EXPANDED PROJECT NOTIFICATION FORM

Haymarket Hotel

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

Submitted by:
Normandy Real Estate Partners
99 Summer Street
Boston, MA 02110

And

Harbinger Development, LLC
40 Walnut Street
Wellesley, MA 02481

Prepared by:
Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754

In Association with:
Perkins + Will
Mel Shuman Law
Howard/Stein Hudson Associates, Inc.
Nitsch Engineering
Haley & Aldrich, Inc
RWDI

October 14, 2014

Epsilon
ASSOCIATES INC.

EXPANDED PROJECT NOTIFICATION FORM

Haymarket Hotel

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

Submitted by:
Normandy Real Estate Partners
99 Summer Street
Boston, MA 02110

And

Harbinger Development, LLC
40 Walnut Street
Wellesley, MA 02481

Prepared by:
Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754

In Association with:
Perkins + Will
Mel Shuman Law
Howard/Stein Hudson Associates, Inc.
Nitsch Engineering
Haley & Aldrich, Inc
RWDI

October 14, 2014

Epsilon
ASSOCIATES INC.

Table of Contents

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

List of Appendices

List of Figures

List of Figures (Continued)

List of Figures (Continued)

List of Tables

List of Tables (Continued)

Chapter 1.0

Project Summary

1.0 PROJECT SUMMARY

1.1 Project Overview

Normandy Real Estate Partners and Harbinger Development, LLC (together, the Proponent), proposes to develop a two-story, 25,000 square foot (sf) market/retail building and a 10-story, 115,000 sf hotel in a prominent location along the Rose Fitzgerald Kennedy Greenway (the Project). The currently undeveloped approximately 50,000 square foot (sf) site (the Project site or Parcel 9) on Blackstone Street in downtown Boston (the Project) is bounded by John F. Fitzgerald Surface Road facing the Rose Fitzgerald Kennedy Greenway (Greenway) to the north, Hanover Street to the west, Blackstone Street to the south, and North Street to the east.

The Project site was made developable by the Massachusetts Department of Transportation (MassDOT) as a result of the Central Artery/Tunnel (CA/T) project, and presents an opportunity not only to expand the market district, but also to activate this portion of the Greenway and link the park to the city. The removal of the raised highway and improvements to the surrounding area, including the creation of the Greenway in place of the removed highway, have raised the profile of this now very visible, underutilized parcel. The Project will expand the existing market district of Haymarket Square with a hotel that will serve tourist activity in this busy area. By coupling the market with the hotel, the public nature of the site will be amplified by the 24-hour activity of the hotel and other public programs such as restaurants, a community room, a fitness room and potentially a pool. Through this activity, the south border of the Greenway will be recharged and will balance the liveliness of the North End that it faces. See Figure 1-1 for a rendering of the Project.

This Expanded Project Notification Form (PNF) is being submitted to the Boston Redevelopment Authority (BRA) to initiate review of the Project under Article 80B, Large Project Review, of the Boston Zoning Code.

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 1-1

View Across the Greenway

1.2 Development Team

Address/Location:	Central Artery Parcel 9 Blackstone Street Boston, MA
Developer:	Normandy Real Estate Partners 99 Summer Street Boston, MA 02110 (617) 443-0710 Justin Krebs Kevin Daly Harbinger Development, LLC 40 Walnut Street Wellesley, MA 02481 (781) 992-5999 Eamon C. O'Marah
Architect:	Perkins + Will 225 Franklin Street Boston, MA 02110 (617) 478-0300 Robert Brown Brian Healy Sandra Smith
Legal Counsel:	Mel Shuman Law 189 Eliot Street Brookline, MA 02467 (617) 487-5228 Mel R. Shuman
Permitting Consultants:	Epsilon Associates, Inc. 3 Clock Tower Place, Suite 250 Maynard, MA 01754 (978) 897-7100 David Hewett Talya Moked

Transportation and Parking Consultant	Howard/Stein-Hudson Associates, Inc 11 Beacon Street, 10th Floor Boston, MA 02108 (617) 482-7080 Guy Busa Mike Santos
Civil Engineer	Nitsch Engineering 2 Center Plaza, Suite 430 Boston, MA 02108 (617) 338-0063 John Schmid
Geotechnical Consultant:	Haley & Aldrich, Inc. 465 Medford Street, Suite 2200 Boston, MA 02129 (617) 886-7400 Mark Haley Bryan Sweeney

1.3 Public Benefits

The Project includes the redevelopment of an underutilized parcel with a pedestrian-friendly building that complements the Greenway District Planning Study Use and Development Guidelines. Among its many other improvements, the Project will result in the following benefits:

- Creation of approximately 250 to 300 construction jobs and 75 new permanent jobs.
- Generation of property tax revenues to the City of Boston by increasing the assessed value of the site.
- Generation of hotel occupancy and meal tax revenues to the City of Boston and to the Commonwealth.

The Project will provide a variety of urban design benefits to the surrounding neighborhood, including:

- Creating approximately 25,000 sf of market/ retail space, which will create pedestrian activity around the site and the Greenway, and provide amenities for the residents of the area hotel guests.
- Improving the urban design characteristics and aesthetic character of the Project surroundings through the introduction of high-quality architecture to the site.

- Complying with Article 37 of the Boston Zoning Code by being Leadership in Energy and Environmental Design (LEED) certifiable at the Silver level.

- Enhancing the public realm by replacing the sidewalks with new, pervious concrete and brick accents, new street trees, and new ADA compliant ramps.

1.4 Preliminary Project Schedule

Construction is anticipated to begin in the fourth quarter of 2015 and will occur over approximately 18 months.

1.5 Consistency with Zoning

The Project is located in the Central Artery Special District governed by Article 49 of the Boston Zoning Code (the Code). Under the provisions of Article 49, Parcel 9 is also deemed to be part of the Government Center/Markets District governed by Article 45 of the Code. Parcel 9 is also located in the Restricted Parking District subject to the Downtown Boston Parking Freeze; however, no parking will be included in the Project.

As currently contemplated, the Project will be ten (10) stories with a zoning height not to exceed 115 feet. The proposed total gross square footage (based on the Code) will be approximately 140,000 sf. The Project's floor area ratio (FAR) will be approximately 2.7 for the entire Project site, including Blackstone Street, and approximately 4.6 excluding Blackstone Street. Since the proposed hotel use is not allowed on the Project site, and the height and FAR exceed that which is currently permitted, the Project will require relief from the provisions of the Code for use, height and FAR. Although the Project site is not currently in an area in which a Planned Development Area (PDA) is permitted, the Proponent intends to seek an amendment to the Code to permit a PDA on the Project site.

1.6 Legal Information

1.6.1 Legal Judgments Adverse to the Proposed Project

The Proponent is not aware of any legal judgments in effect or legal actions pending that would prevent the Proponent from undertaking the Project.

1.6.2 History of Tax Arrears on Property Owned in Boston by the Proponent

No portion of the Project site is in tax arrears to the City of Boston.

1.6.3 Site Control/ Public Easements

The Project site is owned by the Massachusetts Department of Transportation (MassDOT). The Proponent has entered into a Development Agreement with MassDOT under which MassDOT will ground lease the Project site to the Proponent for 99 years. The ground lease is currently being negotiated.

1.7 Regulatory Controls and Permits

The Project will undergo the reviews and will seek the major discretionary permits addressed below.

1.7.1 Article 80 Review Process and Zoning

Because the proposed Project exceeds 50,000 square feet of gross floor area, the Project is subject to the requirements of Large Project Review pursuant to Article 80B of the Boston Zoning Code (the Code). Based on a comprehensive approach to addressing potential impacts and mitigation equivalent to the level of information normally presented in a Draft Project Impact Report, it is the desire of the Project team that the BRA, after reviewing public and agency comments on this Expanded PNF and any further responses to comments made by the Project team, issue a Scoping Determination Waiving Further Review pursuant to the Article 80B process.

If the Code is amended to permit the Project site to be designated a PDA, Proponent will also seek PDA designation for the Project site under Article 80C of the Code, Planned Development Area Review. If the Code is not amended to permit the Project site to be designated a PDA, the Project will require variances from the Board of Appeal under current provisions of the Code as described above.

1.7.2 The Massachusetts Environmental Policy Act (MEPA)

The Project is within MEPA jurisdiction because the lease of the site from MassDOT constitutes a "land transfer" under the MEPA regulations. MEPA review is triggered because the Project will exceed the traffic review threshold at 301 CMR 11.03(6)13, generation of 2,000 or more new adt on roadways providing access to a single location. The Proponent will submit an Environmental Notification Form to the Executive Office of Energy and Environmental Affairs MEPA Office to initiate MEPA review, concurrent with Article 80 review.

1.7.3 Massachusetts Historical Commission

The Project will be subject to State Register Review (950 CMR 71) by the Massachusetts Historical Commission (MHC) due to a transfer of land from the MassDOT, which is considered to be a state action for purposes of State Register Review. To initiate the State Register Review process, an Environmental Notification Form (ENF) will be filed with the MHC.

1.7.4 Anticipated Permits

Table 1-1 presents a preliminary list of local, state, and federal permits and approvals that may be required for the Project. The list is based on current information about the Project and is subject to change as the design of the Project advances. Some of the permits listed may not be required, while there may be others not listed that will be needed.

Table 1-1 Preliminary List of Permits and Approvals

Agency Name	Permit / Approval
Federal	
U.S. Environmental Protection Agency	National Pollution Discharge Elimination System; Small Construction Discharges; Groundwater Treatment; Construction Dewatering
Federal Aviation Administration	Determination of No Hazard to Air Navigation
State	
Department of Environmental Protection, Division of Water Pollution Control	Sewer Connection and Extension Permit
Department of Environmental Protection, Division of Air Quality Control	Pre-Construction Notice
Executive Office of Energy and Environmental Affairs (MEPA Office)	Secretary's Certificate
Massachusetts Water Resources Authority	Sewer Use Discharge Permit; Construction Dewatering Permit
Massachusetts Historical Commission	Determination of Affect on Historic Resources
Massachusetts Department of Transportation, Highway Division	Highway Access Permit
Local	
Boston Redevelopment Authority	Article 80B Large Project Review; Possible Article 80C Planned Development Area Review
Board of Appeal	Possible Zoning Variances
Boston Civic Design Commission	Schematic Design Review
Boston Zoning Commission	Possible Planned Development Area Approval
Boston Transportation Department	Transportation Access Plan Agreement; Construction Management Plan; Street and Sidewalk Occupation Permits; Tieback/Earth Retention Permit;
Boston Water and Sewer Commission	Sewer Use Discharge Permit; Site Plan Approval; Construction Dewatering Permit; Sewer Extension/ Connection Permit; Stormwater Connection
Public Works Department/Public Improvement Commission	Streetscape Improvements; Curb Cut Permits; Specific Repairs
City of Boston Inspectional Services Department	Building and Occupancy Permits

Chapter 2.0

Project Description

2.0 PROJECT DESCRIPTION

This Chapter describes the Project in detail, including its location, Project site plan, and proposed building program.

2.1 Surrounding Neighborhood

The Project site is located in downtown Boston in a prominent location along the Greenway. The surrounding area includes mid-rise commercial and residential buildings and structured parking garages. The northern portion of the site faces the Greenway. To the south of the site is Faneuil Hall and Quincy Market, with Post Office Square and the Financial District several blocks beyond that. The site also has convenient access to the North End and Boston Harbor, making it an ideal location for tourists. The Project is designed to blend well with the existing buildings and to activate the Greenway frontage. Figures 2-1 and 2-2 present photos of the existing conditions in the area in and around the Project site and Figure 2-3 presents the context of the area. All figures are at the end of this Chapter.

2.2 Project Description

2.2.1 Project Site

The Project site is approximately 50,000 sf located in downtown Boston, and is bounded by John F. Fitzgerald Surface Road facing the Greenway to the north, Hanover Street to the west, Blackstone Street to the south, and North Street to the east. The site is currently undeveloped and occupies the entire block. See Figure 2-4 for an aerial locus map. See Appendix A for a site survey.

2.2.2 Proposed Development

The Project consists of two distinct, but attached building forms. The first, and primary form, is the two-story, approximately 25,000 sf market/ retail block. The second form is a 10-story, approximately 115,000 sf hotel with approximately 225 keys. The Project will also contain facilities for the Haymarket Pushcart Association including trash, storage and restrooms. No on-site parking will be provided. There will, however, be a valet managed pick-up/drop-off area provided along Surface Road at the hotel entrance. Table 2-1 presents the Project program. See Figures 2-5 through 2-12 for proposed site plans and floor plans.

Table 2-1 Project Program

Project Element	Approximate Dimension
Hotel	225 keys/ 115,000 GSF
Retail	25,000 GSF
Total Square Footage	140,000 GSF
Parking	No on-site parking is provided
Zoning Height	10 stories/103 feet
Parcel Area	Parcel 9 +/-29,400 square feet Blackstone Street +/-21, 056 TOTAL Project Area +/- 50, 456 square feet
FAR	**2.7**

The Project will transform a currently undeveloped site with significant frontage along the Greenway into a new development with two distinctive purposes. The two story market/retail block will be a pavilion along the Greenway starting at the northern 'point' of the Project site. The pavilion will be transparent and open, reflecting the activity and openness of this civic space. The Greenway will expand into the market through the winter garden and public passage so that it creates a shortcut between the Blackstone Street market and the Greenway. At the second floor overlooking the Greenway and Blackstone Street will be a paved and landscaped terrace that will serve the conference and pool spaces on the hotel floor as well as the second level of market retail in the Pavilion. The design includes glass storefronts and a standing seam metal roof. The pavilion has been designed and detailed so that it will be recognizable as a unique location along the Greenway that will naturally draw pedestrians and others to this special place.

By contrast, the 10-story hotel will be "L" shaped, located on the eastern side of the site expanding the existing market district of Haymarket Square, and acting as a background building to the Pavilion and the surrounding buildings. The façade of the hotel has been designed to emphasize the expanse of the market/retail based ground floor. The hotel will include amenities such as a meeting space, a fitness center and potentially an indoor pool.

By coupling the market and the hotel the public nature of this busy area will be amplified. The 24-hour activity of the hotel will serve tourists, while the market will primarily serve nearby residents. Through this combined activity, the southern border of the Greenway will be recharged and will provide a balance to the liveliness of the North End that it faces.

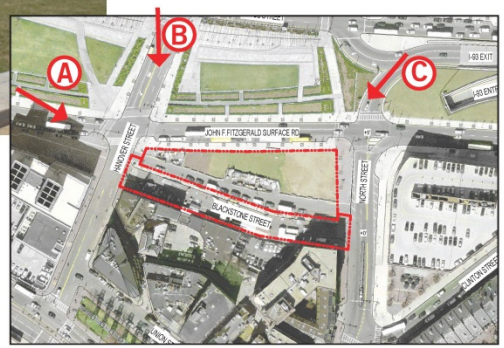
The Project will improve the surrounding streetscape with new sidewalks with pervious concrete and brick accents, new street trees, and new benches. The existing acorn street lighting will be retained and reinstalled. New Americans with Disabilities Act (ADA) compliant ramps will be installed.

2.2.3 Consistency with the Greenway District Planning Study

The Project site is located within the boundaries of the Greenway District Planning Study Use and Development Guidelines (the Guidelines), which was adopted by the BRA Board in July of 2010. The BRA is currently undergoing a public process to codify the Guidelines into the Boston Zoning Code. The Guidelines are made of up seven sub-districts, with the Project site falling in the Market District/Government Center sub-district. The concept for this sub-district is to "shift this center of gravity north and provide a programmatic bridge between the tourism-focused activities of Quincy Market and the historic Haymarket."

The Project is consistent with the goals stated in the Guidelines by achieving the following:

- Placing the primary entrance on the Greenway;
- Providing active, publicly accessible programming directly along the Greenway edge;
- Expanding the Market District and building on the existing historic fabric while providing 21st century accessibility and amenities;
- Improving the architectural quality and retail transparency of the Greenway's western edge; and
- Complementing Haymarket and reinforcing Hanover Street as the primary spine of the Market District.

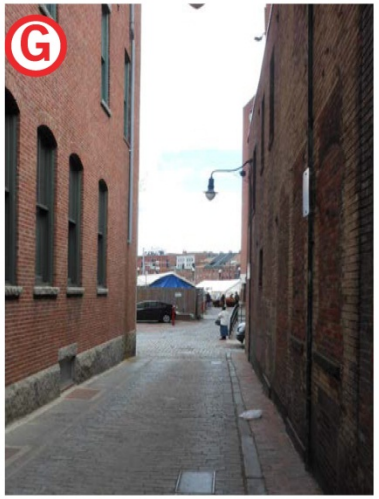


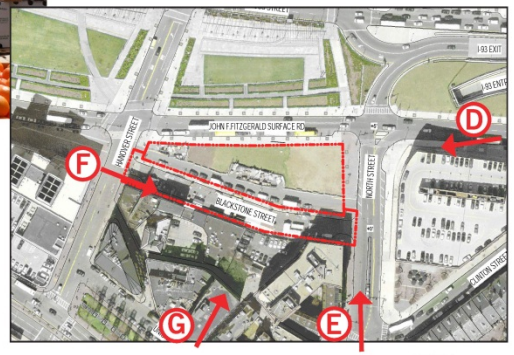
Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-1

Existing Conditions





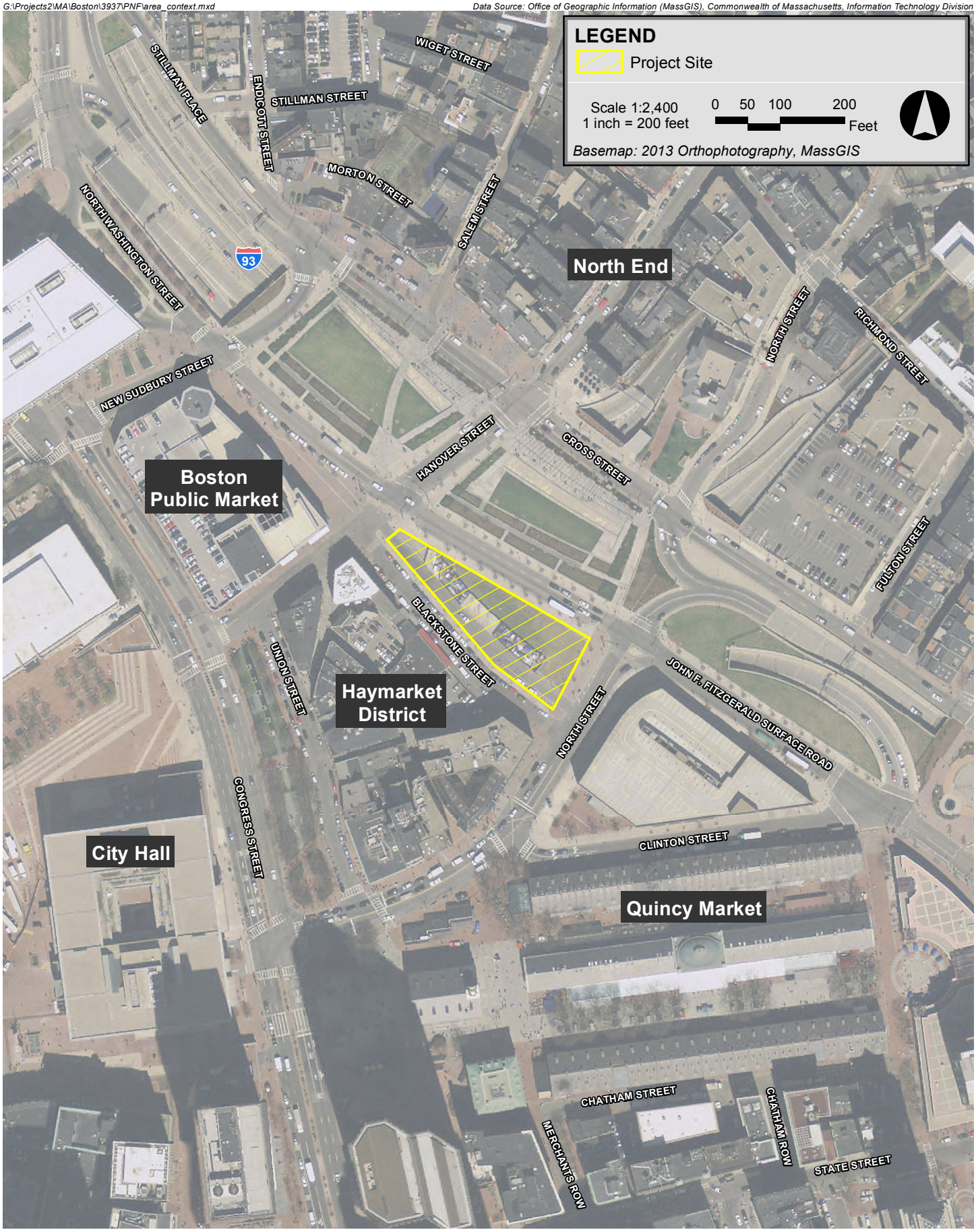
Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-2

Existing Conditions

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



Haymarket Hotel Boston, Massachusetts

Epsilon ASSOCIATES INC.

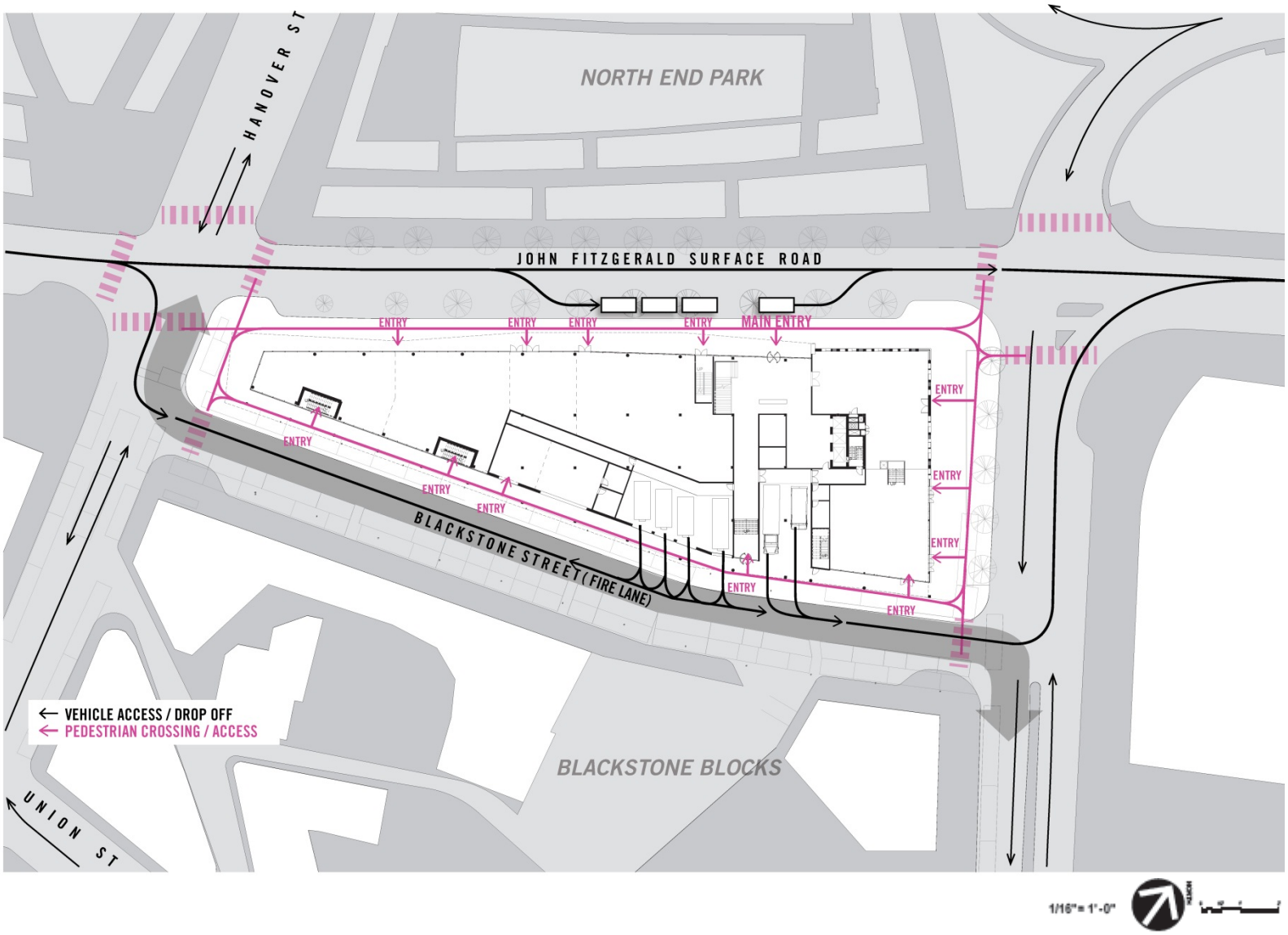
Figure 2-3
Area Context

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

Haymarket Hotel Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 2-4
Aerial Locus Map

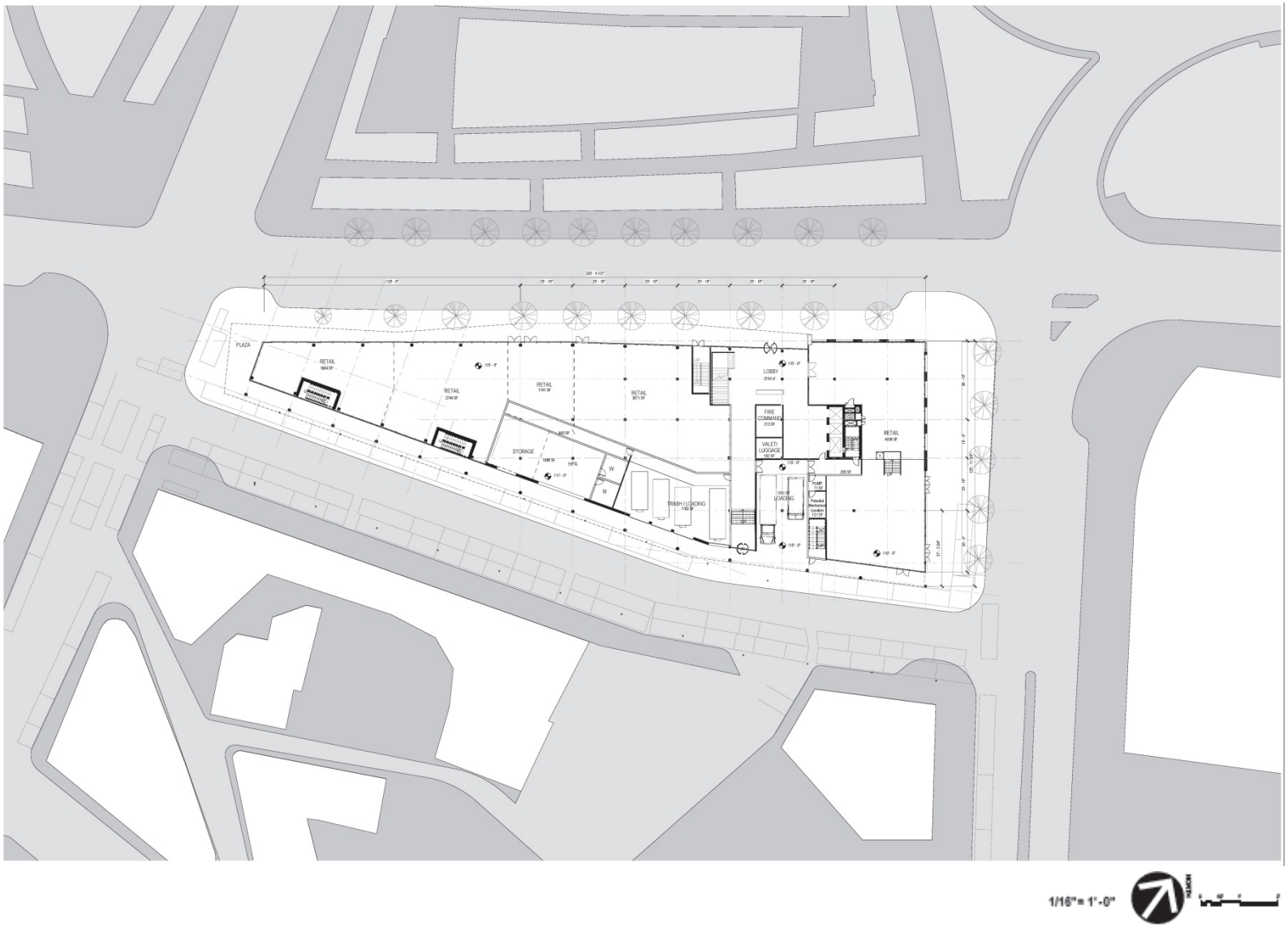


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-5

Site Plan

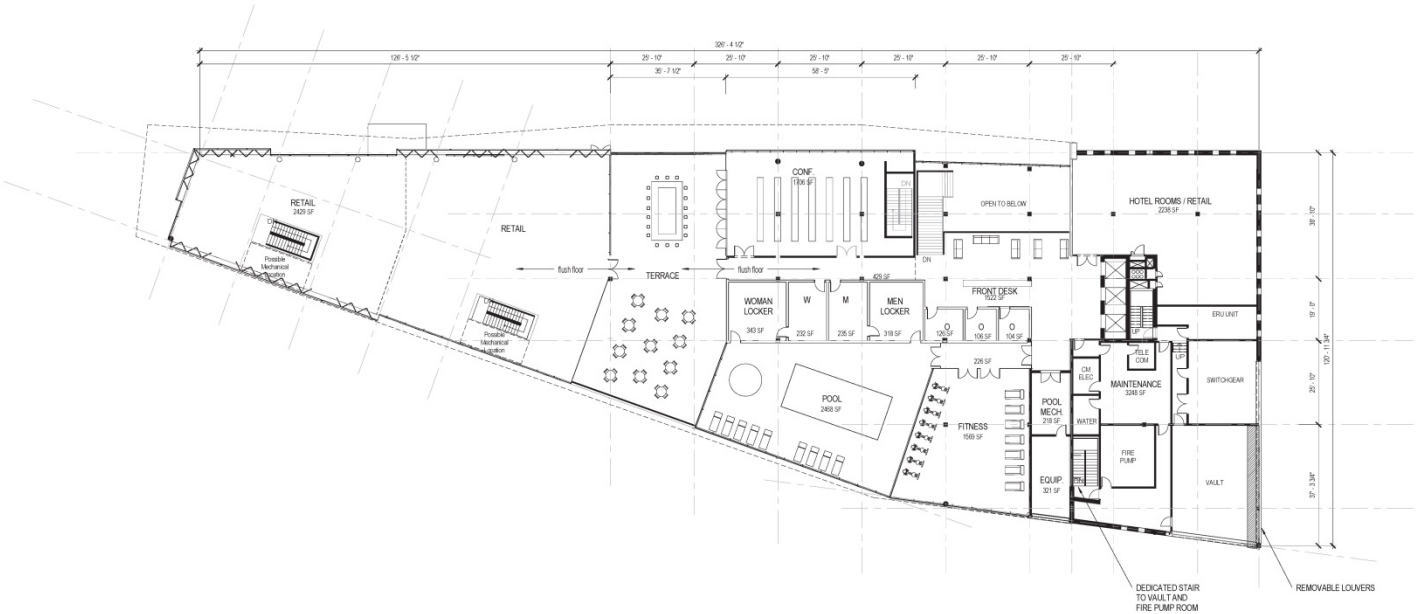


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-6

Ground Floor Plan



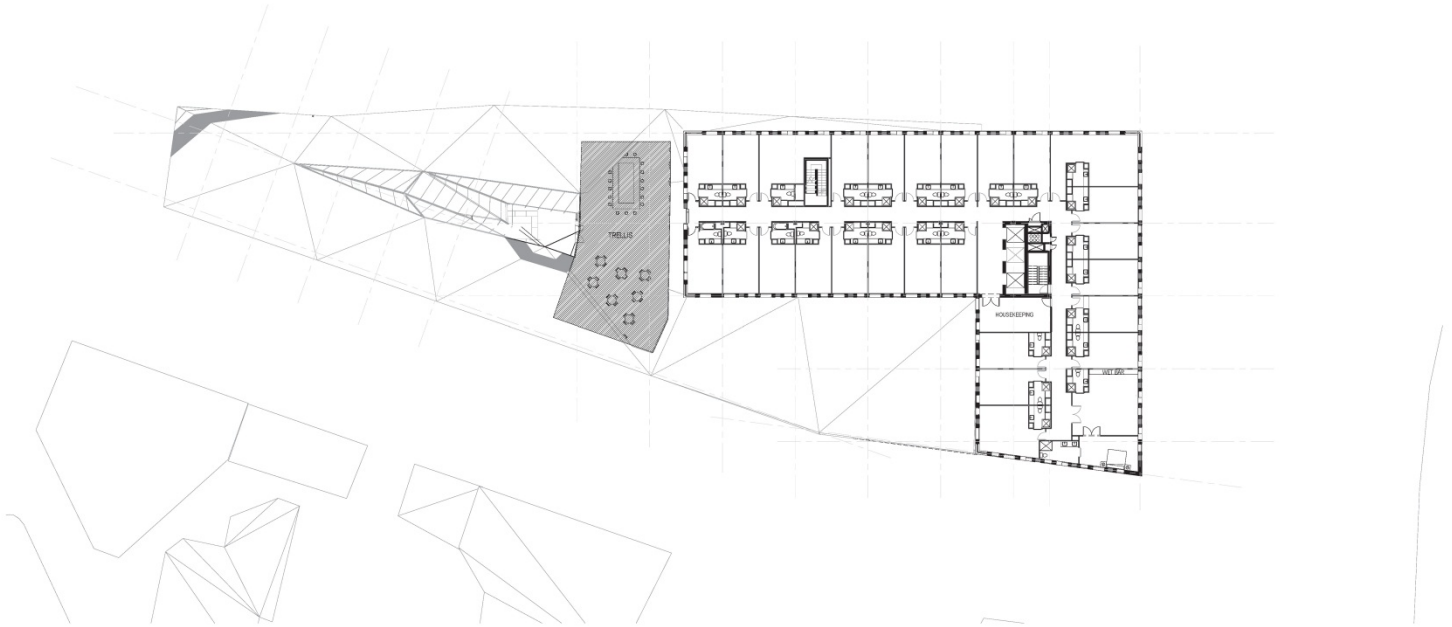
1/16" = 1'-0"

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-7

Second Floor Plan



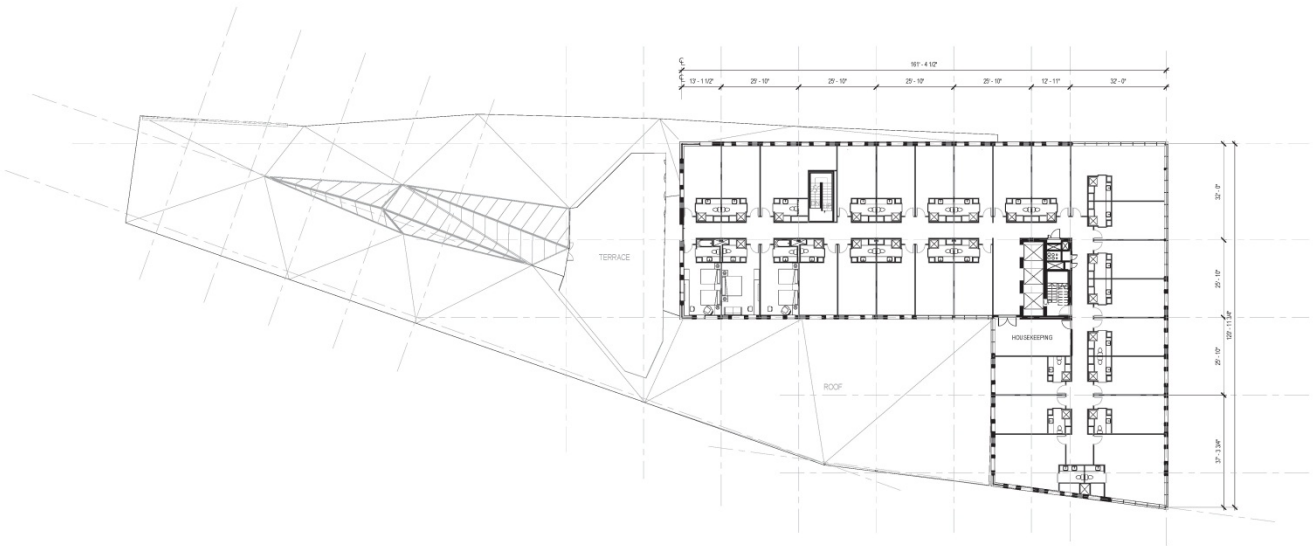
1/16" = 1'-0"

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-8

Third Floor Plan



TYPICAL FLOOR	
ELEC CLO	1'-6" X 4'-0"
TELE / DATA	1'-6" X 3'-0"
FIRE ALARM	1'-6" X 3'-0"
EMERG ELEC	2'-0" X 2'-0"
CORR SUPPLY	3'-0" X 1'-8"
EXP. CHASE	1'-6" X 6'-0"

1/16" = 1'-0"

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-9

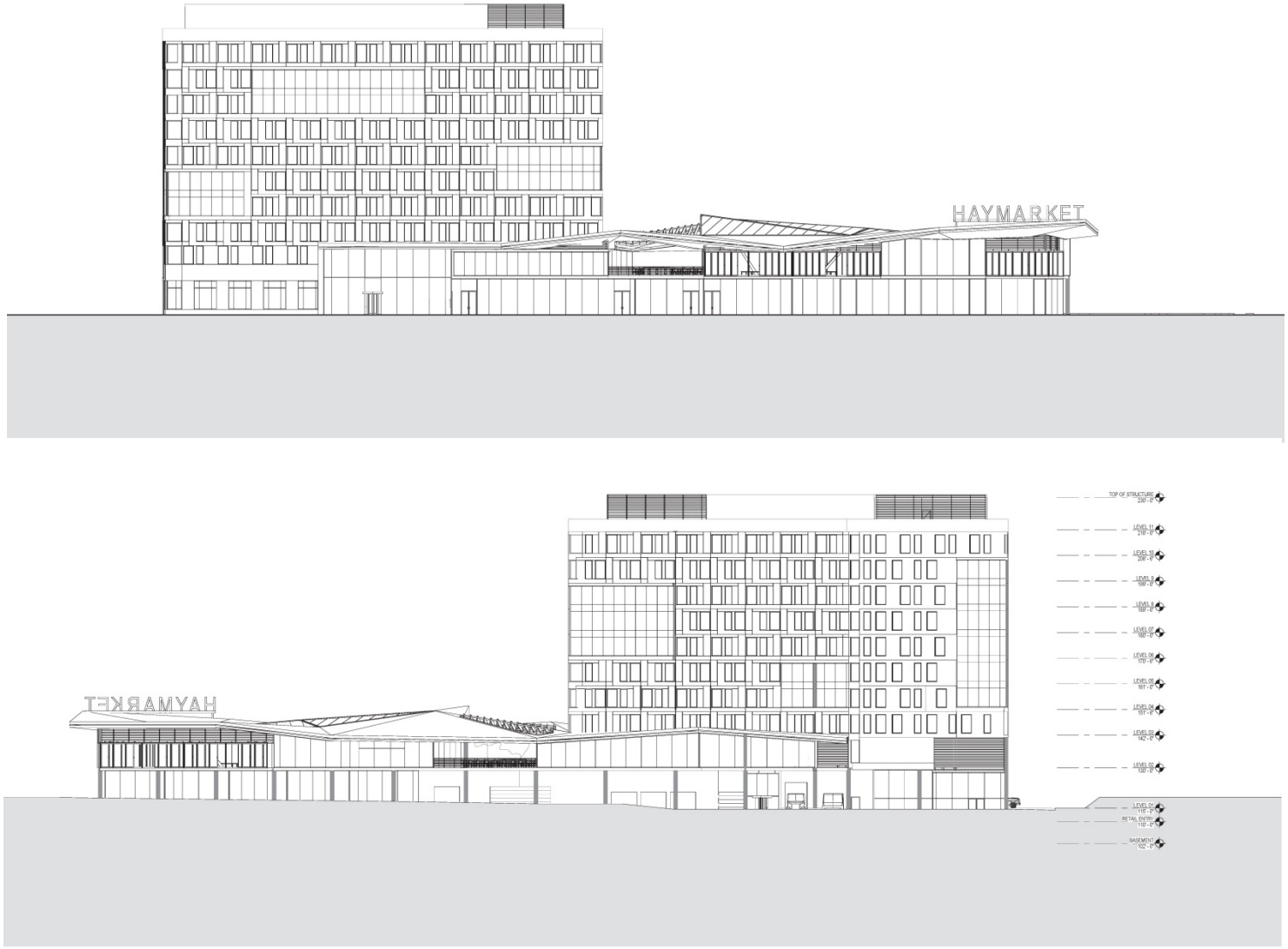
Levels 4-10 Plans

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-10

East and West Elevations

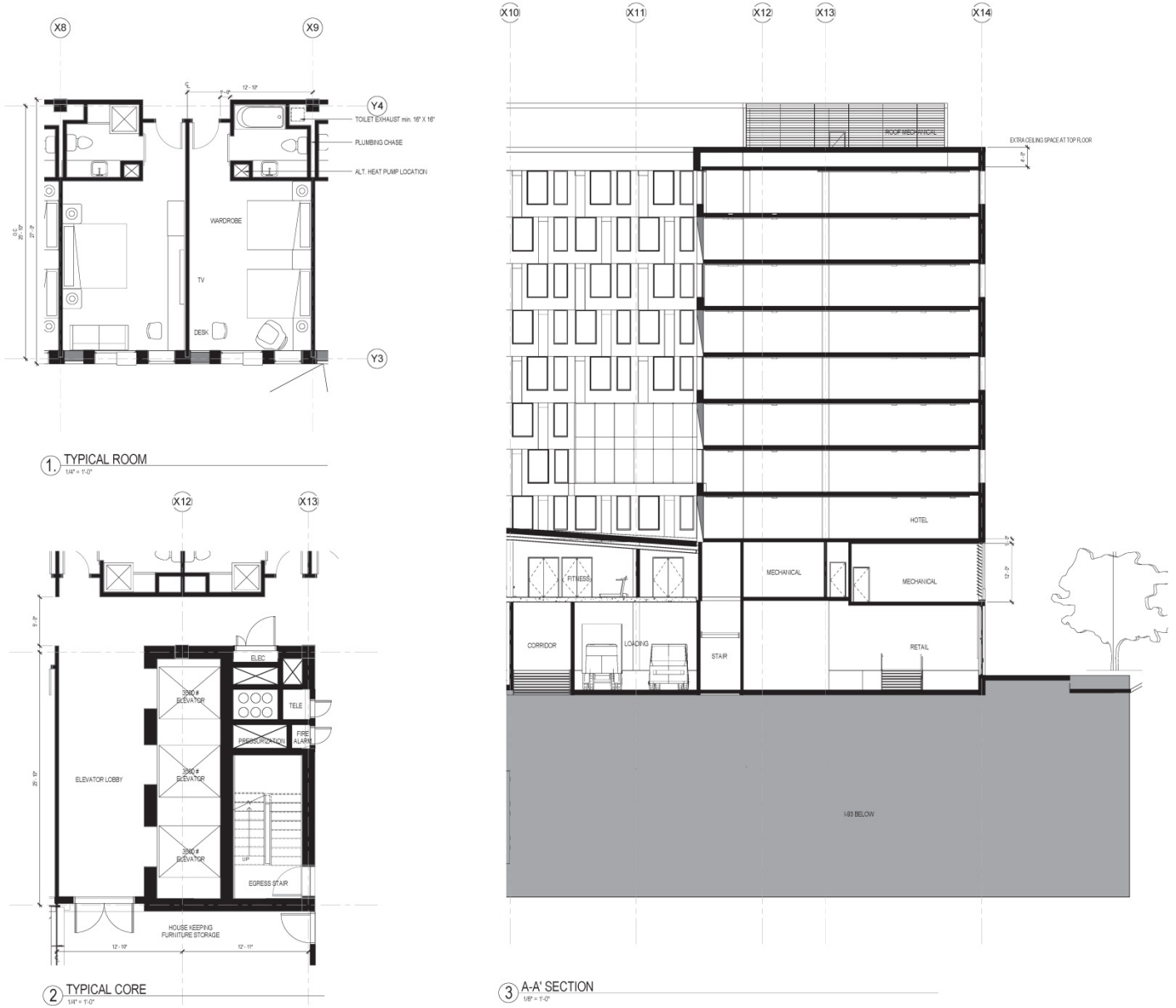


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-11

North and South Elevations



Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 2-12

Typical Units

Chapter 3.0

Transportation Component

3.0 TRANSPORTATION COMPONENT

3.1 Introduction

Howard/Stein-Hudson Associates, Inc. (HSH) has conducted an evaluation of the transportation impacts of the proposed hotel and market/retail development to be located on Blackstone Street along the Rose Fitzgerald Kennedy Greenway near Haymarket Station in downtown Boston, Massachusetts. This transportation study adheres to the Boston Transportation Department (BTD) *Transportation Access Plan Guidelines* and the BRA's Article 80 development review process. This study includes an evaluation of existing traffic and parking conditions, future conditions with and without the Project, transit services, and pedestrian and bicycle activity. Based on the results presented in this chapter, the Project is anticipated to have minimal impact on the surrounding transportation infrastructure.

This section of the PNF summarizes the transportation issues related to the Project and discusses trip generation estimates, anticipated transportation-related impacts, and potential transportation demand management measures.

3.1.1 Project Description

The Project site is currently vacant and encompasses the block bounded by John F. Fitzgerald Surface Road (Surface Road) to the north, Hanover Street to the west, Blackstone Street to the south, and North Street to the east as shown in Figure 3-1.

The Project consists of a 10-story hotel containing approximately 225 rooms along with 25,000 sf of ground floor market/retail space. Parking will not be provided on site. A valet service will be provided for both the hotel and restaurant uses and will use the curb along Surface Road adjacent to the site for operations. Loading, deliveries, and trash pick-up will be accommodated on-site by two loading bays accessed from Blackstone Street in the rear of the site.

3.1.2 Study Area

The study area consists of the following seven intersections in the vicinity of the Project site, also shown on Figure 3-1:

- Surface Road/Hanover Street;
- Surface Road/North Street/I-93 Northbound Off-Ramp;
- Surface Road/Clinton Street/I-93 Southbound Off-Ramp;
- North Street/Clinton Street/Hotel Driveway;
- North Street/Union Street;
- North Street/Congress Street/City Hall Driveway; and
- Hanover Street/Union Street.

Not to scale.

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-1
Study Area Intersections

3.1.3 Study Methodology

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

The existing conditions analysis includes an inventory of the existing (2014) transportation conditions 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 on June 16, 2014 at the study area intersections. The traffic counts form the basis for the transportation analysis conducted as part of this evaluation.

The future transportation conditions analysis evaluates potential transportation impacts associated with the Project. Long-term impacts are evaluated for the year 2019, based on a five-year horizon from the year of the filing of this traffic study. Expected roadway, parking, transit, pedestrian, bicycle accommodation, and loading capabilities and deficiencies are identified. This section includes the following scenarios:

- The 2019 No Build conditions scenario includes both general background traffic growth and traffic growth associated with specific developments and transportation improvements that are planned in the vicinity of the Project site.
- The 2019 Build conditions scenario includes Project-generated traffic volume estimates added to the traffic volumes developed as part of the 2019 No Build conditions scenario.

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

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

3.2 Existing Conditions

3.2.1 Existing Roadway Conditions

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

John F. Fitzgerald Surface Road is classified as an urban principal arterial roadway under MassDOT jurisdiction located adjacent to the northern side of the Project site. Surface Road runs one-way in the southeast direction between North Washington Street to the north and Purchase Street to the south. Surface Road is separated from Cross Street and Atlantic Avenue, which run one-way in the northwest direction, by the Rose Fitzgerald Kennedy

Greenway. Surface Road consists of two travel lanes, a bike lane, and a parking lane for tour buses at the Project site, but generally consists of three travel lanes, a bike lane, and no parking lane further south.

North Street is classified as an urban minor arterial roadway under BTD jurisdiction located south of the Project site. North Street runs in an east-west direction between Congress Street to the west and Surface Road to the east. North Street consists of two lanes in the westbound direction, two lanes in the eastbound direction west of Clinton Street, and one lane in the eastbound direction east of Clinton Street. Sidewalks are provided along both sides of North Street. Parking is not allowed along either side of North Street within the study area.

Hanover Street is classified as a local roadway under BTD jurisdiction located north of the Project site. Hanover Street runs in a northeast-southwest direction between Congress Street to the southwest and Atlantic Avenue in the North End to the northeast. Hanover Street consists of a single lane of travel in each direction, with additional turn lanes provided near the Greenway. Sidewalks are provided along both sides of Hanover Street. Parking is not allowed along either side of Hanover Street within the study area. Parking is allowed along Hanover Street northeast of the Project site in the North End neighborhood.

Blackstone Street is classified as a local roadway under BTD jurisdiction located adjacent to the west side of the Project site. Blackstone Street runs in a northwest-southeast direction between Hanover Street to the northwest and North Street to the southeast. Blackstone Street consists of a single lane and is one-way in the southbound direction. Blackstone Street is also the primary location for the Haymarket open-air produce market, during which it is closed off to parking and vehicular traffic. At all other times, parking is allowed along both sides of the roadway. Sidewalks are provided along both sides of Blackstone Street.

Congress Street is classified as an urban principal arterial under BTD jurisdiction located west of the Project site. Congress Street generally runs in a north-south direction between New Chardon Street to the north and the Fort Point Channel area/Seaport District to the south. Congress Street consists of three lanes of travel in each direction within the study area. Sidewalks are provided along both sides of Congress Street. Parking is not allowed along either side of Congress Street within the study area.

Union Street is classified as a local roadway under BTD jurisdiction located west of the Project site. Union Street runs in a north-south direction between Hanover Street to the north and North Street to the south. Union Street consists of a single lane of travel and is one-way in the northbound direction. Sidewalks are provided along both sides of Union Street. Parking is allowed along both sides of Union Street.

Clinton Street is classified as an urban minor arterial roadway under BTD jurisdiction located southeast of the Project site. Clinton Street runs in an east-west direction between North Street to the west and Surface Road to the east. Clinton Street consists of two travel lanes and is one-way in the westbound direction. Sidewalks are provided along both sides of Clinton Street. Parking is allowed along the southerly side of Clinton Street.

3.2.2 Existing Intersection Conditions

Existing conditions at the study area intersections are described below.

Surface Road/Hanover Street is a four legged, signalized intersection. The Surface Road southeastbound approach consists of a shared left-turn/through lane and a shared through/right-turn lane. An exclusive bicycle lane is also provided along this approach. The Hanover Street southwestbound approach consists of a through lane and a left-turn lane. The Hanover Street northeastbound approach consists of a through lane and a shared through/right-turn lane. Sidewalks are provided along both sides of Surface Road and Hanover Street. Crosswalks are marked across all approaches and pedestrian signals are provided at all corners. Parking is provided along the Surface Road southbound approach.

