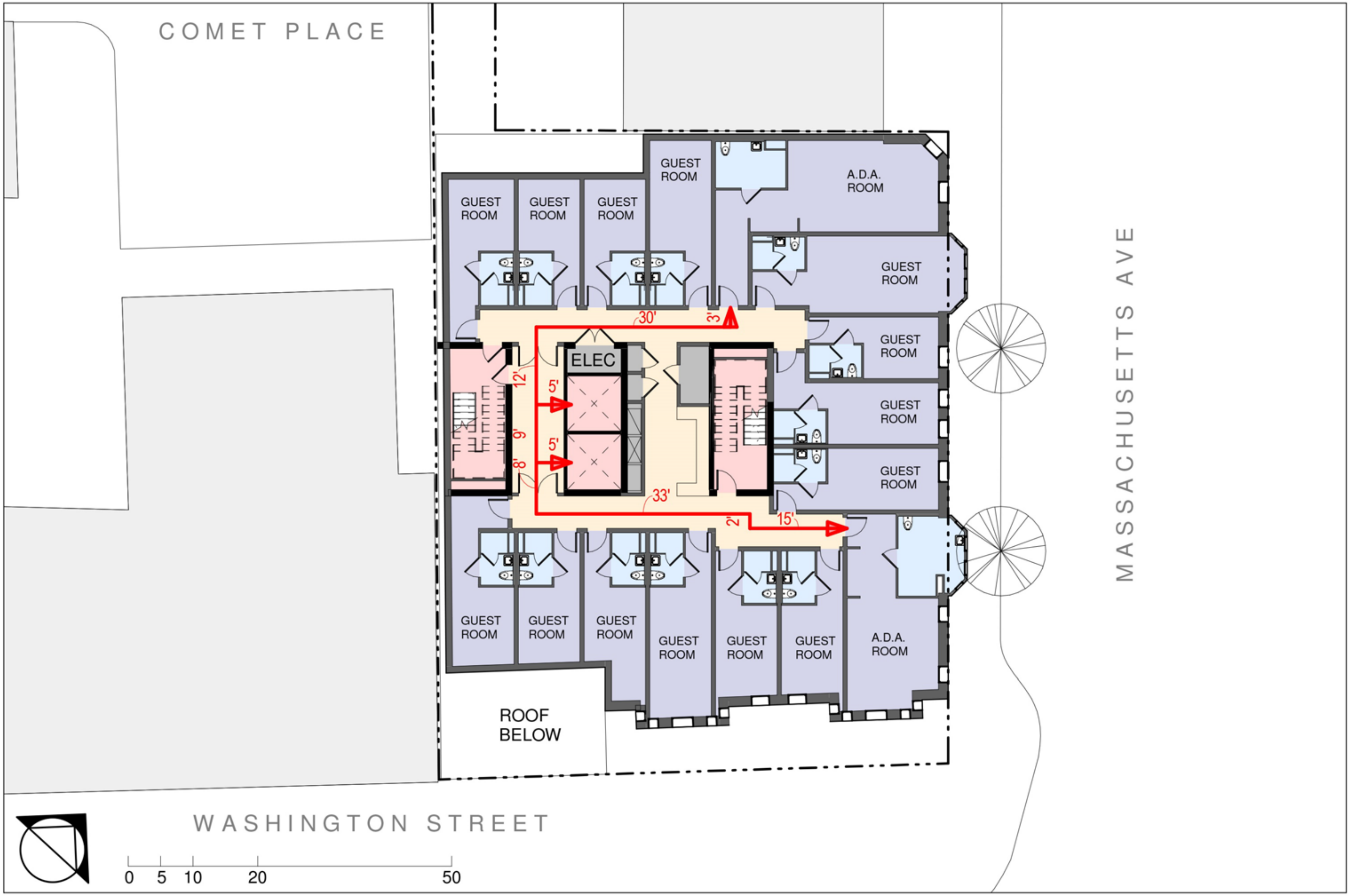
First Floor Accessibility Plan



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