Surface Road/North Street/I-93 Northbound Off-Ramp is a four-legged, signalized intersection. The Surface Road southeastbound approach consists of a through lane and a shared through/right-turn lane. An exclusive bicycle lane is also provided along this approach. The North Street northeastbound approach consists of a single channelized right-turn lane. The I-93 Northbound Off-Ramp southwestbound approach consists of a shared left-turn/through lane and a through lane. Sidewalks are provided along both sides of Surface Road and North Street. Pedestrians are prohibited from the I-93 Northbound Off-Ramp. Crosswalks and pedestrian signals are provided for all crossings except across the southeast side of the intersection. A parking lane for tour buses is provided along the Surface Road southbound approach.

Surface Road/Clinton Street/I-93 Southbound Off-Ramp is a four-legged, signalized intersection. The Surface Road southeastbound approach consists of two through lanes and a shared through/right-turn lane. The I-93 Southbound Off-Ramp southwestbound approach consists of a left-turn lane, a shared through/left-turn lane, and a through lane. Clinton Street is a one-way, two-lane roadway that departs the intersection in the westbound direction and proceeds west to North Street. Sidewalks are provided along both sides of Surface Road and Clinton Street. Pedestrians are prohibited from the I-93 Southbound Off-Ramp. Crosswalks and pedestrian signals are provided for all crossings except across the southeast side of the intersection. Commercial vehicle parking is allowed along the southerly side of Clinton Street.

North Street/Clinton Street/Hotel Driveway is a four-legged, signalized intersection. The North Street eastbound approach consists of a single shared left/through/right-turn lane. The North Street westbound approach consists of an exclusive left-turn lane and a shared left-

turn/through/right-turn lane. The Clinton Street northbound approach consists of a single left-turn lane and a shared left/through/right-turn lane. The Millennium Bostonian Hotel has a two-way, two-lane private driveway which uses the same signal as North Street and Clinton Street. Vehicles may enter from either North Street or Clinton Street but must exit only left or right onto North Street. Sidewalks are provided along both sides of North Street and Clinton Street. Crosswalks and pedestrian signals are provided for the west and south crossings. Pedestrians cross the hotel driveway without a signal at sidewalk level. Commercial vehicle parking is allowed along the southerly side of the Clinton Street approach.

North Street/Union Street is a three-legged, signalized intersection. The North Street eastbound approach consists of a shared left-turn/through lane and a through lane. The North Street westbound approach consists of a through lane and a shared through/right-turn lane. Union Street is a one-way, one-lane roadway that departs the intersection in the northbound direction and proceeds north to Hanover Street. Sidewalks are provided along both sides of North Street and Union Street. Crosswalks and pedestrian signals are provided for the east and north crossings, however a pedestrian crossing on the west side exists at the nearby intersection of North Street and Congress Street. Parking is permitted along both sides of Union Street. A Hubway bike-share station is located at the northwest corner of the intersection.

North Street/Congress Street/City Hall Driveway is a four-legged, signalized intersection. The North Street westbound approach consists of an exclusive left-turn lane and a shared left-turn/right-turn lane. No parking lane is provided on either side of North Street. Opposite from North Street, a driveway for City Hall pick-up and drop-off also uses the signal at this intersection. The Congress Street northbound and southbound approaches consist of three travel lanes each with left and right turns permitted. Sidewalks are provided along both sides of North Street and Congress Street. Crosswalks are provided for all crossings and pedestrian signals are provided for all crossings except the west crossing of the City Hall driveway.

Hanover Street/Union Street is a three-legged, unsignalized intersection. The Hanover Street eastbound and westbound approaches each consist of a single through lane. The Union Street northbound approach consists of a single lane and is stop-controlled. Sidewalks are provided along both sides of Hanover Street and Union Street. A crosswalk is provided across the Union Street approach to the intersection.

2.2.3 Existing Traffic Conditions

Traffic movement data was collected at the study area intersections on June 16, 2014. Manual turning movement counts (TMCs) and vehicle classification counts were conducted during the weekday a.m. and p.m. peak periods (7:00 – 9:00 a.m. and 4:00 – 6:00 p.m., respectively) at the study area intersections.

The vehicle classification counts included car, truck, pedestrian, and bicycle movements. Based on the TMCs, the peak hours of vehicular traffic throughout the study area are 8:00 – 9:00 a.m. and 4:00 – 5:00 p.m. The 2014 Existing weekday a.m. and p.m. peak hour traffic volumes are shown in Figures 3-2 and 3-3, respectively. The detailed traffic counts are provided in Appendix B.

3.2.4 Existing Traffic Operations

The criterion for evaluating traffic operations is level of service (LOS), which is determined by assessing average delay experienced by vehicles at intersections and along intersection approaches. Trafficware's Synchro (version 6) software package was used to calculate average delay and associated LOS at the study area intersections. This software is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 Highway Capacity Manual (HCM). Field observations were performed by HSH to collect intersection geometry such as number of turning lanes, lane length, and lane width that were then incorporated into the operations analysis.

LOS designations are based on average delay per vehicle for all vehicles entering an intersection. 0Table 3-1 displays the intersection LOS criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst (unacceptable) 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.

Table 3-1 Level of Service Criteria

Level of Service	Average Stopped Delay (sec./veh.)	
	Signalized Intersections	Unsignalized Intersections
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50
Source: 2000 Highway Capacity Manual, Transportation Research Board.		

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

Not to scale.

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-2

Existing Conditions (2014) Turning Movement Volumes, a.m. Peak Hour

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-3

Existing Conditions (2014) Turning Movement Volumes, p.m. Peak Hour

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.

Tables 3-2 and 3-3 present the 2014 Existing Conditions operational analysis for the study area intersection during the a.m. and p.m. peak hours, respectively. The detailed analysis sheets are provided in Appendix B.

Table 3-2 Existing Conditions (2014), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue Length (ft)	95th Percentile Queue Length (ft)
Signalized					
Surface Road/Hanover Street	**C**	**20.8**	-	-	-
Surface Road SEB left/thru | thru/right	C	26.8	0.49	130	181
Hanover Street NEB thru | thru/right	C	21.4	0.05	8	13
Hanover Street SWB left	B	11.2	0.19	31	46
Hanover Street SWB thru	B	11.6	0.24	66	108
Surface Road/North Street/I-93 NB Off-Ramp	**B**	**17.2**	-	-	-
Surface Road SEB thru | thru/right	C	28.9	0.79	198	225
North Street NEB right	B	15.8	0.10	46	70
I-93 NB Off-Ramp SWB left/thru | thru	B	12.0	0.61	231	356
Surface Road/I-93 SB Off-Ramp/Clinton Street	**C**	**32.6**	-	-	-
Surface Road SEB thru | thru | thru/right	C	26.3	0.72	109	229
I-93 SB Off-Ramp SWB left	D	50.3	0.90	306	#503
I-93 SB Off-Ramp SWB left/thru | thru	C	29.9	0.91dl	190	254
North Street/Clinton Street/Hotel Driveway	**B**	**11.0**	-	-	-
North Street EB left/thru | thru	B	10.2	0.04	14	29
North Street WB thru | thru/right	A	3.5	0.36	22	121
Clinton Street NB left	D	44.9	0.61	63	m69
Clinton Street NB left/thru/right	D	41.0	0.53	54	38
Hotel Driveway SB left/thru/right	C	33.2	0.26	1	22
North Street/Union Street	**B**	**11.6**	-	-	-
North Street EB left/thru | thru	A	2.0	0.05	1	m3
North Street WB thru | thru/right	B	12.5	0.58	160	207
North Street/Congress Street/City Hall Driveway	**F**	**>80.0**	-	-	-
City Hall Driveway EB left/thru/right	B	12.1	0.15	7	34
North Street WB left	F	>80.0	>1.00	~346	#484
North Street WB left/thru/right	F	>80.0	>1.00	~286	96
Congress Street NB left/thru | thru | thru/right	B	13.1	0.59	13	21
Congress Street SB left/thru | thru | thru/right	F	>80.0	>1.00	~242	#316
Unsignalized					
Hanover Street/Union Street	-	-	-	-	-
Hanover Street EB thru	A	0.0	0.01	-	0
Hanover Street WB thru	A	0.0	0.14	-	0
Union Street NB left/right	A	9.4	0.05	-	4

95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.
dl Defacto Left Lane. The shared lane operates as an exclusive left-turn lane.
m Volume for 95th percentile queue is metered by upstream signal.
Grey shading indicates LOS E or LOS F.

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

Intersection	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue Length (ft)	95th Percentile Queue Length (ft)
Signalized					
Surface Road/Hanover Street	**B**	**15.3**	-	-	-
Surface Road SEB left/thru | thru/right	B	11.9	0.32	92	123
Hanover Street NEB thru | thru/right	C	26.4	0.07	8	23
Hanover Street SWB left	C	23.6	0.21	37	67
Hanover Street SWB thru	C	22.9	0.16	43	78
Surface Road/North Street/I-93 NB Off-Ramp	**B**	**16.2**	-	-	-
Surface Road SEB thru | thru/right	C	24.1	0.64	96	93
North Street NEB right	A	5.1	0.20	19	21
I-93 NB Off-Ramp SWB left/thru | thru	A	9.1	0.16	42	84
Surface Road/I-93 SB Off-Ramp/Clinton Street	**B**	**19.9**	-	-	-
Surface Road SEB thru | thru | thru/right	B	13.6	0.44	58	97
I-93 SB Off-Ramp SWB left	C	31.5	0.42	107	164
I-93 SB Off-Ramp SWB left/thru | thru	C	28.9	0.36	85	109
North Street/Clinton Street/Hotel Driveway	**C**	**27.4**	-	-	-
North Street EB left/thru | thru	B	12.3	0.04	3	45
North Street WB thru | thru/right	A	5.8	0.12	38	79
Clinton Street NB left	E	57.5	0.65	84	141
Clinton Street NB left/thru/right	E	55.5	0.63	80	134
Hotel Driveway SB left/thru/right	D	44.2	0.36	5	29
North Street/Union Street	**B**	**16.5**	-	-	-
North Street EB left/thru | thru	A	1.0	0.06	0	m0
North Street WB thru | thru/right	C	21.2	0.30	130	180
North Street/Congress Street/City Hall Driveway	**B**	**19.5**	-	-	-
City Hall Driveway EB left/thru/right	B	17.5	0.11	12	3
North Street WB left	C	29.0	0.67	37	43
North Street WB left/thru/right	A	8.8	0.62	49	0
Congress Street NB left/thru | thru | thru/right	A	4.2	0.55	21	29
Congress Street SB left/thru | thru | thru/right	D	39.2	0.77	141	#236
Unsignalized					
Hanover Street/Union Street	-	-	-	-	-
Hanover Street EB thru	A	0.0	0.01	-	0
Hanover Street WB thru	A	0.0	0.06	-	0
Union Street NB left/right	A	8.9	0.05	-	4

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

As shown in Tables 3-2 and 3-3, under the 2014 Existing conditions:

The intersection of Surface Road/Hanover Street currently operates at LOS C during the weekday a.m. peak hour and at LOS B during the p.m. peak hour. The longest queues at the intersection occur along Surface Road during both the a.m. and p.m. peak hours.

The intersection of Surface Road/North Street/I-93 NB Off-Ramp currently operates at LOS B during both the weekday a.m. and p.m. peak hours. The longest queues at the intersection occur along the I-93 NB off-ramp during the a.m. peak hour and along Surface Road during the p.m. peak hour.

The intersection of Surface Road/I-93 SB Off-Ramp/Clinton Street currently operates at LOS C during the weekday a.m. peak hour and at LOS B during the p.m. peak hour. The longest queues at the intersection occur along the I-93 SB off-ramp during both the a.m. and p.m. peak hours.

The intersection of North Street/Clinton Street/Hotel Driveway currently operates at LOS B during the weekday a.m. peak hour and at LOS C during the p.m. peak hour. The longest queues at the intersection occur along the Clinton Street northbound approach during both the a.m. and p.m. peak hours.

The intersection of North Street/Union Street currently operates at LOS B during both the weekday a.m. and p.m. peak hours. The longest queues at the intersection occur along the North Street westbound approach during both the a.m. and p.m. peak hours.

The intersection of North Street/Congress Street/City Hall Driveway currently operates at LOS F during the weekday a.m. peak hour and at LOS B during the p.m. peak hour. The North Street westbound left approach, the North Street westbound left/thru/right approach and the Congress Street southbound approach all operate at LOS F during the a.m. peak hour. The longest queues at the intersection occur along North Street westbound during the a.m. peak hour and along the Congress Street southbound approach during the p.m. peak hour.

At the unsignalized intersection of Hanover Street/Union Street, all approaches currently operate at LOS A during both the weekday a.m. and p.m. peak hours.

Based on the results of this analysis, the majority of the intersections currently operate acceptably and under their operational capacity. The intersection of North Street/Congress Street/City Hall Driveway currently operates with moderate delay and queuing during the a.m. peak hour only.

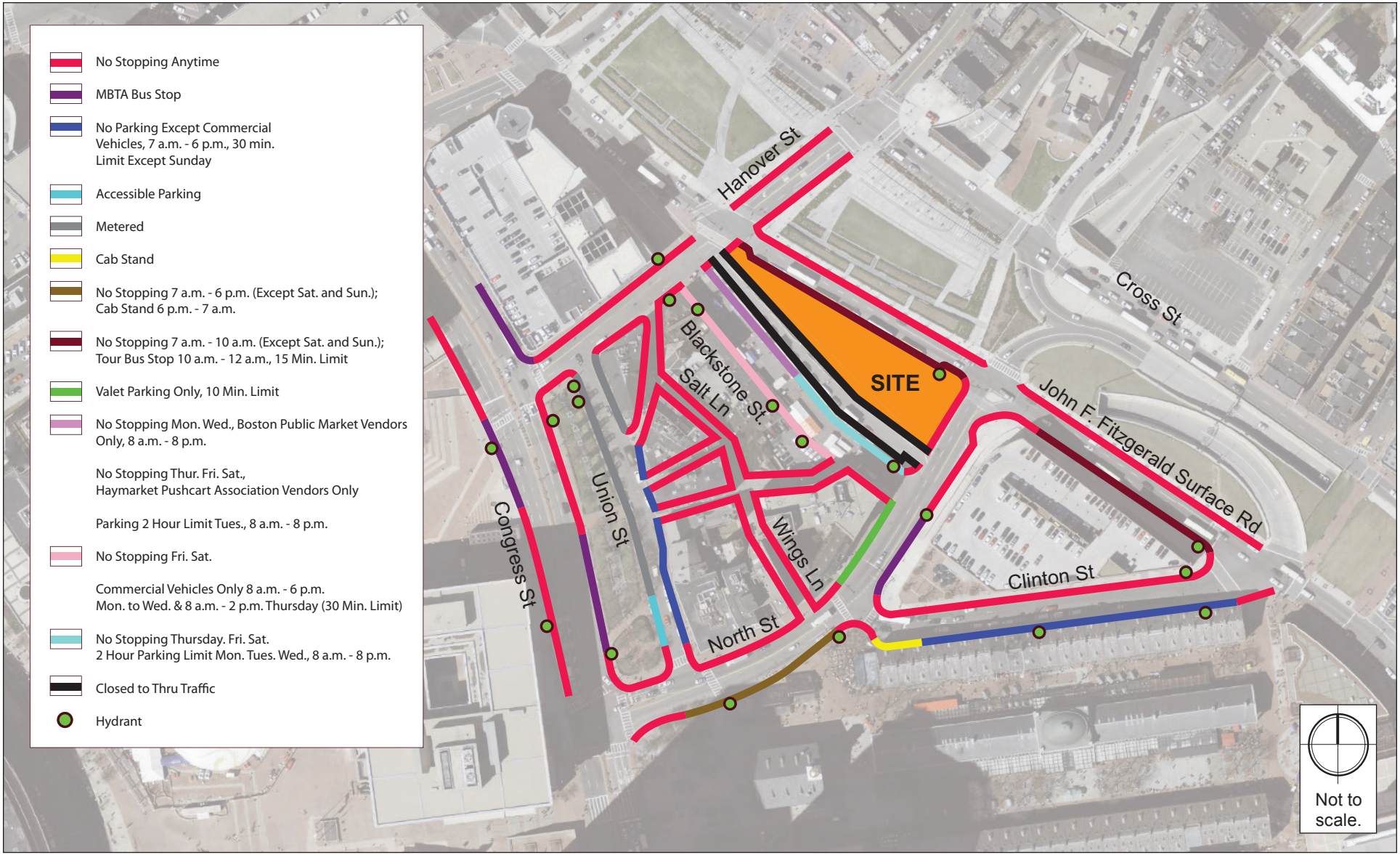
3.2.5 Parking

3.2.5.1 On Street Parking and Curb Usage

On street parking surrounding the Project site generally consists of tour bus stop parking along Surface Road adjacent to the Project site, no parking/no stopping regulations along Hanover Street and North Street, and two-hour parking and commercial parking along Blackstone Street. Parking is prohibited along Blackstone Street on Fridays, Saturdays, and Sundays to accommodate the Haymarket open-air market. The on-street parking regulations within the study area are shown on Figure 3-4.

3.2.5.2 Off-Street Parking

As shown in Figure 3-5, there are 18 parking lots and 13 parking garages located within a quarter-mile of the Project site. In total there are 1,200 private spaces and 2,801 public spaces available. A detailed summary of all parking lots and garages is shown in Table 3-4.



Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-4
On-Street Parking Regulations

1/4 Mile Radius: Parking Lots

Map ID	Facility Name	Private Capacity	Public Capacity
1	JFK Lot	23	0
2	Alley 102	17	0
3	Creek Square Lot	10	0
4	BDPW Lot	14	0
5	Real Prop Lot	0	39
6	Richmond Street Lot	12	0
7	133-147 North Street	15	0
8	D'Amore Parking	67	0
9	Endicott @ Stillman Street	10	0
10	MDC Employee Lot	73	0
11	Langone Funeral Home	19	0
12	Friend Street Lot	12	0
13	P & P	0	83
14	Michael Angelo School Lot	10	0
15	57 Friend Street Lot	0	0
16	Fulton Street Lot	110	0
17	Chatham Street Lot	0	31
18	Broad & Water Lot	0	21

1/4 Mile Radius: Parking Garages

Map ID	Facility Name	Private Capacity	Public Capacity
A	Center Plaza Garage	0	586
B	City Hall Exec Garage	28	0
C	City Hall Garage	60	0
D	JFK Building Garage	180	0
E	MBTA Haymarket Station Garage	0	310
F	44 Prince Street, LLC	70	0
G	Devonshire Tower	109	87
H	60 State Street Associates	78	227
I	Exchange Place	93	0
J	Clinton Street Garage	0	597
K	Long Wharf Hotel	190	0
L	75 State Street Garage	0	700
M	Marketplace Center Garage	0	120

Haymarket Hotel Boston, Massachusetts

Table 3-4 Off Street Parking Lots and Garages

Map #	Address	Facility	Private Capacity	Public Capacity
		Lots		
1	Cambridge Street	JFK Lot	23	0
2	Alley 102	Alley 102	17	0
3	Creek Square	Creek Square Lot	10	0
4	Blackstone Street	BDPW Lot	14	0
5	North Washington Street	Real Prop Lot	0	39
6	174 North Richmond Street	Richmond Street Lot	12	0
7	133–147 North Street	133–147 North Street	15	0
8	34 Cooper Street	D'Amore Parking	67	0
9	60 Endicott Street	Endicott @ Stillman Street	10	0
10	DCR	DCR Employee Lot	73	0
11	72-80 Merrimac Street	Langone Funeral Home	19	0
12	200–204 Friend Street	Friend Street Lot	12	0
13	Merrimac Street	P & P	0	83
14	70 Charter Street	Michael Angelo School Lot	10	0
15	57 Friend Street	57 Friend Street Lot	0	0
16	56 Fulton Street	Fulton Street Lot	110	0
17	49–51 Chatham Street	Chatham Street Lot A	0	31
18	47-49 Broad Street	Broad & Water Lot	0	21
		Parking Lots—Subtotals	**392**	**174**
		Garages		
A	50 Cambridge Street	Center Plaza Garage	0	586
B	City Hall	City Hall Executive Garage	28	0
C	City Hall	City Hall Garage	60	0
D	Congress Street	JFK Building Garage	180	0
E	Congress Street Parcel 7	MBTA Haymarket Station Garage	0	310
F	44 Prince Street	44 Prince Street, LLC	70	0
G	1 Devonshire Place	Devonshire Tower	109	87
H	60 State Street	60 State Street Associates	78	227
I	53 State Street	Exchange Place	93	0
J	Clinton Street	Clinton Street Garage	0	597
K	Atlantic Avenue @ State Street	Long Warf Hotel	190	0
L	75 State Street	75 State Street Garage	0	700
M	200 State Street	Marketplace Center Garage	0	120
		Parking Lots—Subtotals	**808**	**2,627**
		Total Spaces	**1,200**	**2,801**

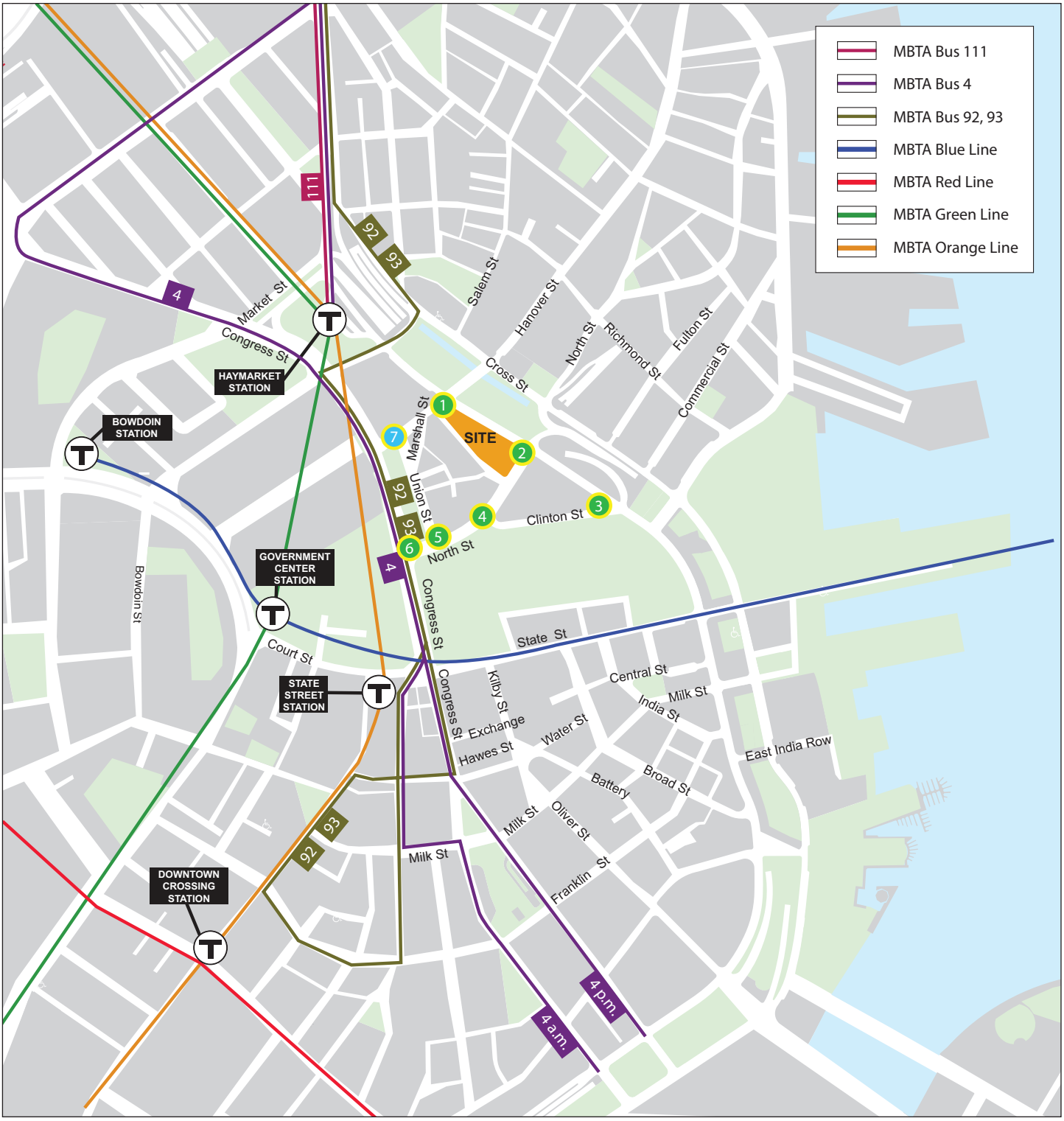
3.2.6 Existing Public Transportation

The Project site is located in an ideal location to take advantage of Boston's public transportation system. The Project site is one block away from the MBTA Haymarket Station, which provides access to Orange and Green line subway service, as well as a number of local and express bus services. Additionally, there are several other MBTA stations within a quarter-mile, or about a 7-minute walk, of the Project site, including those on the Orange Line at State Street station, the Green Line at Government Center Station (closed until 2016), and the Blue Line at Bowdoin, Government Center, and State Street stations. North Station, located one stop north on the Orange and Green lines, also provides access to the MBTA's regional commuter rail trains serving the northern and northwestern suburbs of Boston. Connection to the Red Line subway service is also available one stop south of the State Street station at Downtown Crossing.

Nine express bus routes and four local bus routes travel within a quarter-mile walk of the Project site. Five of the express buses run only during the peak a.m. and p.m. periods, and one express bus only runs one daily round trip. Out of these 13 bus routes, one local bus (Route 111) and five express buses (the Route 400's to the inner suburbs) use the MBTA Haymarket bus bays. Of the buses that enter the bus facility, approximately 65% of the total daily bus trips are from the Route 111 buses (serving Chelsea and Revere) contributing to over 75% of all patrons using the Haymarket bus facility. Other nearby bus stops are located curbside along Congress Street at Hanover Street and at State Street.

The MBTA operates for 20 hours of the day, with the commuter peak periods being the busiest. The peak periods of use at the MBTA Haymarket bus facility are weekdays between 7:00 and 8:30 a.m. and 4:30 and 6:00 p.m. Since none of the 400 series bus routes are in service on weekends, the only activity in the bus facility on weekends is from Route 111 buses. Due to the low frequency of service for the 400 series routes during typical weekday non-peak commuter periods, the MBTA Haymarket bus facility is primarily used by Route 111 buses during non-peak commuter periods.

Figure 3-6 shows a map of all public transportation service located within a quarter-mile of the Project site, and Table 3-5 provides a brief summary of all routes.



Not to scale.

Haymarket Hotel Boston, Massachusetts

Table 3-5 Public Transportation

Service	Origin/Destination	Rush-hour Headway (minutes)
Rapid Transit Routes		
Orange Line	Forest Hills–Oak Grove	6
Blue Line	Bowdoin–Wonderland	5
Green Line	Boston College – Park Street Cleveland Circle – North Station Riverside – Park Street Heath Street – Lechmere	6–7
Red Line	Alewife – Braintree Alewife – Ashmont	9 9
Local Bus Routes		
Route 4	North Station-World Trade Center via Federal Courthouse and South Station	12-21
Route 92	Assembly Sq. Mall–Downtown via Sullivan Sq., Main St. and Haymarket Station	15
Route 93	Sullivan Sq. Station–Downtown via Bunker Hill St. and Haymarket Station	7–8
Route 111	Woodlawn or Broadway and Park Avenue–Haymarket Station via Tobin Bridge	3–5
Express Bus Routes		
Route 325	Elm Street, Medford–Haymarket Station via Fellsway West, Salem Street, and I-93	15-20
Route 326	West Medford–Haymarket Station via Playstead Road, High Street, Medford, and I-93	15-20
Route 352	Burlington-Boston Via Route 128 and I-93	20-30
Route 354	Woburn Express-Boston Via Woburn Square and I-93	15-20
Route 424	Eastern Avenue and Essex Street–Haymarket Station or Wonderland Salem Depot–Haymarket Station or Wonderland Salem Depot–Central Square, Lynn, via Highland Avenue	30
Route 426	Central Square, Lynn–Haymarket Station via Cliftondale	15-20
Route 428	Oaklandvale–Haymarket Station via Granada Highlands	30-40
Route 434	Peabody–Haymarket Express via Goodwin's Circle	1 daily roundtrip
Route 450	Eastern Avenue and Essex Street–Haymarket Station or Wonderland Salem Depot–Haymarket Station or Wonderland Salem Depot–Central Square, Lynn via Highland Avenue	30

3.2.7 Existing Pedestrian Conditions

The Project site is located along the Rose Fitzgerald Kennedy Greenway, a 1.5-mile linear park that connects various neighborhoods of downtown Boston. The Greenway experiences significant pedestrian activity, especially throughout the summer months. In general, sidewalks are provided along all roadways and are in good condition. Crosswalks and pedestrian signal equipment are also provided at the study area intersections.

To estimate the amount of pedestrian activity within the study area, pedestrian counts were conducted concurrent with the TMCs on June 16, 2014 at the study area intersections, and are presented in Figure 3-7. As shown in the figure, pedestrian activity is heavy throughout the study area, with the heaviest pedestrian volumes occurring along Congress Street.

3.2.8 Existing Bicycle Conditions

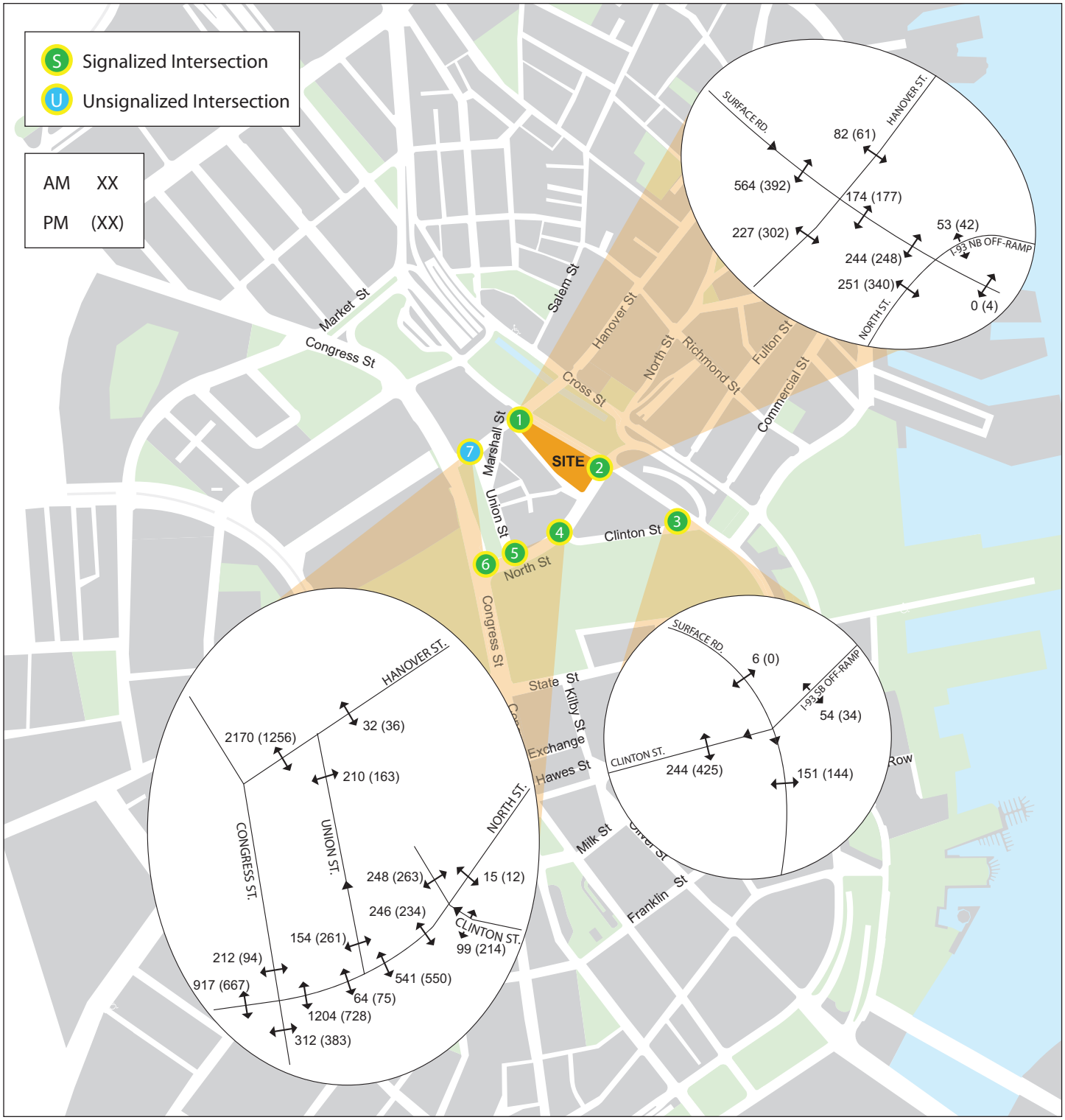
In recent years, bicycle use has increased dramatically throughout the City of Boston. The Project site is conveniently located in close proximity to several bicycle facilities. Congress Street is designated as an advanced bicycle route on the City of Boston's "Bike Routes of Boston" map, and is suitable for experienced and traffic confident cyclists. However, Congress Street has no formal bike accommodations.

Surface Road has an exclusive bicycle lane in the southbound direction in the vicinity of the Project site. Bicycle counts were conducted concurrent with the vehicular TMCs on June 16, 2014, and are presented in Figure 3-8. As shown in the figure, bicycle volumes are heaviest along Surface Road during the peak periods.

Hubway is a bicycle sharing system in the Boston area which was launched in 2011 and consists of over 140 stations and 1,300 bicycles. The nearest Hubway station to the Project site is located at Faneuil Hall near the intersection of Union Street and North Street. Figure 3-9 shows the Hubway stations within a quarter-mile radius of the Project site.

3.2.9 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.



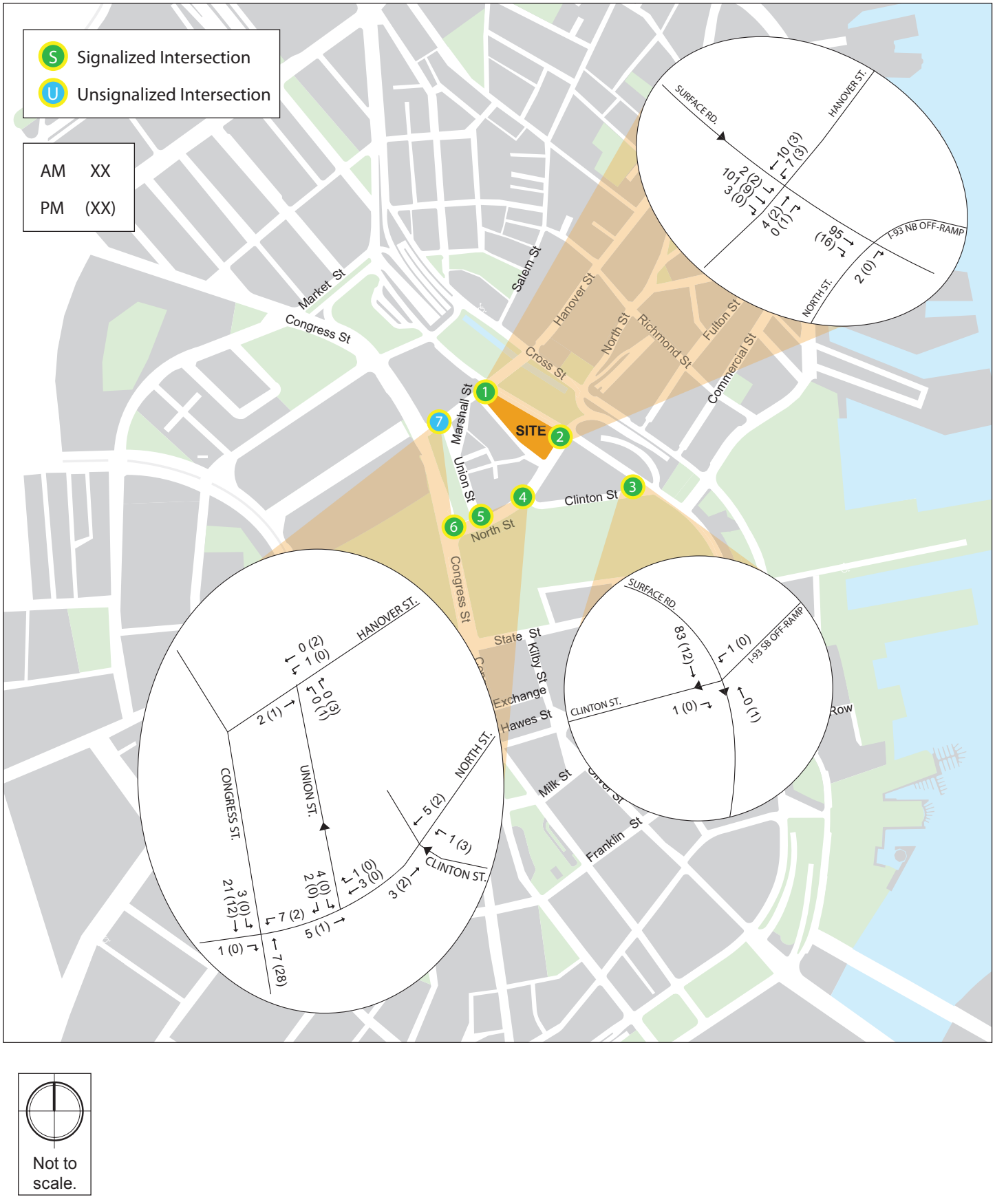
Not to scale.

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-7

Existing Conditions (2014) Pedestrian Volumes, a.m. and p.m. Peak Hour



Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-8

Existing Conditions (2014) Bicycle Volumes, a.m. and p.m. Peak Hour

Not to scale.

Haymarket Hotel Boston, Massachusetts

Zipcar is the primary company in the Boston car sharing market. There are currently 13 Zipcar locations within a half-mile walk of the Project site:

- 75 State St.
- Pi Alley Garage
- Center Plaza
- Government Center Garage
- Boston Harbor Garage
- Lewis Wharf
- 290 Commercial St.
- 33 Arch St.
- One Federal
- Post Office Sq.
- 225 Franklin St.
- 125 High St.
- Two International Place

The nearby car sharing locations are shown in Figure 3-9.

3.3 Future Conditions

For transportation impact analyses, it is standard practice to evaluate two future conditions: No Build conditions (without the proposed project) and Build conditions (with the proposed project). In accordance with BTD guidelines, these conditions are projected to a future date five years from the current year. For the evaluation of this Project, 2019 was selected as the horizon year for the future conditions analyses.

This section presents a description of the 2019 future conditions scenarios, and includes an evaluation of the transportation facilities under the No Build and Build conditions.

3.3.1 No Build Conditions

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

3.3.1.1 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-percent per year annual traffic growth rate was used to develop the future conditions traffic volumes.

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. The following projects are located in the vicinity of the study area:

Government Center Garage – This BRA board-approved project calls for the construction of a 2.4 million sf development including 771 residential units, 204 new hotel rooms, 1.3 million sf of offices, 82,500 sf of retail space and 1,159 parking spaces. Trips expected to be generated by this project were assigned to the study area intersections.

Simpson Housing (The Victor) – This project, currently under construction, is located on Beverly Street and consists of the construction of 284 residential units above 14,910 sf of ground floor retail, with 142 parking spaces on-site. Trips expected to be generated by this project were assigned to the study area intersections.

The Merano – This BRA board approved project is located between Beverly Street and Medford Street and involves the construction of 230 residential units, a 210-room hotel, and 184 parking spaces. Trips expected to be generated by this project were distributed to the study area intersections.

One Canal Street – This BRA board-approved project calls for approximately 320 units of residential apartments, 21,300 sf of retail, and 159 parking spaces. This project is currently under construction as of July 2014. Trips expected to be generated by this project were assigned to the study area intersections.

121-127 Portland Street - Also known as the Forecaster Building, this BRA board-approved project will add two floors to an existing six-story building. The project calls for approximately 81 residential units, 3,179 sf of commercial space, and 42 parking spaces. Trips expected to be generated by this project were distributed to the study area intersections.

Lovejoy Wharf –This BRA board-approved project, also known as the Hoffman Building, is under construction at 160 North Washington Street and calls for the reuse of an existing structure of 336,335 square feet. The proposed project is expected to include 187,187 sf of

office use, 20,543 sf of commercial space, including a 300-seat restaurant, and 175 residential units. Trips expected to be generated by this project were distributed to the study area intersections.

Garden Garage – This project is located on Martha Road and Lomasney Way on approximately three acres of land at Longfellow Place in Boston's West End. According to a Draft Project Impact Report filed with the BRA in Fall 2011, the proposed project will create two new buildings on the site of the existing above-ground Garden Garage. The West Tower will consist of approximately 190 residential apartment units and approximately 3,000 square feet of ground-floor retail and the East Tower will consist of approximately 310 residential apartment units. In addition, the existing 650-space garage will be replaced with an 850-space underground parking structure, resulting in a net increase of 200 new spaces. Trips generated by this project were assigned to the study area intersections.

Massachusetts General Hospital Institutional Master Plan Building for the 3rd Century (MGH) - MGH is constructing a new ambulatory care building on the site of several former hospital buildings. One phase of the project, the Yawkey Outpatient Center, is already complete and includes a 725-space parking garage. Both the garage and Yawkey Center are operational. A second 150-bed addition has also been permitted and constructed. No new parking is to be built as part of the second phase. Trips generated by this project were assigned to the study area intersections.

Nashua Street Residences – This BRA board-approved project includes the development of a 503-unit residential tower with 3,575 sf of retail space and 270 parking spaces. Trips expected to be generated by this project were distributed to the study area intersections.

The Boston Garden – This BRA board-approved, mixed-use project will include 497 residential units, a 306 room hotel, 668,000 sf of office space, 235,000 sf of retail/restaurant space including a neighborhood grocery store, and over 65,000 sf in expansions to elevators, lobbies, concessions, and an atrium hall for TD Garden and the North Station's use. An additional 800 parking spaces are planned to be added beneath the Project site and will be connected to the existing 1,275 parking space garage at the existing TD Garden. Trips generated by this project were distributed to the study area intersections.

Suffolk University - 20 Somerset Street – This project, currently under construction, involves the demolition of the former Metropolitan District Commission Building and its replacement with an eight-story, 112,000-square-foot building that will include classrooms, studios for art students, and gallery space. Trips expected to be generated by this project are reflected within the general background growth rate.

17 Court Street – This BRA board-approved project calls for the renovation and reconfiguration of the 130,000 sf existing shelter and will allow for 35 new efficiency units, in addition to the 59 single resident occupancies. Trips expected to be generated by this project are reflected within the general background growth rate.

296 Cambridge Street – This project, currently under construction, calls for a 30,185 sf, 5-story office building. Trips expected to be generated by this project are reflected within the general background growth rate.

A map of the background projects is provided on Figure 3-10.

The one percent per year annual growth rate was applied to the 2014 Existing conditions traffic volumes, then the traffic volumes associated with the background development projects were added to develop the 2019 No Build conditions traffic volumes. The 2019 No Build a.m. and p.m. peak hour traffic volumes are shown on Figure 3-11 and Figure 3-12, respectively.

3.3.1.2 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. The proposed infrastructure improvements are highlighted below.

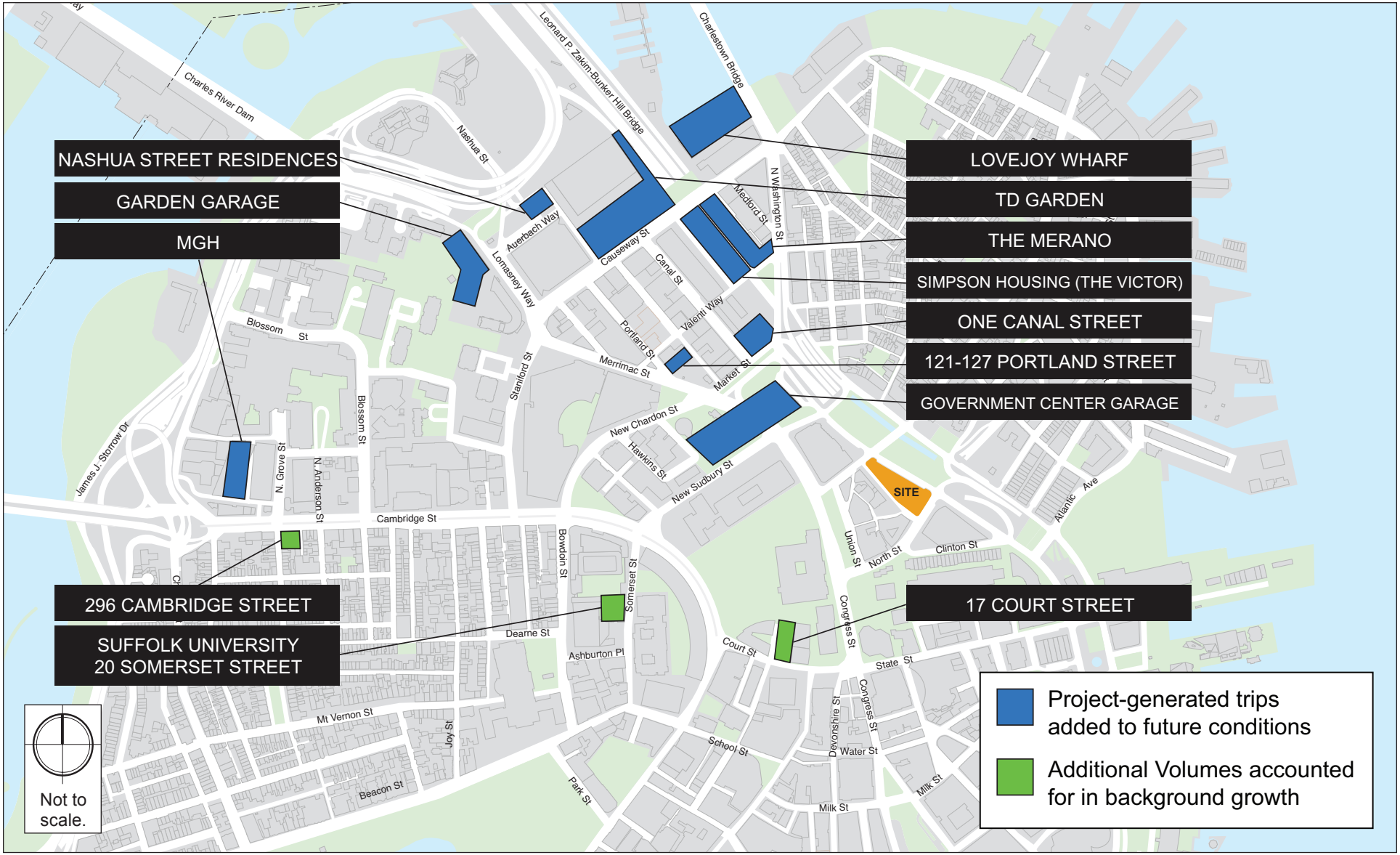
Connect Historic Boston – Connect Historic Boston (CHB) is a planned infrastructure project with an aim to improve bicycle, pedestrian, transit access, comfort, and safety around the historical sites of downtown Boston. This initiative between the National Park Service (NPS) and the Boston Transportation Department (BTD) consists of several target areas for reconstruction, one of which is the Blackstone Block, located adjacent to the southwest side of the Project site. There are high levels of pedestrian traffic in this area due to the popular Freedom Trail, a high concentration of retail and dining establishments, and nearby transit hubs for commuters such as Haymarket and North Station.

Some of the proposed improvements within the study area include the following:

- A raised intersection will be installed at the intersection of Union Street and North Street, providing better pedestrian connectivity to Faneuil Hall.
- Union Street and Hanover Street (between Congress Street and Surface Road) will be converted into "shared" streets which will allow mixed pedestrian and vehicle traffic.
- Parking will be removed from Creek Square and will be redesigned into a pedestrian plaza.

3.3.1.3 No Build Conditions Traffic Operations

The 2019 No Build conditions scenario analysis uses the same methodology as the 2014 Existing Conditions scenario analysis. Table 3-6 and Table 3-7 present the 2019 No Build conditions operations analysis for the a.m. and p.m. peak hours, respectively. The detailed analysis sheets are provided in Appendix B.



Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-10
Background Projects

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-11

No-Build Conditions (2019) Turning Movement Volumes, a.m. Peak Hour

Not to scale.

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-12

No-Build Conditions (2019) Turning Movement Volumes, p.m. Peak Hour

Table 3-6 No Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue Length (ft)	95th Percentile Queue Length (ft)
Signalized					
Surface Road/Hanover Street	**C**	**21.2**	-	-	-
Surface Road SEB left/thru | thru/right	C	27.2	0.50	147	200
Hanover Street NEB thru | thru/right	C	21.4	0.05	8	13
Hanover Street SWB left	B	11.3	0.20	32	47
Hanover Street SWB thru	B	11.9	0.27	74	118
Surface Road/North Street/I-93 NB Off-Ramp	**B**	**19.5**	-	-	-
Surface Road SEB thru | thru/right	C	26.8	0.80	225	239
North Street NEB right	B	14.2	0.11	47	81
I-93 NB Off-Ramp SWB left/thru | thru	B	16.6	0.74	326	521
Surface Road/I-93 SB Off-Ramp/Clinton Street	**D**	**35.1**	-	-	-
Surface Road SEB thru | thru | thru/right	C	29.1	0.80	152	245
I-93 SB Off-Ramp SWB left	D	52.0	0.91	329	#545
I-93 SB Off-Ramp SWB left/thru | thru	C	33.2	0.93dl	246	325
North Street/Clinton Street/Millennium Driveway	**B**	**14.1**	-	-	-
North Street EB left/thru | thru	B	13.5	0.05	15	28
North Street WB thru | thru/right	A	6.9	0.47	30	223
Clinton Street NB left	D	39.7	0.76	103	m78
Clinton Street NB left/thru/right	C	33.9	0.66	86	42
Millennium Driveway SB left/thru/right	C	33.2	0.26	1	22
North Street/Union Street	**B**	**16.3**	-	-	-
North Street EB left/thru | thru	A	2.6	0.06	1	m5
North Street WB thru | thru/right	B	17.3	0.76	226	348
North Street/Congress Street/City Hall Driveway	**F**	**>80.0**	-	-	-
City Hall Driveway EB left/thru/right	B	12.1	0.17	7	35
North Street WB left	F	>80.0	>1.00	~436	#568
North Street WB left/thru/right	F	>80.0	>1.00	~431	#166
Congress Street NB left/thru | thru | thru/right	C	24.1	0.65	21	37
Congress Street SB left/thru | thru | thru/right	F	>80.0	>1.00	~272	#348
Unsignalized					
Hanover Street/Union Street	-	-	-	-	-
Hanover Street EB thru	A	0.0	0.01	-	0
Hanover Street WB thru	A	0.0	0.15	-	0
Union Street NB left/right	A	9.5	0.05	-	4

95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.
dl Defacto Left Lane. The shared lane operates as an exclusive left-turn lane.
m Volume for 95th percentile queue is metered by upstream signal.

Table 3-7 No Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue Length (ft)	95th Percentile Queue Length (ft)
Signalized					
Surface Road/Hanover Street	**B**	**15.7**	-	-	-
Surface Road SEB left/thru | thru/right	B	12.9	0.39	120	156
Hanover Street NEB thru | thru/right	C	26.0	0.07	8	24
Hanover Street SWB left	C	23.6	0.22	40	70
Hanover Street SWB thru	C	22.9	0.18	47	84
Surface Road/North Street/I-93 NB Off-Ramp	**B**	**15.5**	-	-	-
Surface Road SEB thru | thru/right	C	20.9	0.64	99	104
North Street NEB right	A	6.3	0.23	28	22
I-93 NB Off-Ramp SWB left/thru | thru	B	11.5	0.23	67	107
Surface Road/I-93 SB Off-Ramp/Clinton Street	**B**	**19.9**	-	-	-
Surface Road SEB thru | thru | thru/right	B	15.0	0.50	82	102
I-93 SB Off-Ramp SWB left	C	30.1	0.35	87	139
I-93 SB Off-Ramp SWB left/thru | thru	C	28.9	0.36	86	110
North Street/Clinton Street/Millennium Driveway	**C**	**30.4**	-	-	-
North Street EB left/thru | thru	B	14.5	0.04	12	44
North Street WB thru | thru/right	A	7.1	0.16	61	107
Clinton Street NB left	E	62.1	0.72	109	172
Clinton Street NB left/thru/right	E	59.3	0.69	104	167
Millennium Driveway SB left/thru/right	D	44.2	0.36	5	29
North Street/Union Street	**B**	**17.5**	-	-	-
North Street EB left/thru | thru	A	1.3	0.07	0	m3
North Street WB thru | thru/right	C	21.4	0.41	182	239
North Street/Congress Street/City Hall Driveway	**C**	**27.0**	-	-	-
City Hall Driveway EB left/thru/right	B	17.6	0.14	12	3
North Street WB left	C	34.8	0.77	44	53
North Street WB left/thru/right	B	15.9	0.69	107	0
Congress Street NB left/thru | thru | thru/right	A	6.0	0.64	28	50
Congress Street SB left/thru | thru | thru/right	E	55.5	0.94	~168	#293
Unsignalized					
Hanover Street/Union Street	-	-	-	-	-
Hanover Street EB thru	A	0.0	0.01	-	0
Hanover Street WB thru	A	0.0	0.07	-	0
Union Street NB left/right	A	9.0	0.05	-	4

95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.
Grey shading indicates a decrease to LOS E or LOS F from Existing conditions.

As shown in Table 3-6 and Table 3-7, under the 2019 No-Build conditions, operations at the study area intersections are expected to experience minimal degradation in operations under the 2019 No Build conditions when compared to the 2014 Existing conditions. In general, the study area intersections have enough capacity to accommodate the future traffic volumes without the Project in place.

The intersection of Surface Road/Hanover Street will continue to operate at LOS C during the a.m. peak hour and at LOS B during the p.m. peak hour. The longest queues at the intersection will continue to occur along Surface Road during both the a.m. and p.m. peak hours.

The intersection of Surface Road/North Street/I-93 NB Off-Ramp will continue to operate at LOS B during both the a.m. and p.m. peak hours. The longest queues at the intersection will continue to occur along the I-93 NB off-ramp during the a.m. peak hour and along Surface Road during the p.m. peak hour.

The intersection of Surface Road/I-93 SB Off-Ramp/Clinton Street will operate at LOS D during the a.m. peak hour and will continue to operate at LOS B during the p.m. peak hour. The longest queues at the intersection will continue to occur along the I-93 SB off-ramp left-turn approach during both the a.m. and p.m. peak hours.

The intersection of North Street/Clinton Street/Hotel Driveway will continue to operate at LOS B during the a.m. peak hour and at LOS C during the p.m. peak hour. The longest queues at the intersection will occur along the North Street westbound approach during the a.m. peak hour and will continue to occur along the Clinton Street northbound left approach during the p.m. peak hour.

The intersection of North Street/Union Street will improve and will operate at LOS B during both the a.m. and p.m. peak hours. The longest queues at the intersection will continue to occur along the North Street westbound approach during both the a.m. and p.m. peak hours.

The intersection of North Street/Congress Street/City Hall Driveway will continue to operate at LOS F during the a.m. peak hour and at LOS C during the p.m. peak hour. The longest queues at the intersection will continue to occur along the North Street westbound approach during the a.m. peak hour and along the Congress Street southbound approach during the p.m. peak hour.

At the unsignalized intersection of Hanover Street/Union Street, all approaches will continue to operate at LOS A during both the weekday a.m. and p.m. peak hours.

3.3.2 Build Conditions

As previously summarized, the Project consists of a 10-story hotel containing approximately 225 rooms along with 25,000 sf of ground floor market/retail space. A valet service will be provided for both the hotel and restaurant uses and will use the curb along Surface Road adjacent to the site for operations. Loading, deliveries, and trash pick-up will be accommodated on-site by two loading bays accessed from Blackstone Street in the rear of the site.

3.3.2.1 Site Access and Circulation

As shown in the Project site plan in Figure 3-13, no vehicular access to the site will be provided for automobiles. Project traffic will be accommodated by a valet service that will be accessed from the existing curb along Surface Road. Typical of an urban hotel, it is anticipated that the majority of the guests will either arrive by taxi or public transportation, and will not have a need for parking. The proximity to Haymarket Station and the other nearby MBTA stations in downtown Boston provide the hotel guests easy access to and from North Station, South Station, and Logan Airport. The valet service is expected to use one or more nearby garages for operations. Currently, the parking regulations along Surface Road adjacent to the site allow tour buses to stage and idle. As part of the Project, the parking regulations along Surface Road, adjacent to the site, are anticipated to be changed to allow for a valet service and short-term pick-up/drop-off. These changes will be made in coordination with the BTD. Pedestrians will access the site primarily from Surface Road, with additional access points located along North Street for the retail space and along Blackstone Street for both the hotel use and the retail space. Service access to the loading bays on the Project site will be provided along Blackstone Street. The site access plan is shown in Figure 3-13.

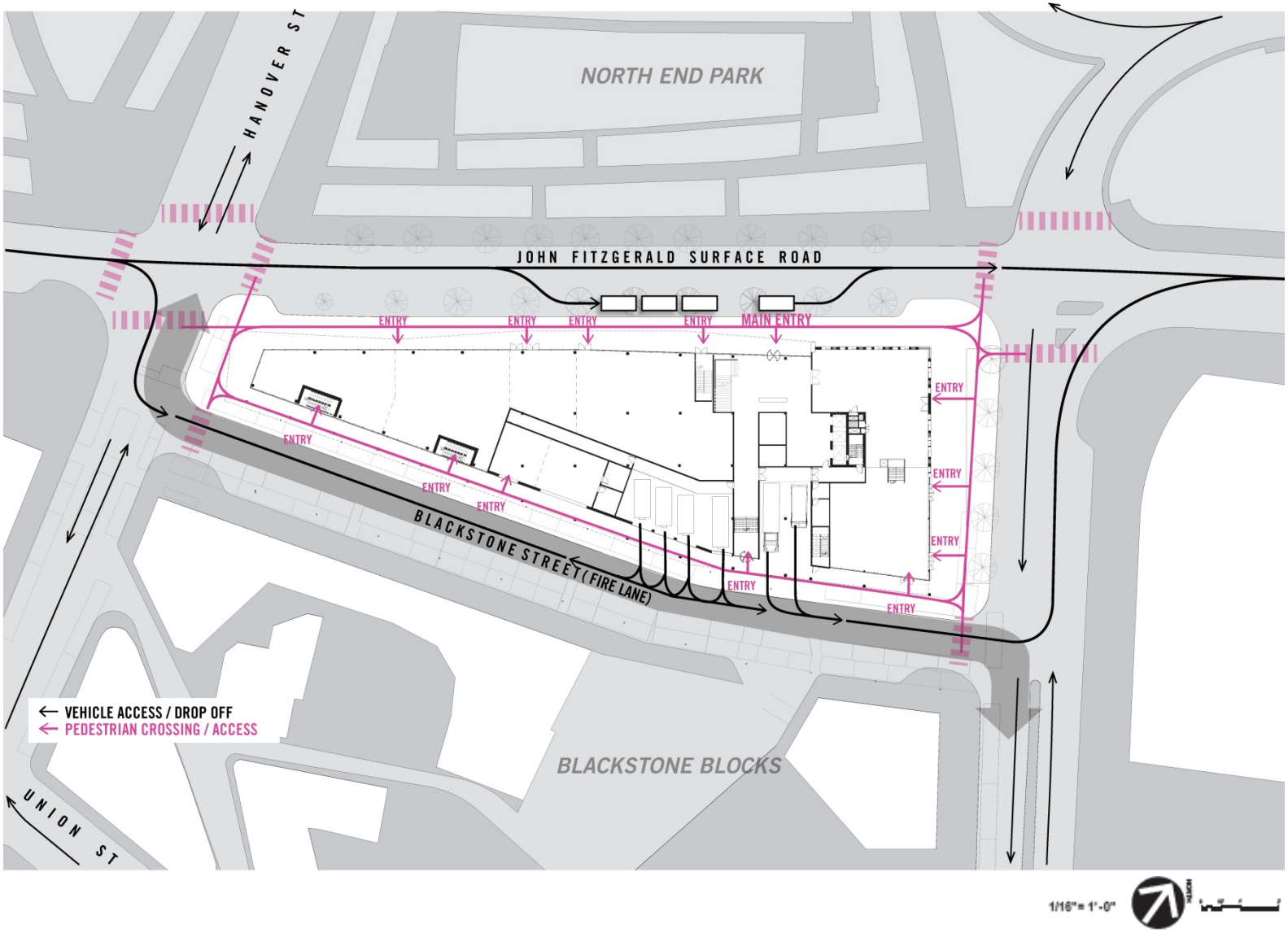
3.3.2.2 Trip Generation Methodology

Trip generation is a complex, multi-step process that produces an estimate of vehicle trips, transit trips, walk trips, and bicycle trips associated with a proposed 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 project site.

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

---

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



Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 3-13

Site Access Plan

To estimate the unadjusted number of vehicular trips for the Project, the following ITE land use codes (LUCs) were used:

Hotel Uses: LUC 310 – Hotel. The hotel land use is defined as a place of lodging that provides sleeping accommodations and supporting facilities such as restaurants, cocktail lounges, meeting/banquet/convention rooms, limited recreational facilities, and/or other retail and service shops. Hotel trip generation estimates are based on average vehicle rates per number of hotel rooms.

Retail Uses: LUC 820 – Shopping Center. The Shopping Center land use code is defined as an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. Shopping center trip generation estimates are based on average vehicle rates per square footage of retail space. The Shopping Center land use code was selected because it is more general has slightly higher trip generation rates than the other similar retail land uses provided in the Trip Generation Manual, presenting a more conservative scenario.

3.3.2.3 Mode Share

The BTD publishes vehicle, transit, and walking/bicycling mode split rates for different areas of Boston. The Project site is located within BTD's designated Area 2. The unadjusted vehicular trips were converted to person trips by using vehicle occupancy rates published by the Federal Highway Administration (FHWA)[2]. The BTD's travel mode share data for Area 2 are shown in Table 3-8.

Table 3-8 Travel Mode Shares

Land Use	Direction	Walk/ Bicycle Share	Transit Share	Auto Share	Vehicle Occupancy Rate
Daily					
Hotel	In	41%	35%	24%	2.20
	Out	41%	35%	24%	2.20
Retail	In	59%	20%	21%	1.78
	Out	59%	20%	21%	1.78
a.m. Peak Hour					
Hotel	In	5%	62%	33%	2.20
	Out	46%	15%	39%	2.20
Retail	In	14%	46%	40%	1.78
	Out	58%	10%	32%	1.78

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

Table 3-8 Travel Mode Shares (Continued)

Land Use	Direction	Walk/ Bicycle Share	Transit Share	Auto Share	Vehicle Occupancy Rate
p.m. Peak Hour					
Hotel	In	46%	15%	39%	2.20
	Out	5%	62%	33%	2.20
Retail	In	58%	10%	32%	1.78
	Out	14%	46%	40%	1.78

As shown in Table 3-8, the automobile share is 40 percent or lower for Area 2. The majority of the trips to/from origins and destinations around the Project site are walk/bicycle or transit based trips.

3.3.2.4 Trip Generation

The mode share percentages were applied to the number of person trips to develop walk/bicycle, transit, and vehicle trip generation estimates. The trip generation for the Project by mode is shown in Table 3-9. The detailed trip generation information is provided in Appendix B.

Table 3-9 Project Trip Generation

Land Use		Transit Trips	Walk/Bike Trips	Valet Trips	Taxi Trips
Daily					
Hotel *230 rooms*	In	724	848	169	56
	Out	724	848	169	56
Retail/Restaurant *25,000 sf*	In	156	460	69	23
	Out	156	460	69	23
a.m. Peak Hour					
Hotel *230 rooms*	In	98	8	18	6
	Out	17	51	15	5
Retail/Restaurant *25,000 sf*	In	10	3	3	1
	Out	1	8	2	0
p.m. Peak Hour					
Hotel *230 rooms*	In	23	71	20	7
	Out	93	8	17	6
Retail/Restaurant *25,000 sf*	In	6	37	8	3
	Out	33	10	12	4

3.3.2.5 Vehicle Trip Generation

To develop the overall trip generation characteristics, the adjusted vehicular trips associated with the Project were estimated. The Project is not providing park on-site. All vehicular trips will be valet or pick-up/drop-off trips. It is also expected that a portion of the vehicle trips associated with the hotel will be by taxi. Based on published data[3], it is anticipated that approximately 25 percent of the vehicular trips associated with the hotel use will be taxi trips. The Project-generated new vehicle valet/taxi trips are summarized in Table 3-10, with the detailed trip generation information provided in Appendix B.

Table 3-10 Project Vehicle Trip Generation

Time Period	Direction	Hotel[1]		Retail/ Restaurant[2]		Project Generated
		Valet	Taxi	Valet	Taxi	
Daily	In	169	56	69	23	317
	Out	169	56	69	23	317
	Total	338	112	138	46	634
a.m. Peak Hour	In	18	6	3	1	28
	Out	15	5	2	1	23
	Total	33	11	4	2	51
p.m. Peak Hour	In	20	7	8	3	38
	Out	17	6	12	4	39
	Total	37	13	20	75	77

1 Based on ITE LUC 310 – Hotel for 230 keys.
2 Based on ITE LUC 820 – Shopping Center for 20,500 SF

As shown in Table 3-10, the Project is anticipated to generate approximately 634 new daily vehicle trips (317 entering and 317 exiting), with 51 new vehicle trips during the a.m. peak hour (28 entering and 23 exiting) and 77 new vehicle trips during the p.m. peak hour (38 entering and 39 exiting).

3.3.2.6 Trip Distribution

The trip distribution identifies the various travel paths for vehicles arriving and leaving the Project site. Trip distribution patterns for the Project were based on BTD's origin-destination data for Area 2 and trip distribution patterns presented in traffic studies for nearby projects. The trip distribution patterns for the Project are illustrated in Figure 3-14 and Figure 3-15.

[3] Central Artery/Tunnel Project Detailed Travel Model Documentation; Bechtel/Parsons Brinckerhoff and Cambridge Systematics, Inc.; Boston/Cambridge, MA; September 30, 1994.

Not to scale.

Haymarket Hotel Boston, Massachusetts

Figure 3-14
Vehicle Trip Distribution Entering

Not to scale.

Haymarket Hotel Boston, Massachusetts

The Project-generated vehicle trips were assigned to the study area roadway network based on the trip distribution patterns and are shown in Figure 3-16 and Figure 3-17 for the a.m. peak hour and Figure 3-18 and Figure 3-19 for the p.m. peak hour. The Project-generated trips were assigned to the curbside along Surface Road where the valet/taxi trips would pick-up/drop-off. The Project-generated trips were added to the 2019 No Build conditions traffic volumes to develop the 2019 Build conditions peak hour traffic volume networks and are shown in Figure 3-20 and Figure 3-21 for the a.m. and p.m. peak hours, respectively.

3.3.2.7 Build Conditions Traffic Operations

The 2019 Build conditions scenario analysis uses the same methodology as the 2014 Existing conditions and the 2019 No Build conditions scenario analyses. The results of the 2019 Build condition traffic analysis at study area intersections are presented in Table 3-11 and Table 3-12 for the a.m. and p.m. peak hours, respectively and indicate that the Project will have only a minimal impact on traffic operations. The detailed analysis sheets are provided in Appendix B.

Not to scale.

Haymarket Hotel Boston, Massachusetts

Figure 3-16

Project Generated Trips, a.m. Entering Peak Hour

Not to scale.

Haymarket Hotel Boston, Massachusetts

Figure 3-17

Project Generated Trips, a.m. Exiting Peak Hour

Not to scale.

Haymarket Hotel Boston, Massachusetts

Figure 3-18

Project Generated Trips, p.m. Entering Peak Hour

Not to scale.

Haymarket Hotel Boston, Massachusetts

Figure 3-19

Project Generated Trips, p.m. Exiting Peak Hour

Not to scale.

Haymarket Hotel Boston, Massachusetts

Figure 3-20

Build Conditions (2019) Turning Movement Volumes, a.m. Peak Hour

Haymarket Hotel Boston, Massachusetts

Howard/Stein-Hudson Associates, Inc.
CREATIVE SOLUTIONS • EFFECTIVE PARTNERING

Figure 3-21

Build Conditions (2019) Turning Movement Volumes, p.m. Peak Hour

Table 3-11 Build Conditions (2019), Capacity Analysis Summary, a.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue Length (ft)	95th Percentile Queue Length (ft)
Signalized					
Surface Road/Hanover Street	**C**	**20.8**	-	-	-
Surface Road SEB left/thru | thru/right	C	27.4	0.52	152	205
Hanover Street NEB thru | thru/right	B	14.7	0.09	8	13
Hanover Street SWB left	B	11.7	0.24	39	56
Hanover Street SWB thru	B	11.9	0.27	74	118
Surface Road/North Street/I-93 NB Off-Ramp	**C**	**21.1**	-	-	-
Surface Road SEB thru | thru/right	C	29.6	0.83	238	271
North Street NEB right	B	14.4	0.12	48	80
I-93 NB Off-Ramp SWB left/thru | thru	B	17.5	0.75	347	499
Surface Road/I-93 SB Off-Ramp/Clinton Street	**D**	**35.8**	-	-	-
Surface Road SEB thru | thru | thru/right	C	30.6	0.83	177	#253
I-93 SB Off-Ramp SWB left	D	52.1	0.91	332	#550
I-93 SB Off-Ramp SWB left/thru | thru	C	33.0	0.93dl	248	326
North Street/Clinton Street/Hotel Driveway	**B**	**14.7**	-	-	-
North Street EB left/thru | thru	B	13.9	0.05	15	28
North Street WB thru | thru/right	A	6.8	0.47	32	215
Clinton Street NB left	D	41.7	0.78	112	m87
Clinton Street NB left/thru/right	D	35.4	0.68	94	46
Hotel Driveway SB left/thru/right	C	33.2	0.26	1	22
North Street/Union Street	**B**	**17.0**	-	-	-
North Street EB left/thru | thru	A	2.6	0.06	1	m5
North Street WB thru | thru/right	B	18.1	0.78	236	348
North Street/Congress Street/City Hall Driveway	**F**	**>80.0**	-	-	-
City Hall Driveway EB left/thru/right	B	12.1	0.17	7	35
North Street WB left	F	>80.0	>1.00	~473	#607
North Street WB left/thru/right	F	>80.0	>1.00	~348	#112
Congress Street NB left/thru | thru | thru/right	C	25.4	0.66	21	37
Congress Street SB left/thru | thru | thru/right	F	>80.0	>1.00	~272	#348
Unsignalized					
Hanover Street/Union Street	-	-	-	-	-
Hanover Street EB thru	A	0.0	0.01	-	0
Hanover Street WB thru	A	0.0	0.15	-	0
Union Street NB left/right	A	9.3	0.07	-	5

95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.
dl Defacto Left Lane. The shared lane operates as an exclusive left-turn lane.
m Volume for 95th percentile queue is metered by upstream signal.

Table 3-12 Build Conditions (2019), Capacity Analysis Summary, p.m. Peak Hour

Intersection	LOS	Delay (seconds)	V/C Ratio	50th Percentile Queue Length (ft)	95th Percentile Queue Length (ft)
Signalized					
Surface Road/Hanover Street	**B**	**15.8**	-	-	-
Surface Road SEB left/thru | thru/right	B	13.5	0.40	124	170
Hanover Street NEB thru | thru/right	B	16.1	0.13	8	30
Hanover Street SWB left	C	23.9	0.29	53	85
Hanover Street SWB thru	C	22.2	0.17	47	81
Surface Road/North Street/I-93 NB Off-Ramp	**B**	**18.0**	-	-	-
Surface Road SEB thru | thru/right	C	25.4	0.76	136	131
North Street NEB right	A	5.9	0.23	17	22
I-93 NB Off-Ramp SWB left/thru | thru	B	10.6	0.22	57	107
Surface Road/I-93 SB Off-Ramp/Clinton Street	**C**	**20.2**	-	-	-
Surface Road SEB thru | thru | thru/right	B	13.6	0.54	72	102
I-93 SB Off-Ramp SWB left	C	32.3	0.46	118	179
I-93 SB Off-Ramp SWB left/thru | thru	C	30.4	0.45	112	138
North Street/Clinton Street/Hotel Driveway	**C**	**30.9**	-	-	-
North Street EB left/thru | thru	B	15.4	0.04	12	44
North Street WB thru | thru/right	A	9.2	0.16	61	m113
Clinton Street NB left	E	58.7	0.75	120	185
Clinton Street NB left/thru/right	E	55.8	0.71	116	180
Hotel Driveway SB left/thru/right	D	44.2	0.36	5	29
North Street/Union Street	**B**	**18.6**	-	-	-
North Street EB left/thru | thru	A	1.3	0.07	0	m3
North Street WB thru | thru/right	C	22.4	0.45	202	261
North Street/Congress Street/City Hall Driveway	**C**	**27.1**	-	-	-
City Hall Driveway EB left/thru/right	B	17.9	0.15	12	3
North Street WB left	C	33.5	0.77	45	54
North Street WB left/thru/right	B	17.9	0.71	105	0
Congress Street NB left/thru | thru | thru/right	A	5.9	0.64	28	50
Congress Street SB left/thru | thru | thru/right	E	55.4	0.94	167	#293
Unsignalized					
Hanover Street/Union Street	-	-	-	-	-
Hanover Street EB thru	A	0.0	0.02	-	0
Hanover Street WB thru	A	0.0	0.07	-	0
Union Street NB left/right	A	9.0	0.09	-	7

95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

As shown in Table 3-11 and Table 3-12, under the 2019 Build conditions, the Project is expected to have minimal impact upon traffic operations at the study area intersections and no additional roadway or intersection improvements are required to accommodate the Project-generated traffic volumes.

The intersection of **Surface Road/Hanover Street** will continue to operate at LOS C during the a.m. peak hour and at LOS B during the p.m. peak hour. The longest queues at the intersection will continue to occur along Surface Road during both the a.m. and p.m. peak hours.

The intersection of **Surface Road/North Street/I-93 NB Off-Ramp** will worsen from LOS B to LOS C during the a.m. peak hour and will continue to operate at LOS B during the p.m. peak hour. The longest queues at the intersection will continue to occur along the I-93 NB off-ramp during the a.m. peak hour and along Surface Road during the p.m. peak hour.

The intersection of **Surface Road/I-93 SB Off-Ramp/Clinton Street** will continue to operate at LOS D during the a.m. peak hour and worsen from LOS B to LOS C during the p.m. peak hour. The longest queues at the intersection will continue to occur along the I-93 SB off-ramp left-turn approach during both the a.m. and p.m. peak hours.

The intersection of **North Street/ Clinton Street/Hotel Driveway** will continue to operate at LOS B during the weekday a.m. peak hour and at LOS C during the p.m. peak hour. The longest queues at the intersection will occur along the North Street westbound approach during the a.m. peak hour and will continue to occur along the Clinton Street northbound approach during the p.m. peak hour.

The intersection of **North Street/Union Street** will continue to operate at LOS B during both the a.m. and p.m. peak hours. The longest queues at the intersection will continue to occur along the North Street westbound approach during both the a.m. and p.m. peak hours.

The intersection of **North Street/ Congress Street/City Hall Driveway** will continue to operate at LOS F during the weekday a.m. peak hour and at LOS C during the p.m. peak hour. The longest queues at the intersection will continue to occur along the North Street westbound approach during the a.m. peak hour and along the Congress Street southbound approach during the p.m. peak hour.

At the unsignalized intersection of **Hanover Street/Union Street**, all approaches will continue to operate at LOS A during both the weekday a.m. and p.m. peak hours under the Build conditions.

3.3.2.8 Parking

The Project will have no parking on site. A valet managed pick-up/drop-off area will be provided along Surface Road near the entrance to the hotel. The valet will serve both the hotel and retail/restaurant uses on the Project site. The parking regulations along Surface

Road adjacent to the site are anticipated to be changed from the existing tour bus staging area to accommodate both the valet operations and short-term pick-up/drop-off operations. Visitors that travel to the site by personal vehicle have limited on-street parking options and many off-street parking options (in surface lots and garages), as previously shown in Figure 3-4 and Figure 3-5.

3.3.2.9 Public Transportation

As previously discussed, the Project is ideally situated to take advantage of nearby public transportation opportunities including the MBTA Orange, Green, Red, and Blue lines and several MBTA bus routes. Based on the transit mode shares presented earlier, the future transit trips associated with the Project were estimated and are summarized in Table 3-13.

Table 3-13 Project Transit Trips

Time Period	Direction	Hotel	Retail/ Restaurant	Total
Daily	In	724	156	880
	Out	724	156	880
	Total	**1,448**	**312**	**1,760**
a.m. Peak Hour	In	98	10	108
	Out	17	1	18
	Total	**115**	**11**	**126**
p.m. Peak Hour	In	23	6	29
	Out	93	33	126
	Total	**116**	**39**	**155**

As shown in Table 3-13, the Project will generate an estimated 1,760 new transit trips on a daily basis. Approximately 126 new transit trips will occur during the a.m. peak hour (108 alighting and 18 boarding) and 155 new trips will occur during the p.m. peak hour (29 alighting and 126 boarding). These transit trips will be accommodated by the MBTA Orange, Green, Blue, and Red Lines and the various bus routes that travel near the site and serve Haymarket Station.

3.3.2.10 Pedestrians

The Project site is ideally situated to accommodate pedestrian trips, being located along the Rose Fitzgerald Kennedy Greenway in downtown Boston. Based on the walk mode shares presented earlier, the future walk trips were estimated and are summarized in Table 3-14.

Table 3-14 Project Pedestrian Trips

Time Period	Direction	Hotel	Retail	Total
Daily	In	848	460	1,308
	Out	848	460	1,308
	Total	**1,696**	**920**	**2,616**
a.m. Peak Hour	In	8	3	11
	Out	51	8	59
	Total	**59**	**11**	**70**
p.m. Peak Hour	In	71	37	108
	Out	8	10	18
	Total	**79**	**47**	**126**

Over the course of a day, the Project will generate an estimated 2,616 new pedestrian trips and an additional 1,760 new transit trips that will require a walk to or from the site. This results in an additional estimated 4,376 new pedestrian trips per day. Approximately 70 new pedestrian trips will occur during the a.m. peak hour and 126 new pedestrian trips will occur during the p.m. peak hour, in addition to the transit trips that will also require a walk from the site. The pedestrian facilities surrounding the site have adequate capacity to accommodate the pedestrian trips generated by the Project.

3.3.2.11 Bicycle Accommodations

BTD has established guidelines requiring projects subject to Transportation Access Plan Agreements to provide secure covered bicycle parking for residents and employees, and short-term bicycle racks for visitors. The Project will provide secure storage for approximately thirteen to sixteen bicycles. Additional storage will be provided by outdoor bicycle racks accessible to visitors to the site in accordance with BTD guidelines.

3.3.2.12 Loading and Service Activity

Two on-site, ground-level loading docks/bays will provide space for trash and loading truck operations. The entrance to both of these areas is from Blackstone Street at the rear of the building.

Truck trip estimates for both the hotel and the storefront retail Project elements were based on data provided in the Truck Trip Generation Rates by Land Use in the Central Artery/Tunnel Project Study Area report[4]. Based on the CTPS report, hotel uses generate approximately 0.03 light truck trips and 0.01 medium/heavy truck trips per 1,000 sf of gross floor area. Storefront retail uses generate approximately 0.15 light truck trips and 0.02

[4] *Truck Trip Generation Rates by Land Use in the Central Artery/Tunnel Project Study Area*; Central Transportation Planning Staff; September 1993.

medium/heavy truck trips per 1,000 sf of gross floor area. With a proposed 115,000 GSF of hotel space and 25,000 GSF of retail space, the project is expected to generate approximately 6-7 light truck trips per day and 1-2 medium/heavy truck trips per day. These numbers do not include trash truck trips. Since traffic operations are expected to remain light along Blackstone Street, these trips should not impact level of service at nearby intersections and should have minimal impact to the surrounding roadway network and adjacent sidewalks.

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

The Proponent is responsible for preparation of the Transportation Access Plan Agreement (TAPA), a formal legal agreement between the Proponent and the BTD. The TAPA formalizes the findings of the transportation study, mitigation commitments, elements of access and physical design, transportation 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.

The Proponent will also produce a Construction Management Plan (CMP) for review and approval by BTD. The CMP will detail the schedule, staging, parking, delivery, and other associated impacts of the construction of the Project. See Section 3.6 for additional information related to the CMP.

3.5 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 visitors 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 implement 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.

- **Transit Pass Programs**: The Proponent will require the hotel operator to encourage employees to use transit and will offer on-site transit pass sales and 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.

3.6 Evaluation of Short-term Construction Impacts

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

To minimize transportation impacts during the construction period, the following measures will be 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;
- A subsidy for MBTA passes will be considered for full-time construction employees; and
- Secure spaces will be provided on-site for workers' supplies and tools so they do not need to be brought to the site each day.

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

Chapter 4.0

Environmental Review Component

4.0 ENVIRONMENTAL PROTECTION COMPONENT

4.1 Pedestrian Level Winds

A pedestrian wind study was conducted for the Project by Rowan Williams Davies & Irwin Inc. (RWDI) to assess the effect of the proposed Project on local conditions in pedestrian areas around the study site. The No Build (present condition including approved, but not yet built projects in the area) and Build including the Project in the presence of all existing and approved surroundings) conditions were tested by placing specially designed wind sensors at 89 locations, chosen in consultation with the BRA, surrounding the Project site on a scaled model of the Project area as described more fully in Section 4.1.3. The wind analysis shows that the overall wind conditions expected in the surrounding area under the Build Condition are largely similar to the No Build Condition. Screens and other mitigation measures are being considered and will be assessed as design continues to minimize any Project impacts.

4.1.1 Overview

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

The 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 actual effects of wind can range from pedestrian inconvenience, due to the blowing of dust and other loose material in a moderate breeze, to severe difficulty with walking due to the wind forces on the pedestrian.

4.1.2 Methodology

The study involved wind simulations on a 1:300 scale model of the proposed Project and surroundings. These simulations were then conducted in RWDI's boundary-layer wind tunnel at Guelph, Ontario, for the purpose of quantifying local wind speed conditions and

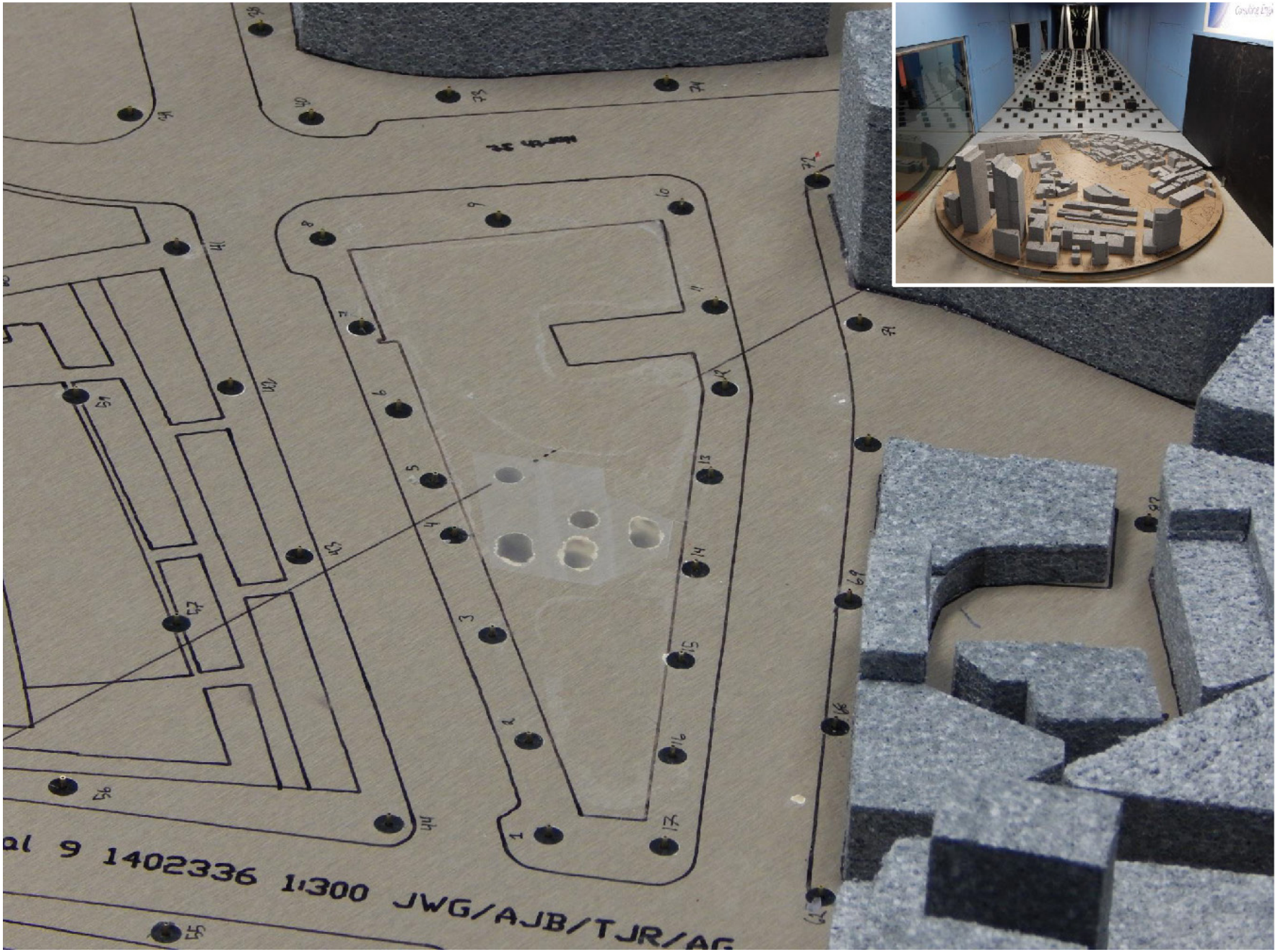
comparing to appropriate criteria for gauging wind comfort in pedestrian areas. The model was constructed based on information provided by the Proponent and its architect Perkins + Will. The criteria recommended by the BRA were used in this study. The following section includes a discussion of the methods and the results of the wind tunnel simulations. Information concerning the site and surroundings was derived from: site photographs; information on surrounding buildings and terrain; site plans and elevations of the proposed Project. The following configurations were simulated:

- No Build Configuration: includes all existing and approved surrounding buildings; and,
- Build Configuration: includes the proposed Project, and all existing and approved surroundings.

As shown in Figures 4.1-1 and 4.1-2, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1,200 foot radius of the study 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 89 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 grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 wind directions, in 10-degree increments, starting from true north. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the reference wind speed in the free stream above the model. The results were then combined with long-term meteorological data, recorded during the years 1980 to 2013 at Boston's Logan International Airport, in order to predict full scale wind conditions. The analysis was performed separately for each of the four seasons and for the entire year.

Figures 4.1-3 through 4.1-5 present "wind roses", summarizing the annual and seasonal wind climates in the Boston area, based on the data from Logan International Airport. The wind roses, in Figures 2a and 2b, are based on all observed wind readings for the given season. The left-hand side wind rose in Figure 4.1-2, for example summarize the spring (March, April, and May) wind data. In general, the prevailing winds are from the west-northwest, northwest, west and southwest. In the case of strong winds, however, the most common wind direction is northwest and west. On an annual basis (Figure 4.1-5) the most common wind directions are those between southwest and northwest. These are also the dominant directions for strong winds.

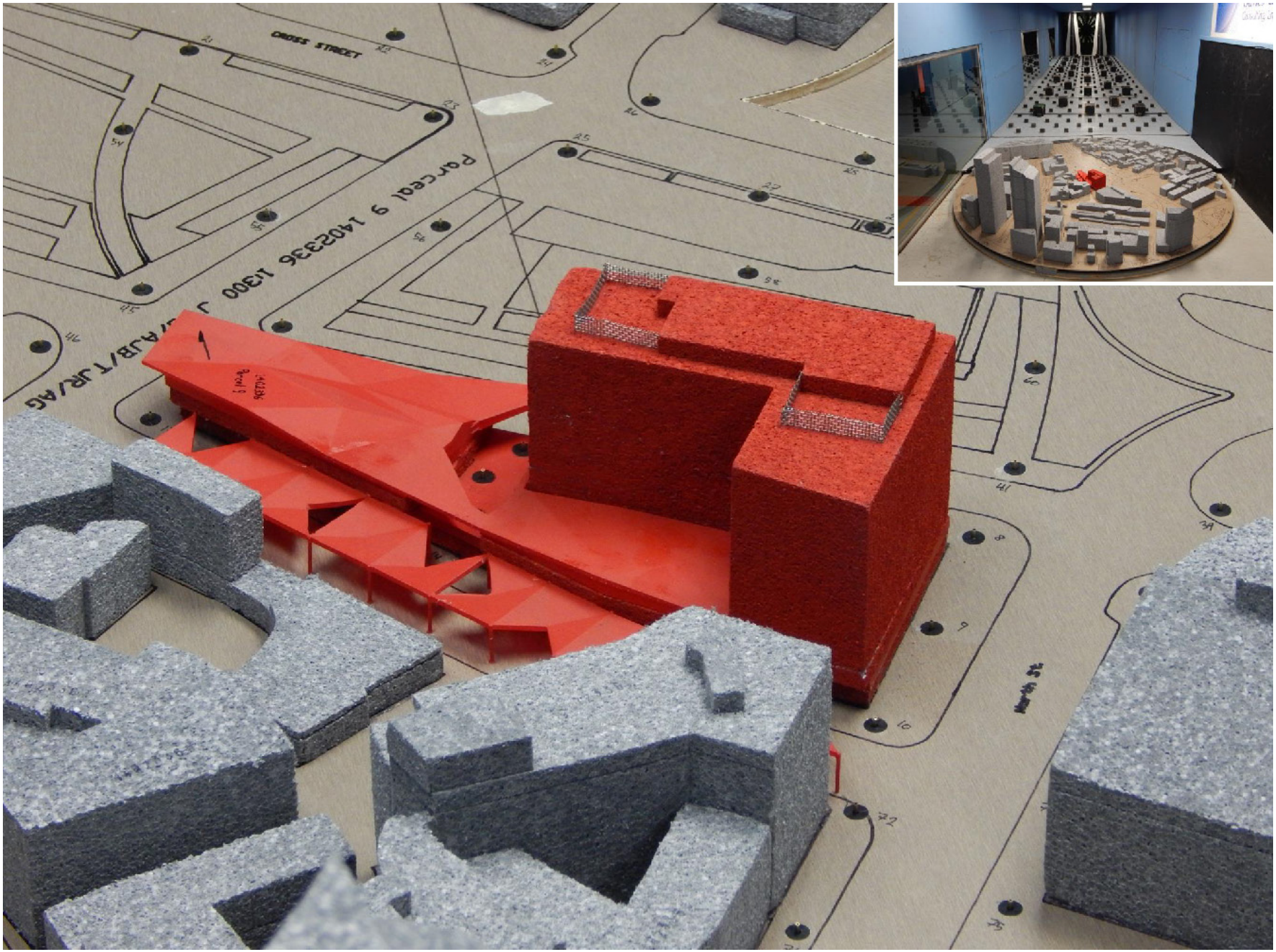
This study involved state-of-the-art measurement and analysis techniques to predict wind conditions at the study site. Nevertheless, some uncertainty remains in predicting wind comfort, and this must be kept in mind. For example, the sensation of comfort among individuals can be quite variable. Variations in age, individual health, clothing, and other human factors can change a particular response of an individual. The comfort limits used in



Haymarket Hotel **Boston, Massachusetts**

Figure 4.1-1

Wind Tunnel Study Model, No Build

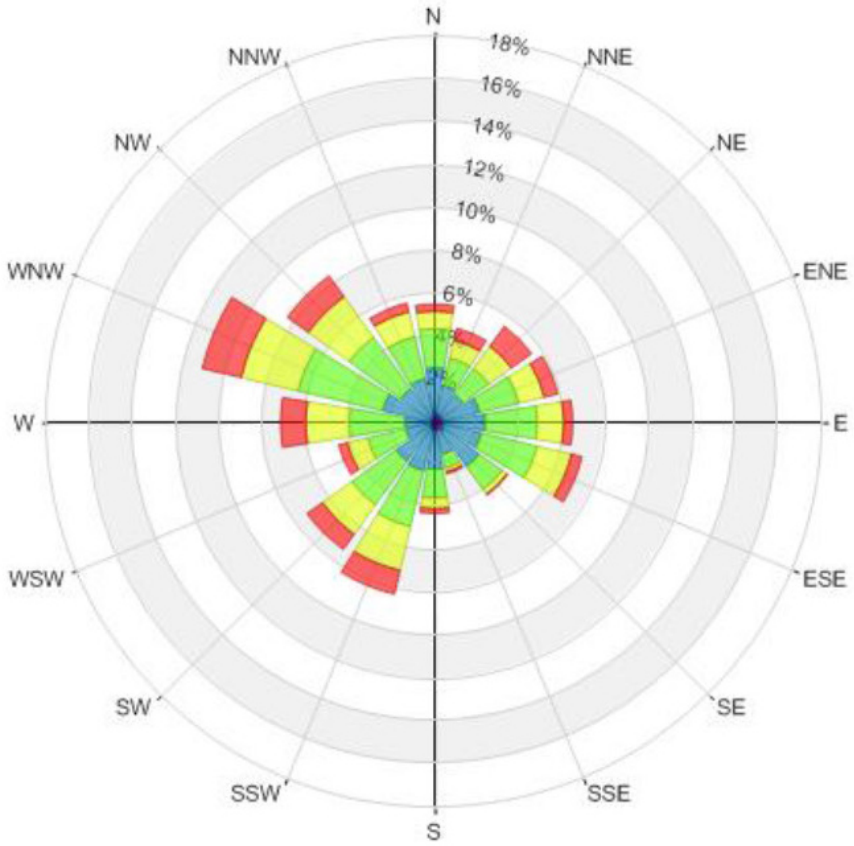


Haymarket Hotel **Boston, Massachusetts**

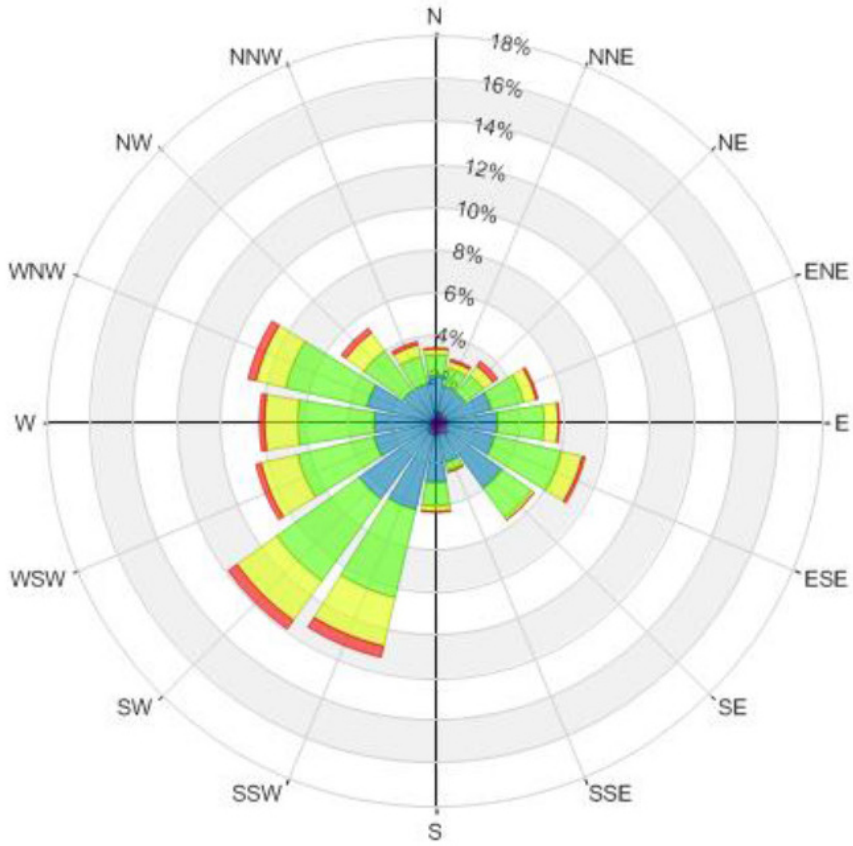
RWDI

Figure 4.1-2

Wind Tunnel Study Model, Build



Spring
(March - May)

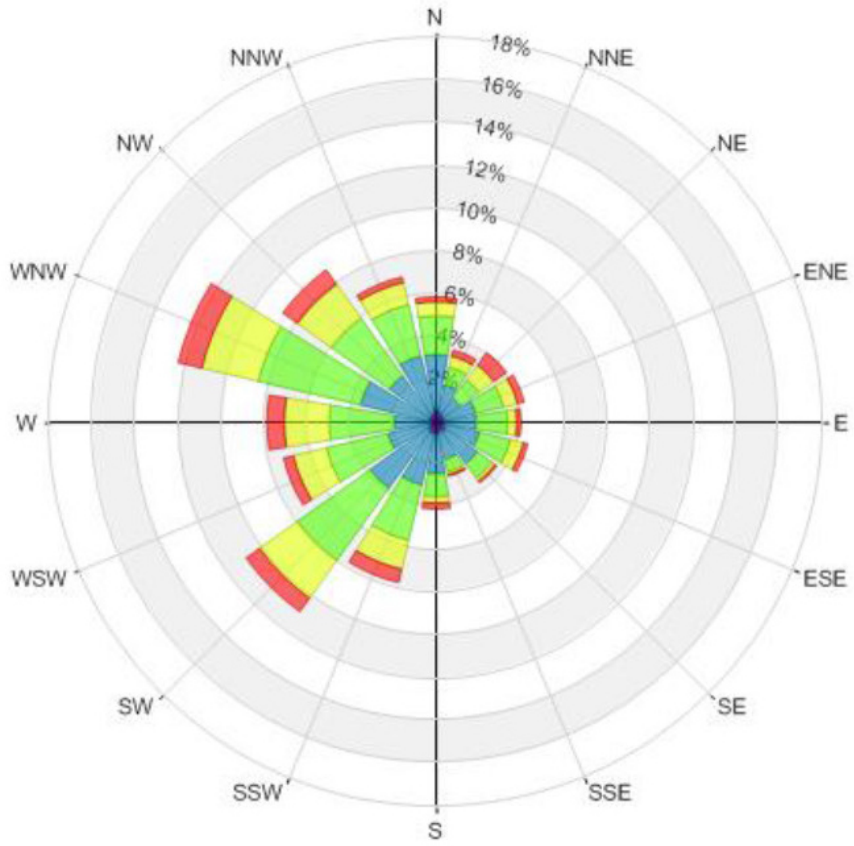


Summer
(June - August)

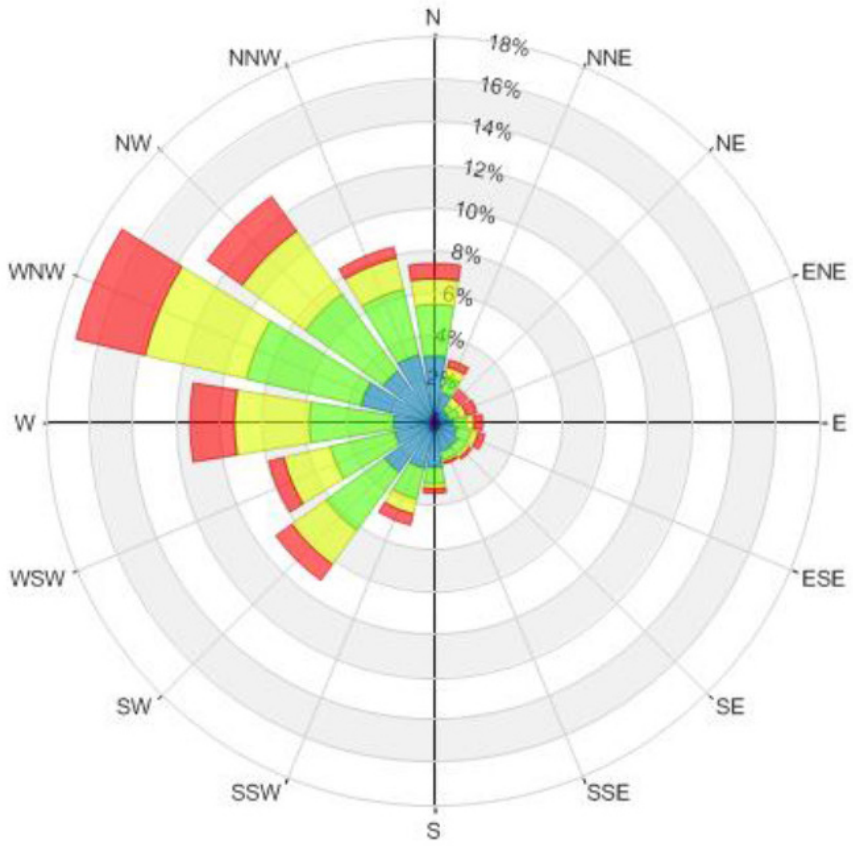
Wind Speed (mph)	Probability (%) Spring	Summer
Calm	1.8	1.9
1-5	5.4	7.3
6-10	27.3	36.5
11-15	33.5	36.6
16-20	20.9	14.7
>20	11.0	3.0

Figure 4.1-3

Directional Distribution (%) of Winds (Blowing From), Boston Logan International Airport (1980 - 2013)



Fall
(September - November)



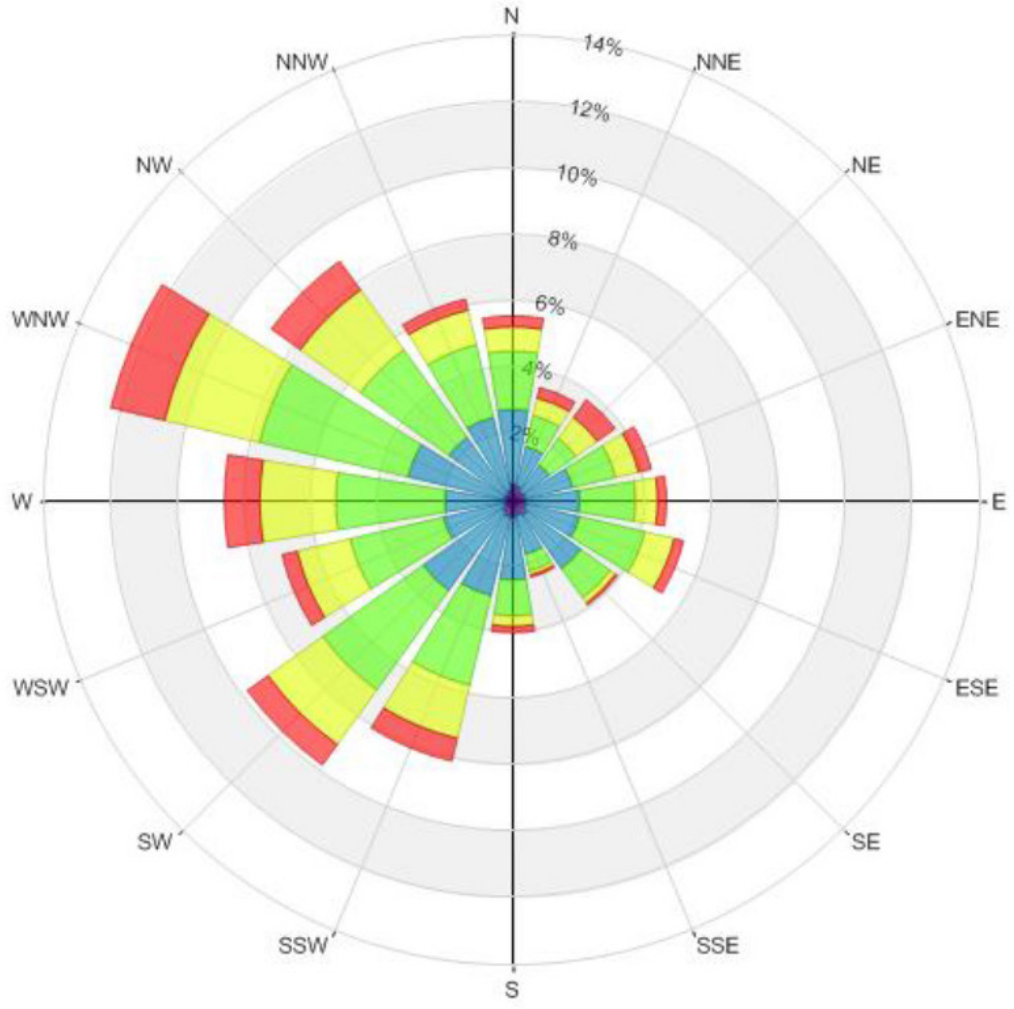
Winter
(December - February)

Wind Speed (mph)	Probability (%) Fall	Winter
Calm	2.1	1.6
1-5	6.9	5.4
6-10	32.4	26.0
11-15	34.1	31.8
16-20	17.2	21.9
>20	7.3	13.2

Haymarket Hotel Boston, Massachusetts

Figure 4.1-4

Directional Distribution (%) of Winds (Blowing From), Boston Logan International Airport (1980 - 2013)



Annual Winds

Wind Speed (mph)	Probability (%)
Calm	1.9
1-5	6.2
6-10	30.6
11-15	34.0
16-20	18.7
>20	8.6

Haymarket Hotel Boston, Massachusetts

Figure 4.1-5

Directional Distribution (%) of Winds (Blowing From), Boston Logan International Airport (1980 - 2013)

this report represent an average for the total population. Also, unforeseen changes in the project area, such as the construction or removal of buildings, can affect the conditions experienced at the site. Finally, the prediction of wind speeds is necessarily a statistical procedure. The wind speeds reported are for the frequency of occurrence stated (one percent of the time). Higher wind speeds will occur but on a less frequent basis.