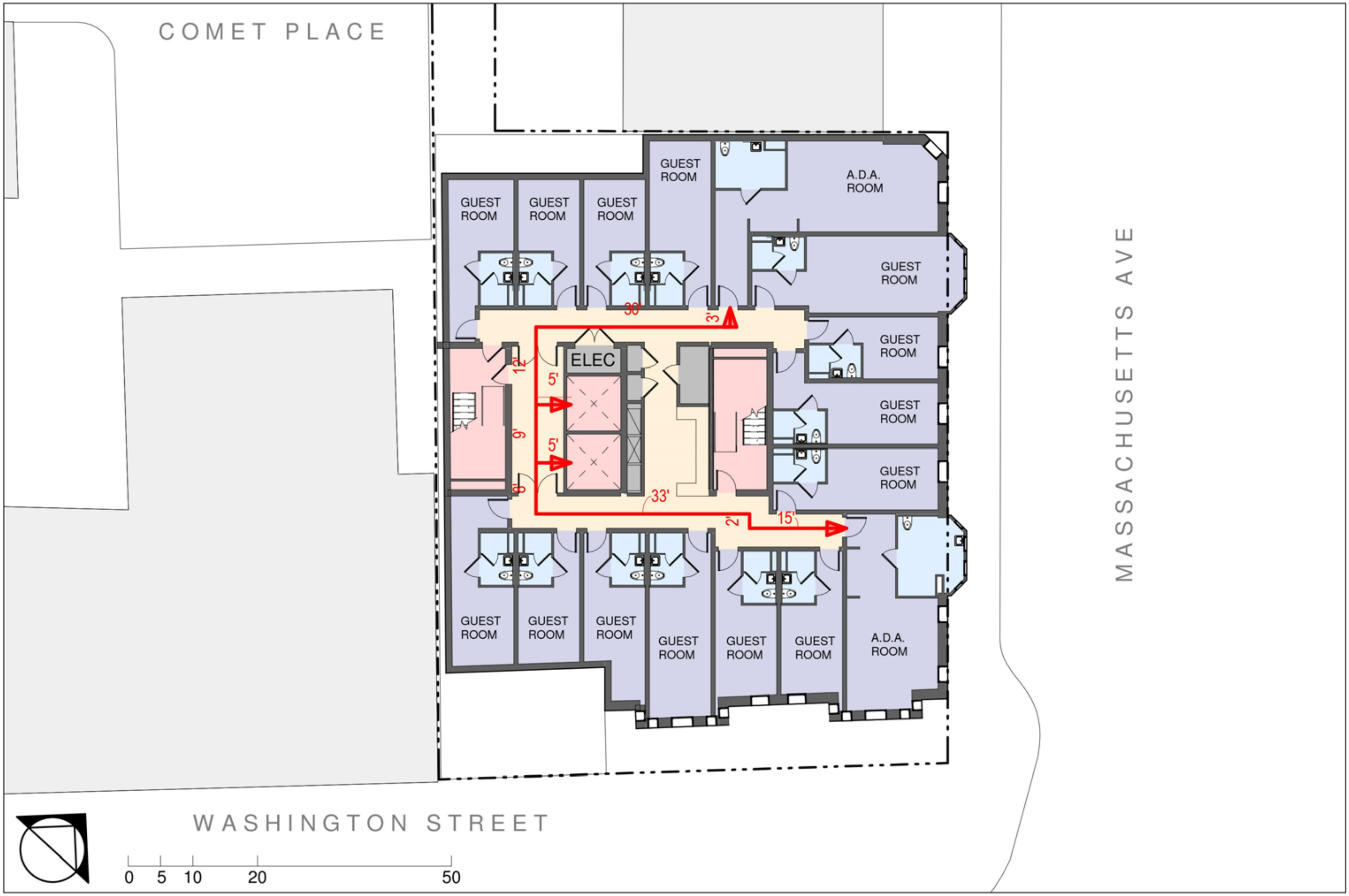
Second Floor Accessibility Plan



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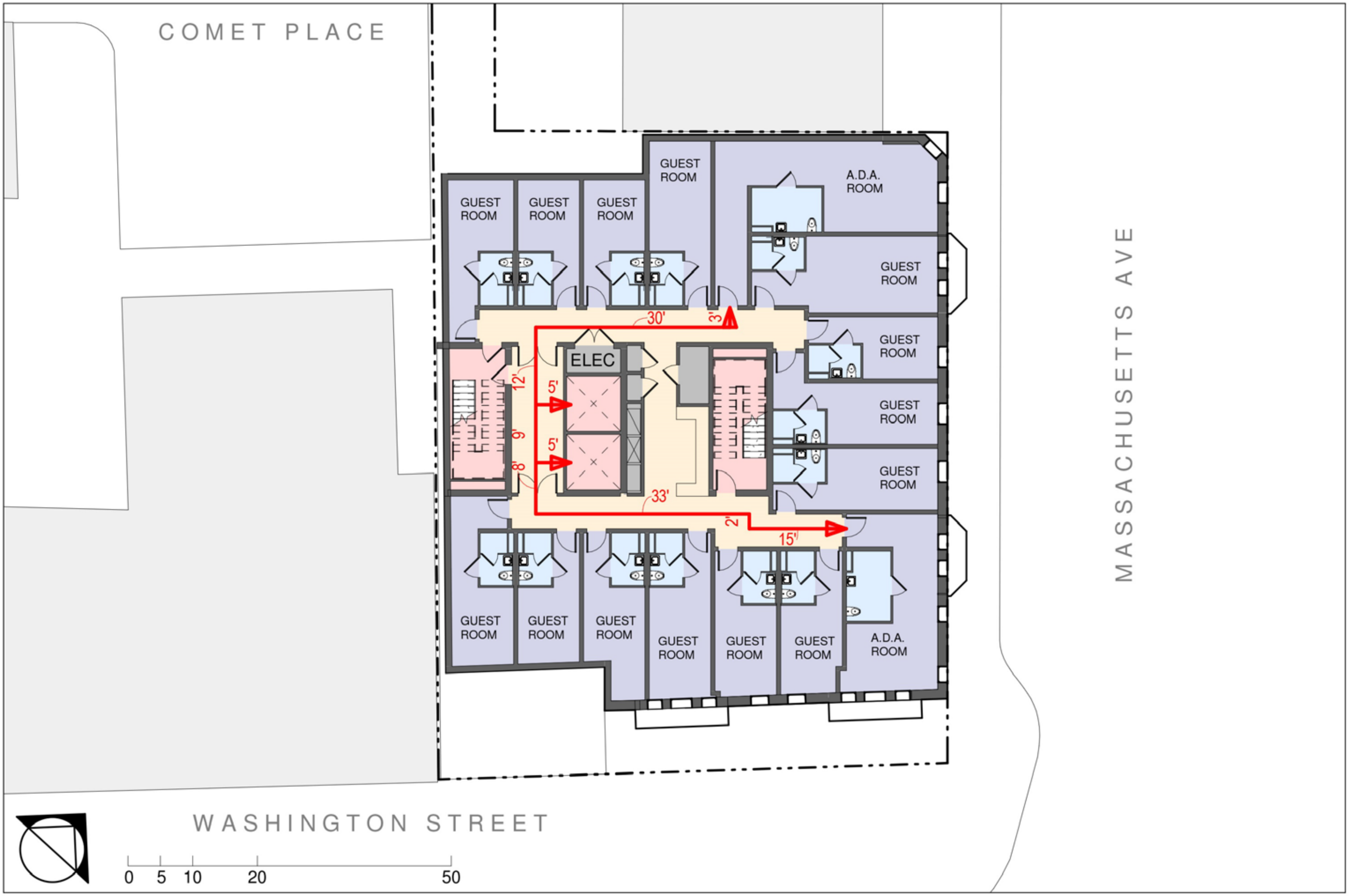