4.1.3 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed + 1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BRA 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 one percent of the time (i.e., the 99-percentile mean wind speed). They are as shown in Table 4.1-1 below.

Table 4.1-1 Boston Redevelopment Authority Mean Wind Criteria*

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

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

4.1.4 Test Results

Appendix C presents the mean and effective gust wind speeds for each season as well as annually. Figures 4.1-6 through 4.1-9 graphically depict the wind conditions at each wind measurement location based on the annual winds. 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 summary of pedestrian wind comfort is based on the annual winds for each configuration tested, except where noted below in the text.

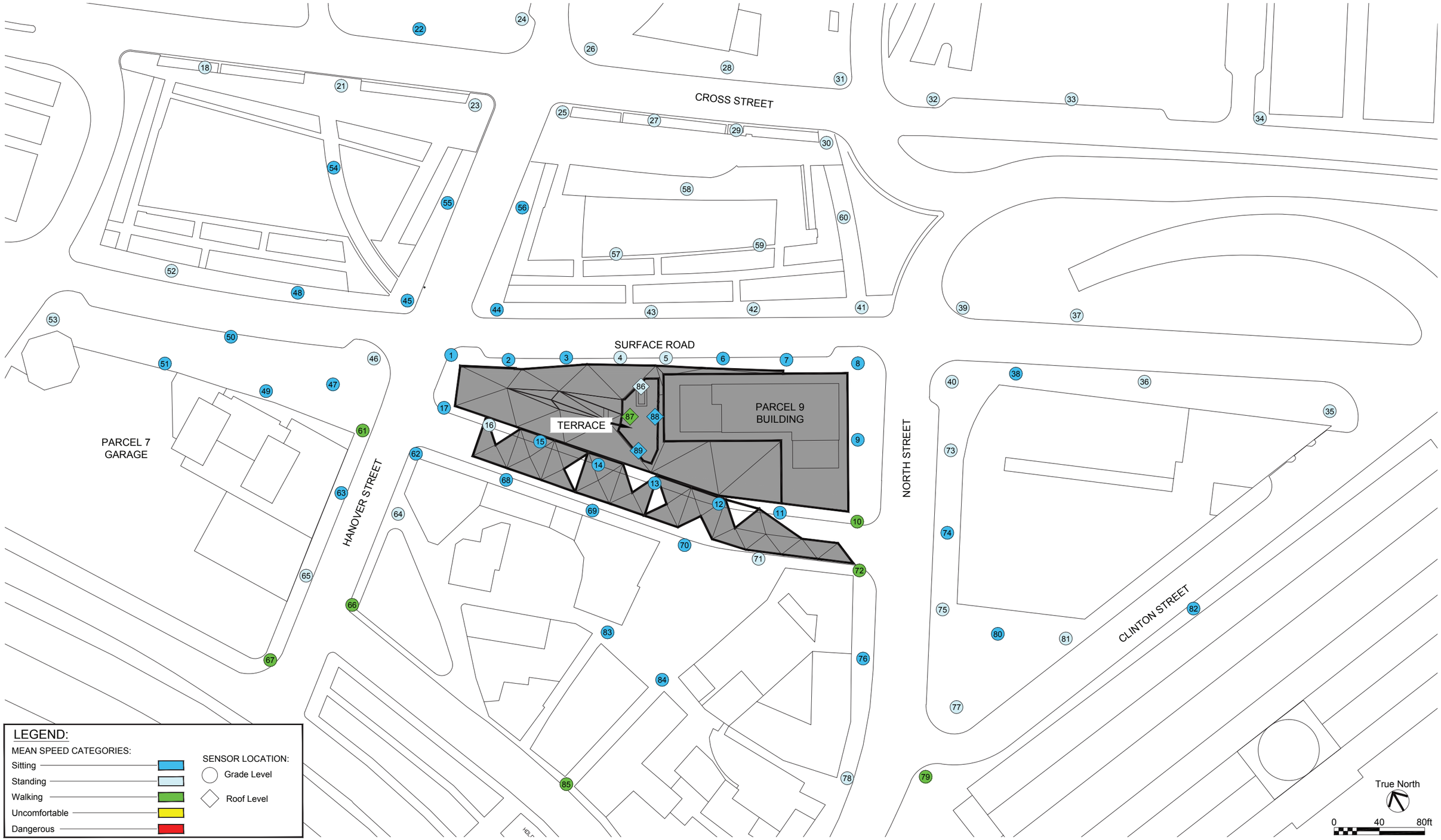
[1] Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions", Journal of Industrial Aerodynamics, 3 (1978) 241 - 249.

Haymarket Hotel **Boston, Massachusetts**

RWDI

Figure 4.1-6

Pedestrian Wind Conditions - Mean Speed - No Build, Annual



Haymarket Hotel **Boston, Massachusetts**

RWDI

Figure 4.1-7

Pedestrian Wind Conditions - Mean Speed - Build, Annual

CROSS STREET

SURFACE ROAD

PARCEL 7
GARAGE

HANOVER STREET

NORTH STREET

CLINTON STREET

LEGEND:

EFFECTIVE GUST CATEGORIES:
- Acceptable
- Unacceptable

SENSOR LOCATION:
- Grade Level
- Roof Level

True North

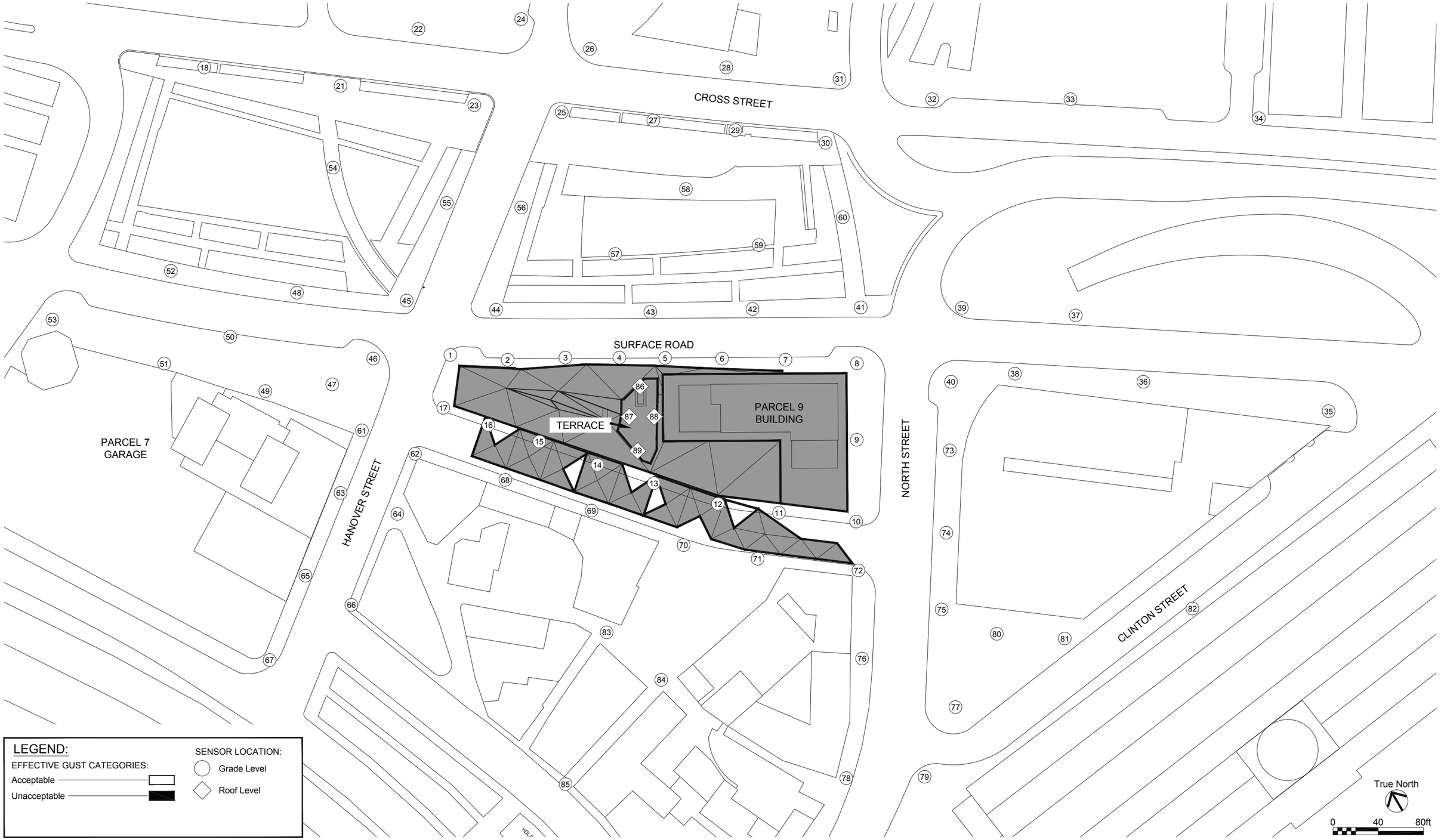
0 40 80ft

Haymarket Hotel Boston, Massachusetts

RWDI

Figure 4.1-8

Pedestrian Wind Conditions - Effective Gust Speed - No Build, Annual



Haymarket Hotel **Boston, Massachusetts**

RWDI

Figure 4.1-9

Pedestrian Wind Conditions - Effective Gust Speed - Build, Annual

In general, wind conditions suitable for walking are appropriate for sidewalks, and lower wind speeds conducive to standing are preferred at building entrances.

4.1.4.1 No Build Configuration

As shown in Figure 4.1-6, under the No Build Configuration, all locations were suitable for walking or better annually and seasonally, with the exception of Location 66 (located offsite) which was rated uncomfortable during the spring and winter.

The effective gust criterion was met seasonally and annually at all locations.

4.1.4.2 Build Configuration

Building Entrances and On and Off-site Sidewalks

Wind conditions suitable for walking are acceptable for sidewalks seasonally and annually. In the winter and spring, walking conditions are also considered acceptable in courtyard areas. The preferred wind climate during the summer should be comfortable for standing in the vicinity of building entrances and courtyards.

Under the Build Configuration, all locations recorded conditions suitable for walking or better on an annual basis. In particular, on-site locations (Locations 1 through 17, 62, and 68 through 72) all recorded wind conditions comfortable for sitting or standing on an annual basis, with the exception of Locations 10 and 72, where conditions comfortable for walking are predicted (see Figure 3b and Table 2). These wind conditions are considered appropriate for the anticipated use of the space. The existing uncomfortable wind conditions at Location 66 were improved slightly by the Project, with the spring wind conditions becoming comfortable for walking.

The effective gust criterion was met seasonally and annually at all locations.

Terrace (Locations 86 through 89)

It is generally desirable for wind conditions on terraces to be comfortable for sitting or standing, as pedestrians will be stationary for prolonged periods of time. During the winter season, these areas will not be in frequent use and therefore, higher winds are acceptable. Terraces are typically treated as an optional use area, whereby the occupant has the choice, based on the weather conditions, as to whether they will use the terrace or not. Therefore on windy days it is anticipated that the area would not be used.

Wind conditions on the terrace are predicted to be comfortable for standing (Locations 86 and 87) or sitting (Locations 88 and 89) during the summer. During the spring and fall, wind conditions are expected to be comfortable for sitting or standing (Locations 86, 88 and 89) with the exception of Location 87, which is expected to be comfortable for walking.

The effective gust criterion was met seasonally and annually at all locations.

Wind conditions could be improved in the spring and fall by including a wind control feature, such as a vertical wind screen, along the north side of the terrace. An alternative mitigation measure could be to place a dense coniferous landscaping in the same location.

4.2 Shadow Impacts

4.2.1 Introduction and Methodology

A shadow impact analysis was conducted to assess potential shadow impacts from the Project. The study looked at the following four times of the year:

1. Spring Equinox (March 21) at 9:00 a.m., 12:00 noon, and 3:00 p.m.
2. Summer Solstice (June 21) at 9:00 a.m., 12:00 noon, 3:00 p.m. and 6:00 p.m.
3. Autumnal Equinox (September 21) at 9:00 a.m., 12:00 noon, 3:00 p.m. and 6:00 p.m.
4. Winter Solstice at 9:00 a.m., 12:00 noon, and 3:00 p.m.

The shadow analysis presents the existing shadow, shadow created by the as-of-right alternative, and new shadow that would be created by the 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. Shadows have been determined using the applicable Altitude and Azimuth data for Boston. Figures showing the net new shadow from the Project are provided in Figures 4.2-1 to 4.2-14 at the end of this section.

The results of the analysis show that new shadow from the Project will generally be limited to nearby streets and sidewalks. Of the 14 time periods studied, no new shadow is cast onto any bus stops in the vicinity of the Project. New shadow cast onto North Street Park is limited to only one of the 14 time periods studied. Given the location of North End Park immediately north of the Project site, new shadow will be cast onto the North End Park. However, during many of these time periods, shadow is cast only onto a small portion of the park at its southern edge. No new shadow is cast onto other open spaces in the vicinity of the Project.

4.2.2 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, shadow from the Project will be cast to the northwest. The shadow from the as-of-right alternative would be cast onto Blackstone Street and its sidewalks, and onto Hanover Street and its sidewalks. Shadow from the Project will be similar, but generally less than the shadow from the as-of-right alternative, with limited new shadow on Hanover Street and its southern sidewalk. No new shadow is cast onto open spaces or bus stops in the vicinity of the Project.

At 12:00 p.m., shadow from the Project will be cast to the north. The shadow from the as-of-right alternative would be cast onto Hanover Street and its eastern sidewalk, and onto John F. Fitzgerald Surface Road and its southern sidewalk. Shadow from the market portion of the Project will be cast onto a smaller portion of Hanover Street and onto John F. Fitzgerald Surface Road, and shadow from the hotel portion of the Project will extend beyond the as-of-right alternative onto a small portion of the North End Park. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

At 3:00 p.m., shadow from the Project will be cast to the northeast. The shadow from the as-of-right alternative would be cast onto John F. Fitzgerald Surface Road and its sidewalks, and onto a portion of the North End Park. Shadow from the market portion of the Project will be cast onto John F. Fitzgerald Surface Road, but will not extend onto North End Park. Shadow from the hotel portion of the Project will extend beyond the as-of-right alternative onto the southeastern portion of the North End Park. Overall, the Project will cast a limited amount of new shadow onto the North End Park as compared to the as-of-right alternative. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

4.2.3 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, shadow from the Project will be cast to the west. The shadow from the as-of-right alternative would be cast onto Blackstone Street and its sidewalks, and onto Hanover Street and its southern sidewalk. Shadow from the Project will be cast onto smaller portions of Blackstone and Hanover Streets when compared to the as-of-right alternative. No new shadow is cast onto open spaces or bus stops in the vicinity of the Project.

At 12:00 p.m., shadow from the Project will be cast to the north. The shadow from the as-of-right alternative would be limited to the sidewalks on Hanover Street and John F. Fitzgerald surface road adjacent to the Project site. Shadow from the Project will be similar to the as-of-right alternative, extending slightly onto John F. Fitzgerald Surface Road. No new shadow is cast onto open spaces or bus stops in the vicinity of the Project.

At 3:00 p.m., shadow from the Project is cast to the northeast. The shadow from the as-of-right alternative would be cast onto John F. Fitzgerald Surface Road and its southern sidewalk. Shadow from the hotel portion of the Project will extend beyond the as-of-right alternative onto a small portion of North Street and its western sidewalk, and onto a small portion of the southeastern edge of North End Park. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

At 6:00 p.m., shadow from the Project is cast to the east. The shadow from the as-of-right alternative would be cast onto John F. Fitzgerald Surface Road and its southern sidewalk, and onto North Street and its sidewalks. Shadow from the hotel portion of the Project will

extend beyond the as-of-right alternative onto an additional portion for John F. Fitzgerald Surface Road, and onto a minor portion of the southeastern corner of the North End Park. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

4.2.4 Autumnal Equinox (September 21)

At 9:00 a.m. during the autumnal equinox, shadow from the Project will be cast to the northwest. The shadow from the as-of-right alternative would be cast onto Blackstone Street and its sidewalks, and onto Hanover Street and its sidewalks. Shadow from the Project will be similar to the as-of-right alternative, with limited new shadow on Hanover Street and its southern sidewalk. No new shadow is cast onto open spaces or bus stops in the vicinity of the Project.

At 12:00 p.m., shadow from the Project will be cast to the north. The shadow from the as-of-right alternative would be cast onto Hanover Street and its eastern sidewalk, and onto John F. Fitzgerald Surface Road and its southern sidewalk. Shadow from the market portion of the Project will be cast onto a smaller portion of Hanover Street and John F. Fitzgerald Surface Road, and shadow from the hotel portion of the Project will extend beyond the as-of-right alternative onto a small portion of the North End Park. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

At 3:00 p.m., shadow from the Project will be cast to the northeast. The shadow from the as-of-right alternative would be cast onto John F. Fitzgerald Surface Road and its sidewalks, and onto a portion of the North End Park. Shadow from the market portion of the Project will be cast onto John F. Fitzgerald Surface Road, but will not extend onto North End Park. Shadow from the hotel portion of the Project will extend beyond the as-of-right alternative onto the southeastern portion of the North End Park. Overall, the Project will cast a limited amount of new shadow onto the North End Park as compared to the as-of-right alternative. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

At 6:00 p.m., most of the area is under existing shadow. The shadow from the as-of-right alternative would be cast onto a portion John F. Fitzgerald Surface Road and its sidewalks, a portion of North Street and its western sidewalk, a portion of Cross Street and its southern sidewalk, and onto the I-93 entry and exit ramps. Shadow would also be cast onto portions of the North End Park not under existing shadow. Shadow from the market portion of the Project will be cast onto a smaller portion of North End Park than the as-of-right alternative. Shadow from the hotel portion of the Project will extend beyond the as-of-right alternative shadow onto an additional portion of Cross Street and its sidewalks, an additional portion of the I-93 entry and exit ramps, and a portion of Fulton Street and its sidewalks. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

4.2.5 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.

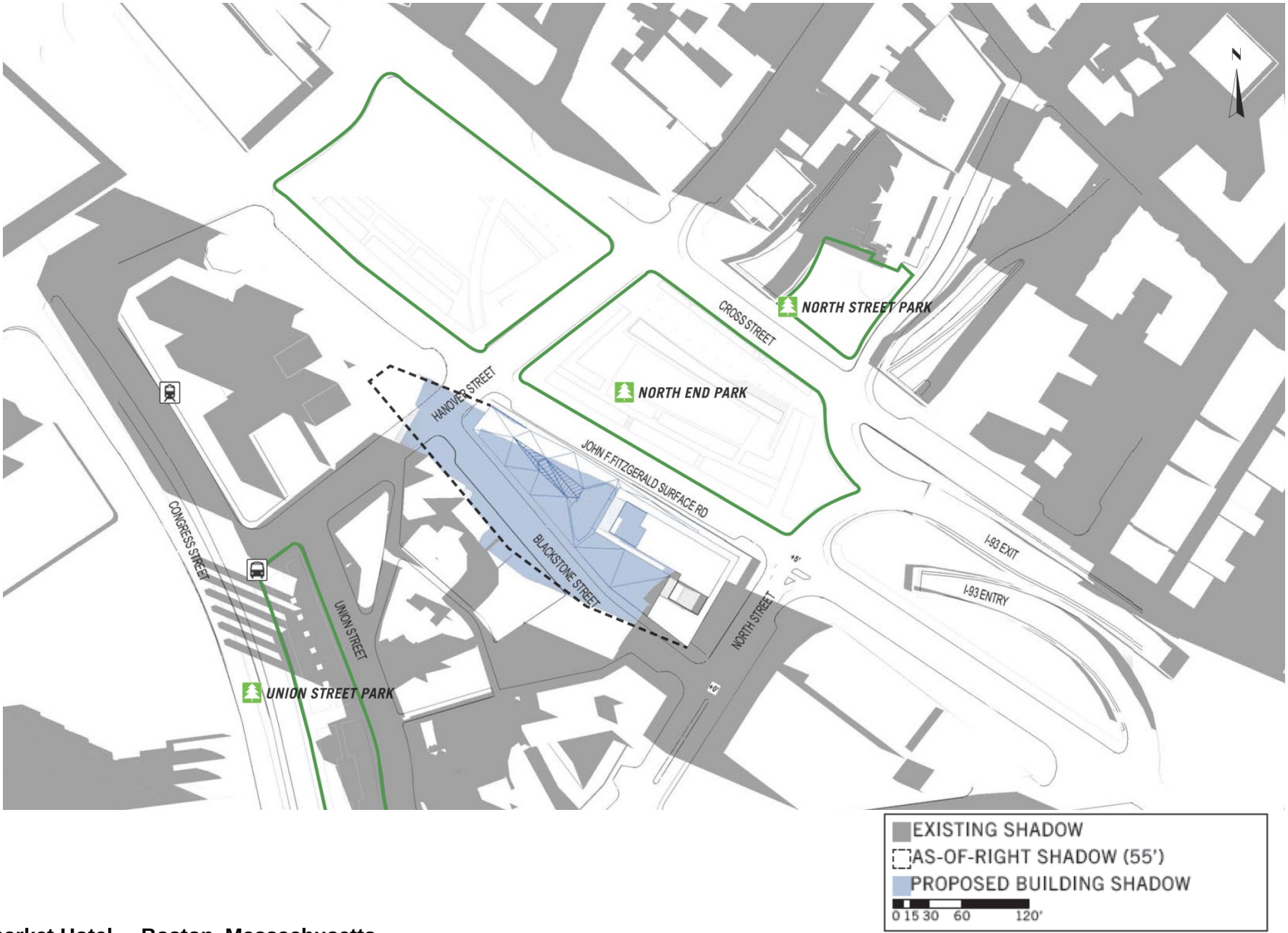
At 9:00 a.m., shadow from the Project will be cast to the northwest. The shadow from the as-of-right alternative would be cast onto a portion of John F. Fitzgerald Surface Road and its sidewalks, a portion of Sudbury Street and its sidewalks, and onto a small portion of the southern edge of North End Park. Shadow from the Project will extend further onto portions of John F. Fitzgerald Surface Road and Sudbury Street and their sidewalks, as well as a small additional portion of the southern edge of North End Park. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

At 12:00 p.m., shadow from the Project will be cast to the northeast. The shadow from the as-of-right alternative would be cast onto Hanover Street and its sidewalks, John F. Fitzgerald Surface Road and its sidewalks, and onto a portion of the North End Park. Shadow from the market portion of the Project will be cast onto a smaller portion of Hanover Street and onto only a sliver of North End Park. Shadow from the hotel portion of the Project will extend onto an additional portion of North End Park as compared to the as-of-right alternative. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

At 3:00 p.m., shadow from the Project will be cast to the northeast. The shadow from the as-of-right alternative would be cast onto a portion of Hanover Street, onto John F. Fitzgerald Surface Road and its sidewalks and onto North End Park. Shadow from the market portion of the Project will be cast onto a smaller portion of Hanover Street and a smaller portion of North End Park. The hotel portion of the Project will extend beyond the as-of-right alternative shadow onto North End Park, and will cast shadow onto a portion of Cross Street and its sidewalks and onto the North Street Park. No new shadow is cast onto other open spaces or bus stops in the vicinity of the Project.

4.2.6 Conclusions

Shadow impacts from the Project were compared to the as-of-right alternative in accordance with the Greenway District Planning Study Use and Development Guidelines. New shadow from the as-of-right alternative and the Project will generally be limited to the immediately surrounding streets and sidewalks. Of the 14 time periods studied, no new shadow is cast onto any bus stops in the vicinity of the Project. New shadow will be cast onto the North End Park. However, during many of these time periods studied, shadow is cast only onto a small portion of the park at its southern edge. The amount of shadow cast onto the North End Park is generally similar to the as-of-right alternative. New shadow will be cast onto the North Street Park during one time period. No new shadow is cast onto other open spaces or any bus stops in the vicinity of the Project.

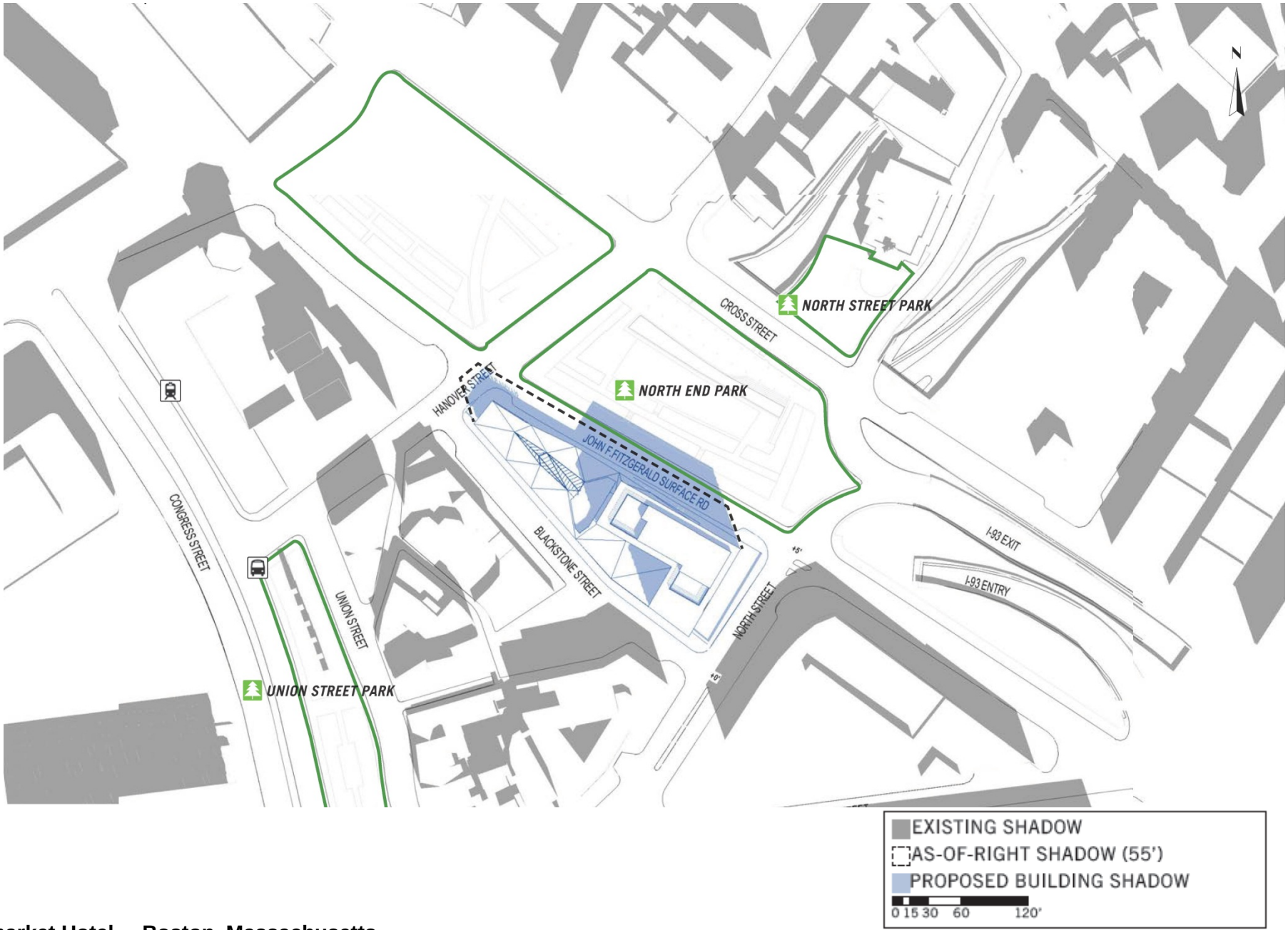


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-1

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

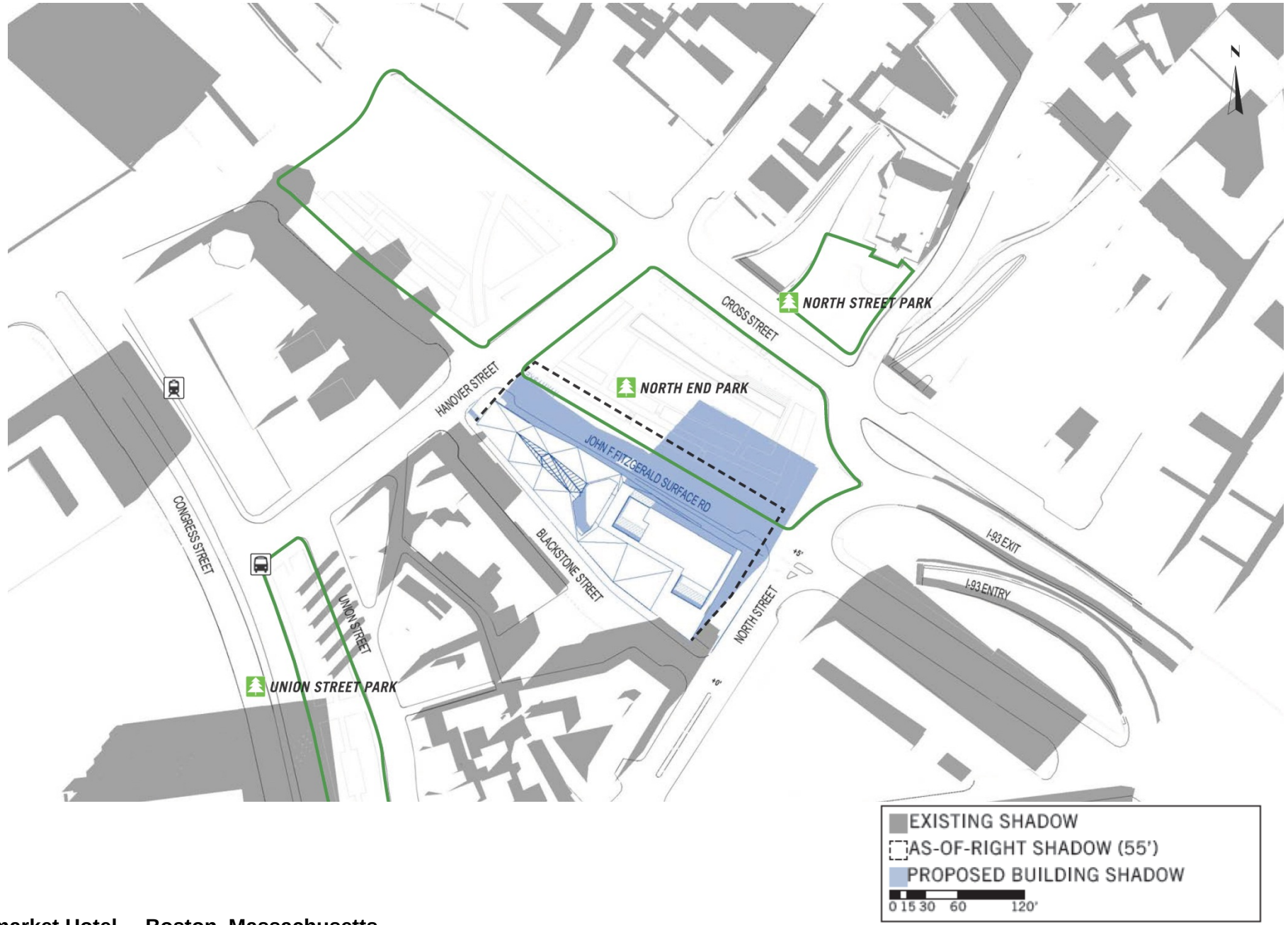


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-2

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

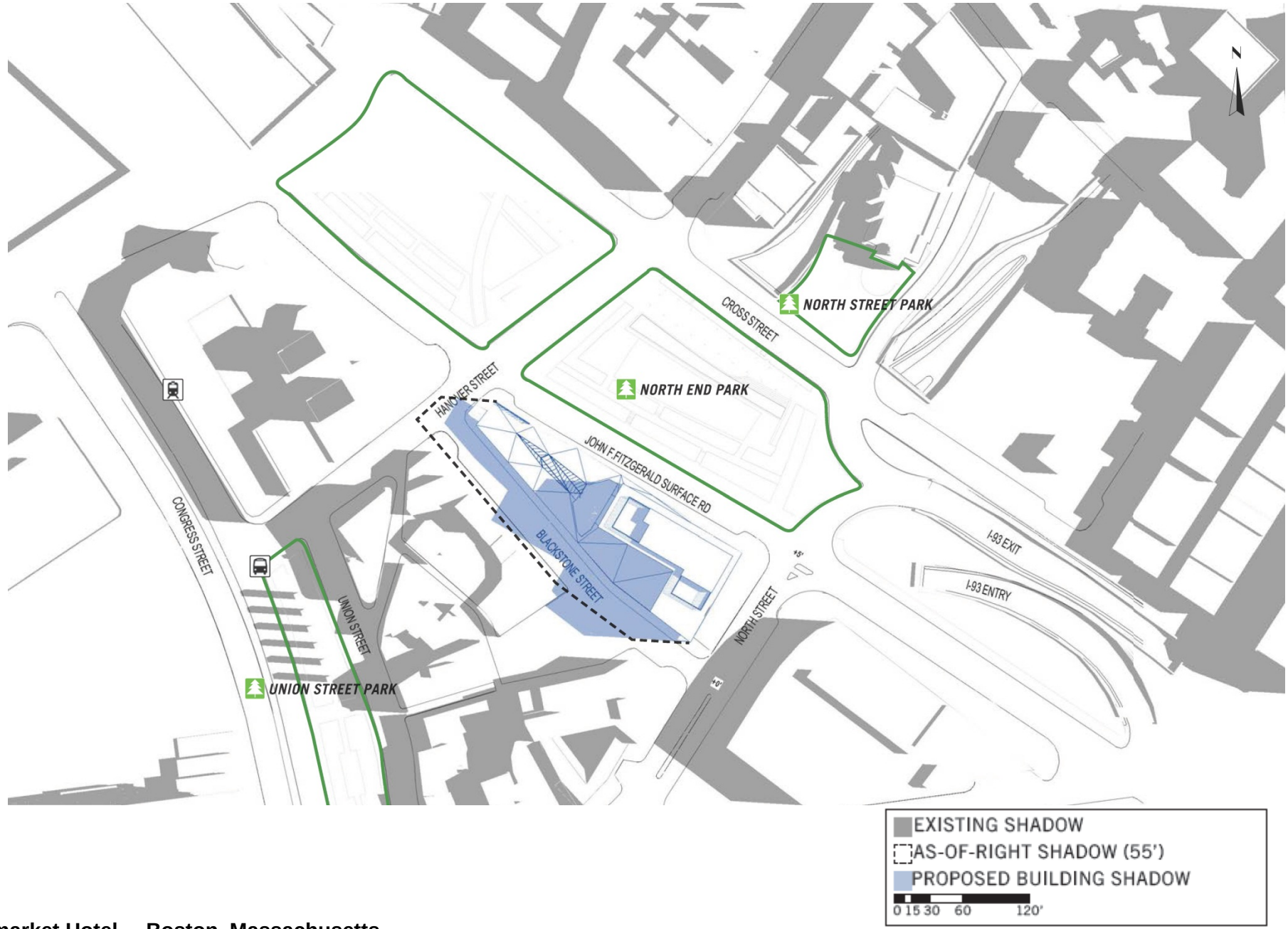


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-3

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

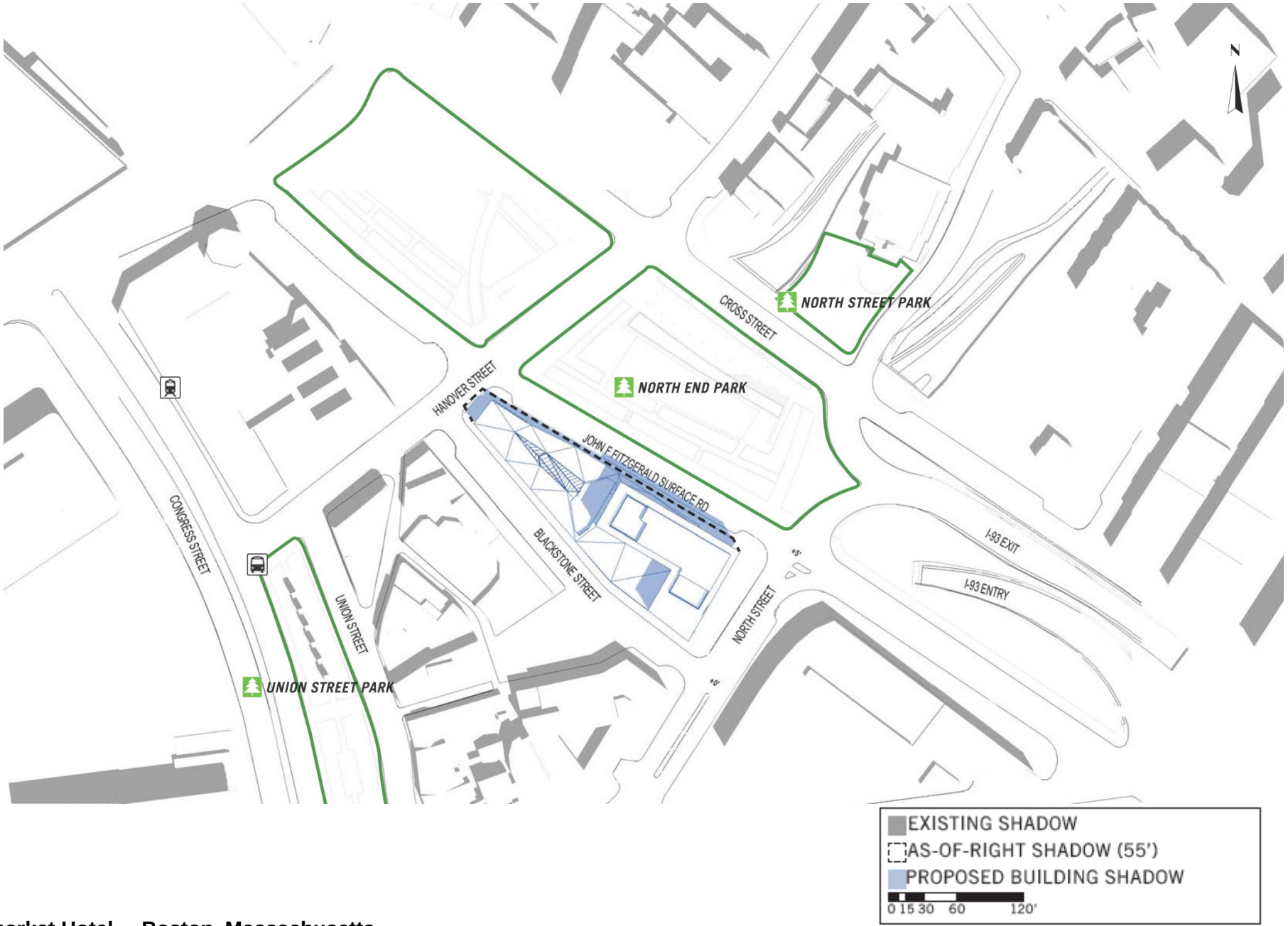


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-4

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

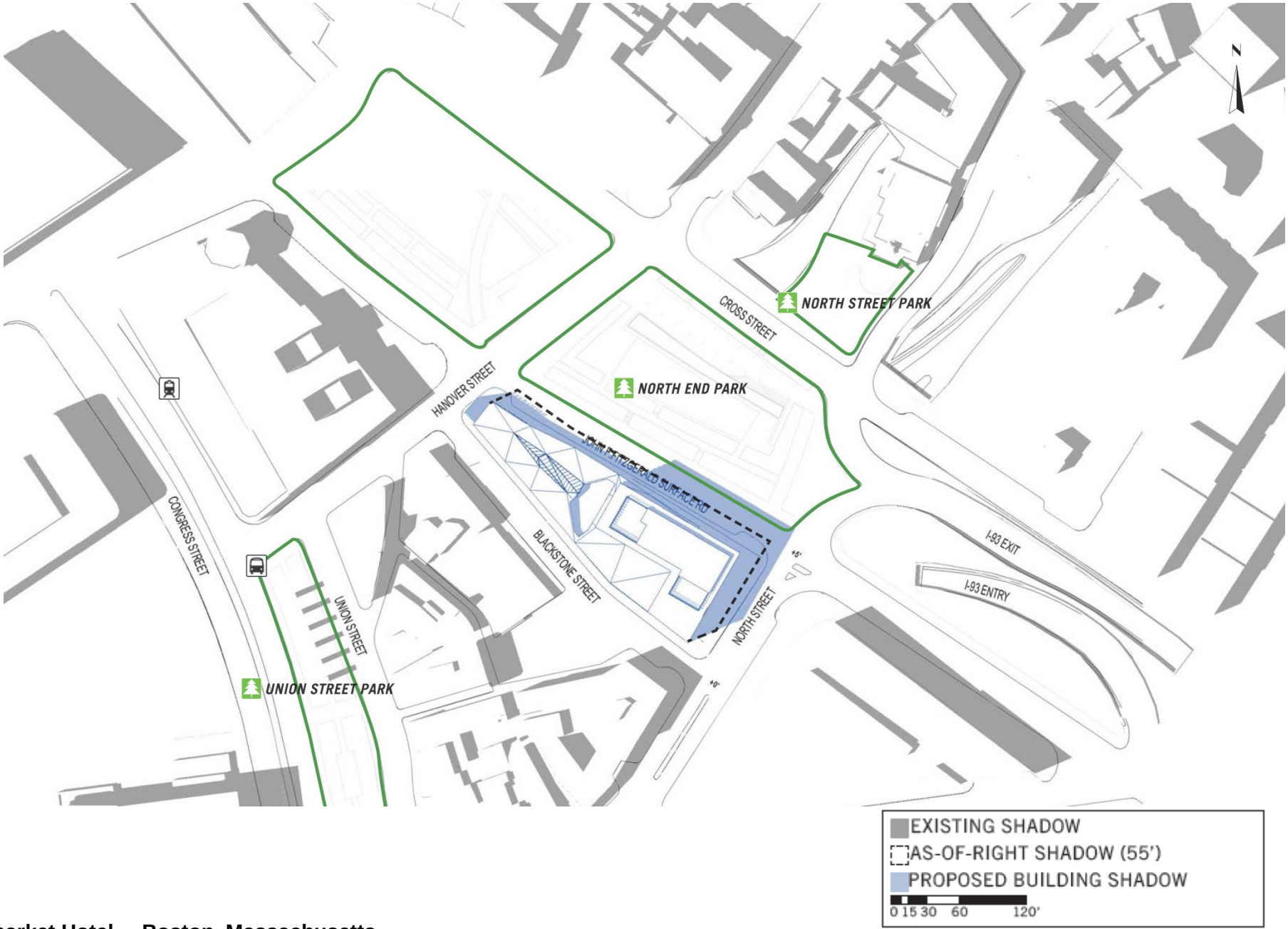


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-5

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

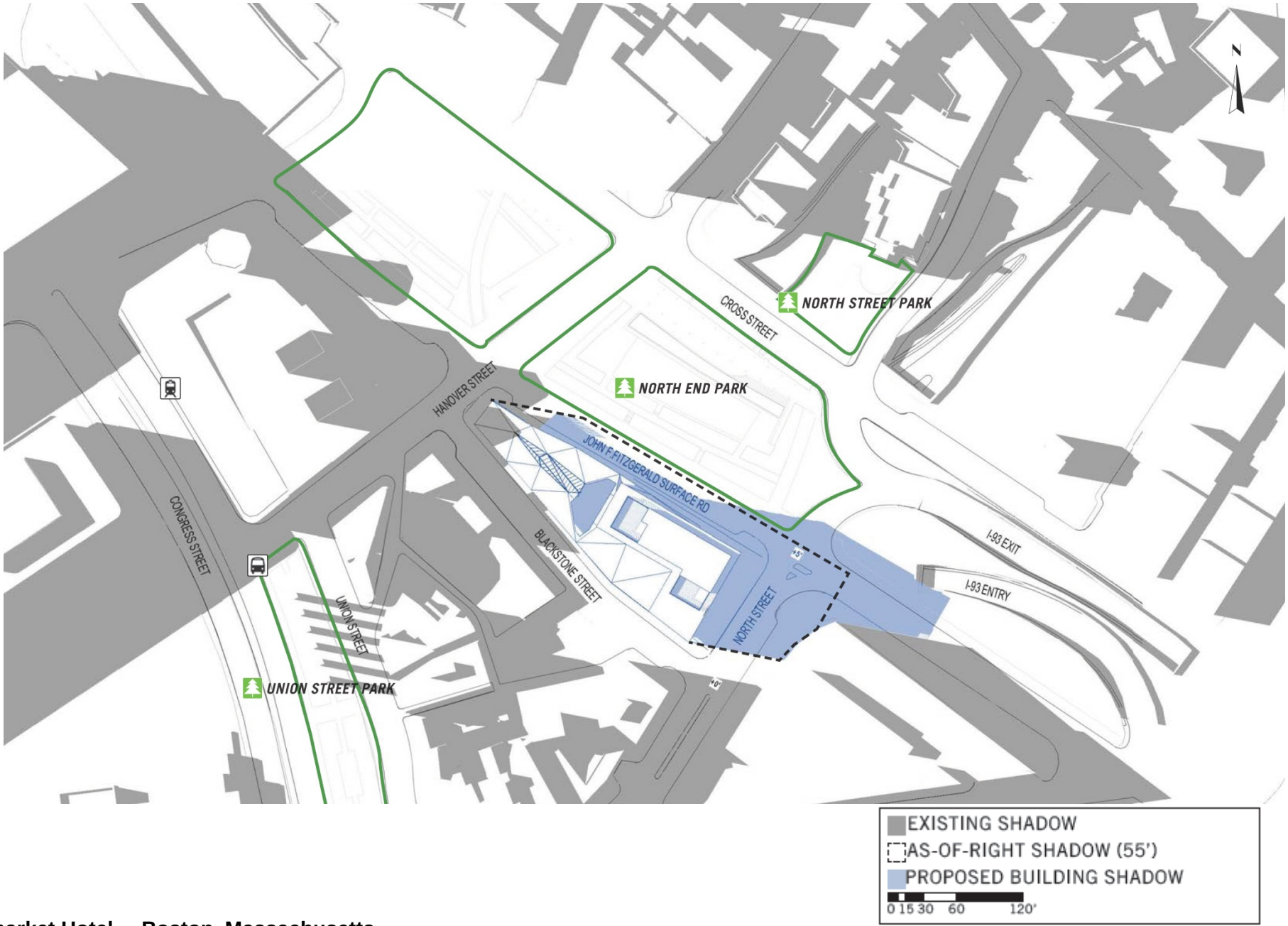


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-6

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

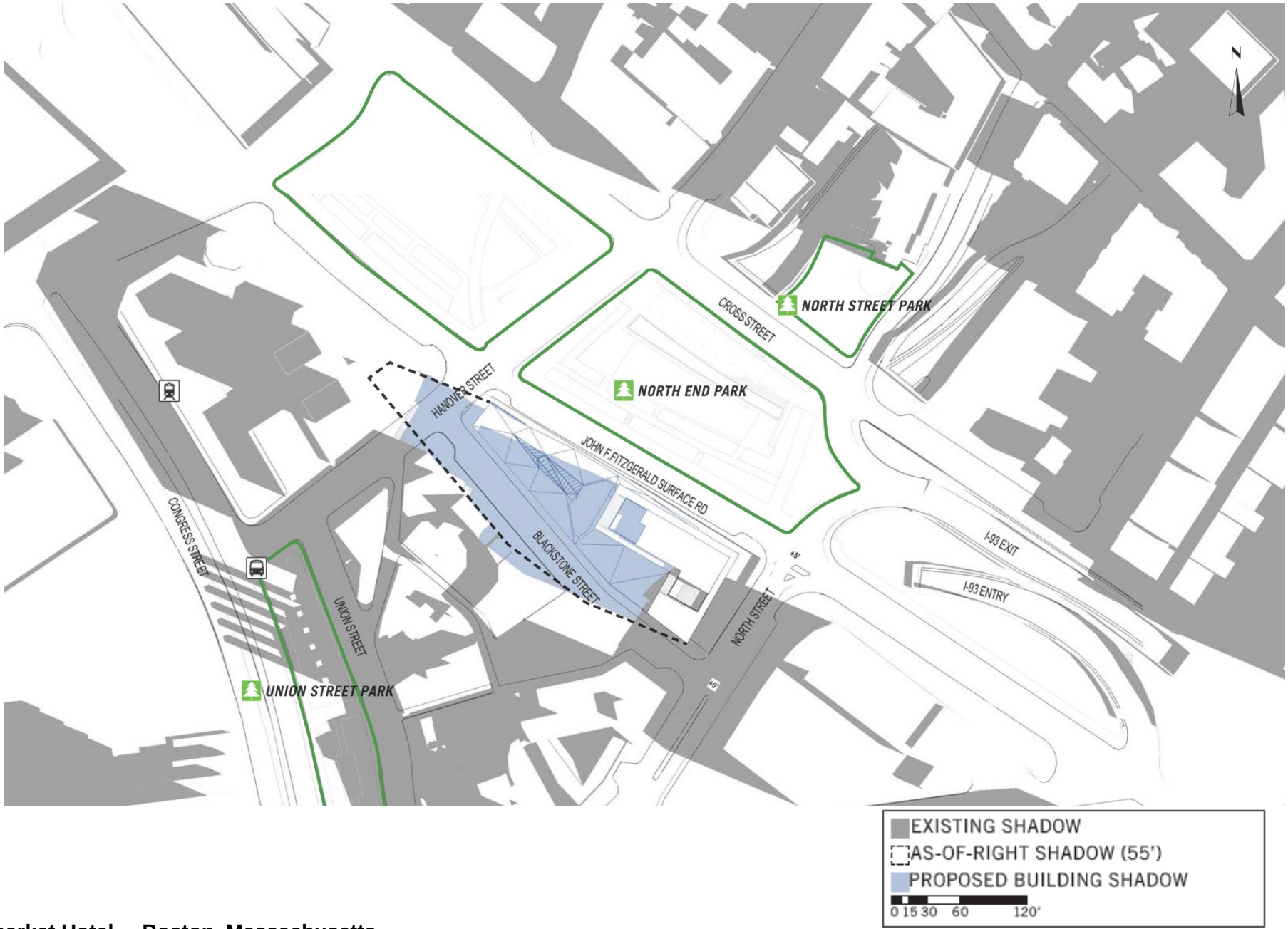


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-7

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

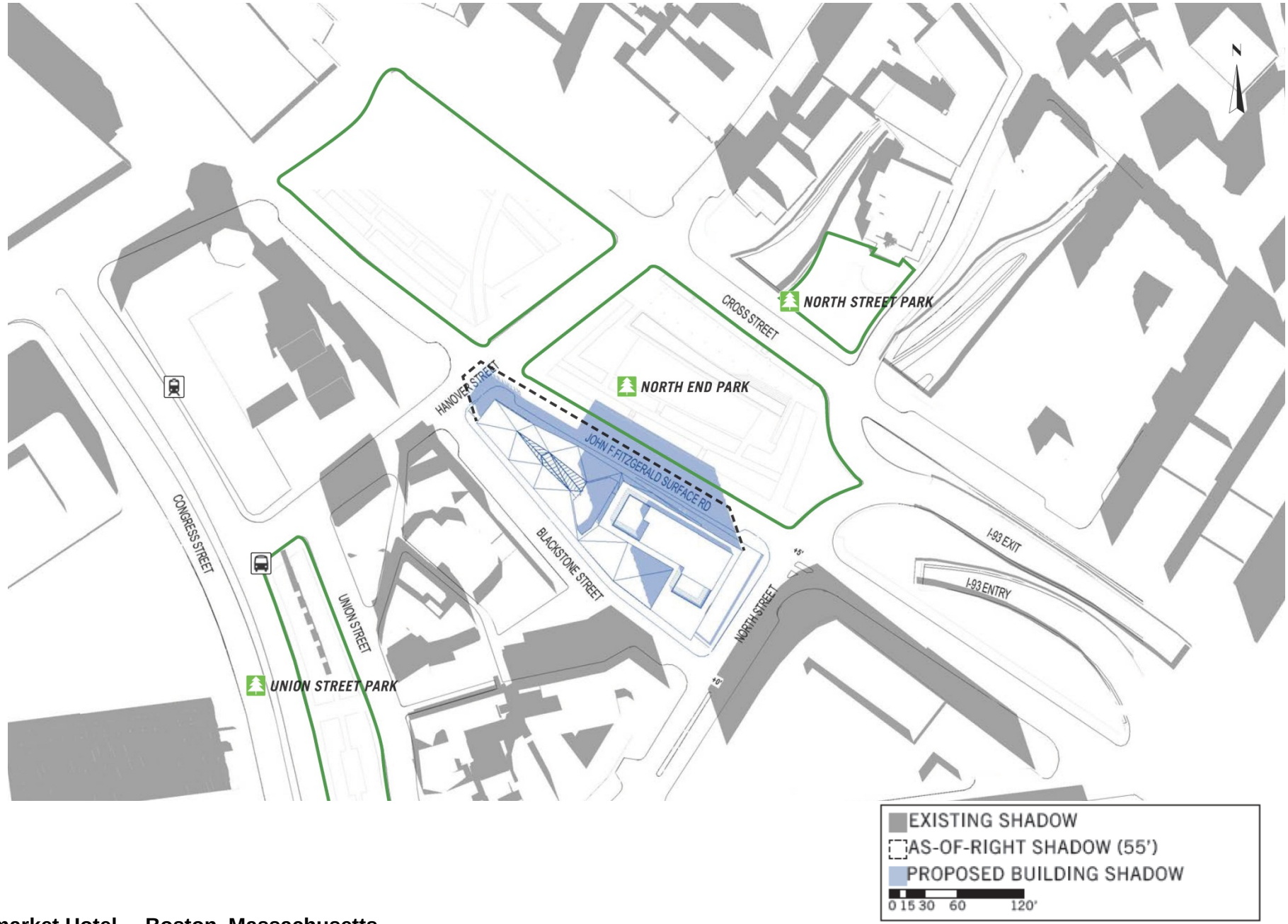


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-8

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

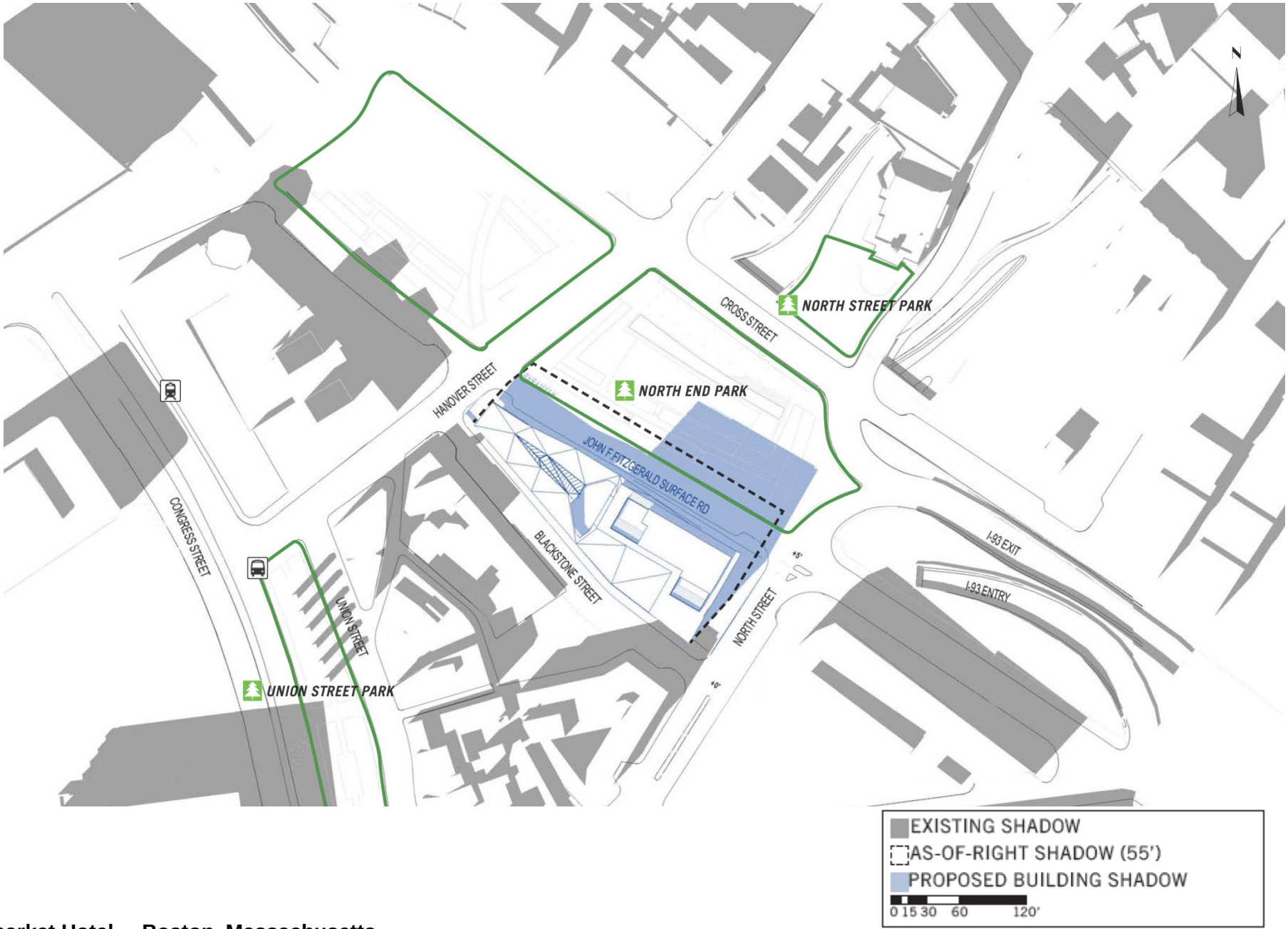


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-9

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

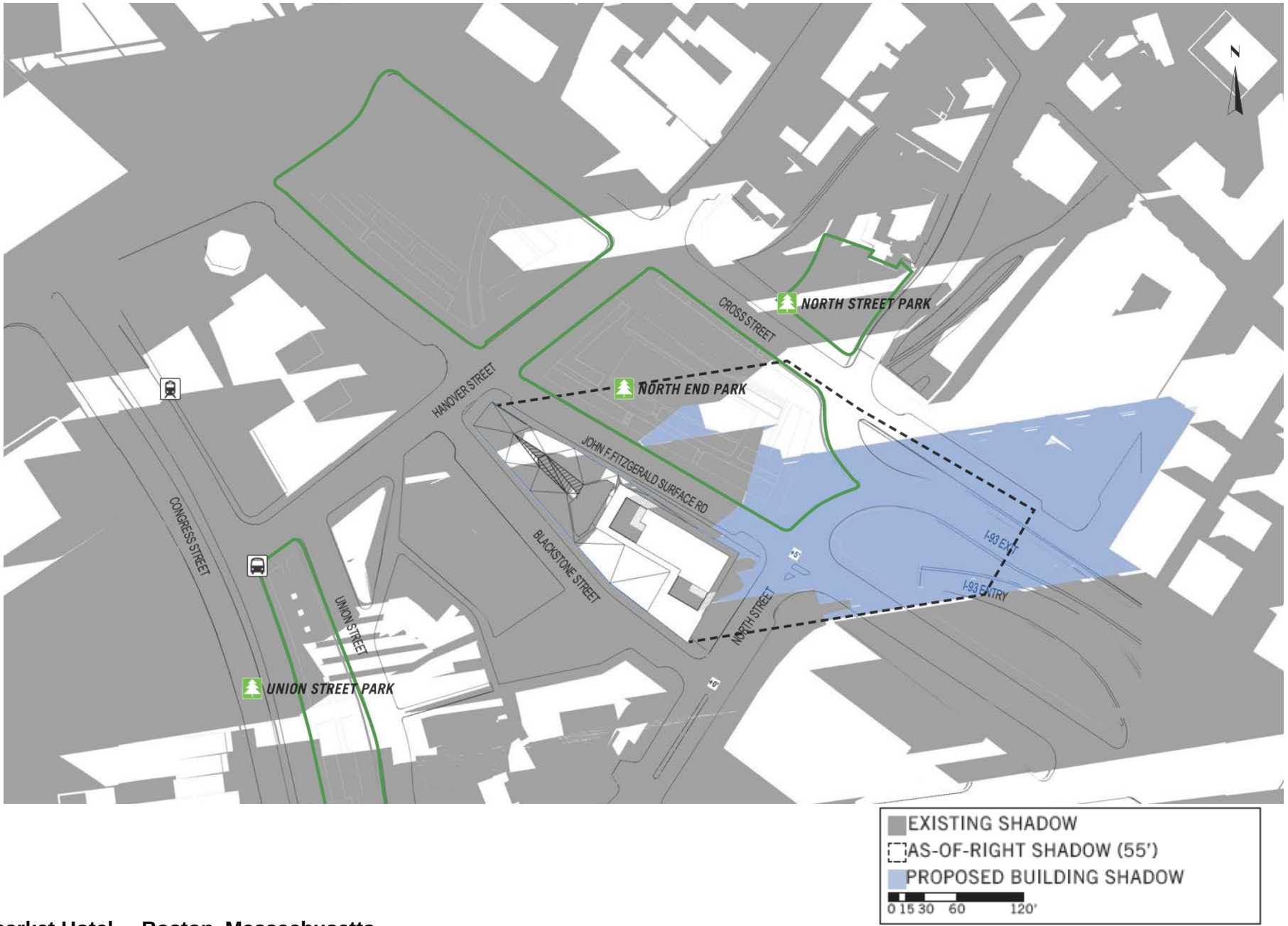


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-10

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

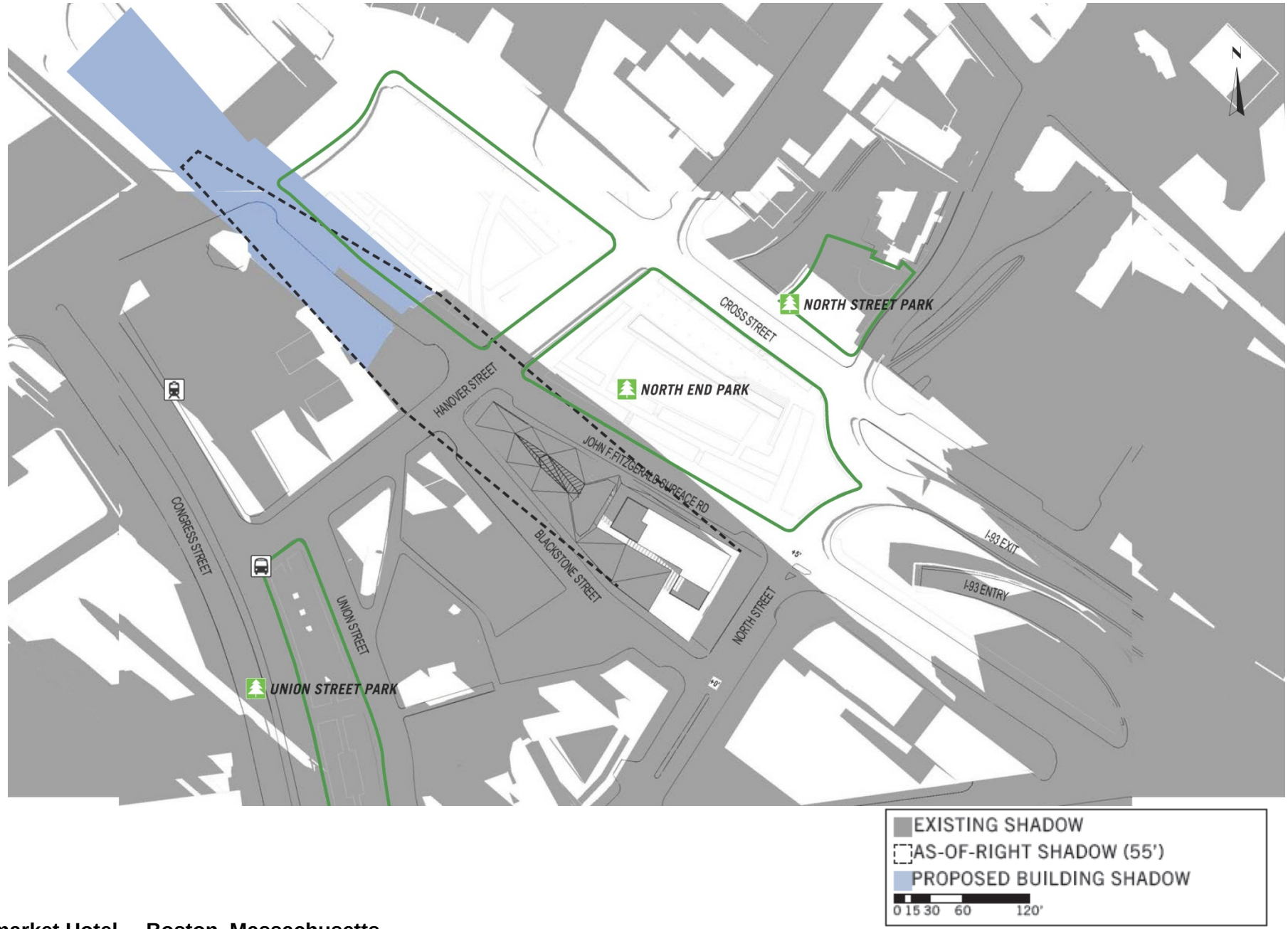


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-11

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

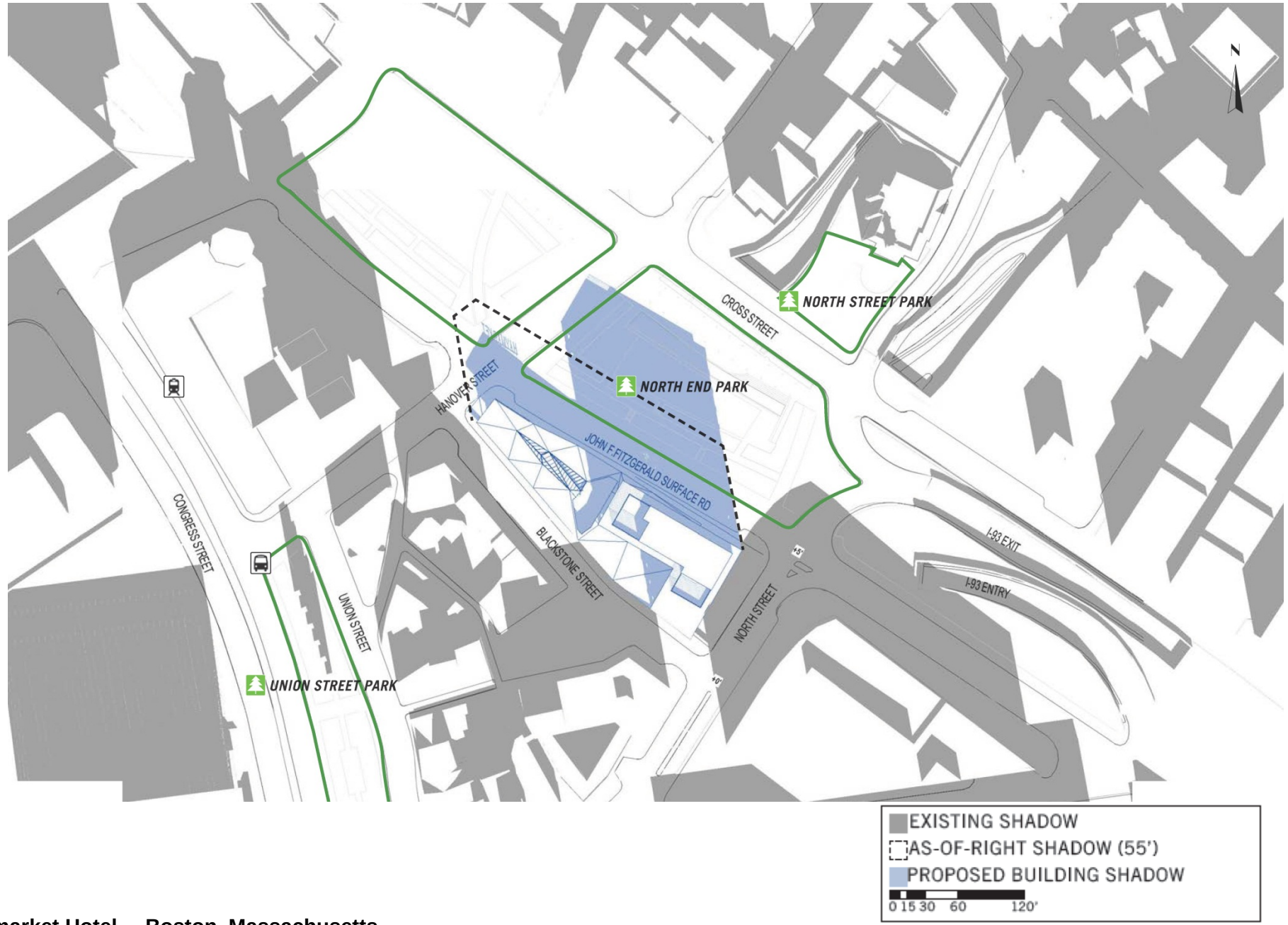


Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-12

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



Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-13

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

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 4.2-14

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

4.3 Daylight Analysis

4.3.1 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.

Because the Project site is currently undeveloped, the proposed Project will inherently increase daylight obstruction; however, the resulting conditions are typical of the area and other urban areas.

4.3.2 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.

Since the Project site is currently undeveloped, the analysis compares the proposed conditions to the context of the area.

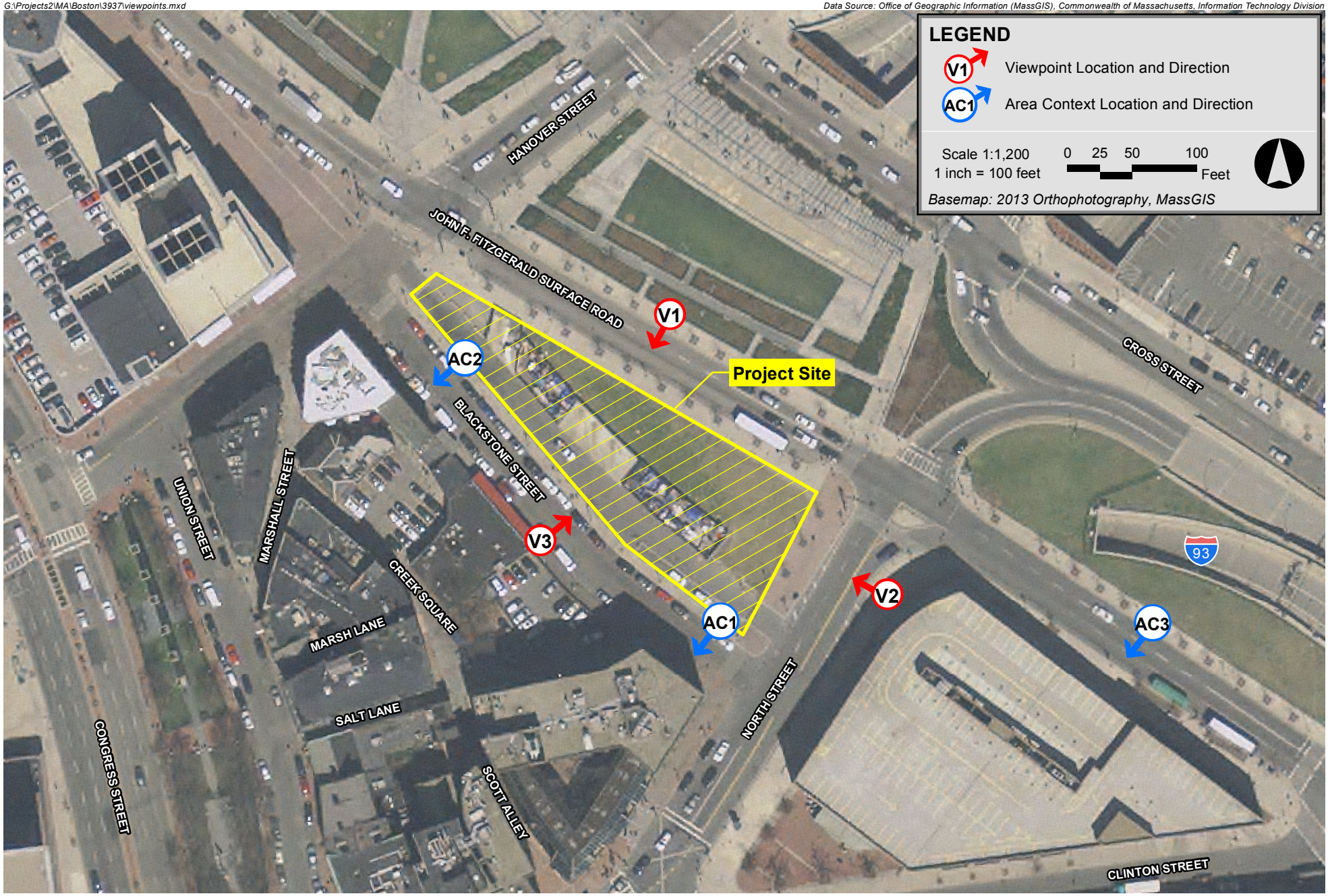
Three viewpoints were chosen to evaluate the daylight obstruction for the proposed conditions, one from John F. Fitzgerald Surface Road, one from North Street and one from Blackstone Street. Three area context points were considered in order to provide a basis of comparison to existing conditions in the surrounding area. The viewpoint and area context viewpoints were taken in the following locations and are shown on Figure 4.3-1.

- **Viewpoint 1:** View from John F. Fitzgerald Surface Road facing southwest toward the Project site.

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

G:\Projects2\MA\Boston\3937\viewpoints.mxd

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



Haymarket Hotel Boston, Massachusetts

Epsilon Associates Inc.

Figure 4.3-1

Viewpoint and Area Context Locations

- **Viewpoint 2:** View from North Street facing northwest toward the Project site.
- **Viewpoint 3:** View from Blackstone Street facing northeast toward the Project site.
- **Area Context Viewpoint AC1:** View from Blackstone Street facing southeast toward the building at 26 North Street.
- **Area Context Viewpoint AC2:** View from Blackstone Street facing southeast toward the building at 108 Blackstone Street.
- **Area Context Viewpoint AC3:** View from John F. Fitzgerald Surface Road facing southeast toward the Dock Square Garage.

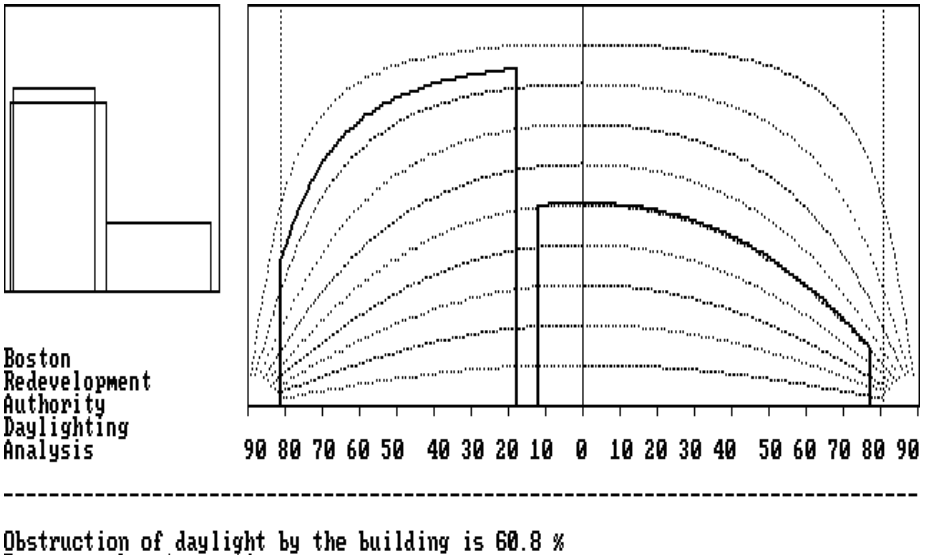
4.3.3 Results

The results for each viewpoint are described in Table 4.3-1. Figures 4.3-2 and 4.3-3 illustrate the BRADA results for each analysis.

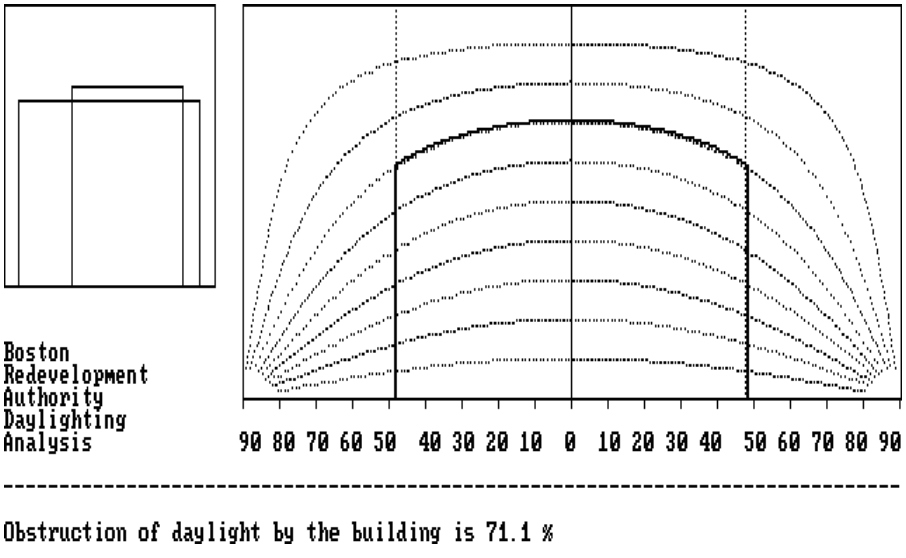
Table 4.3-1 Daylight Analysis Results

Viewpoint Locations		Existing Conditions	Proposed Conditions
Viewpoint 1	View from John F. Fitzgerald Surface Road facing southwest toward the Project site	N/A	60.8%
Viewpoint 2	View from North Street facing northwest toward the Project site	N/A	71.1%
Viewpoint 3	View from Blackstone Street facing northeast toward the Project site		61.3%
Area Context Points			
AC1	View from Blackstone Street facing southeast toward the building at 26 North Street	61.1%	N/A
AC2	View from Blackstone Street facing southeast toward the building at 108 Blackstone Street	48.5%	N/A
AC3	View from John F. Fitzgerald Surface Road facing southeast toward the Dock Square Garage	52.8%	

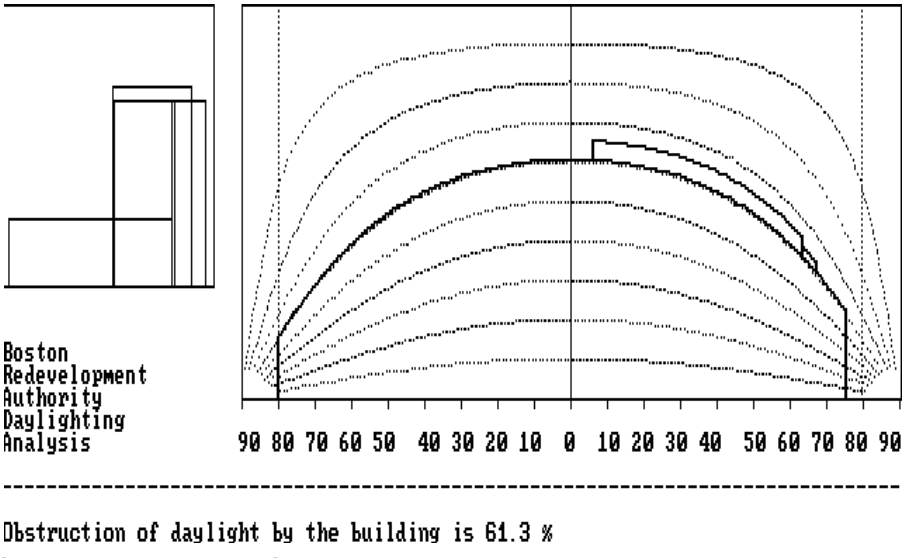
Viewpoint 1: View from John F. Fitzgerald Surface Road facing southwest toward the Project site



Viewpoint 2: View from North Street facing northwest toward the Project site

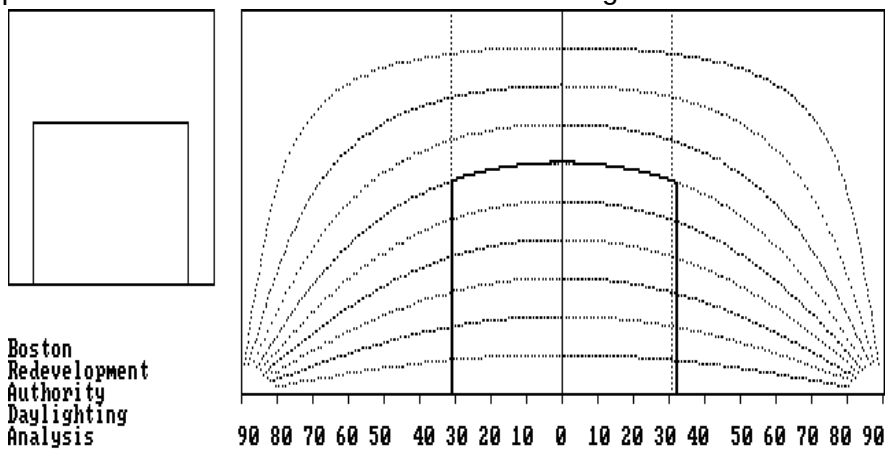


Viewpoint 3: View from Blackstone Street facing northeast toward the Project site

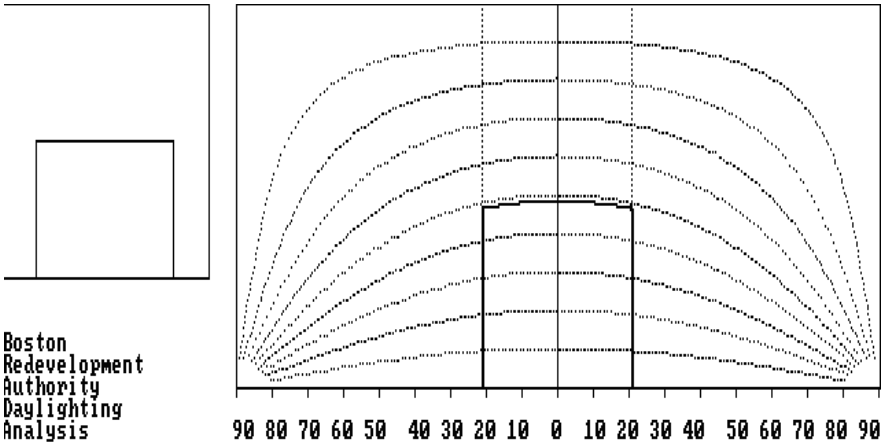


Haymarket Hotel **Boston, Massachusetts**

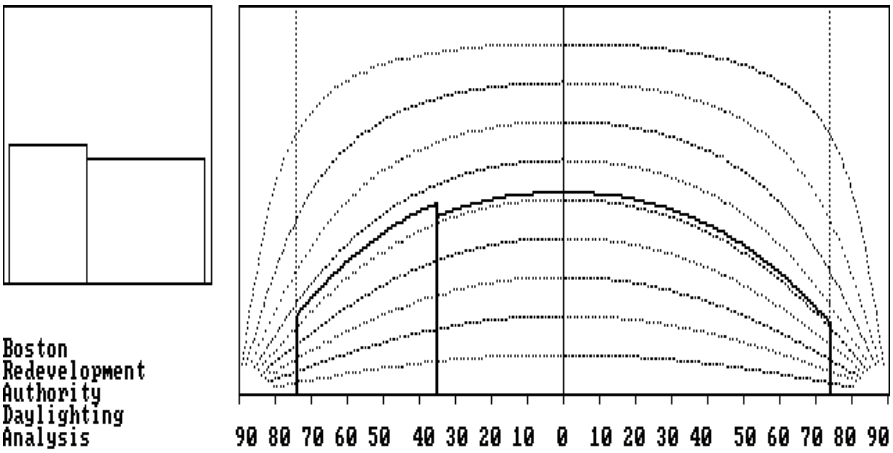
Area Context Viewpoint AC1: : View from Blackstone Street facing southeast toward the building at 26 North Street



Area Context Viewpoint AC2: View from Blackstone Street facing southeast toward the building at 108 Blackstone Street



Area Context Viewpoint AC3: View from John F. Fitzgerald Surface Road facing southeast toward the Dock Square Garage



John F. Fitzgerald Surface Road – Viewpoint 1

John F. Fitzgerald Surface Artery runs along the northeastern edge of the Project site. Viewpoint 1 was taken from the center of John F Fitzgerald Surface Artery looking southwest toward the Project site. The development of the proposed Project will result in a daylight obstruction value of 60.8%. Since the Project site is currently undeveloped, this is an increase over existing conditions. However, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

North Street – Viewpoint 2

North Street runs along the southeastern edge of the Project site. Viewpoint 2 was taken from the center of North Street facing northwest toward the Project site. The development of the Project will result in a daylight obstruction value of 71.1%. Although this is slightly higher than the Area Context buildings, this daylight obstruction value is typical of dense urban areas, including locations in adjacent Downtown and North End.

Blackstone Street – Viewpoint 3

Blackstone Street runs along the southwestern edge of the Project site. Viewpoint 3 was taken from the center of Blackstone Street facing northeast toward the Project site. The development of the Project will result in a daylight obstruction value of 61.3%. Since the Project site is currently undeveloped, this is an increase over existing conditions. However, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

Area Context Viewpoints

The Project area consists of low to mid-rise commercial buildings and parking garages. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for the three Area Context Viewpoints described above and shown on Figure 4.3-1. The daylight obstruction values ranged from 48.5% for AC2 to 61.1% for AC1. Daylight obstruction values for the Project are generally consistent with Area Context values.

4.3.4 Conclusions

The daylight analysis conducted for the Project describes proposed daylight obstruction conditions at the Project site and existing conditions in the surrounding area. The results of the BRADA analysis indicate that while the development of the Project will result in increased daylight obstruction over existing conditions, the resulting conditions will be consistent with daylight obstruction values within the surrounding area and typical of densely built urban areas. The increased daylight obstruction is a result of developing on a site that is currently undeveloped.

4.5 Air Quality Analysis

4.5.1 Introduction

An air quality analysis has been conducted to determine the impact of pollutant emissions from mobile sources generated by the Project. Specifically, a microscale analysis was performed to evaluate the potential air quality impacts of carbon monoxide (CO) resulting from traffic flow around the Project area. Any new stationary sources will be reviewed by the Massachusetts Department of Environmental Protection (MassDEP) during permitting under the Environmental Results Program (ERP), if necessary.

4.5.1.1 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, U.S. Environmental Protection Agency (EPA) promulgated National Ambient Air Quality Standards (NAAQS) for these 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 4.5-1. Massachusetts Ambient Air Quality Standards (MAAQS) are typically identical to NAAQS.

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

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

The standards were developed by EPA to protect the human health against adverse health effects with a margin of safety.

Table 4.5-1 National Ambient Air Quality Standards

Pollutant	Averaging Period	National Ambient Air Quality Standards and Massachusetts Ambient Air Quality Standards (micrograms per cubic meter)	
		Primary	Secondary
NO_2	Annual [1]	100	Same
	1-hour [7]	188	None
SO_2	Annual [1,8]	80	None
	24-hour [2,8]	365	None
	3-hour [2]	None	1,300
	1-hour [7]	196	None
PM-10 [6]	Annual	50	Same
	24-hour [3]	150	Same
PM-2.5	Annual [4]	12	15
	24-hour [5]	35	Same
CO	8-hour [2]	10,000	Same
	1-hour [2]	40,000	Same
Ozone	8-hour [3]	147	Same
Pb	3-month [1]	1.5	Same

Notes:
[1] Not to be exceeded.
[2] Not to be exceeded more than once per year.
[3] Not to be exceeded more than an average of one day per year over three years.
[4] Not to be exceeded by the arithmetic average of the annual arithmetic averages from three successive years.
[5] Not to be exceeded based on the 98th percentile of data collection.
[6] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM-10 standard in 2006 (effective December 17, 2006). However, the annual standard remains codified in 310 CMR 6.00.
[7] Not to be exceeded. Based on the three-year average of the 98th (NO_2) or 99th (SO_2) percentile of the daily maximum one-hour concentrations.
[8]The Annual and 24-hour SO_2 standards were revoked on June 2, 2010. However, these standards remain in effect until one year after an area is designated for the one-hour standard, unless currently in nonattainment.
Source: 40 CFR 50 and 310 CMR 6.00

4.5.1.2 Background Concentrations

MassDEP guidance directs project proponents to use the three most recent years of available background air quality monitoring data from within 10 km of a project site. Background concentrations were determined from the closest available monitoring stations to the proposed development from the most recent air quality monitor data reported by the MassDEP as available in its Annual Air Quality Reports for 2010 to 2012. The closest monitor is located at 175 North Street but only samples PM-2.5. The next closest monitor is at One City Square but only samples PM-10 and PM-2.5. Kenmore Square, the third closest location samples for the remaining criteria pollutants. All monitors are located in Boston, and consistent with MassDEP guidance, are within 10 km of the Project site.

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

A summary of the background air quality concentrations are presented in Table 4.5-2.

Table 4.5-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Time	Form	2010	2011	2012	Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][7][8]	1-Hour	99th %	50.6	34.6	31.4	50.6	Kenmore Sq., Boston
	3-Hour	H2H	64.5	36.2	41.9	64.5	Kenmore Sq., Boston
	24-Hour	H2H	24.6	14.1	15.7	24.6	Kenmore Sq., Boston
	Annual	H	6.2	4.9	2.6	6.2	Kenmore Sq., Boston
PM-10	24-Hour	H2H	34	37	40	40.0	One City Sq., Boston
	Annual	H	15.9	16.8	18	18.0	One City Sq., Boston
PM-2.5	24-Hour [4]	98th %	23.9	20.9	20	21.6	174 North St, Boston
	Annual [5]	H	10.32	9.47	8.8	9.5	174 North St, Boston
NO_2 [3]	1-Hour [6]	98th %	99.5	92.1	90.2	93.9	Kenmore Sq., Boston
	Annual	H	38.3	35.9	33.4	38.3	Kenmore Sq., Boston
CO [2]	1-Hour	H2H	1710	1482	1482	1710.0	Kenmore Sq., Boston
	8-Hour	H2H	1368	1026	1026	1368.0	Kenmore Sq., Boston

Notes:
From 2010-2013 MassDEP Annual Data Summaries
[1] SO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 2.62 $\mu g/m^3$.
[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.
[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 1.88 $\mu g/m^3$.
[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.
[5] Background level for annual PM-2.5 is the average for three years.
[6] Background level for one-hour NO_2 is the average of the 98th percentile of the daily maximum one-hour values over three years.
[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.
[8] The 2011 - 2013 SO_2 three-hour value is no longer reported by MassDEP. One-hour H2H used instead. 2013 24-hour value also no longer reported. Obtained from EPA AirData website.

Air quality is generally good in the area, with all of the ambient concentrations well below their respective NAAQS. For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 1.5 ppm (1,710 $\mu g/m^3$) for one-hour and 1.2 ppm (1,368 $\mu g/m^3$) for eight-hour CO.

4.5.2 Methodology

4.5.2.1 Microscale Analysis

The BRA typically requests an analysis of the effect on air quality of the increase in traffic generated by projects subject to Large Project Review. This "microscale" analysis is typically required for any intersection (including garage entrances/exits) 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 carbon monoxide (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 analysis for the Project followed the procedure outlined in EPA's intersection modeling guidance.[3]

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 (2014) and future year (2019) 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.

---

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

Existing background values of CO at the nearest monitor location at Kenmore Square were obtained from MassDEP. CAL3QHC results were then added to background CO values of 1.5 ppm (one-hour) and 1.2 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).

The modeling methodology was developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[4]

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

Intersection Selection

The traffic volumes and LOS calculations provided in Chapter 3 form the basis of evaluating the traffic data versus the microscale thresholds. Two intersections included in the traffic study meet the criteria for inclusion in the microscale analysis (described above):

- The intersection of Congress Street and North Street, and
- The intersection of Surface Road and Interstate 93 Southbound Off-ramp.

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2014 existing conditions, and the 2019 No Build and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak periods.

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 (2014) and Build year (2019) 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 intersections as stated in traffic modeling (SYNCHRO) reports. A speed of 30 mph is used

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

for all free-flow traffic. 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 analyses.

Receptors and Meteorology Inputs

Sets of up to 115 receptors were placed in the vicinity of the modeled intersection. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersection. The roadway links and receptor locations of the modeled intersection are presented in Figures 4.5-1 and 4.5-2.

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°, every 10° were selected. A surface roughness length of 321 centimeters was selected for both intersections.[7]

Impact Calculations (CAL3QHC)

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

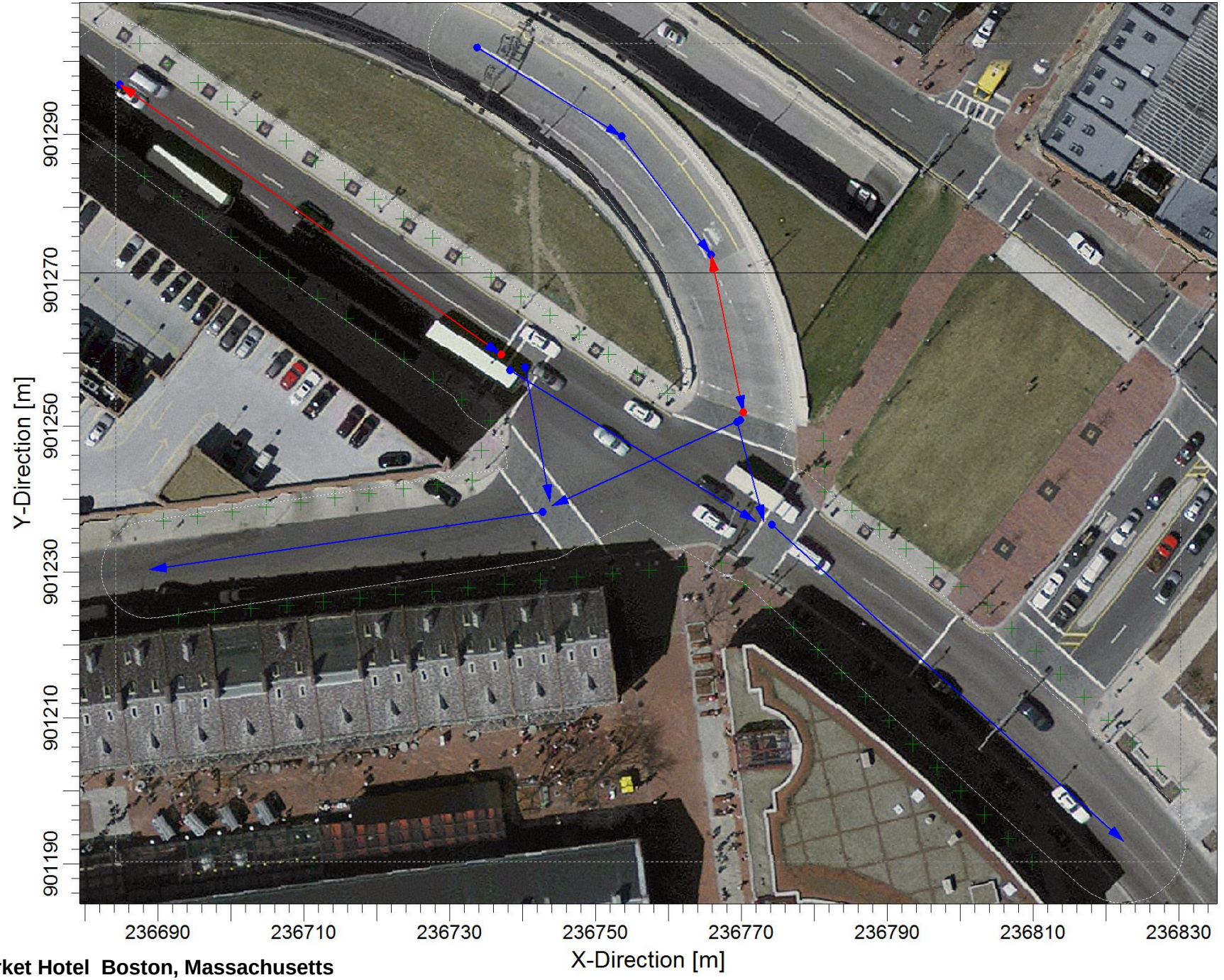
---

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

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

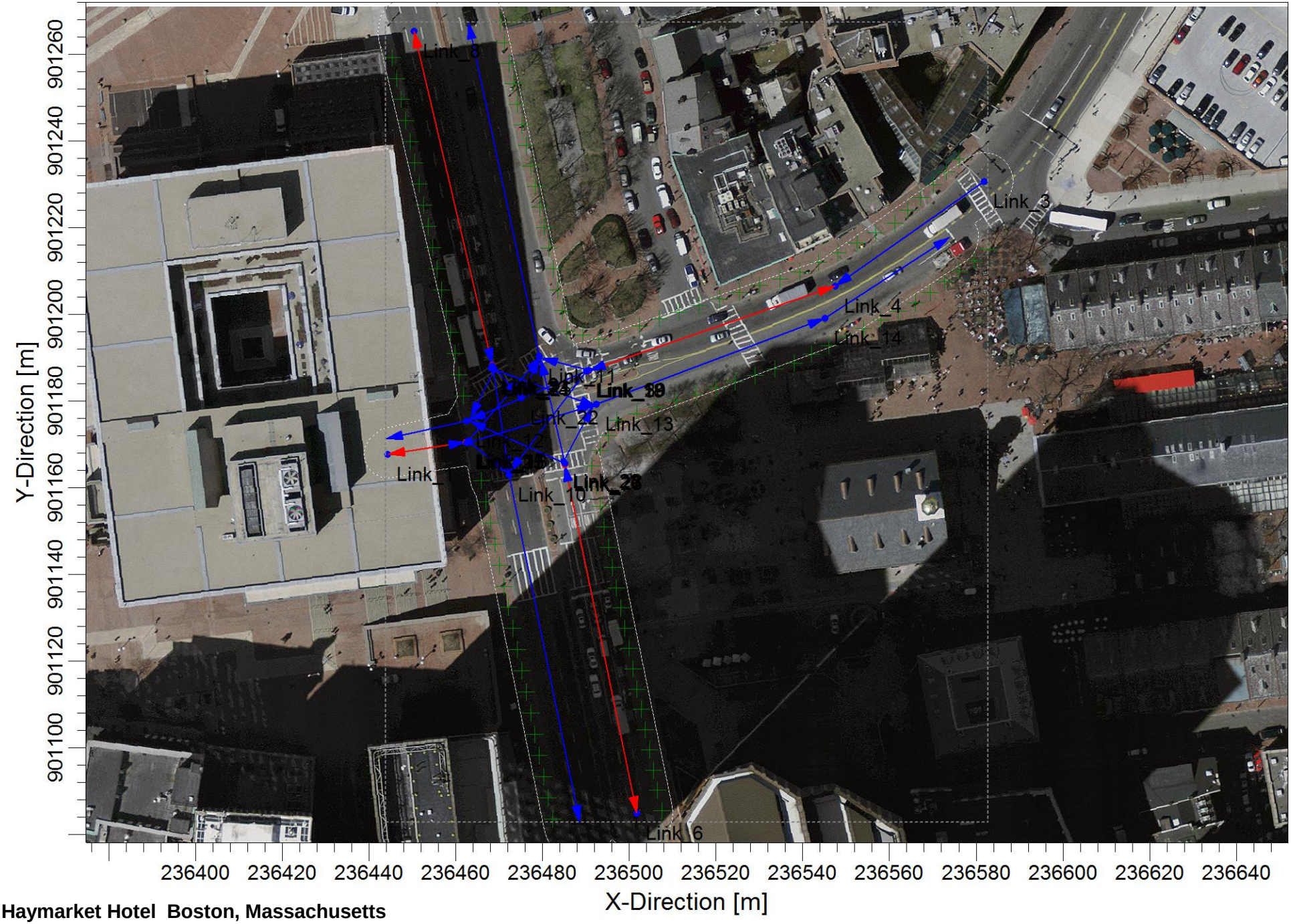


Haymarket Hotel Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 4.5-1

Link and Receptor Locations for CAL3QHC modeling of Intersection of Surface Rd. and I-93 SB Off-ramp



Haymarket Hotel Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 4.5-2

Link and Receptor Locations for CAL3QHC modeling of Intersection of Congress St. and North St.