Third and Fourth Floor Accessibility Plan



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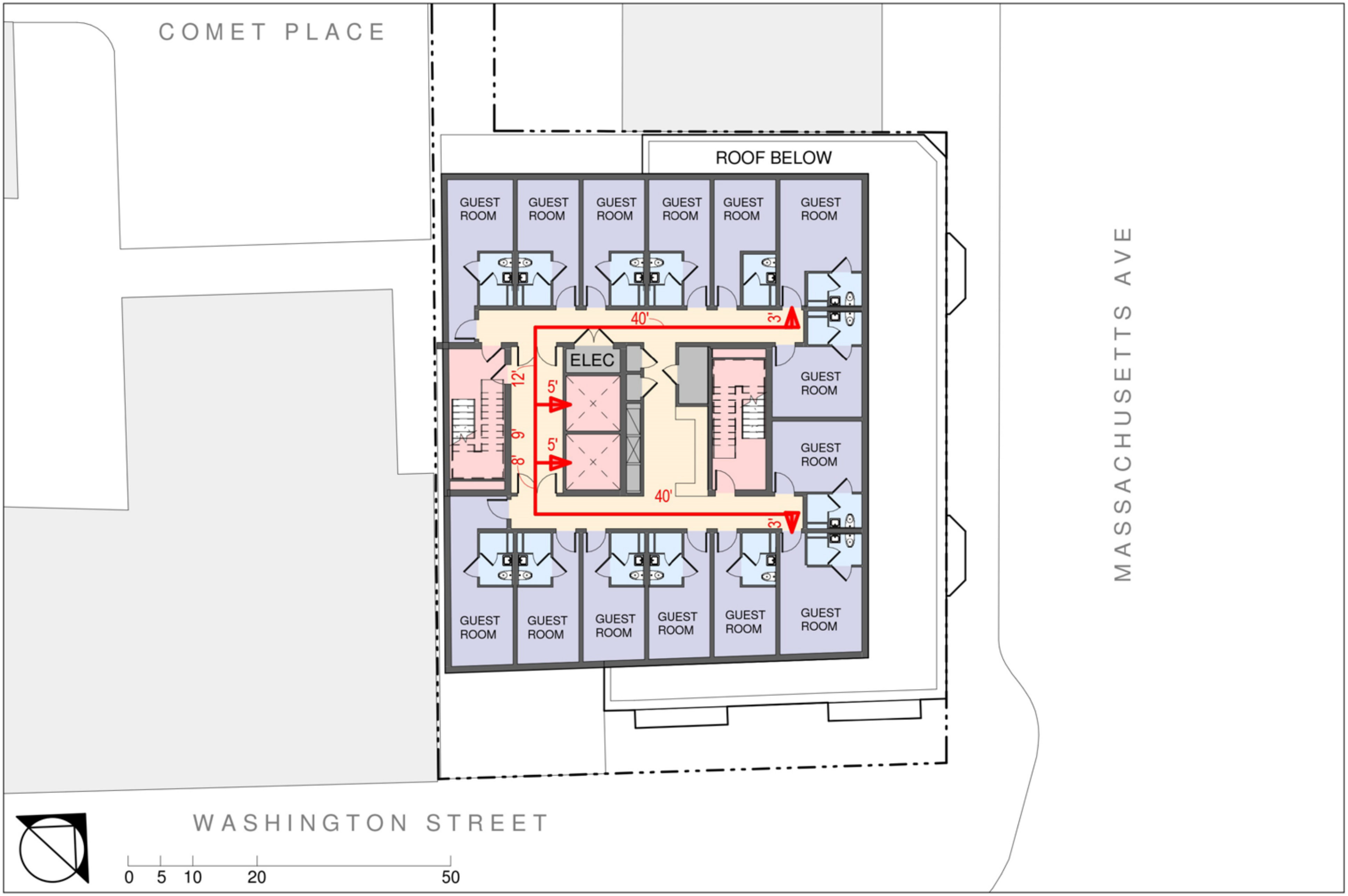