4.5.3 Air Quality Results

4.5.3.1 Microscale Analysis

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 4.5-3 through 4.5-5 for the 2014 and 2019 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.7.[9]

The results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the area of the Project, for the modeled conditions (1.1 ppm) plus background (1.5 ppm) is 2.6 ppm for the 2014 Existing a.m. peak case at the intersection of Congress Street and North Street. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.8 ppm) plus background (1.2 ppm) is 2.0 ppm for at the same location and scenario. All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

4.5.4 Conclusions

4.5.4.1 Microscale Analysis

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

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

Table 4.5-3 Summary of Microscale Modeling Analysis (Existing 2014)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Surface Road and I-93 Southbound Off-ramp	AM	0.7	1.5	2.2	35
	PM	0.5	1.5	2.0	35
Congress Street and North Street	AM	1.1	1.5	2.6	35
	PM	0.8	1.5	2.3	35
8-Hour					
Surface Road and I-93 Southbound Off-ramp	AM	0.5	1.2	1.7	9
	PM	0.4	1.2	1.6	9
Congress Street and North Street	AM	0.8	1.2	2.0	9
	PM	0.6	1.2	1.8	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.					

Table 4.5-4 Summary of Microscale Modeling Analysis (No Build 2019)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Surface Road and I-93 Southbound Off-ramp	AM	0.5	1.5	2.0	35
	PM	0.2	1.5	1.7	35
Congress Street and North Street	AM	0.7	1.5	2.2	35
	PM	0.6	1.5	2.1	35
8-Hour					
Surface Road and I-93 Southbound Off-ramp	AM	0.4	1.2	1.6	9
	PM	0.1	1.2	1.3	9
Congress Street and North Street	AM	0.5	1.2	1.7	9
	PM	0.4	1.2	1.6	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.					

Table 4.5-5 Summary of Microscale Modeling Analysis (Build 2019)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Surface Road and I-93 Southbound Off-ramp	AM	0.5	1.5	2.0	35
	PM	0.3	1.5	1.8	35
Congress Street and North Street	AM	0.7	1.5	2.2	35
	PM	0.6	1.5	2.1	35
8-Hour					
Surface Road and I-93 Southbound Off-ramp	AM	0.4	1.2	1.6	9
	PM	0.2	1.2	1.4	9
Congress Street and North Street	AM	0.5	1.2	1.7	9
	PM	0.4	1.2	1.6	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.7.					

4.6 Solid and Hazardous Waste

4.6.1 Hazardous Waste

If soil disposal is required, the Proponent will obtain site specific information regarding environmental conditions of excavated soils to evaluate for the presence of oil and hazardous materials. Foundation construction for the new building may generate soil requiring off-site transport. Chemical testing of the material will be required by receiving facilities to identify chemical constituents and any contaminants present. Chemical testing of the material will be conducted prior to construction in accordance with facility requirements.

Any material leaving the site will be required to be legally transported in accordance with local, state and federal requirements. In addition, any regulated soil conditions related to oil and hazardous materials will be managed in accordance with appropriate Massachusetts MassDEP regulatory requirements.

4.6.2 Operation Solid and Hazardous Waste Generation

The Project will generate solid waste typical of hotel, restaurant and retail 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 296 tons of solid waste per year.

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

4.6.3 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 5.

4.7 Noise Impacts

A sound level assessment was conducted for the Project, including 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 mechanical equipment associated with the Project, and a comparison of future Project sound levels to applicable noise regulations, including the City of Boston Zoning District Noise Standards (City Noise Standards)..

This analysis, which is consistent with the BRA's typical guidance for noise studies, indicates that with appropriate noise controls, predicted noise levels from the Project will comply with the City Noise Standards.

4.7.1 Noise Terminology

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

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

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

The sound-level meter used to measure noise is a standardized instrument.[10] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. One network is the A-weighting network (there are also B- and C-weighting networks), which most closely approximates how the human ear responds to sound as a function of frequency, and is the accepted scale used for community sound level measurements. Sounds are frequently reported as detected with the A-weighting network of the sound level meter, in dBA. A-weighted sound levels emphasize the middle frequencies (i.e., middle pitched—around 1,000 Hertz sounds), and de-emphasize lower- and higher- frequencies.

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

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

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

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

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

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

[10] *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.

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

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

4.7.2 Noise Regulations and Criteria

The primary set of regulations relating to the potential increase in noise levels is the City Noise Standards (City of Boston Code – Ordinances: Section 16–26 Unreasonable Noise; and City of Boston Air Pollution Control Commission Regulations for the Control of Noise in the City of Boston). Separate regulations within the City Noise Standards provide criteria to control different types of noise. Regulation 2 is applicable to the effects of the proposed building, as completed, and was considered in the noise study for the Project. Table 4.7-1 includes the City Noise Standards.

Table 4.7-1 City Noise Standards, Maximum Allowable Sound Pressure Levels

Octave Band Center	Residential 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:	Noise standards are extracted from Regulation 2.5, City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976. All standards apply at the property line of the receiving property. dB and dBA based on a reference pressure of 20 micropascals. Daytime refers to the period between 7:00 a.m. and 6:00 p.m. daily except Sunday.					

4.7.3 Existing Conditions

4.7.3.1 Baseline Noise Environment

An ambient noise-level survey was conducted to characterize the "baseline" acoustical environment in the vicinity of the Project site. Existing noise sources currently include: vehicular traffic (including trucks and buses) on local roadways, pedestrians, occasional sirens and horns, birds, and the general din of the city.

4.7.3.2 Noise Measurement Locations

The selection of the sound-monitoring locations was based upon a review of the current land uses in the Project area. Five noise-monitoring locations (one daytime-only) were selected as representative in obtaining a sampling of the ambient baseline noise environment. The measurement locations are depicted in Figure 4.7-1 and are described below.

- Location ST-1 is located on the sidewalk corner of 120 Commercial Street at the intersection of Richmond Street to the east of the Project site. This location is representative of the noise sensitive receivers to the east of the Project distanced from the pathway of Interstate-93. Noise sources at this location include vehicular traffic on local roadways, mechanical noise from a nearby building, some pedestrian activity, birds chirping (daytime only), and the general din of the city.

- Location ST-2 is located on the sidewalk at 60 Salem Street near Morton Street to the north of the Project site. This location is representative of the noise sensitive receivers to the north of the Project. Noise sources at this location include vehicular traffic on local roadways, frequent pedestrian activity, commercial activity, occasional backup alarms, birds chirping (daytime only), air conditioners from nearby buildings (nighttime only), and the general din of the city.

- Location ST-3 is located on the sidewalk corner of Blackstone Street and Creek Square outside of the Millennium Bostonian Hotel immediately south of the Project site. This location is representative of the noise sensitive receivers to the south of the Project. Noise sources at this location include vehicular traffic on local roadways, pedestrian activity, occasional air traffic, utility truck activity (daytime only), mechanical exhaust from the Hotel (nighttime only), and the general din of the city.

- Location ST-4 is located on the sidewalk outside 149 Hanover Street near Marshall Street to the west of the Project site. This location is representative of the noise sensitive receivers to the west of the Project. Noise sources at this location include vehicular traffic on local roadways, pedestrian activity, truck delivery and forklift operation (nighttime only), occasional backup alarms, birds chirping (daytime only), and the general din of the city.

Haymarket Hotel Boston, Massachusetts

Epsilon Associates Inc.

Figure 4.7-1

Sound Level Measurement Locations

- Location ST-5 (daytime only) is located at North End Park to the north of the Project site. This location is representative of the daytime-use city park north of the Project. Noise sources at this location include vehicular traffic on local roadways (including trucks and idling buses), park water fountains, pedestrian activity, occasional sirens and backup alarms, and the general din of the city.

4.7.3.3 Noise Measurement Methodology

Sound-level measurements were taken for approximately 20 minutes per location during the daytime (11:00 a.m. to 2:00 p.m.) on June 24, 2014, and during nighttime hours (12:00 a.m. to 2:30 a.m.) on July 11, 2014. Since noise impacts are greatest at night when existing noise levels are lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to exclude peak traffic conditions.

The sound levels were measured at publicly-accessible locations around the Project site at a height of approximately 1.5 meters above the ground. The measurements were made under low wind conditions, and roadway surfaces were dry. 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, including wind speed, temperature, and humidity, as well as land use in the community, were made solely to characterize the existing sound levels in the area and to estimate the noise sensitivity at properties near the proposed Project.

4.7.3.4 Measurement Equipment

A Larson Davis model 831 Sound Level Analyzer, equipped with a Larson Davis model PRM831 Preamplifier, a PCB Piezotronics half-inch microphone, and a manufacturer-provided windscreen were used to collect broadband and octave band ambient sound pressure level data. The instrumentation meets the "Type 1 – Precision" requirements set forth in American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. The meter was tripod-mounted at a height of five feet above ground level (AGL). The meter has data logging capability and was programmed to log statistical data for each 20-minute sampling period for the following parameters: L_{10}, L_{50}, L_{90}, L_{max}, L_{min}, and L_{eq}.

All measurement equipment was calibrated in the field before and after the surveys with a LD CAL200 acoustical calibrator, which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. The meters were calibrated and certified as accurate to standards set by the National Institute of Standards and Technology. These calibrations were conducted by an independent laboratory within the past 12 months.

4.7.3.5 Baseline Ambient Noise Levels

Baseline noise monitoring results are presented in Table 4.7-2, and summarized below. It should be noted that the existing ambient background levels immediately surrounding the Project already exceed the City of Boston limits without any contribution from the Project

- The daytime residual background (L90) measurements ranged from 59 to 64 dBA;
- The nighttime residual background (L90) measurements ranged from 55 to 62 dBA;
- The daytime equivalent level (Leq) measurements ranged from 64 to 69 dBA; and
- The nighttime equivalent level (Leq) measurements ranged from 59 to 69 dBA.

Table 4.7-2 Baseline Ambient Sound Level Measurements

Receptor ID	Start Time	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{90} Sound Level (dB) per Octave Band Center Frequency								
		(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
ST-1 Day	11:32 AM	64	84	65	60	59	65	65	61	61	55	52	46	41	29
ST-2 Day	12:02 PM	66	80	68	64	62	66	64	63	60	60	57	53	49	38
ST-3 Day	12:53 PM	68	88	70	63	60	70	68	62	58	56	55	51	45	33
ST-4 Day	1:17 PM	68	85	70	66	64	68	68	64	63	61	59	54	47	34
ST-5 Day	11:06 AM	69	88	70	64	61	71	70	64	57	55	55	53	51	43
ST-1 Night	1:24 AM	60	76	59	58	57	60	61	58	59	55	52	46	38	28
ST-2 Night	12:28 AM	63	81	64	59	58	63	67	60	57	55	53	48	42	32
ST-3 Night	12:55 AM	59	76	60	56	55	64	64	60	53	53	50	45	38	28
ST-4 Night	2:01 AM	69	85	71	64	62	63	65	60	59	59	58	53	45	32

Notes:

1. Daytime weather: Temperature = 84˚ F, Relative Humidity = 34%, mostly clear skies, north-northwest winds 3-8 miles per hour.
   Nighttime weather: Temperature = 74˚ F, Relative Humidity = 61%, clear skies, westerly winds 0-2 miles per hour.

2. All road surfaces were dry during measurements.

3. Sampling periods were at least 20 minutes in duration.

4. Daytime measurements were collected on June 24, 2014.
   Nighttime measurements were collected on July 11, 2014.

4.7.4 Overview of Potential Project Noise Sources

The primary sources of continuous sound exterior to the Project will consist of ventilation, heating, cooling, and emergency power noise sources. It is anticipated at this point in the design that the major sources of sound exterior to the Project will be one energy recovery unit, two cooling tower cells, and an emergency diesel generator all behind screening walls located on the upper roof, along with an energy recovery unit, a pool dehumidification unit, and three sets of restaurant roof top units and exhaust fans located within or above various 2nd floor mechanical spaces.

Other secondary noise sources, such as air conditioning units, heat pumps, chillers and boilers will either be enclosed within the building interior, or are assumed to have sound levels 10 dBA lower than the primary sources of noise, and were not considered in this analysis to contribute significantly to the overall sound level.

A tabular summary of the modeled mechanical equipment proposed for the Project is presented below in Table 4.7-3a. Sound power level data for each unit, as provided by the manufacturer or calculated from provided sound pressure level data, is presented in Table 3.10-3b. The approximate locations of the mechanical equipment were provided by the Project team in a preliminary roof plan.

One 300 kW emergency diesel generator is proposed for this project to be located behind a screening wall on the upper roof level in a dedicated weather-proof enclosure, exhausted vertically. It is assumed that this generator will only operate during the day for brief, routine testing when background sound levels will be higher or during an emergency interruption of the electrical grid when other rooftop mechanical equipment will not be operating.

Mitigation will be applied to multiple sources as needed, to ensure compliance with the applicable noise regulations. The mitigation assumed in this analysis, as described in Table 4.7-3c, includes a generator enclosure and critical-grade generator exhaust silencer, as well as acoustical louvers on the 2nd floor mechanical spaces and additional noise reduction applied to the 2nd floor restaurant exhaust fans.

Table 4.7-3a Modeled Noise Sources

Noise Source	Quantity	Location	Size/Capacity per Unit
Emergency Generator	1	Upper Roof	550 ekW
Energy Recovery Unit (ERU-1)	1	Upper Roof	6,000 CFM
Amenity Level ERU Vent Unit	1	2nd Floor	3,000 CFM
Pool Dehumidification Unit	1	2nd Floor	7,500 CFM
Restaurant RTU	3	2nd Floor	15,000 CFM
Restaurant Exhaust Fan	3	2nd Floor	12,000 CFM
Cooling Tower	2	Upper Roof	325 Ton

Table 4.7-3b Modeled Sound Power Levels per Noise Source

Noise Source	Broadband (dBA)	Sound Level (dB) per Octave Band Center Frequency								
		32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
Emergency Generator – Exhaust[1]	125	NA	124	122	125	120	120	117	113	107
Emergency Generator – Mechanical[2]	112	NA	117	116	111	107	105	103	102	104
Energy Recovery Unit (ERU-1)[3]	96	NA	93	92	93	93	89	88	89	85
Amenity Level ERU Vent Unit[4]	93	NA	91	91	90	88	84	86	87	83
Pool Dehumidification Unit[3]	96	NA	93	92	93	93	89	88	89	85
Restaurant RTU[5]	99	NA	93	93	95	97	94	90	86	80
Restaurant Exhaust Fan[6]	96	NA	102	100	99	92	90	86	79	73
Cooling Tower[7]	88	NA	100	97	90	83	82	79	76	68

Notes:

1. CAT 550 eKW Standby Diesel Generator Set, Model DM8517 , Open Exhaust
2. CAT 550 eKW Standby Diesel Generator Set, Model DM8517 , WP Canopy
3. AAON ERU, Model RN-026-3-0-E60E-3D9:UGFD-D0B-DEL-AGA-CHAA0CD-00-0B00000AB, Discharge Lw
4. AAON ERU, Model RN-016-3-0-E60E-389:VEDD-D0B-DQG-AGA-CHAA0CD-00-0B00000AB, Discharge Lw
5. AAON Energy Recovery Unit, Discharge Lw
6. Greenheck Series 21 Backward Inclined Single Width, 15,000 CFM
7. BAC Model VTL-272-OM Cooling Tower w/ Attenuation

Table 4.7-3c Modeled Noise Reduction by Source

Noise Source	Form of Mitigation	Noise Reduction (dB) per Octave Band Center Frequency								
		32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
Emergency Generator – Exhaust	Exhaust Silencer[1]	0	20	35	35	27	20	20	22	22
2nd Floor Mechanical Rooms	Acoustical Louvers[2]	7	15	14	15	19	30	31	29	29
Restaurant Exhaust Fan[3]	Quieter Model or Noise Barrier Wall[3]	0	0	0	1	0	3	5	3	0

Notes:

1. JB Series Critical Grade Silencer (JB-18), or similar
2. Safe Air Dowco Model UFD-12 Acoustical Louver, or similar. Applied to: Pool Dehumidification Unit, Amenity Level ERU Vent Unit, Restaurant RTU's, and Restaurant Exhaust Fan along North Street
3. Noise reduction applied to fans on 2nd floor roof along Blackstone Street

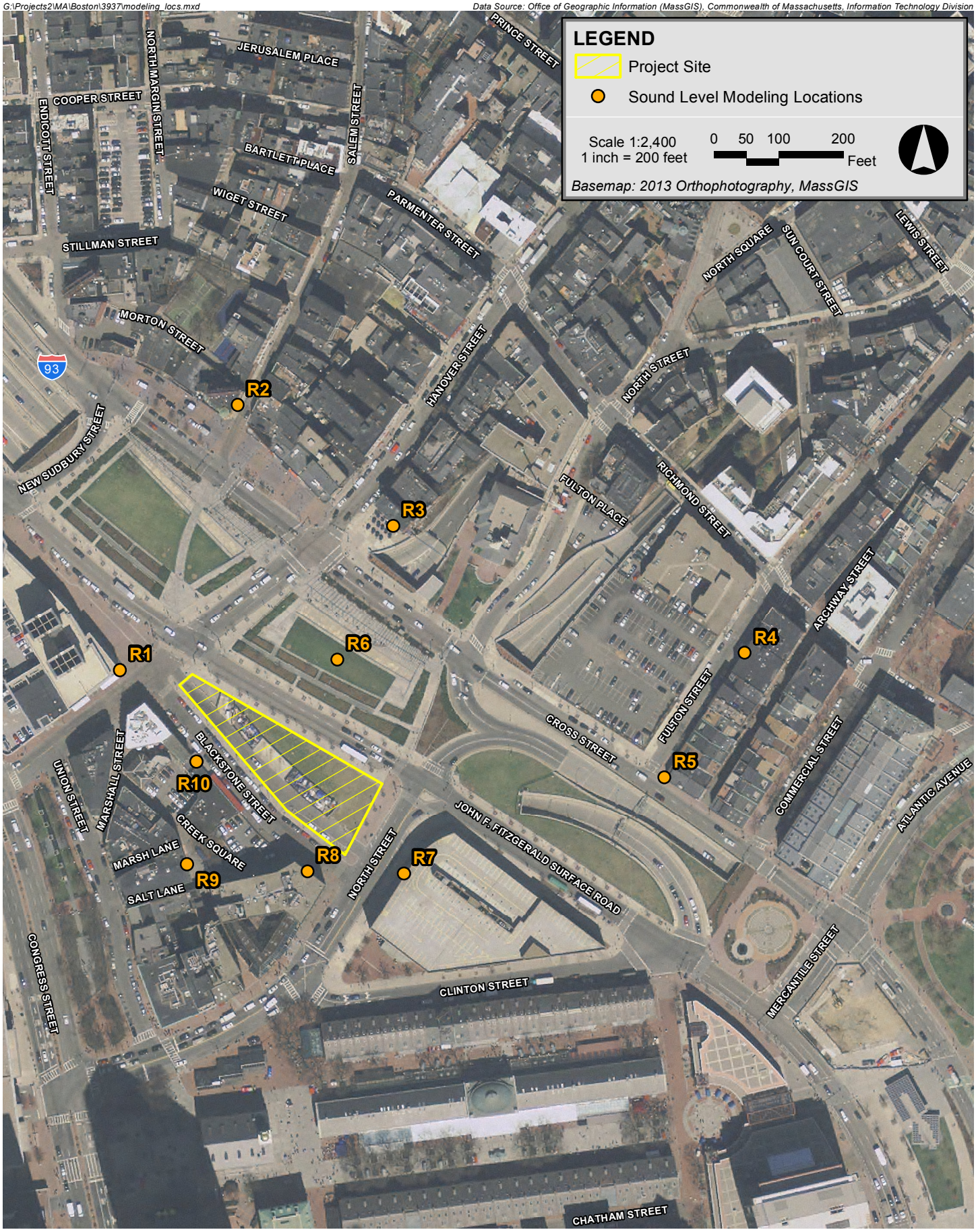
4.7.5 Modeling Methodology

Noise impacts from mechanical equipment associated with the Project were predicted using Cadna/A noise calculation software (DataKustik Corporation, 2005). This software, which uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, diffraction around building edges, reflection off building facades, and atmospheric absorption of sound from multiple noise sources.

The analysis considered two scenarios, the first of which included all the mechanical equipment running without the emergency generator to simulate typical nighttime operating conditions at nearby receptors. The second analysis combined the mechanical equipment and the emergency generator operation to reflect worse-case daytime conditions during brief, routine testing of the generator to be scheduled during daytime hours when ambient levels will be higher. Ten modeling locations with a height of 1.5 meters above-grade were included in both analyses, consisting of nearby residential and business locations, as depicted in Figure 4.7-2, and were evaluated against the applicable daytime or nighttime noise limits.

4.7.5.1 Noise Modeling Results

Without the emergency generator running, predicted exterior sound levels from Project operation are expected to range from 39 to 57 dBA at nearby receptors (39 to 48 at the closest residences). During routine daytime testing periods, Project-only sound levels with the emergency generator running are anticipated to range from 46 to 58 dBA at nearby receptors (46 to 53 dBA at the closest residences). Results of this evaluation demonstrate that sound levels from Project operation are anticipated to fully comply with the City of Boston nighttime and daytime noise limits, as presented in Tables 4.7-4 and 4.7-5, respectively.



Haymarket Hotel Boston, Massachusetts

Epsilon Associates Inc.

Figure 4.7-2

Sound Level Modeling Locations

Table 4.7-4 Comparison of Predicted Project-Only Nighttime Sound Levels to the City of Boston Noise Limits – Without Emergency Generator

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave Band Center Frequency								
			32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
R1	Business	52	61	60	58	56	51	45	38	31	23
R2	Residential	45	52	52	50	50	44	38	31	23	7
R3	Residential	48	56	56	54	52	45	40	33	26	12
R4	Residential	40	51	49	47	44	38	32	25	15	0
R5	Residential	39	51	48	45	41	38	32	25	15	0
R6	Residential	45	55	54	52	49	42	37	30	24	14
R7	Business	45	61	53	52	50	44	31	27	25	17
R8	Residential	48	59	57	54	52	46	39	32	28	20
R9	Residential	42	56	54	50	46	41	32	26	24	13
R10	Business	57	65	64	63	61	55	49	42	36	28
City of Boston Limits	**Residential**	**50**	**68**	**67**	**61**	**52**	**46**	**40**	**33**	**28**	**26**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

Table 4.7-5 Comparison of Predicted Project-Only Daytime Sound Levels to the City of Boston Noise Limits – With Emergency Generator

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave Band Center Frequency								
			32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
R1	Business	56	74	63	60	57	52	50	47	38	25
R2	Residential	46	64	56	53	50	44	40	33	24	7
R3	Residential	49	67	59	56	52	46	41	35	27	14
R4	Residential	47	67	56	53	47	41	42	38	27	4
R5	Residential	48	69	58	54	48	43	44	40	29	11
R6	Residential	47	70	59	55	50	43	39	34	29	22
R7	Business	51	74	63	59	53	47	42	39	35	32
R8	Residential	53	76	65	60	55	49	47	44	37	32
R9	Residential	52	74	64	60	54	47	47	42	34	26
R10	Business	58	75	66	64	61	56	51	46	39	32
City of Boston Limits	**Residential**	**60**	**76**	**75**	**69**	**62**	**56**	**50**	**45**	**40**	**38**
	Business	**65**	**79**	**78**	**73**	**68**	**62**	**56**	**51**	**47**	**44**

4.7.6 Conclusion

With appropriate mitigation (as described in Section 4.7.5), the predicted nighttime sound levels from Project-related equipment are expected to remain below 50 dBA at the nearest residences and below 60 dBA at the closest commercial receptors, within the most stringent nighttime residential zoning limits for the City of Boston.. The results presented in Section 4.7.6 indicate that the Project can operate without significant impact on the existing acoustical environment from outdoor mechanical equipment, and may result in a noise experience similar to that of a typical urban setting.

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. Additional mitigation may include the selection of quieter mechanical units, and/or the addition of acoustical louvers, screening walls, mufflers, duct lining materials, or equipment enclosures, as needed.

4.8 Flood Hazard Zones/ Wetlands

The existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Project site indicates that it is located outside of a designated flood zone (FIRM, City of Boston, Community-Panel Number 25025C0081G, Effective Date September 25, 2009). However, a "preliminary" revised floodplain map for the site area was recently released by FEMA which shows a portion of the site as lying within the 100-year flood zone (FIRM, Suffolk County, Massachusetts; Panel 0081J, Map Number 25025C0081J, Map Revised, Preliminary November 15, 2013). As discussed in Chapter 5, the design of the site and buildings will recognize and account for the site's location proximate to the harbor and within this newly preliminarily designated flood zone, as well as the potential impacts of sea level rise.

The site does not contain wetlands.

4.9 Geotechnical Impacts

This section describes the geotechnical conditions relating to the construction of the Project and discusses the potential impacts that excavation and foundation construction may have on existing adjacent structures.

4.9.1 Subsurface Soil and Bedrock Conditions

Based on CA/T project information in the area, the general soil conditions are listed below, from the ground surface down.

Table 4.9-1 Subsurface Soil Conditions in the Project Area

Generalized Subsurface Strata	Approximate Thickness (ft)
Fill	10 to 15
Clay	10 to 40
Glaciomarine	10 to 50
Till	5 to 15

The top of bedrock is located approximately 90 to 110 feet below the ground surface.

4.9.2 Groundwater

Data from the CA/T reports indicate groundwater levels range from approximately 10 to 12 feet below grade.

The Project is not located within the Groundwater Conservation Overlay District (GCOD). The proposed structure may or may not include one small below-grade mechanical space. If the small mechanical space is constructed, the foundation walls and floor slab will be waterproofed. The Project will have no long term groundwater pumping. The proposed structure will not cause the groundwater to raise, pond or be lowered in the surrounding area.

4.9.3 Foundation Considerations

The proposed building will not have any basement levels.

The building foundations are anticipated to consist of the following:

- New end bearing driven pile foundations for both the 10 story building and also the low rise area located to the south of the CA/T structure. The end bearing piles will would installed in areas where the CA/T tunnel structure is not present below the proposed pile foundations, or

- New rock socketed caissons in the area where the proposed 10 story building is located to the south of the CA/T structure and new soil bearing caissons in the low rise area located to the south of the CA/T structure.

- New soil bearing footings in the low rise area on the west side of the site, above the CA/T structure.

- Beams that transfer loads to the existing CA/T slurry walls on the east side of the site, in areas located above the CA/T structure.

4.10 Construction Impacts

4.10.1 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.

4.10.2 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.

4.10.3 Construction Schedule

The Proponent anticipates that the Project will commence construction in the fourth quarter of 2015 and last for approximately 18 months.

Typical construction hours will be from 7:00 a.m. to 6:00 p.m., Monday through Friday, with most shifts ordinarily ending at 3:30 p.m. No substantial sound-generating activity will occur before 7:00 a.m. 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. It is noted that some activities such as finishing activities could run beyond 6:00 p.m. 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.

4.10.4 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.

4.10.5 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 Inner Boston Harbor" plaques will be installed at storm drains that are replaced or installed as part of the Project.

4.10.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 250 construction jobs will be created over the length of construction. The Proponent will make reasonable good-faith efforts to have at least 50% of the total employee work hours be for Boston residents, at least 25% of total employee work hours be for minorities and at least 10% 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.

4.10.7 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.

4.10.8 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.

4.10.9 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.

4.10.10 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.

4.10.11 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.

4.10.12 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. All necessary permits will be obtained before the commencement of the specific utility installation. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer and drain facilities will be reviewed by BWSC as part of its site plan review process.

4.10.13 Rodent Control

A rodent extermination certificate will be filed with each 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 each phase of the Project, in compliance with the City's requirements.

4.10.14 Wildlife Habitat

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

Chapter 5.0

Sustainable Design and Climate Change Preparedness

5.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE PREPAREDNESS

5.1 Sustainable Design

To comply with Article 37 of the Code, the Proponent intends to measure the results of their sustainability initiatives using the framework of the Leadership in Energy and Environmental Design (LEED) rating system. As new construction for hotel, residential, retail and restaurant uses, the Project will use the LEED V3 NC 2009 (New Construction) to show compliance with Article 37. The LEED rating system tracks the sustainable features of a project by achieving points in the following categories: Sustainable Sites; Water Efficiency; Energy and Atmosphere; Materials and Resources; Indoor Environmental Quality; and Innovation in Design.

A LEED checklist is included at the end of this section, and shows the credits the Project anticipates achieving. The checklist will be updated regularly as the design develops and engineering assumptions are substantiated. Presently, 66 points have been targeted, not including any of the potential Boston Zoning Code Article 37 points. Please note that this is an initial credit checklist and applicable credits may change as the building design advances.

Sustainable Sites

SS Prerequisite 1 - Construction Activity Pollution Prevention: The construction manager will submit and implement a full Erosion and Sedimentation Control (ESC) Plan; this plan will conform to the requirements of 2003 EPA Construction General Permit and specific municipal requirements for the City of Boston.

SS Credit 1 - Site Selection: This Project site meets all the criteria for site selection; the site is not Prime Farmland, it is not below the current 100-year flood elevation, it is not a habitat for threatened or endangered species, it is not within 100 feet of wetlands, and it is not public parkland. It is a previously developed urban site.

SS Credit 2 - Development Density and Community Connectivity: The Project will be in compliance with Option 2, Community Connectivity and is located in downtown Boston. Within a one-half mile radius of the building's main entrance, there are residential areas and many basic services with pedestrian access. These basic services include banks, places of worship, convenience groceries, day cares, cleaners, fire station, retail stores, hospital and dental offices, parks, pharmacies, post office, restaurants, supermarkets, museums, aquarium, and fitness centers.

SS Credit 4.1 - Alternative Transportation-Public Transportation Access: The Project is located within one-quarter mile of at least 21 public bus stops and one-half mile of at least nine public subway stations and one commuter rail station.

SS Credit 4.2 - Alternative Transportation- Bicycle Storage and Changing Rooms: Bike storage will be provided for 5% of full-time equivalent employees with bike racks within 200 yards of the building entrance. The Project will also provide a shower and changing facility for the full-time equivalent employees.

SS Credit 4.3 - Low Emitting and Fuel Efficient Vehicles: The Project will endeavor to place an electric charging station for city and employee use at the drop-off area of the hotel along the Surface Road.

SS Credit 4.4 - Alternative Transportation- Parking Capacity: The Project will not include parking.

SS Credit 6.1 - Stormwater Design - Quantity Control: The Project will meet the criteria for stormwater quantity control for a previously developed site with existing imperviousness less than 50%. The Project will mitigate the stormwater runoff rate and quantity to pre-existing levels for the one and two year 24-hour design storm events.

SS Credit 6.2 - Storm Water Design - Quality Control: The Project will meet the criteria for storm water quality control by capturing and treating 90% of the average annual rainfall using acceptable best management practices (BMPs). The BMPs used to treat the runoff will remove 80% of the total suspended solids (TSS).

SS Credit 7.1 - Heat Island Effect- Non-Roof: As the Project site plan illustrates, this site is a zero lot line project. The building occupies the entire site and is surrounded on all sides by pedestrian sidewalk. The Project will use pedestrian-oriented hardscape materials that will be light-colored with a compliant SRI value of 29 or higher. Street tress will provide shading on two of the four surrounding sidewalks.

SS Credit 7.2 - Heat Island Effect – Roof: The Project will have a combined roofing system that consists of a high reflective SRI membrane roof system on the hotel and a high reflective metal roof with an initial SRI of 82. Nearly 90% of the roof areas will have SRI roofs.

Water Efficiency

WE Prerequisite 1 - Water Use Reduction- 20% Reduction: The Project will comply with the minimum potable water consumption reduction of 20% less water used when compared to a baseline case by using low-flow and efficient plumbing fixtures (not including irrigation).

WE Credit 1.1 - Water Efficient Landscaping: The Project will not include a permanent irrigation system beyond a maximum two-year establishment period. WE Credit 3.1 - Water Use Reduction: Potable water consumption will be reduced by at least 30% when compared to a baseline case by using low-flow and efficient plumbing fixtures (not including irrigation).

Energy and Atmosphere

EA Prerequisite 1 - Fundamental Commissioning of the Building Energy Systems: The Project will have a commissioning authority (CA) that will fulfill the requirements of the prerequisite. The CA's services will include review of the Owner's Project Requirements (OPR) and Basis of Design (BOD) documents, development of a commissioning plan, incorporation of a commissioning specification section into the construction documents and verification through startup observation and functional testing that the installed systems are operating in accordance with the OPR, BOD, and construction documents. The previous services apply to the following commissioned systems: HVAC system, lighting controls, and domestic hot water heating.

EA Prerequisite 2 - Minimum Energy Performance: The Project will comply with the minimum energy performance improvement of 10% based upon the cost of energy compared to the ASHRAE 90.1-2007 baseline standard.

EA Prerequisite 3 - Fundamental Refrigerant Management: The Project will not use chlorofluorocarbon (CFC)-based refrigerants in the HVAC&R systems.

EA Credit 1 - Optimize Energy Performance: The Project will achieve a minimum energy performance improvement of 20-25% compared to the ASHRAE 90.1-2007 baseline standard for use, and a 15% improvement based on energy cost. This is achieved by using an energy-efficient building envelope, lighting systems, and HVAC systems.

EA Credit 3 - Enhanced Commissioning: The Project will have a third party Commissioning Agent that will fulfill the requirements of the credit. The CA's services will include review of the Owner's Project Requirements (OPR) and Basis of Design (BOD) documents, development of a commissioning plan, incorporation of a commissioning specification section into the construction documents and verification through startup observation and functional testing that the installed systems are operating in accordance with the OPR, BOD, and construction documents. The previous services apply to the following commissioned systems: HVAC systems, lighting control, and domestic hot water heating.

EA Credit 4 - Enhanced Refrigerant Management: The Project will select refrigerants for the HVAC&R systems that minimize or eliminate the emissions of compounds that contribute to ozone depletion and climate change.

Materials and Resources

MR Prerequisite 1 - Storage and Collection of Recyclables: Recycling areas for paper, corrugated cardboard, glass, plastics, and metals for the hotel, retail and HPA association will be provided.

MR Credit 2 - Construction Waste Management: Nonhazardous construction and demolition debris will be salvaged for a minimum of 75% of the total construction and demolition debris. The construction manager for the Project will develop and implement a construction waste management plan (CWMP).

MR Credit 4 - Recycled Content: Materials with recycled content will be used such that the sum of the postconsumer recycled content plus one-half of the pre-consumer content constitutes at least 20% based on cost of the total material value in the Project. This is based on specification divisions 03-10, 31, 32 (furniture may be included at Project's decision) and excludes mechanical, electrical plumbing, elevators and other specialty items.

MR Credit 5 - Regional Materials: Building materials or products will be used that have been extracted, harvested or recovered, as well as manufactured within 500 miles of the site for a minimum of 20%, based on cost, of the total materials value. This is based on specification divisions 03-10, 31, 32 (furniture may be included at Project's decision) and excludes mechanical, electrical plumbing, elevators and other specialty items.

MR Credit 7 - Certified Wood: The Project will use FSC-certified wood materials and products that constitute at least 50% based on cost of the total new wood material value in the Project. Only permanently installed wood products and materials are included in this credit (formwork, scaffolding, bracing, etc. are not included). This is based on specification divisions 03-10, 31, 32 (furniture may be included at Project's decision).

Indoor Environmental Quality

Prerequisite 1 - Minimum Indoor Air Quality Performance: The Project will comply with ASHRAE 62.1-2007 for mechanically and naturally ventilated spaces. The ASHRAE spreadsheet will be filled out to indicate the minimum OA compliance for the ventilation zones has been met. There will be HVAC units that perform the majority of the common area ventilation by delivering 100% outside air to all corridors on every level; this positively pressurizes the building to prevent air from leaking in, and prevents air in the hotel rooms from leaking out into the corridors.

IEQ Prerequisite 2 - Environmental Tobacco Smoke Control: The Project will comply with the prerequisite requirements by prohibiting smoking within all areas of the building, and prohibiting smoking within 25 feet of any entry or air intake with exterior signage.

IEQ Credit 1 – Outdoor Air Delivery Monitoring: Monitoring systems will be installed to ensure that ventilation systems maintain design minimum requirements. The monitoring equipment will be configured to generate an alarm when the airflow values or carbon dioxide levels vary by 10% or more from the design values via a building automation system alarm to the building operator. The CO_2 monitors will be tied to the building management system.

IEQ Credit 3.1 - Construction IAQ Management Plan- During Construction: The Construction Manager will develop and implement an IAQ Management Plan for the construction phase of the Project that will comply with the SMACNA 008-2008 Guidelines, will protect on-site absorptive materials from moisture, and will use the appropriate filtration media for permanently installed air handlers used during construction.

IEQ Credit 3.2 – Construction IAQ Management Plan – Before Occupancy: The Construction Manager will develop and implement an IAQ Management Plan after all finishes have been installed and the building has been completely cleaned before occupancy. At the contractor's option, either a flush out or air testing path will be chosen to meet the credit requirements.

IEQ Credit 4.1 - Low-Emitting Materials- Adhesives & Sealants: Adhesives and sealants that comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168 and Green Seal Standard GS-36 will be used. The volatile organic compounds (VOC) limits stated in these standards will not be exceeded for all of the adhesives and sealants used inside of the weatherproofing system and applied on-site. The contractor will submit Material Safety Data Sheets (MSDS) highlighting the VOC content (g/L) for verification in the construction administration process.

IEQ Credit 4.2 - Low-Emitting Materials- Paints & Coatings: Paints and coatings applied to interior walls and ceilings will not exceed the VOC content limits established in the Green Seal Standard GS-11 for paints and primers; Green Seal Standard GS-03 for anticorrosive paints; and the South Coast Air Quality Management District (SCAQMD) Rule #1113 for finishes, stains, and sealers. The contractor will submit Material Safety Data Sheets (MSDS) highlighting the VOC content (g/L) for verification in the construction administration process.

IE Credit 4.3 - Low-Emitting Materials- Flooring Systems: All flooring within the Project will comply with the following as applicable to the Project scope:

- All carpet installed in the building interior will meet the testing and product requirements of the Carpet and Rug Institute Green Label Plus 1 program.
- All carpet cushion installed in the building interior will meet the requirements of the Carpet and Rug Institute Green Label program.
- All carpet adhesive will have less than 50 g/L of VOC.
- All hard surface flooring will meet the requirements of the FloorScore2 standard as shown with testing by an independent third-party.
- Concrete, wood, bamboo and cork floor finishes such as sealer, stain and finish will meet the requirements of the South Coast Air Quality Management District Rule 1113, Architectural Coatings, and effective January 1, 2004.

IEQ Credit 4.4 - Low-Emitting Materials- Composite Wood & Agrifiber Products: The Project will not use composite wood and agrifiber products that contain urea-formaldehyde resins inside the weatherproofing system. Laminate adhesives used to fabricate on site and shop applied composite wood and agrifiber assemblies will not contain added urea-formaldehyde resins. Materials considered fixtures, furniture and equipment (FF&E) are excluded from this calculation. The contractor will submit a manufacturer letter or a Material Safety LEED NC 2.2 Credit Narratives Page 7 Data Sheets (MSDS) highlighting the laminating adhesives used for verification in the construction administration process.

IEQ Credit 5 - Indoor Chemical and Pollutant Source Control: For this Project, entry pollutants and later cross contamination will employ the following strategies:

- Janitors' closets or housekeeping rooms where chemicals are stored will be provided with ventilation; the room will be negatively pressurized in order to prevent any odors from leaking out. Also, all janitors' closet doors will be constructed to reduce the leakage, and the wall around each closet will have full height walls or be tight to a hard ceiling.

- All air handlers will be equipped with a MERV 13 air filter to reduce dust and particles in the air supply.

- At every main, high-volume entryway there will be special floor mats to prevent outside materials from being carried into the building. Each of these mats will be cleaned on a regular basis.

IEQ Credit 6.1 - Controllability of Systems – Lighting: Individual lighting controls will be provided for at least 90% of the building occupants. All hotel rooms will have lighting switches. The retail component is being built as shell and core space.

IEQ Credit 6.2 - Controllability of Systems – Thermal Comfort: Thermal comfort controls will be provided for at least 50% of the building occupants. Each hotel room will have a main thermostat control. All regularly-occupied common areas will have thermostat controls. The retail component constitutes less than 50% of the occupants.

IEQ Credit 7.1 – Thermal Comfort – Design: Heating, ventilating and air conditioning systems and the building envelope will be designed to meet the requirements of ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy. The design compliance will be in accordance with the prescribed documentation standards.

IEQ Credit 8.2 - Daylight and Views: At least 90% of all regularly occupied spaces will have access to outdoor views. Of these spaces with access to views, a direct line of sight will be achieved via vision glazing (between 2'-6" and 7'- 6" above finish floor), and there will be no obstructions above 42 inches.

Innovation in Design

It is anticipated that several points will be achieved in the Innovation & Design category.

ID Credit 1.1 - Green Housekeeping Program: A program will be established for cleaning supplies for the hotel and a mandate in the retail rental agreements that their cleaning products be eco-friendly. The policy that will be developed will include cleaning products, disinfectants, metal polishes, floor finishes, strippers, disposable janitorial paper products and trash bags, and hand soaps in addition to hotel bathroom amenities.

ID Credit 1.2 - Sustainable Education: An educational program will be established that is actively instructional. The following elements will be included in the educational program:

- A comprehensive signage program built into the building's spaces to educate the occupants and visitors of the benefits of green buildings. This program may include an LCD screen showing the Building Management System and monitoring of energy savings.
- Signage identifying various water and energy saving devices.
- An educational outreach program including a guided tour focusing on sustainable design, operations and maintenance using the Project as an example.

ID Credit 1.3 - SS 4.1 Exemplary Performance- Doubled Public Transportation Access: The Project is located in a dense urban fabric that has access to several different subway stops, commuter rail lines, and bus stops. The Project is located within a one-half mile radius of two or more subway stops and a commuter rail line, and/or within a one-quarter mile radius of four or more bus stops. Also, the frequency of the transit system is at least 200 transit rides per day.

ID Credit 1.4 - Energy Star Appliances: Energy Star Appliances will be used in the hotel including appliances, equipment, lamping, etc. and will prescribe in retail rental agreements, to the extent that Energy Star Appliances are available that they be used.

ID Credit 1.5 - Trash Composting: A dedicated composting container will be provided for both the hotel, retail and HPC operators.

ID Credit 2 - LEED Accredited Professional: The Project complies with the credit requirements of having at least one LEED AP on the Project team.

Regional Priority

The regional priority (RP) credits are additional points that identify credits that have environmental importance for a geographic region. The credits are assigned by an area's zip code. The Project's zip code is 02215, and the available RP credits include SSc3, SSc6.1, SSc7.1, SSc7.2, EAc2, and MRc1.1. The Project anticipates that several points will be achieved in the Regional Priority category.

1. RP Credit 1.1, SS Credit 7.2, Heat Island Effect- Roof

2. RP Credit 1.2, SS Credit 7.1, Heat Island Effect- Non-Roof

3. RP Credit 1.3, SS Credit 6.1, Storm water Design- Quantity Control.

LEED 2009 for New Construction and Major Renovations

Project Checklist

Haymarket Hotel/Parcel 9/August 6, 2014

Sustainable Sites — Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
1			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
	1		Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y			Prereq 1	Water Use Reduction—20% Reduction	
4			Credit 1	Water Efficient Landscaping	2 to 4
	2		Credit 2	Innovative Wastewater Technologies	2
6			Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
3		16	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
	3		Credit 5	Measurement and Verification	3
	2		Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
	1	1	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

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

Indoor Environmental Quality — Possible Points: 15

Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
	1		Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
	1		Credit 7.2	Thermal Comfort—Verification	1
	1		Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

1			Credit 1.1	Innovation in Design: Green Housekeeping	1
1			Credit 1.2	Innovation in Design: Sustainable Education	1
1			Credit 1.3	Exemplary Performance SS 4.1 Public Transportation	1
1			Credit 1.4	Innovation In Design: Energy Star Appliances	1
1			Credit 1.5	Innovation in Design: Composting Trash	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

1			Credit 1.1	Heat Island Effect Roof	1
1			Credit 1.2	Heat Island Non Roof	1
1			Credit 1.3	Regional Priority: Storm Water Design Quality Control	1
			Credit 1.4	Regional Priority: Specific Credit	1

66	12	32	**Total**	Possible Points: 110

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

5.2 Climate Change Preparedness

Projects subject to Article 80, Large Project Review are required to complete the Climate Change Preparedness Checklist. Climate change conditions considered 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 events, and increased wind gusts.

The expected life of the Project is anticipated to be approximately 50 years. Therefore, the Proponent planned for climate change conditions projected at a 50-year time span. A copy of the completed checklist is included in Appendix E. Given the preliminary level of design, the responses are also preliminary and may be updated as the Project design progresses.

Extreme Heat Events

The Intergovernmental Panel on Climate Change (IPCC) has predicted that in Massachusetts the number of days with temperatures greater than 90°F will increase from the current five-to-twenty days annually, to thirty-to-sixty days annually[1].

The Project design will incorporate a number of measures to minimize the impact of high temperature events, including:

- Installing operable windows where possible;
- Using Energy Recovery Ventilation to reduce cooling loads;
- External shading devices;
- Specifying high reflective paving materials and high albedo roof tops to minimize the heat island effect; and
- Planting new trees to shade areas of hardscape around the site.

Energy modeling for the Project has not yet been completed; however, as indicated on the LEED Checklist, the Proponent will strive to reduce the Project's overall energy demand and greenhouse gas emissions that contribute to global warming. The Project's proposed TDM program described in Section 3.5 will also help to lessen fossil fuel consumption.

---

[1] IPCC (Intergovernmental Panel on Climate Change), 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Avery, M. Tignor, and H. L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, and New York, 996 pp.

Rain Events

As a result of climate change, the Northeast is expected to experience more frequent and intense storms. To mitigate this, the Proponent will take measures to minimize stormwater runoff. These measures include:

- Decreasing stormwater runoff from the two-year 24-hour design storm;
- Providing landscaped areas on the site;
- Directing stormwater runoff from the roof to a subsurface recharge system on-site; and
- Ensuring wastewater and stormwater back flow prevention.

Drought Conditions

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, the landscape design is anticipated to incorporate native and adaptive plant materials. Aeration fixtures and appliances will be chosen for water conservation qualities, conserving potable water supplies. In public areas, sensor operated faucets and toilets will be installed.

Sea Level Rise

According to the IPCC, if the sea level continues to rise at historic rates, the sea level in Massachusetts as a whole will rise by one foot by the year 2100. However, using a high emissions scenario of climate change, sea level rise could reach six feet by 2100. Adding this potential rise to the mean higher high water (MHHW) level, in 50 years the MHHW could be as high as 15.2 feet Boston City Base (BCB), assuming a sea level rise of approximately four feet.[2] The first floor elevation of the Project is approximately 20.65 feet BCB.

Sea level rise is also a concern when combined with a large storm. If a major storm, such as another "Superstorm Sandy" with significant storm surge, were to impact Boston at high tide, the potential for flooding would markedly increase. Such a storm would be anticipated to increase sea level to approximately 18.7 feet BCB, which would impact the first floor of the building.[3] To minimize the impact of flooding, critical mechanical equipment is located above the first floor and the utility conduits will be water tight. Elevator equipment such as electrical controls and hydraulic pumps will be located above 18.7 feet BCB.