Fifth Floor Accessibility Plan



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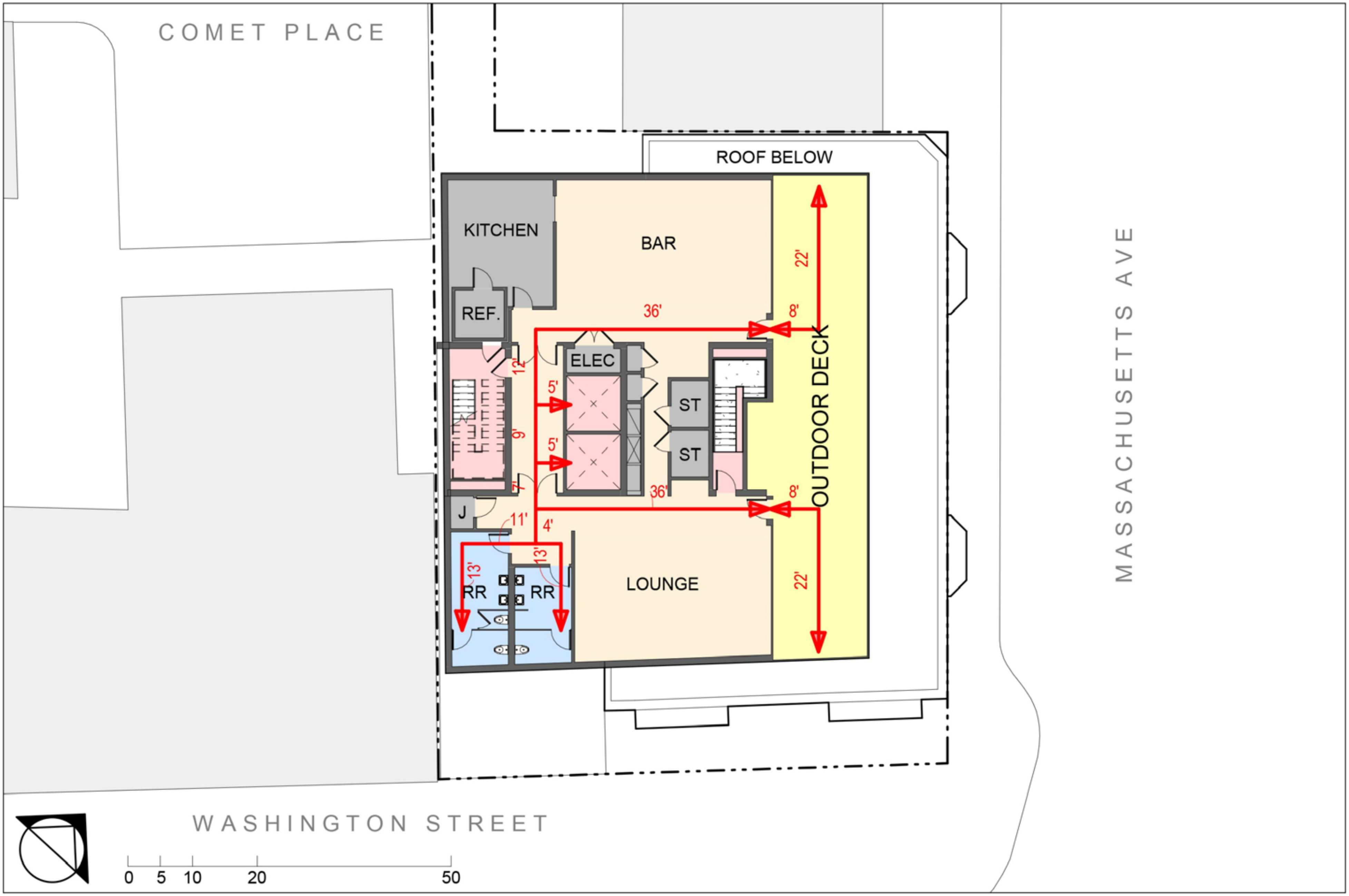
Sixth Through Eleventh Floor Accessibility Plan



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Twelfth Floor Accessibility Plan