---

[2] "Preparing for the Rising Tide". The Boston Harbor Association. February 2013.

[3] Ibid.

Chapter 6.0

Urban Design

6.0 URBAN DESIGN

6.1 Project Site History

The currently undeveloped Project site is located in downtown Boston, and is bound by John F. Fitzgerald Surface Road facing the Rose Fitzgerald Kennedy Greenway to the north, Hanover Street to the west, Blackstone Street to the south, and North Street to the east. The site is part of the historic Haymarket Square, where sellers of fresh produce have gathered since approximately 1830. The elevated Central Artery Highway, constructed in the 1950's, towered over Haymarket and the site, keeping it in perpetual shadow and spewing noise and pollution. During the Central Artery/Tunnel Project (CA/T), the size of Haymarket was reduced.

With the completion of the CA/T Project, the surface was replaced with open space known formally as the Rose Fitzgerald Kennedy Greenway. The realization of the Greenway is an important achievement in both the life and history of the City of Boston. In addition to actively reconnecting the torn historic fabric of the City, the Greenway is also a powerful symbol of Boston's future. The edges along the Greenway, including the Project site, will architecturally engage and enhance this bold new condition in the City fabric. As previously described, the Project site was made developable by MassDOT as a result of the Central Artery/Tunnel project, and presents an opportunity not only to expand the market district, but also to activate this portion of the Greenway and link the park to the city.

6.2 Urban Design and Architectural Style

The proposed Project consists of two distinct building forms. The first, and primary form, is the two story market/retail block, which will be an open two story pavilion along the Greenway starting at the northern 'point' of the Project site. The pavilion will be transparent and open, reflecting the activity and openness of this civic space. The Greenway will expand into the market through the winter garden and public passage so that it creates a shortcut between the Blackstone Street market and the Greenway.

The design of the pavilion includes glass storefronts and a standing seam metal roof. It will have large roll up and French door openings that will create a seamless transition from the market hall to the outdoor vendor area, opening up the sides of the market to allow for ease of circulation, perusing and shopping. The Pavilion has been designed and detailed to make it recognizable as a unique location along the Greenway that will naturally draw pedestrians and others to this special place. See Figures 6-1 and 6-2 for renderings of the pavilion.

By contrast, the secondary form is an "L" shaped 10-story hotel which acts as a background building to the pavilion and the surrounding buildings (see Figure 6-3). The hotel form is presented in materials traditional to the North End and Blackstone blocks, Boston red brick

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 6-1

View from Hanover Street facing Southeast

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 6-2

View from Hanover Street facing East

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 6-3

Blackstone Street Elevation

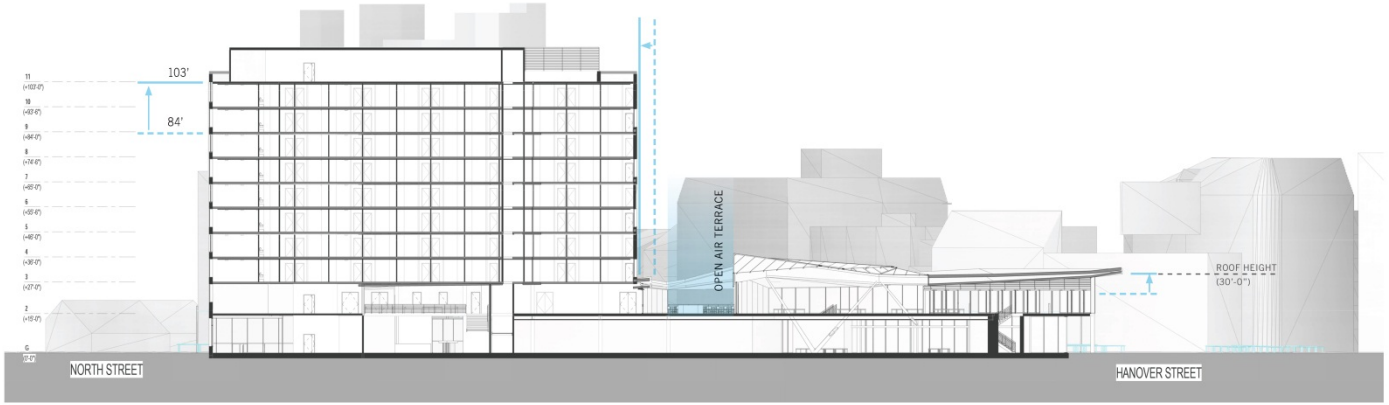
with traditional windows. Careful attention has been paid to the design of the façade so as to minimize the impact of the hotel and to emphasize the expanse of the market/retail based ground floor.

6.3 Evolution of Design

The current massing was developed in direct response to concerns regarding the quality of the views from the North End and from the Greenway. The initial designs put more of the hotel massing over the site in accordance with the zoning height of 55 feet. The design was modified to the current design in order to enlarge the footprint of the market/retail pavilion.

The predominant view corridors are from northeast to southwest, with the northern 'point' of the site being in the relative foreground and the North Street Blackstone Street corner being in the background. By lengthening and lowering the height of the Pavilion, the views of the top floors of the buildings within the historic Blackstone Block have been improved and preserved. The revised roof line adds interest to the development itself and identifies the pavilion as a place of gathering (see Figure 6-4).

FORMER PROPOSAL



CURRENT PROPOSAL

Haymarket Hotel **Boston, Massachusetts**

PERKINS + WILL

Figure 6-4

Evolution of Design

Chapter 7.0

Historic and Archaeological Resources

7.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

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

7.1 Project Site

As described in Chapter 2, the Project site is approximately 50,000 sf located in the Boston's Central Business District. The Project site is the entire block bound by John F. Fitzgerald Surface Road with the Greenway to the north, Hanover Street to the west, Blackstone Street to the south, and North Street to the east (see Figure 2-4). Currently, there are no built structures within the Project site. The site is part of the historic Haymarket Square area, where sellers of fresh produce have gathered since approximately 1830, and formerly home to multi-story buildings until construction of the elevated Central Artery in the 1950s. When the Central Artery was extant, the site was also used as a highway off-ramp and for surface parking beneath the elevated highway. During the CA/T Project, the size of Haymarket Square was reduced, the elevated highway removed, and the Greenway constructed to the north. The Project site is a new parcel made developable by MassDOT as part of the CA/T Project that occupies a portion of the historic site of Haymarket Square.

The Project site is located adjacent to multi-story masonry buildings of varying heights, sizes, and construction dates. To the north, the Greenway consists of open greenspace, but beyond it further north across the John F. Fitzgerald Surface Road is Boston's North End with numerous multi-story, brick, mixed-use buildings. To the west across Hanover Street is 136 Blackstone Street, a five-story brick commercial building and parking garage built in two phases between 1996 and 2004. To the south across Blackstone Street, is the Blackstone Block Historic District, a district listed on the National Register of Historic Places, with brick buildings of varying heights and sizes constructed from the 18th through 20th centuries. To the east across North Street is the seven-story brick Dock Square Parking Garage constructed in 1979.

7.2 Historic Resources in the Project Vicinity

No historic resources exist within the vacant Project site. The Project site is in the vicinity of numerous properties and districts included on the State and National Registers of Historic Places, as well as properties included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory). In the immediate vicinity, the Blackstone Block Historic District, a National Register historic district and a Boston Local Landmark, is located to the south across Blackstone Street. National Register historic districts in the vicinity of the Project site include: Quincy Market (also a National Historic Landmark); Fulton-Commercial Streets District in the North End; Custom House District; and the Bulfinch Triangle Historic District. Additionally, several individual National Register-listed properties are located within a one-quarter mile radius of the Project site, as well as properties included in the

Inventory including the North End Area and Causeway/North Washington Streets Area. Table 7-1 lists historic resources within a one-quarter mile radius of the Project site; the locations of these resources are depicted on Figure 7-1.

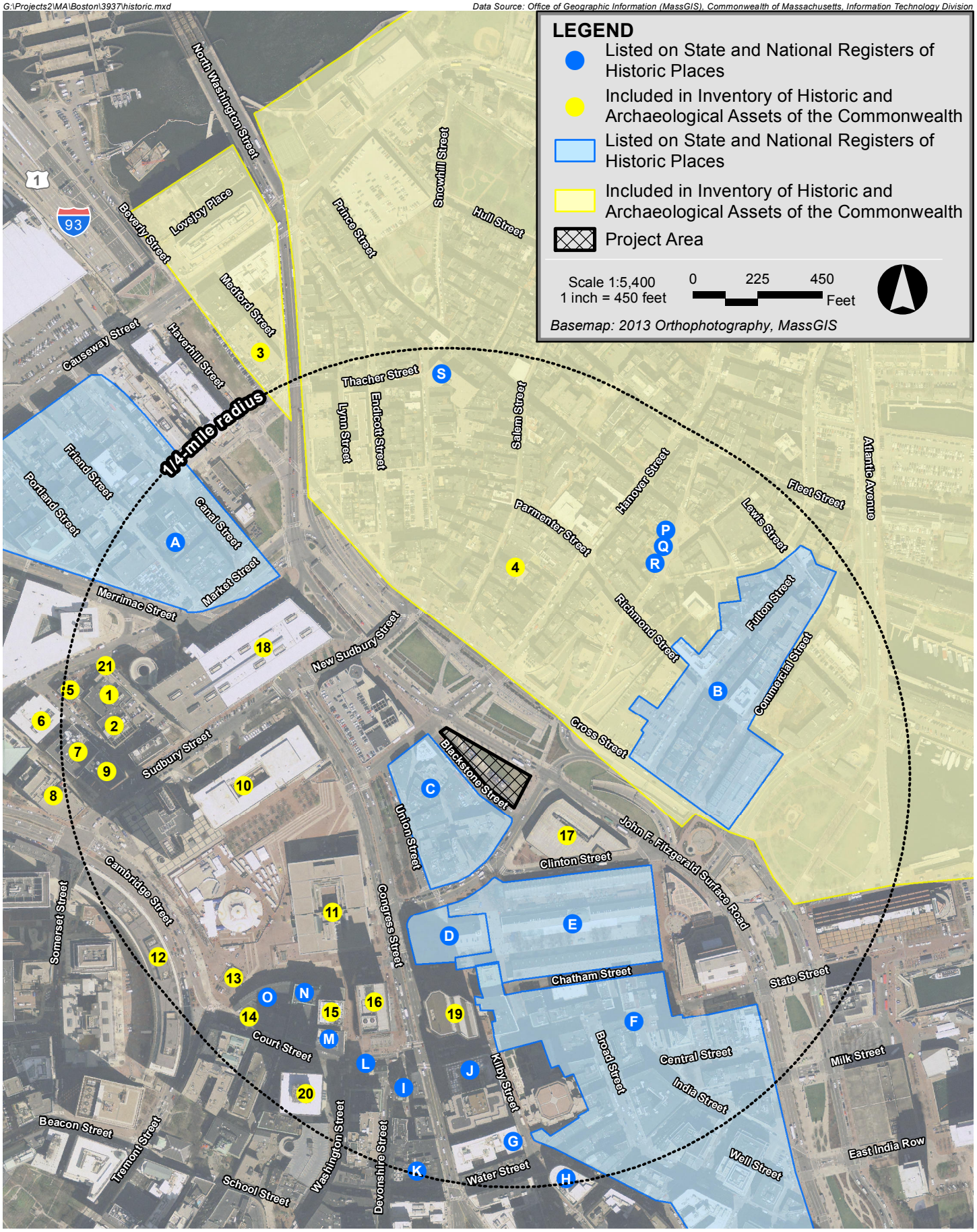
Table 7-1 Historic Resources in the Vicinity of the Project

Existing Map Key	Historic Resource	Address
State and National Register-Listed Properties		
A	Bulfinch Triangle Historic District	Canal, Causeway, Friend, Lancaster, Lowell Square, Merrimack, Portland, and Traverse Streets
B	Fulton-Commercial Streets District	North End, Fulton, Commercial, Mercantile, Lewis, and Richmond Streets
C	Blackstone Block Historic District	Union, Hanover, Blackstone and North Streets
D	Faneuil Hall	1 Dock Square
E	Quincy Market	North and South Market Streets
F	Custom House District	Between Kilby Street, JFK Expressway, High and Batterymarch streets, Merchants Road, South Market and State Streets
G	Codman Building (10 Liberty Square Building)	51-57 Kilby Street
H	Samuel Appleton Building	110-114 Milk Street
I	Second Brazer Building	25-29 State Street
J	Stock Exchange Building	43-65 State Street
K	National Shawmut Bank Building	20-42 Water Street
L	Old State House	State Street
M	Ames Building	1 Court Street
N	Old Colony Trust Company Building (VA Outpatient Clinic)	17 Court Street
O	Sears Crescent and Sears Block	38-68 and 70-72 Cornhill
P	Mariners' House	11 North Square
Q	Paul Revere House	19 North Square
R	Moses Pierce – Nathaniel Hichborn House	29 North Square
S	Vermont Building	6-12 Thatcher Street

Table 7-1 Historic Resources in the Vicinity of the Project (Continued)

Existing Map Key	Historic Resource	Address
Properties included in the *Inventory of Historic and Archaeological Assets of the Commonwealth*		
1	Overseers of the Public Welfare Building	43 Hawkins Street, 31 Bowker Street, 41 New Chardon Street
2	Boston Edison Substation	29-33 Hawkins Street
3	Causeway/North Washington Streets Area	Causeway and North Washington Streets
4	North End Area	Roughly the waterfront to North Washington to Central Artery to Clinton Street to Atlantic Avenue
5	O'Neil Building (formerly Jewish Family and Children's Service)	31 New Chardon Street
6	Royal Globe Insurance Co.	25 New Chardon Street
7	R.K.O. General	40 Hawkins Street
8	New England Telephone	6 Bowdoin Square
9	Capital Bank Building	One Bulfinch Place
10	JFK Federal Building	15 Cambridge Street
11	Boston City Hall	One City Hall Square
12	Center Plaza	1, 2, 3 Center Plaza/Cambridge Street
13	Government Center MBTA Station	Cambridge Street/City Hall Square
14	City Bank and Trust Company	25 Court Street
15	One Washington Mall	1 Washington Mall
16	New England Merchants National Bank	28 State Street
17	Dock Square Parking Garage	20 Clinton Street
18	Government Center Parking Garage	50 New Sudbury Street
19	60 State Street	60 State Street
20	Boston Company Building	201 Washington Street
21	Temporary Home for Women	40-50 Bowker Street

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



Haymarket Hotel Boston, Massachusetts

Epsilon Associates Inc.

Figure 7-1
Historic Resources

7.3 Impacts to Historic Resources

7.3.1 Design and Visual Impacts

As described in Chapter 6, the Project consists of two distinct building forms. The primary form is the two-story market/retail block, which will be a transparent two-story pavilion along the Greenway starting at the northwestern 'point' of the Project site. The design of the pavilion includes glass storefronts and a standing seam metal roof (see Figures 6-1 and 6-2). The secondary form is an L- shaped 10-story hotel which has been designed as a background building to the pavilion and is sited among other tall modern buildings (see Figure 6-3). The hotel form is presented in style and materials to be complimentary to the North End and Blackstone Block with its L-shaped footprint, rectangular window openings, and red brick exterior. The exterior materials have been chosen to fit into the existing palette seen in the area with a combination of brick, standing seam metal, and glass.

Given its proximity to the Blackstone Block Historic District, the Project will be visible from, and has the potential to affect views of historic properties within the district. However, the Project is not expected to introduce elements that are visually incompatible to the adjacent district. As envisioned, the Project's design will be respectful of, and complement, the historic and architectural character of the Blackstone Block. Its uses, massing, and height will help serve as appropriate new infill construction of an unfinished edge of the street wall along Blackstone Street and the Greenway. The minimal obstruction of the viewshed is a consequence of construction on an underutilized parcel. Any new construction at the Project site has the potential to affect the viewshed of historic properties; however, as designed, the Project will only affect views from portions of the immediately surrounding streets and the Greenway.

The proposed siting, massing, and materials are complimentary to the surrounding buildings. The surrounding buildings include a variety of heights and are clad in red brick. The predominant view corridors are from the northeast to the southwest with the northwestern 'point' of the site being in the relative foreground and the North Street/Blackstone Street corner being in the background. With the positioning of the 10-story hotel at the southeastern end of the parcel and the two-story open pavilion at the northwestern end of the parcel, views to the Blackstone Block are only minimally affected. Additionally, the proposed positioning of the hotel places it adjacent to the Dock Square Parking Garage across North Street and the Millennium Bostonian Hotel (26 North Street) within the Blackstone Block across Blackstone Street. The proposed hotel will be located the furthest possible from the nearby low-rise historic buildings, and among other tall modern brick buildings (see Figures 6-1and 6-2). The Project's proposed massing preserves views of the upper stories of the buildings within the historic Blackstone Block.

7.3.2 Shadow Impacts

While shadow impacts are inevitable given the largely unimproved nature of the Project site, impacts to the historic resources will be minimal given their locations to the north, south, and west of the Project site.

As described in greater detail in Section 4.2, shadow studies were conducted to investigate impacts from the Project at three times of day (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 the 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.

As illustrated in the shadow study diagrams (Figures 4.2-1 to 4.2-14), during isolated time periods the Project will cast minimal net new shadow primarily on areas of the Blackstone Block Historic District and the North End Area. New net shadow will also be cast on other (non-historic) properties within the vicinity, including the Greenway and 136 Blackstone Street. Specifically, during three of the time periods studied (March 21 at 9:00 a.m., June 21 at 9:00 a.m., and September 21 at 9:00 a.m.), new shadow may be cast on a portion for the northern edge of the Blackstone Block, only slightly more shadow than what is allowable by right. Additionally, during two of the time periods studied (September 21 at 6:00 p.m., and December 21 at 3:00 p.m.) shadow will be cast within the North End Area, an area included in the Inventory. However, none of the shadow impacts resulting from the Project will adversely impact the character-defining features of the Blackstone Block or the North End Area that make them eligible for inclusion in the National Register.

7.4 Archaeological Resources

The Project site consists of a previously developed urban parcel. One archaeological site included in the Inventory has been identified as being located in the vicinity of the Project site. Due to previous extensive development activities and disturbances, including site grading activities associated with the construction of the former raised Central Artery, as well as the CA/T Project and the Greenway, it is not anticipated that significant archaeological resources remain within the Project site. No impacts to archaeological resources are anticipated as a result of the Project.

7.5 Status of Project Reviews with Historical Agencies

7.5.1 Massachusetts Historical Commission Review

The Project will be subject to State Register Review (950 CMR 71) by the Massachusetts Historical Commission (MHC) due to a transfer of land from the MassDOT, which is considered to be a state action for purposes of State Register Review. To initiate the State Register Review process, an Environmental Notification Form (ENF) will be filed with the MHC.

Chapter 8.0

Infrastructure

8.0 INFRASTRUCTURE SYSTEMS COMPONENT

8.1 Introduction

The Infrastructure Systems Component outlines the existing utilities surrounding the Project site, the connections required to provide service to the Project, and any impacts on the existing utility systems that may result from the construction of the Project. The following utility systems are discussed herein:

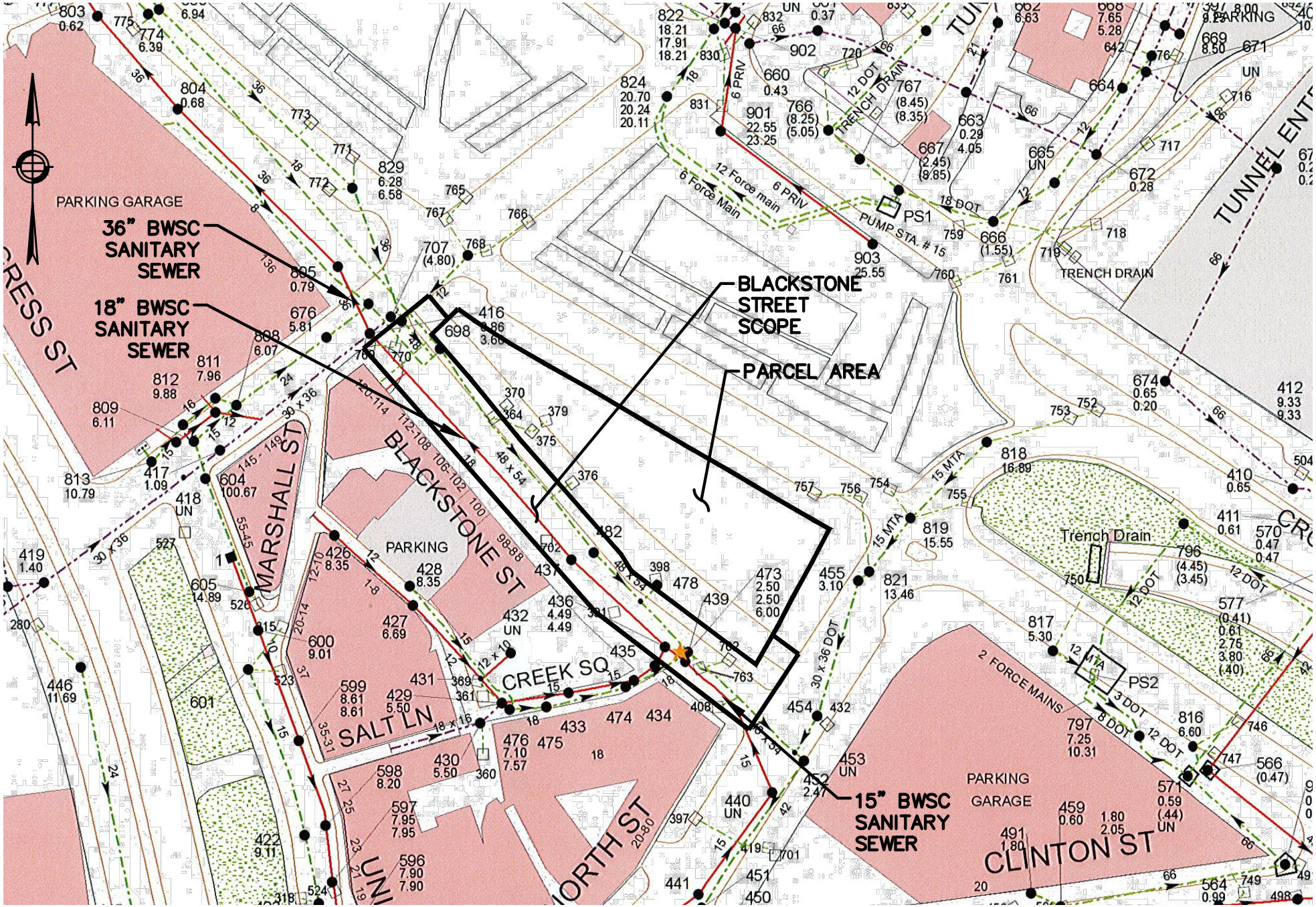
- Sewer
- Domestic water
- Fire protection
- Drainage
- Natural gas
- Electricity
- Telecommunications

The Project includes the development of an approximately 140,000-s.f., 10-story hotel and retail building on an existing unused lot. The approximately 50,000 sf Project site is located on Blackstone Street, and is bounded by Blackstone Street to the south, Hanover Street to the west, North Street to the east, and John F. Fitzgerald Surface Road facing the Rose Fitzgerald Kennedy Greenway to the north.

8.2 Wastewater

8.2.1 Sewer Infrastructure

Existing Boston Water and Sewer Commission (BWSC) sanitary sewer mains are located in Blackstone Street adjacent to the Project site. There is a 15-inch sanitary sewer main in Blackstone Street which flows westerly and increases to an 18-inch sanitary sewer main and then to a 36-inch sanitary main. The 36-inch sanitary sewer main flows into a 30-inch by 36-inch combined sewer main in Hanover Street which flows northerly. The 30-inch by 36-inch combined sewer main flows to a 66-inch combined sewer main in Cross Street which flows easterly. The 66-inch combined sewer main continues flowing easterly to the MassDOT interceptor in Fulton Street. The combined sewer continues flowing to the MWRA Deer Island Waste Water Treatment Plant for treatment and disposal, or during times of high flow, discharges to the Inner Boston Harbor. The existing sewer system is illustrated in Figure 8-1.



Haymarket Square Hotel **Boston, Massachusetts**

Nitsch Engineering

Figure 8-1

Existing Sewer System

8.2.2 Wastewater Generation

The Project's sewage generation rates were estimated using the Massachusetts Division of Water Pollution Control Sewer System Extension and Connection Permit Program from 310 CMR 15.20 and the proposed building program. 310 CMR 15.20 lists typical sewage generation values for the proposed building use, as shown in Table 8-1. Typical generation values are conservative values for estimating the sewage flows from new construction. 310 CMR 15.20 sewage generation values are used to evaluate new sewage flows or an increase in flows to existing connections. The existing site is an unused grass lot, and does not currently produce any sewage flows. Table 8-1 describes the increased sewage generation in gallons per day (GPD) due to the Project.

Table 8-1 Proposed Project Wastewater Generation

Room Use	Size		314 CMR Value (GPD/unit)		Total Flow (GPD)
Residential (Hotel)	225	bedrooms	110	/bedroom	24,750
Retail	25,000	SF	75	/1,000 SF	1,875
				Total Proposed Flow:	26,625

8.2.3 Sewage Capacity

The Project's impact on the existing BWSC systems in Blackstone Street was analyzed. The existing sewer system capacity calculations are presented in Table 8-2.

Table 8-2 Sewer Hydraulic Capacity Analysis

Manhole (BWSC Number)	Distance (feet)	Invert Elevation (up)	Invert Elevation (down)	Slope (%)	Diameter (inches)	Manning's Number	Flow Capacity (cfs)	Flow Capacity (MGD)
Blackstone Street								
440 to 439	124	4.80	4.61	0.2%	15	0.013	2.53	1.63
439 to 436	19	4.61	4.49	0.6%	15	0.013	5.13	3.32
436 to 437	80	4.49	4.29	0.3%	15	0.013	5.93	3.83
437 to 416	231	3.29	3.02	0.1%	18	0.013	3.59	2.32
416 to 805	58	3.02	0.79	3.9%	36	0.013	12.99	8.39
						Minimum Flow Analyzed:	2.53	1.63

Notes:
1. Manhole numbers taken from record Boston Water & Sewer plan entitled "From Hanover St. to North St. City Proper" dated 9/4/81
2. Flow Calculations based on Manning's Equation

Table 8-2 indicates the hydraulic capacity of the sanitary sewer in Blackstone Street. The minimum hydraulic capacity of the sewer is 1.63 million gallons per day (MGD) or 2.53 cubic feet per second (cfs) for the 15-inch system in Blackstone Street. Based on an average daily flow estimate for the Project of 26,625 GPD or 0.026 MGD, and with a factor of safety of 10 (total estimate = 0.027 MGD x 10 = 0.27 MGD), no capacity problems are expected within the Blackstone Street sanitary sewer system due to the Project.

8.2.4 Proposed Conditions

The Proponent will coordinate with the BWSC on the design and capacity of the proposed connections to the BWSC sanitary sewer system. The Project is expected to generate an increase in wastewater flows from the site of approximately 26,625 gallons per day. Approval for the increase in sanitary flow will be provided by BWSC.

The sanitary sewer services for the Project will connect to the existing sanitary sewer main located in Blackstone Street.

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

8.3 Water Supply

8.3.1 Water Infrastructure

Water for the Project site will be provided by the BWSC. There are five water systems within the City, and these provide service to portions of the City based on ground surface elevation. The five systems are: Southern Low (commonly known as low service), Southern High (commonly known as high service), Southern Extra High, Northern Low, and Northern High. There is a 12-inch BWSC Southern High main and a 12-inch BWSC Southern Low main in North Street. There is 16-inch BWSC High Pressure Fire Service main, a 12-inch BWSC Southern Low main, and a 12-inch BWSC Southern High main in Blackstone Street. The existing water system is illustrated in Figure 8-2.

8.3.2 Water Consumption

The Project's water demand estimate for domestic water service is based on the Project's estimated sewage generation, described above. A conservative factor of 1.1 (10%) is applied to the estimated average daily wastewater flows calculated with 310 CMR 15.20 values to account for consumption, system losses and other usages to estimate an average daily water demand. The Project's estimated domestic water demand is 29,288 GPD. The water for the Project will be supplied by the BWSC systems in North Street and/or Blackstone Street.

Efforts to reduce water consumption will be made. Aeration fixtures and appliances will be chosen for water conservation qualities. In public areas, sensor operated faucets and toilets will be installed.

New water services will be installed in accordance with the latest local, state, and federal codes and standards. Backflow preventers will be installed at both domestic and fire protection service connections. New meters will be installed with Meter Transmitter Units (MTU's) as part of the BWSC's Automatic Meter Reading (AMR) system.

8.3.3 Existing Water Capacity

BWSC record flow test data containing actual flow and pressure for hydrants within the vicinity of the Project site was requested by the Proponent. Hydrant flow data was not available near the Project site. As the design progresses, the Proponent will request hydrant flows be conducted by BWSC adjacent to the Project, as hydrant flow test data must be less than one year old when used for design.

8.3.4 Proposed Project

The domestic water and fire protection services for the Project will connect to the existing BWSC water mains in North Street and/or Blackstone Street.

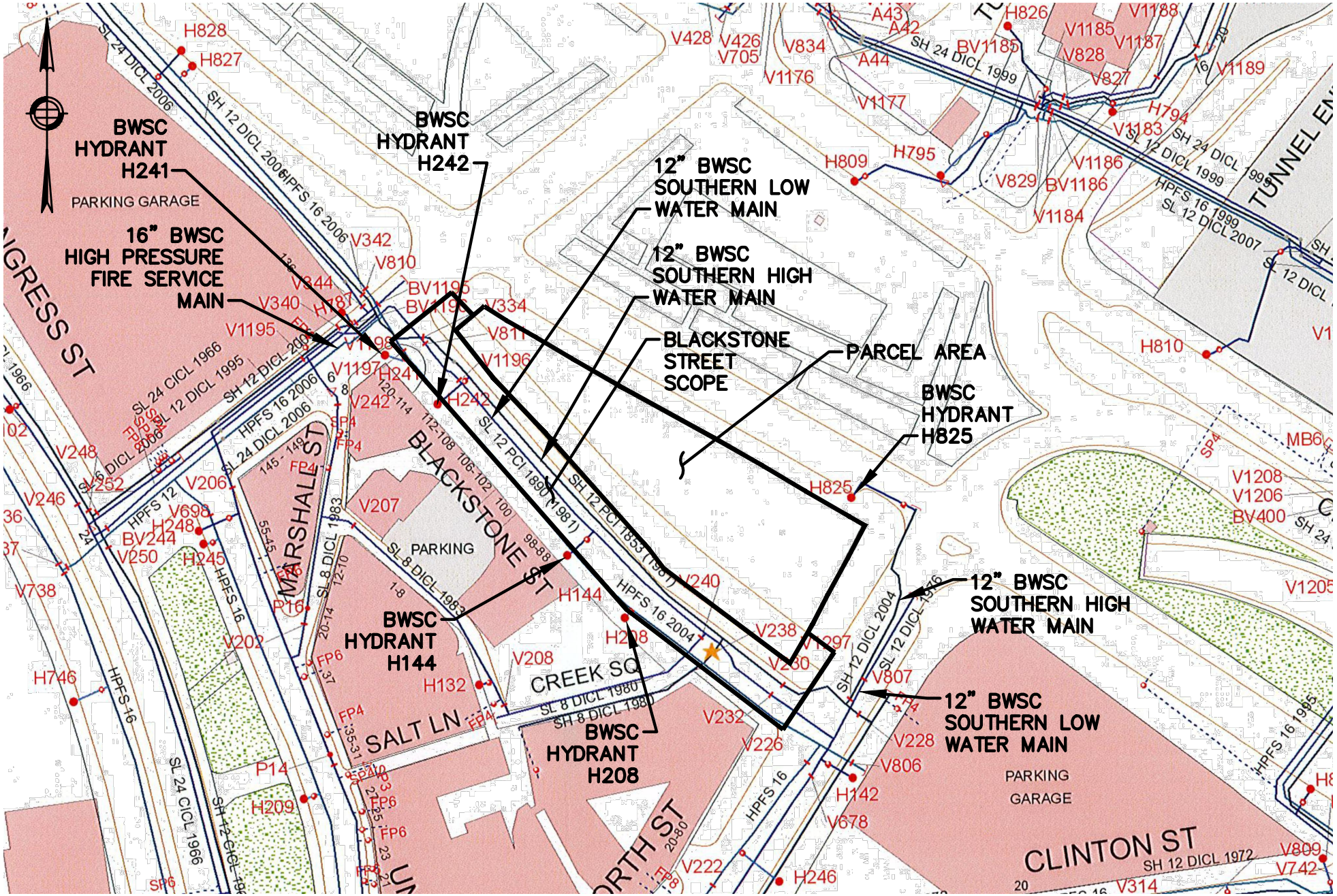
The domestic water and fire protection service connections required for the Project will meet the applicable City and State codes and standards, including cross-connection backflow prevention. Compliance with the standards for the domestic water system service connection will be reviewed as part of BWSC's Site Plan Review process. This review will include sizing of domestic water and fire protection services, calculation of meter sizing, backflow prevention design, and location of hydrants and siamese connections that conform to BWSC and Boston Fire Department requirements.

Water capacity problems are not anticipated within the BWSC water system as a result of the Project's construction.

8.4 Stormwater

8.4.1 Existing Storm Drainage System

There are existing BWSC, and MassDOT storm drain mains in North Street, Blackstone Street, and Hanover Street. There is a 15-inch MTA storm drain main and a 30-inch x 36-inch MassDOT storm drain main in North Street. There is a 48-inch x 54-inch storm drain main in Blackstone Street. There is also a 12-inch BWSC storm drain main in Hanover Street. The 12-inch storm drain main in Hanover Street flows southerly to the 48-inch x 54-inch storm drain main in Blackstone Street, which flows easterly. The 48-inch x 54-inch storm drain main in Blackstone Street continues flowing easterly to the 42-inch storm drain



Haymarket Square Hotel **Boston, Massachusetts**

SCALE: 1"=100'

Figure 8-2

Existing Water System

Nitsch Engineering

main in North Street. The 15-inch MTA storm drain main in North Street which flows southerly, increases to the 30-inch MassDOT storm drain main, and continues flowing to the 42-inch storm drain main in North Street. The 42-inch storm drain main in North Street continues flowing southerly to the 66-inch storm drain main in Clinton Street. The 66-inch storm drain main in Clinton Street flows southerly to the 66-inch storm drain main in John F. Fitzgerald Surface Road, which flows northerly, and then continues flowing across the Greenway. The 66-inch storm drain main flowing across the Greenway continues flowing to the MassDOT interceptor in Fulton Street. The combined sewer continues flowing to the MWRA Deer Island waste Water Treatment Plant for treatment and disposal, or during times of high flow, discharges to the Inner Boston Harbor. The existing storm drain system is illustrated in Figure 8-3.

Stormwater infiltrates into the ground for the portion of the site that is grass. Stormwater runoff from the existing roadway and paved pedestrian areas sheet flows to catch basins, which connect to the storm drain systems system in North Street, Blackstone Street, Hanover Street and John F. Fitzgerald Surface Road.

8.4.2 Proposed Storm Drainage System

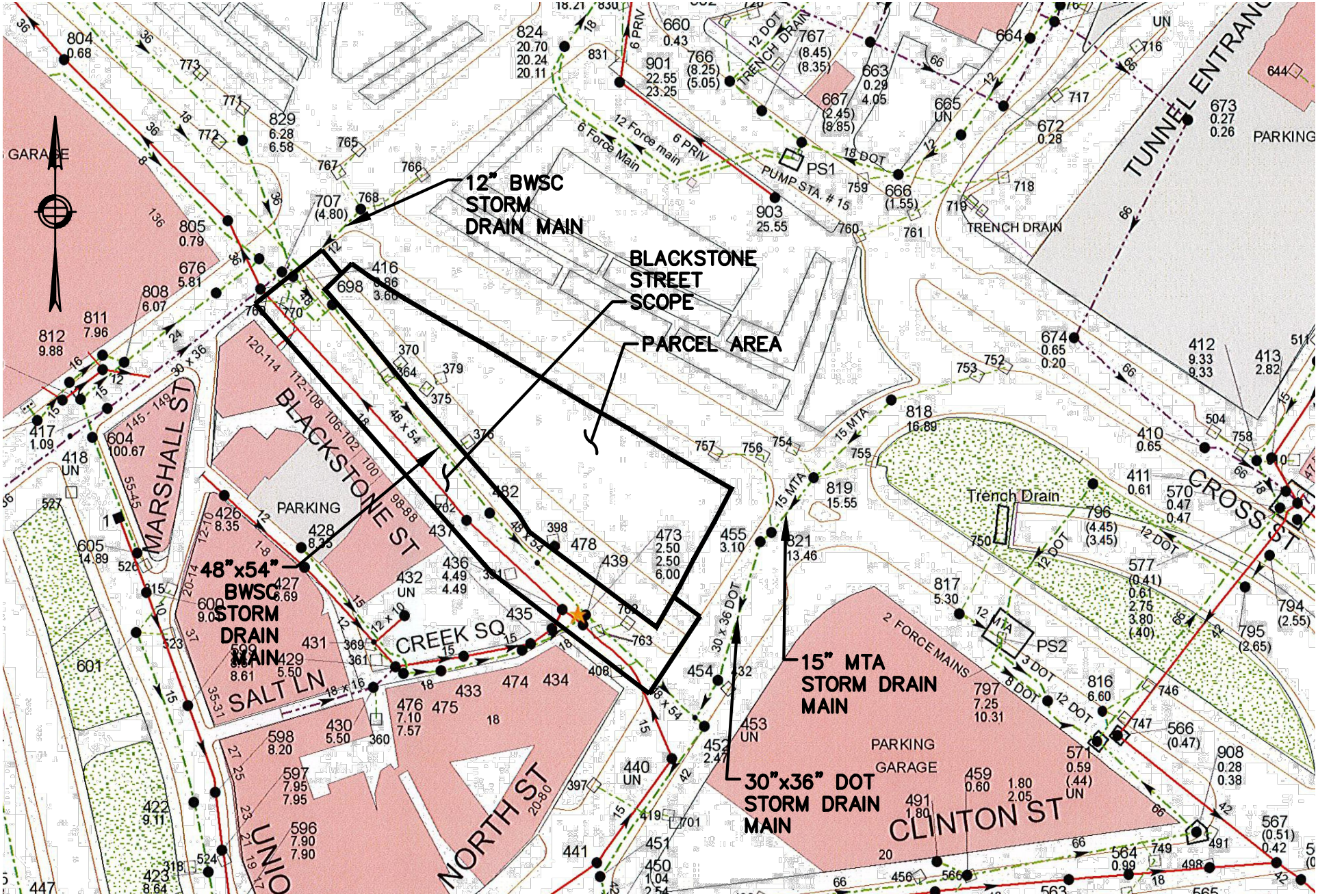
The existing site is approximately 40-percent (40%) impervious cover. The amount of impervious area at the site will increase compared to the existing condition due to the Project. The proposed site will be nearly 100-percent (100%) impervious cover. The Project will reduce the existing peak rates and volumes of stormwater runoff from the site and promote stormwater recharge to the greatest extent possible.

The Project will strive to infiltrate one-inch of stormwater runoff from the proposed impervious areas of the site into the ground to the greatest extent possible. Roof stormwater runoff will be collected and charged into the ground prior to discharging into the BWSC storm drain system. The building stormwater recharge system and any required site closed drainage systems will be designed so that there will be no increase in the peak rate of stormwater discharge from the Project site in the developed condition compared to the existing condition.

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

8.4.3 Water Quality Impact

The Project will not affect the water quality of nearby water bodies. Erosion and sediment control measures will be implemented during construction to minimize the transport of site soils to off-site areas and BWSC storm drain systems. During construction, existing catch



Haymarket Square Hotel **Boston, Massachusetts**

SCALE: 1"=100'

Nitsch Engineering

Figure 8-3

Existing Storm Drain System

basins will be protected with filter fabric, straw bales and/or crushed stone, to provide for sediment removal from runoff. These controls will be inspected and maintained throughout the construction phase until the areas of disturbance have been stabilized through the placement of pavement, structure, or vegetative cover.

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

8.4.4 MassDEP Stormwater Management Policy Standards

In March 1997, MassDEP adopted a Stormwater Management Policy to address non-point source pollution. In 1997, MassDEP published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy, which was revised in February 2008. The Policy prescribes specific stormwater management standards for development projects, including urban pollutant removal criteria for projects that may impact environmental resource areas. Compliance is achieved through the implementation of Best Management Practices (BMPs) in the stormwater management design. The Policy is administered locally pursuant to MGL Ch. 131, s. 40.

A brief explanation of each Policy Standard and the system compliance is provided below:

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

Compliance: The proposed design will comply with this Standard. There are no new stormwater conveyances proposed.

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

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

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

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

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

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

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

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

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

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

Compliance: The proposed design will comply with this standard. The Project is not associated with Higher Potential Pollutant Loads (per the Policy, Volume I, page 1-6).

Standard #6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts

Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

Compliance: The proposed design will comply with this Standard. The Project will not discharge untreated stormwater to a sensitive area or any other area.

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

Compliance: The proposed design will comply with this Standard. The Project complies with the Stormwater Management Standards as applicable to the redevelopment.

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

Compliance: The Project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design of these projects and employed during construction.

Standard *9: A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

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

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

Compliance: The Project will comply with this standard. There will be no illicit connections associated with the proposed Project.

8.5 Utility Protection During Construction

Existing public and private infrastructure located within nearby public rights-of-way will be protected during Project construction. The installation of proposed utility connections within public ways will be undertaken in accordance with BWSC, Boston Public Works Department, the Dig-Safe Program, and applicable utility company requirements. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer, and drain facilities will be reviewed by the BWSC as part of its Site Plan Review process. All necessary permits will be obtained before the commencement of work.

The Proponent will continue to work and coordinate with the BWSC and the utility companies to ensure safe and coordinated utility operations in connection with the Project.

8.6 Conservation of Resources

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

8.7 Proposed Energy Usage and Impacts

NSTAR owns the electrical system in the vicinity of the Project site. It is expected that adequate service is available in the existing electrical systems in the surrounding streets to serve the Project. The Proponent will work with NSTAR to confirm adequate system capacity as the design is finalized.

8.8 Telecommunications Systems

The Proponent will select private telecommunications companies to provide telephone, cable, and data services. There are several potential candidates with substantial downtown Boston networks capable of providing service. Upon selection of a provider or providers, the Proponent will coordinate service connection locations and obtain appropriate approvals.

8.9 Gas Systems

National Grid has gas services in the vicinity of the Project site. The Proponent will work with National Grid to confirm adequate system capacity as design is finalized.

Chapter 9.0

Coordination with other Governmental Agencies

9.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

9.1 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. See Appendix F for the Accessibility Checklist.

9.2 Massachusetts Environmental Policy Act (MEPA)

The Project is within MEPA jurisdiction because the lease of the site from MassDOT constitutes a "land transfer" under the MEPA regulations. MEPA review is triggered because the Project will exceed the traffic review threshold at 301 CMR 11.03(6)13, generation of 2,000 or more new adt on roadways providing access to a single location. The Proponent will submit an Environmental Notification Form to the Executive Office of Energy and Environmental Affairs MEPA Office to initiate MEPA review, concurrent with Article 80 review.

9.3 Massachusetts Historical Commission

The Project will be subject to State Register Review (950 CMR 71) by the Massachusetts Historical Commission (MHC) due to a transfer of land from the MassDOT, which is considered to be a state action for purposes of State Register Review. To initiate the State Register Review process, an Environmental Notification Form (ENF) will be filed with the MHC.

9.4 Boston Civic Design Commission

Because the Project is located within the Central Artery Special District and subject to Large Project Review, it will be subject to review by the Boston Civic Design Commission (BCDC) under the provisions of Article 28 of the Code. The BRA will submit this PNF to the BCDC to initiate such review.

Appendix A

Site Survey

10/10/2014 12:16 PM

LEGEND

▦	CATCH BASIN
Ⓓ	DRAIN MANHOLE
Ⓢ	SEWER MANHOLE
WSO ○	WATER SHUT-OFF
GG ○	GAS GATE
WG ○	WATER GATE
	FIRE HYDRANT
	UTILITY POLE
	LIGHT POLE
MB	MAIL BOX
S ◆	SIGN POST
12	DECIDUOUS TREE WITH TRUNK DIAMETER
60.43	SPOT ELEVATION
CLF	CHAIN LINK FENCE
VGC	VERTICAL GRANITE CURB
WCR	WHEELCHAIR RAMP
BIT. CONC.	BITUMINOUS CONCRETE
CONC.	CONCRETE
R=	RIM ELEVATION EQUALS
I=	INVERT ELEVATION EQUALS
T.H.=	TOP OF HOOD ELEVATION EQUALS
INV=	INVERT ELEVATION EQUALS
B.C.=	BOTTOM OF CHANNEL ELEVATION EQUALS
C.I.	CAST IRON PIPE
TW	TOP OF WALL ELEVATION
DH	DRILL HOLE
SB	STONE BOUND
CATV	UNDERGROUND CABLE TELEVISION LINE
D	UNDERGROUND DRAIN LINE
E	UNDERGROUND ELECTRIC LINE
G	UNDERGROUND GAS LINE
S	UNDERGROUND SEWER LINE
T	UNDERGROUND TELEPHONE LINE
W	UNDERGROUND WATER LINE
OHW	OVERHEAD WIRES
	BENCH MARK

UTILITY INFORMATION STATEMENT

1. THE SUB-SURFACE UTILITY INFORMATION SHOWN HEREON IS COMPILED BASED ON FIELD SURVEY INFORMATION, RECORD INFORMATION AS SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES, AND PLAN INFORMATION SUPPLIED BY THE CLIENT, IF ANY; THEREFORE WE CANNOT GUARANTEE THE ACCURACY OF SAID COMPILED SUB-SURFACE INFORMATION TO ANY CERTAIN DEGREE OF STATED TOLERANCE. ONLY PHYSICALLY LOCATED SUB-SURFACE UTILITY FEATURES FALL WITHIN NORMAL STANDARD OF CARE ACCURACIES.

2. THE LOCATIONS OF UNDERGROUND PIPES, CONDUITS, AND STRUCTURES HAVE BEEN DETERMINED FROM SAID INFORMATION, AND ARE APPROXIMATE ONLY. COMPILED LOCATIONS OF ANY UNDERGROUND STRUCTURES, NOT VISIBLY OBSERVED AND LOCATED, CAN VARY FROM THEIR ACTUAL LOCATIONS.

3. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED.

4. THE STATUS OF UTILITIES, WHETHER ACTIVE, ABANDONED, OR REMOVED, IS AN UNKNOWN CONDITION AS FAR AS OUR COMPILATION OF THIS INFORMATION.

5. IT IS INCUMBENT UPON INDIVIDUALS USING THIS INFORMATION TO UNDERSTAND THAT COMPILING UTILITY INFORMATION IS NOT EXACT, AND IS SUBJECT TO CHANGE BASED UPON VARYING PLAN INFORMATION RECEIVED AND ACTUAL LOCATIONS.

6. THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES IS SUBJECT TO FIELD CONDITIONS, THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS AND OTHER MATTERS.

7. THE PROPER UTILITY ENGINEERING/COMPANY SHOULD BE CONSULTED AND THE ACTUAL LOCATIONS OF SUBSURFACE STRUCTURES SHOULD BE VERIFIED IN THE FIELD (V.I.F.) BEFORE PLANNING FUTURE CONNECTIONS. CONTACT THE DIG SAFE CALL CENTER AT 1-888-344-7233, SEVENTY-TWO HOURS PRIOR TO EXCAVATION, BLASTING, GRADING, AND/OR PAVING.

8. AS OF THE DATE OF THIS PLAN, NITSCH ENGINEERING HAS NOT RECEIVED RECORD INFORMATION FOR THE FOLLOWING UTILITIES: CABLE, DRAIN/SEWER, ELECTRIC, FIRE, GAS, TELEPHONE, TELECOMMUNICATIONS, OR WATER.

NOTES

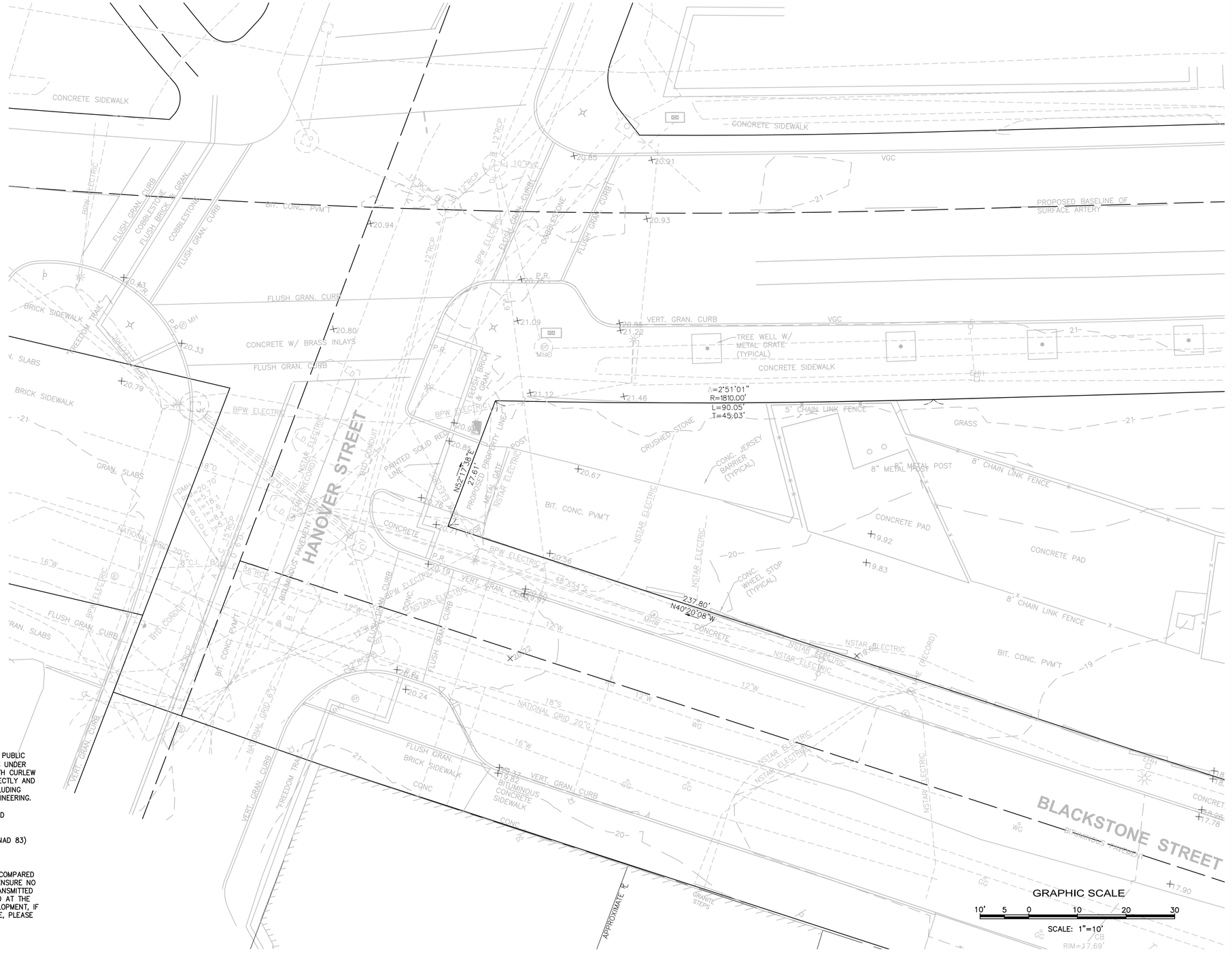
1.) THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF NITSCH ENGINEERING. IT IS ISSUED TO THE CITY OF BOSTON PUBLIC WORKS DEPARTMENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO NITSCH ENGINEERING'S SCOPE OF SERVICES UNDER CONTRACT WITH THE CITY OF BOSTON PUBLIC WORKS DEPARTMENT FOR LAND SURVEYING SERVICES ASSOCIATED WITH CURLEW STREET. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT AND PROJECT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN AUTHORIZATION IS GIVEN THEREFOR BY NITSCH ENGINEERING.

2.) THE PURPOSE OF THIS PLAN IS TO SHOW TOPOGRAPHY AND PROPERTY AS THE RESULT OF AN ON-THE-GROUND INSTRUMENT SURVEY WHICH OCCURRED IN AUGUST, SEPTEMBER AND OCTOBER OF 2014.

3.) HORIZONTAL COORDINATES REFER TO THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MA MAINLAND (NAD 83)

4.) ELEVATION REFERS TO BOSTON CITY BASE (BCB) VERTICAL DATUM.

5.) THE INFORMATION CONTAINED ON THE DISK OR ELECTRONIC DRAWING FILE ACCOMPANYING THIS PLAN MUST BE COMPARED TO THE SEALED AND SIGNED HARD COPY OF THE PLAN TO ENSURE THE ACCURACY OF ALL INFORMATION AND TO ENSURE NO CHANGES, ALTERATIONS, OR MODIFICATIONS HAVE BEEN MADE. RELIANCE SHALL NOT BE MADE ON A DOCUMENT TRANSMITTED BY COMPUTER OR OTHER ELECTRONIC MEANS UNLESS FIRST COMPARED TO THE ORIGINAL SEALED DOCUMENT ISSUED AT THE TIME OF THE SURVEY. DUE TO THE CRITICAL NATURE OF SURVEYING, DATA ACQUISITION, AND AUTOCAD PLAN DEVELOPMENT, IF CRITICAL DIMENSIONAL INFORMATION IS NEEDED AND IS NOT SPECIFICALLY SHOWN ON THE ELECTRONIC DRAWING FILE, PLEASE CONTACT NITSCH ENGINEERING.



Nitsch Engineering

www.nitscheng.com
2 Center Plaza, Suite 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

- Civil Engineering
- Land Surveying
- Transportation Engineering
- Sustainable Site Consulting
- Planning
- GIS

PROJECT #	10212.1
FILE:	10220.1_TOPO1.dwg
SCALE:	1"=10'
DATE:	OCTOBER 6, 2014
PROJECT MANAGER:	JG
FIELD BOOK:	41315
DRAFTED BY:	TAL
CHECKED BY:	

REV.	COMMENTS	DATE
	REVISIONS	

TOPOGRAPHIC PLAN OF LAND

PARCEL 9, SURFACE ROAD,
BOSTON, MASSACHUSETTS

PREPARED FOR:
NORMANDY REAL ESTATE
99 SUMMER STREET, BOSTON, MA 02110

SHEET: 1

EX-1

OF 1 REV.

G:\10220.1 parcel 9 survey\correspondence\outgoing\2014-10-10 prelim\10220.1_topo1.dwg

10/10/2014 12:15 PM

SURFACE ROAD
BITUMINOUS PAVEMENT

PARCEL 9
AREA = 29,271 S.F.

CB
RIM=19.22'
A I=17.1
B TH=15.9±

VGC

20.89
20.65

EHH

S59°59'03"E
253.93'

PROPOSED PROPERTY LINE

GRASS

WMH

19.33
19.81
19.73
20.78

PED

GRANITE PAVER CROSSWALK

DMH
RIM=18.52'
A I=13.9(12"RCP)
B I=13.4(15"RCP)
C I=13.4(15"RCP)

DMH
RIM=18.34'
A I=10.6(12"RCP)
B I=9.8(PLUGGED)
C I=12.8(15"RCP)
D I=4.0

BRICK SIDEWALK

CONCRETE

8.45
7.89

8.18
7.97

NATIONAL GRID 20"G

PAD

TRASH COMPACTOR

CONCRETE PAD

8' CHAIN LINK FENCE

8.81
8.67

TREE WELL W/ METAL GRATE (TYPICAL)

8.71

124.04'
S28°52'08"W

PROPOSED PROPERTY LINE

CONCRETE PAD

8' CHAIN LINK FENCE

BIT. CONC. PVM'T

CB
RIM=16.72'
TH=14.1

8.45
8.46
8.28
7.78

CONCRETE SIDEWALK

PROPOSED PROPERTY LINE

VERT. GRAN. CURB

CKSTONE STREET
BITUMINOUS PAVEMENT

7.90

PROPOSED BASELINE OF BLACKSTONE STREET

Δ=12°17'14"
R=156.00'
L=33.45'
T=16.79'

DMH UNDER CAR

NSTAR ELECTRIC

PROPOSED PROPERTY LINE

101.04'
N52°37'22"W

CONCRETE SIDEWALK

CB
IM=17.69'
TH=16.3

NATIONAL GRID 20"G

NATIONAL GRID 6"G

7.78 VERT. GRAN. CURB

8.01

GRANITE STEPS

6.93

VERIZON TELEPHONE

SMH
RIM=15.73'
A I=4.4
BOT.=4.3

12"W RIM=15.12'
I=12.4

12"RCP

SMH
RIM=15.49'

DMH
RIM=15.54

NATIONAL GRID 6"G

NATIONAL GRID 20"G

VERT. GRAN. CURB

VERIZON TELEPHONE

VERIZON TELEPHONE

CB
RIM=15.85

BIT. CONC. PVM'T

7.33
6.79
6.64
6.40
6.15
6.03

PROPOSED BASELINE OF NORTH STREET

NORTH STREET
BITUMINOUS PAVEMENT

6.56

DMH
RIM=15.87'
A I=9.8
B I=9.1

12"RCP

CB
RIM=15.40'
TH=11.0

ASMH
RIM=16.15'
FILLED WITH DIRT/DEBRIS
A T.O.P.=10.2
B T.O.P.=10.2
T.O.W.=12.6

GRAPHIC SCALE
10' 5 0 10 20 30
SCALE: 1"=10'

DMH
A I=11.6
B I=5.1
T.O.W.=5.1±

Nitsch Engineering

www.nitscheng.com
2 Center Plaza, Suite 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

- Civil Engineering
- Land Surveying
- Transportation Engineering
- Sustainable Site Consulting
- Planning
- GIS

PROJECT #	10212.1
FILE:	10220.1_TOPO1.dwg
SCALE:	1"=10'
DATE:	OCTOBER 6, 2014
PROJECT MANAGER:	JG
FIELD BOOK:	41315
DRAFTED BY:	TAL
CHECKED BY:	

REV.	COMMENTS	DATE
	REVISIONS	

TOPOGRAPHIC PLAN OF LAND

PARCEL 9, SURFACE ROAD,
BOSTON, MASSACHUSETTS

PREPARED FOR:
NORMANDY REAL ESTATE
99 SUMMER STREET, BOSTON, MA 02110

SHEET: 1

EX-2

OF 2 REV.

g:\10220.1 parcel 9 survey\correspondence\autocad\2014-10-10 prelim\10220.1_topo1.dwg

Appendix B

Transportation Appendix

Available Upon Request

Appendix C

Wind Appendix

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
1	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	13	+18%	Standing	20	+18%	Acceptable
		Summer	10	+11%	Sitting	15		Acceptable
		Fall	11		Sitting	18	+12%	Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
2	A	Spring	12		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	13		Standing	20	+18%	Acceptable
		Summer	10	+11%	Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20	+11%	Acceptable
		Annual	12		Sitting	19	+12%	Acceptable
3	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	13		Standing	21	+17%	Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	19	+12%	Acceptable
		Winter	12		Sitting	20		Acceptable
		Annual	12		Sitting	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
4	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	15	+25%	Standing	22	+22%	Acceptable
		Summer	11		Sitting	17	+13%	Acceptable
		Fall	14	+27%	Standing	20	+18%	Acceptable
		Winter	16	+33%	Walking	23	+21%	Acceptable
		Annual	14	+27%	Standing	21	+17%	Acceptable
5	A	Spring	13		Standing	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	12		Sitting	17		Acceptable
	B	Spring	14		Standing	20	+11%	Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	18	+12%	Acceptable
		Winter	14	+17%	Standing	20	+11%	Acceptable
		Annual	13		Standing	19	+12%	Acceptable
6	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	11	-15%	Sitting	17	-19%	Acceptable
		Summer	9	-18%	Sitting	13	-24%	Acceptable
		Fall	10	-23%	Sitting	16	-16%	Acceptable
		Winter	11	-21%	Sitting	17	-23%	Acceptable
		Annual	10	-23%	Sitting	16	-20%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
7	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	11	-21%	Sitting	17	-15%	Acceptable
		Summer	9	-18%	Sitting	14	-12%	Acceptable
		Fall	10	-17%	Sitting	16	-16%	Acceptable
		Winter	11	-21%	Sitting	17	-19%	Acceptable
		Annual	10	-23%	Sitting	16	-20%	Acceptable
8	A	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	10	-38%	Sitting	16	-30%	Acceptable
		Summer	8	-38%	Sitting	13	-32%	Acceptable
		Fall	10	-29%	Sitting	16	-20%	Acceptable
		Winter	11	-31%	Sitting	17	-26%	Acceptable
		Annual	10	-33%	Sitting	16	-27%	Acceptable
9	A	Spring	12		Sitting	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
10	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	18	+38%	Walking	25	+25%	Acceptable
		Summer	15	+36%	Standing	20	+25%	Acceptable
		Fall	16	+33%	Walking	23	+21%	Acceptable
		Winter	18	+38%	Walking	25	+19%	Acceptable
		Annual	17	+42%	Walking	24	+26%	Acceptable
11	A	Spring	12		Sitting	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	11		Sitting	16	-20%	Acceptable
		Summer	9		Sitting	13	-19%	Acceptable
		Fall	10		Sitting	16	-11%	Acceptable
		Winter	11	-15%	Sitting	17	-19%	Acceptable
		Annual	10	-17%	Sitting	16	-16%	Acceptable
12	A	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	8	-27%	Sitting	12	-33%	Acceptable
		Summer	6	-33%	Sitting	10	-29%	Acceptable
		Fall	8	-20%	Sitting	12	-29%	Acceptable
		Winter	8	-33%	Sitting	13	-32%	Acceptable
		Annual	8	-27%	Sitting	12	-29%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
13	A	Spring	11		Sitting	18		Acceptable
		Summer	10		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	10		Sitting	17		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	9	-18%	Sitting	16		Acceptable
		Winter	10	-17%	Sitting	17		Acceptable
		Annual	9	-18%	Sitting	16		Acceptable
14	A	Spring	11		Sitting	16		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	17		Acceptable
		Annual	11		Sitting	16		Acceptable
	B	Spring	10		Sitting	14	-12%	Acceptable
		Summer	8	-11%	Sitting	12		Acceptable
		Fall	9	-18%	Sitting	14	-12%	Acceptable
		Winter	10	-17%	Sitting	15	-12%	Acceptable
		Annual	9	-18%	Sitting	14	-12%	Acceptable
15	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	10		Sitting	15		Acceptable
	B	Spring	8	-20%	Sitting	13	-19%	Acceptable
		Summer	7	-12%	Sitting	12		Acceptable
		Fall	8	-11%	Sitting	13	-13%	Acceptable
		Winter	9		Sitting	14	-18%	Acceptable
		Annual	8	-20%	Sitting	13	-13%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
16	A	Spring	15		Standing	21		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	15		Standing	20		Acceptable
	B	Spring	14		Standing	19		Acceptable
		Summer	12		Sitting	16	-11%	Acceptable
		Fall	14		Standing	18		Acceptable
		Winter	15		Standing	20		Acceptable
		Annual	14		Standing	19		Acceptable
17	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	10		Sitting	15	-12%	Acceptable
		Summer	8	-11%	Sitting	12	-14%	Acceptable
		Fall	10		Sitting	14	-12%	Acceptable
		Winter	11		Sitting	16	-11%	Acceptable
		Annual	10		Sitting	15	-12%	Acceptable
18	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
19	A	Spring	10		Sitting	16		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	10		Sitting	15		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	10		Sitting	16		Acceptable
20	A	Spring	12		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	12		Sitting	18		Acceptable
		Summer	10	+11%	Sitting	14		Acceptable
		Fall	12		Sitting	17		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
21	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
22	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
23	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
24	A	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	21		Acceptable
	B	Spring	15		Standing	21		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	15		Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
25	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
26	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
27	A	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
28	A	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
29	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
30	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	14		Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
31	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
32	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
33	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
34	A	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	23		Acceptable
35	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
36	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
37	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	14	-12%	Standing	21	-12%	Acceptable
		Summer	11	-15%	Sitting	17		Acceptable
		Fall	13	-13%	Standing	20		Acceptable
		Winter	15	-17%	Standing	23	-12%	Acceptable
		Annual	14	-12%	Standing	21		Acceptable
38	A	Spring	16		Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	16		Walking	25		Acceptable
	B	Spring	13	-19%	Standing	20	-20%	Acceptable
		Summer	10	-23%	Sitting	16	-16%	Acceptable
		Fall	12	-20%	Sitting	19	-17%	Acceptable
		Winter	13	-24%	Standing	21	-22%	Acceptable
		Annual	12	-25%	Sitting	20	-20%	Acceptable
39	A	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	14	-12%	Standing	21		Acceptable
		Summer	11	-15%	Sitting	17		Acceptable
		Fall	14	-12%	Standing	21		Acceptable
		Winter	15	-17%	Standing	23		Acceptable
		Annual	14	-12%	Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
40	A	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	14	-12%	Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	13	-13%	Standing	21		Acceptable
		Winter	15	-12%	Standing	22	-12%	Acceptable
		Annual	13	-13%	Standing	21		Acceptable
41	A	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	14		Standing	22		Acceptable
42	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	16	+14%	Walking	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15	+15%	Standing	22		Acceptable
		Winter	17	+13%	Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
43	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	15	+15%	Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15	+15%	Standing	22		Acceptable
		Annual	14		Standing	21	+11%	Acceptable
44	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
45	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
46	A	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	13		Standing	20	+11%	Acceptable
		Summer	10	+11%	Sitting	16	+14%	Acceptable
		Fall	12		Sitting	19	+12%	Acceptable
		Winter	14	+17%	Standing	21	+11%	Acceptable
		Annual	13	+18%	Standing	19		Acceptable
47	A	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
48	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	14		Acceptable
		Fall	12		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	12		Sitting	17		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
49	A	Spring	12		Sitting	18		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable
50	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
51	A	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
52	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
53	A	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
54	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
55	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
56	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	15		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
57	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
58	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	15	+15%	Standing	22		Acceptable
		Summer	12		Sitting	18	+12%	Acceptable
		Fall	14		Standing	21	+11%	Acceptable
		Winter	16	+14%	Walking	23		Acceptable
		Annual	15	+15%	Standing	21		Acceptable
59	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15	+15%	Standing	21		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
60	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	23		Acceptable
		Annual	14		Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
61	A	Spring	16		Walking	24		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
	B	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
62	A	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
	B	Spring	11	-15%	Sitting	18	-14%	Acceptable
		Summer	9	-18%	Sitting	15	-12%	Acceptable
		Fall	10	-17%	Sitting	17	-11%	Acceptable
		Winter	11	-21%	Sitting	18	-18%	Acceptable
		Annual	11	-15%	Sitting	17	-15%	Acceptable
63	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	15		Standing	22		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	12	-14%	Sitting	18	-14%	Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13	-13%	Standing	20		Acceptable
		Annual	12	-14%	Sitting	18		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
64	A	Spring	13		Standing	22		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
65	A	Spring	15		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	16		Walking	22		Acceptable
		Annual	15		Standing	20		Acceptable
	B	Spring	14		Standing	20		Acceptable
		Summer	12		Sitting	16		Acceptable
		Fall	14		Standing	19		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	19		Acceptable
66	A	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	19		Walking	27		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
67	A	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	17		Walking	25		Acceptable
	B	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
68	A	Spring	9		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	11	+22%	Sitting	17		Acceptable
		Summer	9	+12%	Sitting	13		Acceptable
		Fall	10	+11%	Sitting	16		Acceptable
		Winter	12	+20%	Sitting	18		Acceptable
		Annual	11	+22%	Sitting	16		Acceptable
69	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	12	+20%	Sitting	18	+12%	Acceptable
		Summer	9	+12%	Sitting	14		Acceptable
		Fall	11	+22%	Sitting	17	+13%	Acceptable
		Winter	12	+20%	Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
70	A	Spring	10		Sitting	16		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	15		Acceptable
		Winter	10		Sitting	17		Acceptable
		Annual	10		Sitting	15		Acceptable
	B	Spring	8	-20%	Sitting	14	-12%	Acceptable
		Summer	7	-12%	Sitting	11	-15%	Acceptable
		Fall	8	-20%	Sitting	13	-13%	Acceptable
		Winter	9		Sitting	14	-18%	Acceptable
		Annual	8	-20%	Sitting	13	-13%	Acceptable
71	A	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
72	A	Spring	13		Standing	20		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	18	+38%	Walking	25	+25%	Acceptable
		Summer	15	+36%	Standing	20	+25%	Acceptable
		Fall	16	+33%	Walking	23	+21%	Acceptable
		Winter	18	+38%	Walking	25	+19%	Acceptable
		Annual	17	+42%	Walking	24	+26%	Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
73	A	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	14	-12%	Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	13	-13%	Standing	21		Acceptable
		Winter	15	-12%	Standing	22	-12%	Acceptable
		Annual	13	-13%	Standing	21		Acceptable
74	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	10		Sitting	17		Acceptable
	B	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
75	A	Spring	15		Standing	23		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	13	-13%	Standing	21		Acceptable
		Summer	10	-17%	Sitting	17		Acceptable
		Fall	12	-20%	Sitting	20		Acceptable
		Winter	14	-12%	Standing	23		Acceptable
		Annual	13	-13%	Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
76	A	Spring	9		Sitting	15		Acceptable
		Summer	7		Sitting	12		Acceptable
		Fall	8		Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9		Sitting	14		Acceptable
	B	Spring	11	+22%	Sitting	18	+20%	Acceptable
		Summer	9	+29%	Sitting	14	+17%	Acceptable
		Fall	10	+25%	Sitting	16	+14%	Acceptable
		Winter	11	+22%	Sitting	17	+13%	Acceptable
		Annual	10	+11%	Sitting	16	+14%	Acceptable
77	A	Spring	13		Standing	22		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	24		Acceptable
		Annual	13		Standing	22		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	22		Acceptable
78	A	Spring	12		Sitting	20		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	12		Sitting	20		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	21		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
79	A	Spring	16		Walking	24		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	27		Acceptable
		Annual	16		Walking	24		Acceptable
	B	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	16		Walking	25		Acceptable
80	A	Spring	9		Sitting	15		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	9		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	9		Sitting	15		Acceptable
	B	Spring	8	-11%	Sitting	14		Acceptable
		Summer	7	-12%	Sitting	12		Acceptable
		Fall	8	-11%	Sitting	14		Acceptable
		Winter	9		Sitting	14	-12%	Acceptable
		Annual	8	-11%	Sitting	14		Acceptable
81	A	Spring	14		Standing	21		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	13		Standing	21		Acceptable
	B	Spring	13		Standing	21		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
82	A	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
	B	Spring	11		Sitting	18		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	18		Acceptable
83	A	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	12		Sitting	18		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
84	A	Spring	14		Standing	21		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	15		Standing	23		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	12	-14%	Sitting	20		Acceptable
		Summer	11	-15%	Sitting	17		Acceptable
		Fall	12	-14%	Sitting	19		Acceptable
		Winter	13	-13%	Standing	20	-13%	Acceptable
		Annual	12	-14%	Sitting	19		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
85	A	Spring	17		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	17		Walking	24		Acceptable
	B	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	16		Walking	24		Acceptable
86	A	Spring	Data Not Available					
		Summer	Data Not Available					
		Fall	Data Not Available					
		Winter	Data Not Available					
		Annual	Data Not Available					
	B	Spring	15		Standing	23		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
87	A	Spring	Data Not Available					
		Summer	Data Not Available					
		Fall	Data Not Available					
		Winter	Data Not Available					
		Annual	Data Not Available					
	B	Spring	18		Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Table 2: Pedestrian Wind Comfort and Safety Categories - Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
88	A	Spring	Data Not Available					
		Summer	Data Not Available					
		Fall	Data Not Available					
		Winter	Data Not Available					
		Annual	Data Not Available					
	B	Spring	10		Sitting	17		Acceptable
		Summer	9		Sitting	15		Acceptable
		Fall	10		Sitting	17		Acceptable
		Winter	11		Sitting	18		Acceptable
		Annual	10		Sitting	17		Acceptable
89	A	Spring	Data Not Available					
		Summer	Data Not Available					
		Fall	Data Not Available					
		Winter	Data Not Available					
		Annual	Data Not Available					
	B	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	12		Sitting	19		Acceptable
		Winter	13		Standing	21		Acceptable
		Annual	12		Sitting	20		Acceptable

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) % Change is based on comparison with Configuration A and only those that are greater than 10% are listed.

Configurations	Mean Wind Speed Criteria		Effective Gust Criteria	
A – No Build	Comfortable for Sitting:	≤ 12 mph	Acceptable:	≤ 31 mph
B – Build	Comfortable for Standing:	> 12 and ≤ 15 mph	Unacceptable:	> 31 mph
	Comfortable for Walking:	> 15 and ≤ 19 mph		
	Uncomfortable for Walking:	> 19 and ≤ 27 mph		
	Dangerous Conditions:	> 27 mph		

Appendix D

Air Quality Appendix

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 2014 and 2019 for speed limits of 0, 9, 15, and 30 mph for use in the microscale analyses.

CAL3QHC

For the intersections studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOBILE6.2. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 370 cm was used for all intersections. Idle emission rates for queue links were based on 0 mph emission rates derived in MOVES. Emission rates for speeds of 9, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

Haymarket Hotel - Boston, MA
Background Concentrations

Background Concentrations									
POLLUTANT	AVERAGING TIME	Form	2011	2012	2013	Units	ppm to $\mu g/m^3$ Conversion Factor	Background Concentration ($\mu g/m^3$)	Location
SO_2 [1][7][8]	1-Hour	99th %	19.3	13.2	12	ppb	2.62	50.6	Kenmore Sq., Boston
	3-Hour	H2H	24.6	13.8	16	ppb	2.62	64.5	Kenmore Sq., Boston
	24-Hour	H2H	9.4	5.4	6	ppb	2.62	24.6	Kenmore Sq., Boston
	Annual	H	2.36	1.87	1	ppb	2.62	6.2	Kenmore Sq., Boston
PM-10	24-Hour	H2H	34	37	40	$\mu g/m^3$	1	40.0	One City Sq., Boston
	Annual	H	15.9	16.8	18	$\mu g/m^3$	1	18.0	One City Sq., Boston
PM-2.5	24-Hour [4]	98th %	23.9	20.9	20	$\mu g/m^3$	1	21.6	174 North St, Boston
	Annual [5]	H	10.32	9.47	8.8	$\mu g/m^3$	1	9.5	174 North St, Boston
NO_2 [3]	1-Hour [6]	98th %	52.9	49	48	ppb	1.88	93.9	Kenmore Sq., Boston
	Annual	H	20.36	19.1	17.78	ppb	1.88	38.3	Kenmore Sq., Boston
CO [2]	1-Hour	H2H	1.5	1.3	1.3	ppm	1140	1710	Kenmore Sq., Boston
	8-Hour	H2H	1.2	0.9	0.9	ppm	1140	1368	Kenmore Sq., Boston

From 2010-2013 MassDEP Annual Data Summaries

[1] SO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 2.62 $\mu g/m^3$.

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

[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 1.88 $\mu g/m^3$.

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

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

[6] Background level for 1-hour NO2 is the average of the 98th percentile of the daily maximum 1-hour values a over three years.

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

[8] The 2011 - 2013 SO_2 3-hr value is no longer reported by MassDEP. 1-hr H2H used instead. 2013 24-hr value also no longer reported. Obtained from EPA AirData website.

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

Appendix E

Climate Change Preparedness Questionnaire

Climate Change Preparedness and Resiliency Checklist for New Construction

In November 2013, in conformance with the Mayor's 2011 Climate Action Leadership Committee's recommendations, the Boston Redevelopment Authority adopted policy for all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding project resiliency, preparedness, and to mitigate any identified adverse impacts that might arise under future climate conditions.

For more information about the City of Boston's climate policies and practices, and the 2011 update of the climate action plan, *A Climate of Progress*, please see the City's climate action web pages at http://www.cityofboston.gov/climate

In advance we thank you for your time and assistance in advancing best practices in Boston.

Climate Change Analysis and Information Sources:

1. Northeast Climate Impacts Assessment (www.climatechoices.org/ne/)
2. USGCRP 2009 (http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/)
3. Army Corps of Engineers guidance on sea level rise (http://planning.usace.army.mil/toolbox/library/ECs/EC11652212Nov2011.pdf)
4. Proceeding of the National Academy of Science, "Global sea level rise linked to global temperature", Vermeer and Rahmstorf, 2009 (http://www.pnas.org/content/early/2009/12/04/0907765106.full.pdf)
5. "Hotspot of accelerated sea-level rise on the Atlantic coast of North America", Asbury H. Sallenger Jr*, Kara S. Doran and Peter A. Howd, 2012 (http://www.bostonredevelopmentauthority.org/planning/Hotspot of Accelerated Sea-level Rise 2012.pdf)
6. "Building Resilience in Boston": Best Practices for Climate Change Adaptation and Resilience for Existing Buildings, Linnean Solutions, The Built Environment Coalition, The Resilient Design Institute, 2103 (http://www.greenribboncommission.org/downloads/Building_Resilience_in_Boston_SML.pdf)

Checklist

Please respond to all of the checklist questions to the fullest extent possible. For projects that respond "Yes" to any of the D.1 – Sea-Level Rise and Storms, Location Description and Classification questions, please respond to all of the remaining Section D questions.

Checklist responses are due at the time of initial project filing or Notice of Project Change and final filings just prior seeking Final BRA Approval. A PDF of your response to the Checklist should be submitted to the Boston Redevelopment Authority via your project manager.

Please Note: When initiating a new project, please visit the BRA web site for the most current Climate Change Preparedness & Resiliency Checklist.

A.1 - Project Information

Project Name:	**Haymarket Hotel**
Project Address Primary:	
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	

A.2 - Team Description

Owner / Developer:	**Normandy Real Estate Partners**
Architect:	**Perkins + Will**
Engineer (building systems):	**Cosentini**
Sustainability / LEED:	**Perkins + Will**
Permitting:	**Epsilon Associates**
Construction Management:	**John Moriarty & Associates**
Climate Change Expert:	

A.3 - Project Permitting and Phase

At what phase is the project – most recent completed submission at the time of this response?

☑ PNF / Expanded PNF Submission	☐ Draft / Final Project Impact Report Submission	☐ BRA Board Approved	☐ Notice of Project Change
☐ Planned Development Area	☐ BRA Final Design Approved	☐ Under Construction	☐ Construction just completed:

A.4 - Building Classification and Description

List the principal Building Uses:	Retail/market, hotel
List the First Floor Uses:	*Retail, hotel lobby*

What is the principal Construction Type – select most appropriate type?

☐ Wood Frame	☐ Masonry	☑ Steel Frame	☑ Concrete

Describe the building?

Site Area:	*50,456 SF*	Building Area:	*140,000 SF*
Building Height:	*103 Ft.*	Number of Stories:	*10 Flrs.*
First Floor Elevation (reference Boston City Base):	*20.65 Elev.*	Are there below grade spaces/levels, if yes how many:	☑ *No / Number of Levels*

A.5 - Green Building

Which LEED Rating System(s) and version has or will your project use (by area for multiple rating systems)?

Select by Primary Use:	☐ New Construction	☐ Core & Shell	☐ Healthcare	☐ Schools
	☐ Retail	☐ Homes Midrise	☐ Homes	☑ Other Hospitality
Select LEED Outcome:	☑ Certified	☐ Silver	☐ Gold	☐ Platinum

Will the project be USGBC Registered and / or USGBC Certified?

Registered:	*Yes* / *No*	Certified:	*Yes* / *No*

A.6 - Building Energy-

What are the base and peak operating energy loads for the building?

Electric:	*1,000 (kW)*	Heating:	*6,000 (includes heat and DHW) (MMBtu/hr)*
What is the planned building Energy Use Intensity:	*(kWh/SF)*	Cooling:	*650 (Tons/hr)*

What are the peak energy demands of your critical systems in the event of a service interruption?

Electric:	*300 (kW)*	Heating:	*1,000 (MMBtu/hr)*
		Cooling:	*0 (Tons/hr)*

What is nature and source of your back-up / emergency generators?

Electrical Generation:	*300 (kW)*		Fuel Source:	*Diesel*
System Type and Number of Units:	☑ Combustion Engine	☐ Gas Turbine	☐ Combine Heat and Power	*(Units)*

B - Extreme Weather and Heat Events

Climate change will result in more extreme weather events including higher year round average temperatures, higher peak temperatures, and more periods of extended peak temperatures. The section explores how a project responds to higher temperatures and heat waves.

B.1 - Analysis

What is the full expected life of the project?

Select most appropriate:	☐ 10 Years	☐ 25 Years	☑ 50 Years	☐ 75 Years

What is the full expected operational life of key building systems (e.g. heating, cooling, ventilation)?

Select most appropriate:	☐ 10 Years	☑ 25 Years	☐ 50 Years	☐ 75 Years

What time span of future Climate Conditions was considered?

Select most appropriate:	☐ 10 Years	☐ 25 Years	☑ 50 Years	☐ 75 Years

Analysis Conditions - What range of temperatures will be used for project planning – Low/High?

8/91 Deg.	Based on ASHRAE Fundamentals 2013 99.6% heating; 0.4% cooling

What Extreme Heat Event characteristics will be used for project planning – Peak High, Duration, and Frequency?

95 Deg.	*5 Days*	*6 Events / yr.*

What Drought characteristics will be used for project planning – Duration and Frequency?

30-90 Days	*0.2 Events / yr.*

What Extreme Rain Event characteristics will be used for project planning – Seasonal Rain Fall, Peak Rain Fall, and Frequency of Events per year?

45 Inches / yr.	*4 Inches*	*0.5 Events / yr.*

What Extreme Wind Storm Event characteristics will be used for project planning – Peak Wind Speed, Duration of Storm Event, and Frequency of Events per year?

130 Peak Wind	*10 Hours*	*0.25 Events / yr.*

B.2 - Mitigation Strategies

What will be the overall energy performance, based on use, of the project and how will performance be determined?

Building energy use below code:	***20%***
How is performance determined:	Energy Model

What specific measures will the project employ to reduce building energy consumption?

Select all appropriate:				
	☑ High performance building envelop	☑ High performance lighting & controls	☐ Building day lighting	☑ EnergyStar equip. / appliances
	☑ High performance HVAC equipment	☑ Energy recovery ventilation	☐ No active cooling	☐ No active heating
Describe any added measures:				

What are the insulation (R) values for building envelop elements?

Roof:	*R = 25*	Walls / Curtain Wall Assembly:	*R = 13BATTS + R8 continuous insulation*
Foundation:	*R = 15*	Basement / Slab:	*R =10*
Windows:	*R = / U =0.4*	Doors:	*R = / U =0.7*

What specific measures will the project employ to reduce building energy demands on the utilities and infrastructure?

☐ On-site clean energy / CHP system(s)	☐ Building-wide power dimming	☐ Thermal energy storage systems	☐ Ground source heat pump
☐ On-site Solar PV	☐ On-site Solar Thermal	☐ Wind power	☑ None

Describe any added measures:	

Will the project employ Distributed Energy / Smart Grid Infrastructure and /or Systems?

Select all appropriate:	☐ Connected to local distributed electrical	☐ Building will be Smart Grid ready	☐ Connected to distributed steam, hot, chilled water	☐ Distributed thermal energy ready

Will the building remain operable without utility power for an extended period?

	Yes / No	If yes, for how long:	*Days*
If Yes, is building "Islandable?			
If Yes, describe strategies:			

Describe any non-mechanical strategies that will support building functionality and use during an extended interruption(s) of utility services and infrastructure:

Select all appropriate:	☑ Solar oriented – longer south walls	☐ Prevailing winds oriented	☐ External shading devices	☐ Tuned glazing,
	☐ Building cool zones	☑ Operable windows	☑ Natural ventilation	☐ Building shading
	☐ Potable water for drinking / food preparation	☐ Potable water for sinks / sanitary systems	☐ Waste water storage capacity	☑ High Performance Building Envelop
Describe any added measures:				

What measures will the project employ to reduce urban heat-island effect?

Select all appropriate:	☑ High reflective paving materials	☑ Shade trees & shrubs	☑ High reflective roof materials	☐ Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate rain events and more rain fall?

Select all appropriate:	☐ On-site retention systems & ponds	☐ Infiltration galleries & areas	☐ Vegetated water capture systems	☐ Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate extreme storm events and high winds?

Select all appropriate:	☐ Hardened building structure & elements	☐ Buried utilities & hardened infrastructure	☐ Hazard removal & protective landscapes	☐ Soft & permeable surfaces (water infiltration)
Describe other strategies:	No basement, Transformers, switchgear, fire pump, fuel oil storage pump located on second floor. Generator located on roof.			

C - Sea-Level Rise and Storms

Rising Sea-Levels and more frequent Extreme Storms increase the probability of coastal and river flooding and enlarging the extent of the 100 Year Flood Plain. This section explores if a project is or might be subject to Sea-Level Rise and Storm impacts.

C.1 - Location Description and Classification:

Do you believe the building to susceptible to flooding now or during the full expected life of the building?

	Yes / *No*

Describe site conditions?

Site Elevation – Low/High Points:	*Boston City Base Elev.(Ft.)*
Building Proximity to Water:	*1,250 Ft.*

Is the site or building located in any of the following?

Coastal Zone:	*Yes* / *No*	Velocity Zone:	*Yes* / *No*
Flood Zone:	*Yes* / *No*	Area Prone to Flooding:	*Yes* / *No*

Will the 2013 Preliminary FEMA Flood Insurance Rate Maps or future floodplain delineation updates due to Climate Change result in a change of the classification of the site or building location?

2013 FEMA Prelim. FIRMs:	*Yes* / *No*	Future floodplain delineation updates:	*Yes* / *No*

What is the project or building proximity to nearest Coastal, Velocity or Flood Zone or Area Prone to Flooding?

0 Ft.

If you answered YES to any of the above Location Description and Classification questions, please complete the following questions. ***Otherwise you have completed the questionnaire; thank you!***

C - Sea-Level Rise and Storms

This section explores how a project responds to Sea-Level Rise and / or increase in storm frequency or severity.

C.2 - Analysis

How were impacts from higher sea levels and more frequent and extreme storm events analyzed:

Sea Level Rise:	*3 Ft.*	Frequency of storms:	*0.25 per year*

C.3 - Building Flood Proofing

Describe any strategies to limit storm and flood damage and to maintain functionality during an extended periods of disruption.

What will be the Building Flood Proof Elevation and First Floor Elevation:

Flood Proof Elevation:	*20.65 Boston City Base Elev.(Ft.)*	First Floor Elevation:	*20.65 Boston City Base Elev. (Ft.)*

Will the project employ temporary measures to prevent building flooding (e.g. barricades, flood gates):

	Yes / *No*	If Yes, to what elevation	*Boston City Base Elev. (Ft.)*
If Yes, describe:			

What measures will be taken to ensure the integrity of critical building systems during a flood or severe storm event:

☑ Systems located above 1st Floor.	☑ Water tight utility conduits	☐ Waste water back flow prevention	☐ Storm water back flow prevention

Were the differing effects of fresh water and salt water flooding considered:

Yes / No

Will the project site / building(s) be accessible during periods of inundation or limited access to transportation:

Yes / No	If yes, to what height above 100 Year Floodplain:	*20.65 Boston City Base Elev. (Ft.)*

Will the project employ hard and / or soft landscape elements as velocity barriers to reduce wind or wave impacts?

Yes / No

If Yes, describe:	There will be trees along the Surface Road and North Street

Will the building remain occupiable without utility power during an extended period of inundation:

Yes / No	If Yes, for how long:	*days*

Describe any additional strategies to addressing sea level rise and or sever storm impacts:

C.4 - Building Resilience and Adaptability

Describe any strategies that would support rapid recovery after a weather event and accommodate future building changes that respond to climate change:

Will the building be able to withstand severe storm impacts and endure temporary inundation?

Select appropriate:	*Yes / No*	☐ Hardened / Resilient Ground Floor Construction	☐ Temporary shutters and or barricades	☐ Resilient site design, materials and construction

Can the site and building be reasonably modified to increase Building Flood Proof Elevation?

Select appropriate:	*Yes / No*	☐ Surrounding site elevation can be raised	☐ Building ground floor can be raised	☐ Construction been engineered
Describe additional strategies:	The major portion of the first floor is already designed to be above the flood plain. .			

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	*Yes / No*	☐ Solar PV	☐ Solar Thermal	☐ Clean Energy / CHP System(s)
		☐ Potable water storage	☐ Wastewater storage	☐ Back up energy systems & fuel
Describe any specific or				

additional strategies:	

Thank you for completing the Boston Climate Change Resilience and Preparedness Checklist!

For questions or comments about this checklist or Climate Change Resiliency and Preparedness best practices, please contact: John.Dalzell.BRA@cityofboston.gov

Appendix F

Accessibility Checklist

Accessibility Checklist

(to be added to the BRA Development Review Guidelines)

In 2009, a nine-member Advisory Board was appointed to the Commission for Persons with Disabilities in an effort to reduce architectural, procedural, attitudinal, and communication barriers affecting persons with disabilities in the City of Boston. These efforts were instituted to work toward creating universal access in the built environment.

In line with these priorities, the Accessibility Checklist aims to support the inclusion of people with disabilities. In order to complete the Checklist, you must provide specific detail, including descriptions, diagrams and data, of the universal access elements that will ensure all individuals have an equal experience that includes full participation in the built environment throughout the proposed buildings and open space.

In conformance with this directive, all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding the following:

- improvements for pedestrian and vehicular circulation and access;
- encourage new buildings and public spaces to be designed to enhance and preserve Boston's system of parks, squares, walkways, and active shopping streets;
- ensure that persons with disabilities have full access to buildings open to the public;
- afford such persons the educational, employment, and recreational opportunities available to all citizens; and
- preserve and increase the supply of living space accessible to persons with disabilities.

We would like to thank you in advance for your time and effort in advancing best practices and progressive approaches to expand accessibility throughout Boston's built environment.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
    a. http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
    a. http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Boston Complete Street Guidelines
    a. http://bostoncompletestreets.org/
4. City of Boston Mayors Commission for Persons with Disabilities Advisory Board
    a. http://www.cityofboston.gov/Disability
5. City of Boston – Public Works Sidewalk Reconstruction Policy
    a. http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
6. Massachusetts Office On Disability Accessible Parking Requirements
    a. www.mass.gov/anf/docs/mod/hp-parking-regulations-mod.doc
7. MBTA Fixed Route Accessible Transit Stations
    a. http://www.mbta.com/about_the_mbta/accessibility/

Article 80 | ACCESSIBILTY CHECKLIST

Project Information

Project Name:	**Haymarket Hotel**
Project Address Primary:	
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	

Team Description

Owner / Developer:	**Normandy Real Estate**
Architect:	**Perkins + Will**
Engineer (building systems):	**Cosentini**
Sustainability / LEED:	**Perkins + Will**
Permitting:	**Epsilon Associates**
Construction Management:	

Project Permitting and Phase

At what phase is the project – at time of this questionnaire?

☑ PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BRA Board Approved
BRA Design Approved	Under Construction	Construction just completed:

Article 80 | ACCESSIBILTY CHECKLIST

Building Classification and Description

What are the principal Building Uses - select all appropriate uses?

	Residential – One to Three Unit	Residential - Multi-unit, Four +	Institutional	Education
	Commercial Hotel	Office	Retail	Assembly
	Laboratory / Medical	Manufacturing / Industrial	Mercantile	Storage, Utility and Other
First Floor Uses (List)	*Retail, Hotel Lobby, HPCA Facilities*			

What is the Construction Type – select most appropriate type?

Wood Frame	Masonry	Steel Frame	Concrete

Describe the building?

Site Area:	*50, 456SF*	Building Area:	*140,000SF*
Building Height:	*103Ft.*	Number of Stories:	*10Flrs.*
First Floor Elevation:	*20.65 Elev.*	Are there below grade spaces:	*Yes / No*

Assessment of Existing Infrastructure for Accessibility:

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

Provide a description of the development neighborhood and identifying characteristics.	The Project site is located in downtown Boston in a prominent location along the Greenway. The surrounding area includes mid-rise commercial and residential buildings and structured parking garages. The northern portion of the site faces the Greenway. To the south of the site is Faneuil Hall and Quincy Market, with Post Office Square and the Financial District several blocks beyond that. The site also has convenient access to the North End and Boston Harbor.
List the surrounding ADA compliant	The Project site is one block away from Haymarket Station, an ADA compliant

MBTA transit lines and the proximity to the development site: Commuter rail, subway, bus, etc.	station which provides access to the Orange and Green Lines.
List the surrounding institutions: hospitals, public housing and elderly and disabled housing developments, educational facilities, etc.	Institutions within a half-mile of the Project include the St John Elementary School, Eliot Elementary School, Northeastern University, North Bennet Street School, Suffolk University, and the North End Rehab Center,
Is the proposed development on a priority accessible route to a key public use facility? List the surrounding: government buildings, libraries, community centers and recreational facilities and other related facilities.	Facilities within a half-mile of the Project site include Boston City Hall, the Massachusetts State House, the New England Aquarium, and the North End Community Health Center.

Surrounding Site Conditions – Existing:

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

Are there sidewalks and pedestrian ramps existing at the development site?	Yes
If yes above, list the existing sidewalk and pedestrian ramp materials and physical condition at the development site.	Concrete and or brick sidewalks, concrete ramps. Fair condition.
Are the sidewalks and pedestrian ramps existing-to-remain? **If yes,** have the sidewalks and pedestrian ramps been verified as compliant? **If yes,** please provide surveyors report.	Plan is to replace all sidewalks and ramps on the project site due to construction activity.
Is the development site within a historic district? **If yes,** please identify.	No

Surrounding Site Conditions – Proposed

Article 80 | ACCESSIBILTY CHECKLIST

This section identifies the proposed condition of the walkways and pedestrian ramps in and around the development site. The width of the sidewalk contributes to the degree of comfort and enjoyment of walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Typically, a five foot wide Pedestrian Zone supports two people walking side by side or two wheelchairs passing each other. An eight foot wide Pedestrian Zone allows two pairs of people to comfortable pass each other, and a ten foot or wider Pedestrian Zone can support high volumes of pedestrians.

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? See: www.bostoncompletestreets.org	Yes
If yes above, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, Boulevard.	Downtown Mixed Use
What is the total width of the proposed sidewalk? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone.	Surface Road: 16'-6" total feet: 6 foot frontage, 8 foot pedestrian, 2'-6" foot furnishing zone Blackstone: 8.0 foot pedestrian zone North Street: varies 22 to 30 feet: 6 foot frontage, 8 foot pedestrian zone, varying furnishing zone Hanover Street: 17 foot pedestrian zone
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?	Light colored pervious concrete with brick accents.
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the City of Boston Public Improvement Commission?	
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way?	The sidewalk along the Surface Road and North Street are wide enough for a 6 foot café seating strip.
If yes above, what are the proposed dimensions of the sidewalk café or	The café areas will be 6 feet with an 8 foot pedestrian sidewalk.

furnishings and what will the right-of-way clearance be?	

Proposed Accessible Parking:

See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability Handicap Parking Regulations.

What is the total number of parking spaces provided at the development site parking lot or garage?	No on-site parking will be provided
What is the total number of accessible spaces provided at the development site?	N/A
Will any on street accessible parking spaces be required? **If yes,** has the proponent contacted the Commission for Persons with Disabilities and City of Boston Transportation Department regarding this need?	N/A
Where is accessible visitor parking located?	N/A
Has a drop-off area been identified? **If yes,** will it be accessible?	Yes, the drop off zone will be accessbile. The hotel drop off zone faces the Greenway along the Surface Road. Parts of the curb will be depressed for accessibility.
Include a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations. Please include route distances.	A diagram is attached.

Circulation and Accessible Routes:

The primary objective in designing smooth and continuous paths of travel is to accommodate persons of all abilities that allow for universal access to entryways, common spaces and the visit-ability* of neighbors.

**Visit-ability – Neighbors ability to access and visit with neighbors without architectural barrier limitations*

Provide a diagram of the accessible route connections through the site.	A diagram is attached.
Describe accessibility at each entryway: Flush Condition, Stairs, Ramp Elevator.	Hotel lobby entrance will be a flush accessible flush entry with swinging doors as will all of the retail entrances.
Are the accessible entrance and the standard entrance integrated?	Yes
If no above, what is the reason?	
Will there be a roof deck or outdoor courtyard space? If yes, include diagram of the accessible route.	Yes, there is a terrace on the second floor. The floor slab will be depressed so that there is a flush condition at the entrance/egress doors.
Has an accessible routes way-finding and signage package been developed? If yes, please describe.	The signage package will not be designed until there is a Hotel Operator involved with the Project.

Accessible Units: (If applicable)

In order to facilitate access to housing opportunities this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing choice.

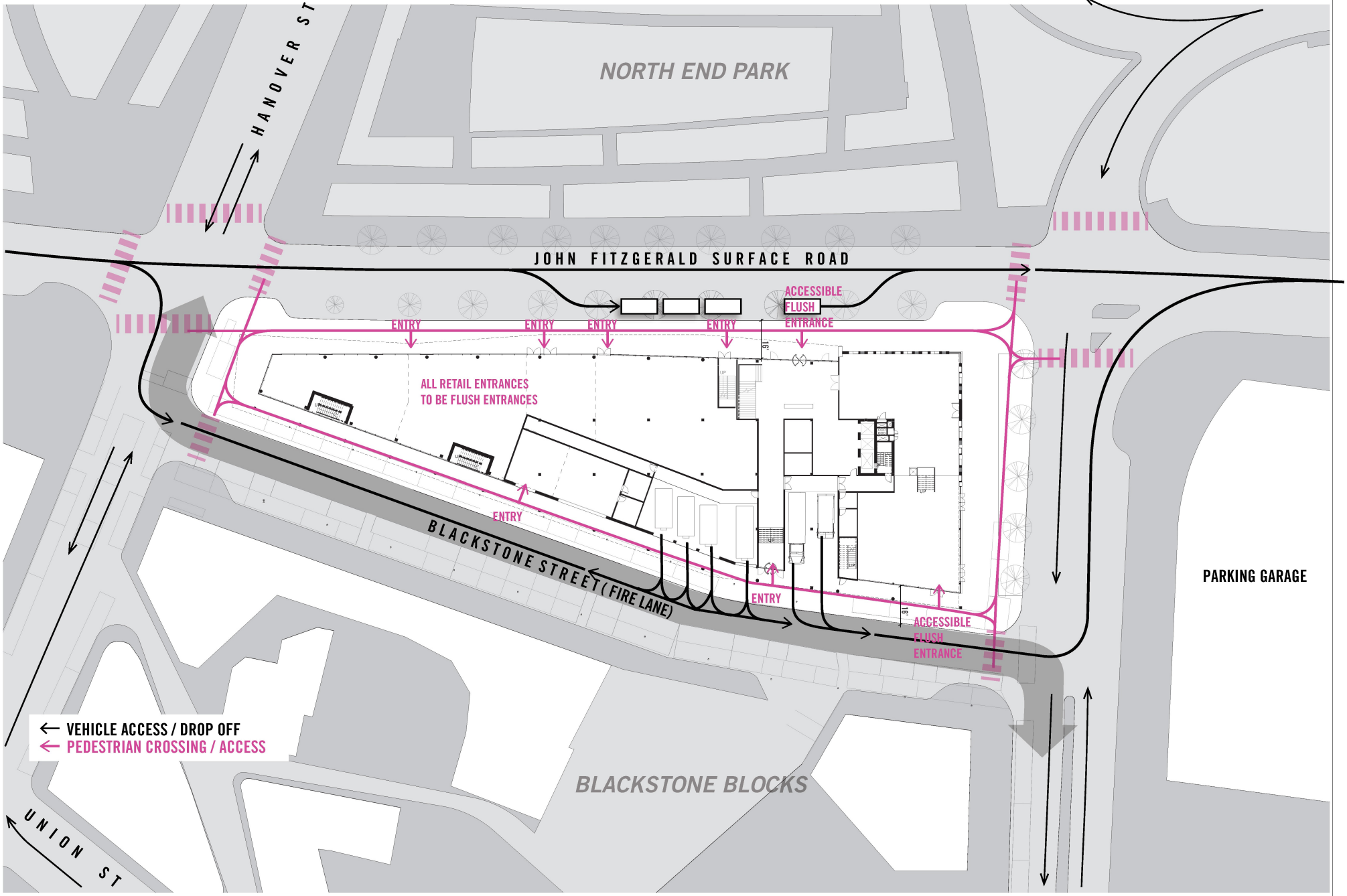
What is the total number of proposed units for the development?	N/A
How many units are for sale; how many are for rent? What is the market value vs. affordable	N/A

breakdown?	
How many accessible units are being proposed?	N/A
Please provide plan and diagram of the accessible units.	N/A
How many accessible units will also be affordable? If none, please describe reason.	N/A
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs at entry or step to balcony. **If yes,** please provide reason.	N/A
Has the proponent reviewed or presented the proposed plan to the City of Boston Mayor's Commission for Persons with Disabilities Advisory Board?	N/A
Did the Advisory Board vote to support this project? **If no,** what recommendations did the Advisory Board give to make this project more accessible?	N/A

Thank you for completing the Accessibility Checklist!

For questions or comments about this checklist or accessibility practices, please contact:

kathryn.quigley@boston.gov | Mayors Commission for Persons with Disabilities



NORTH

1/16" = 1' - 0"

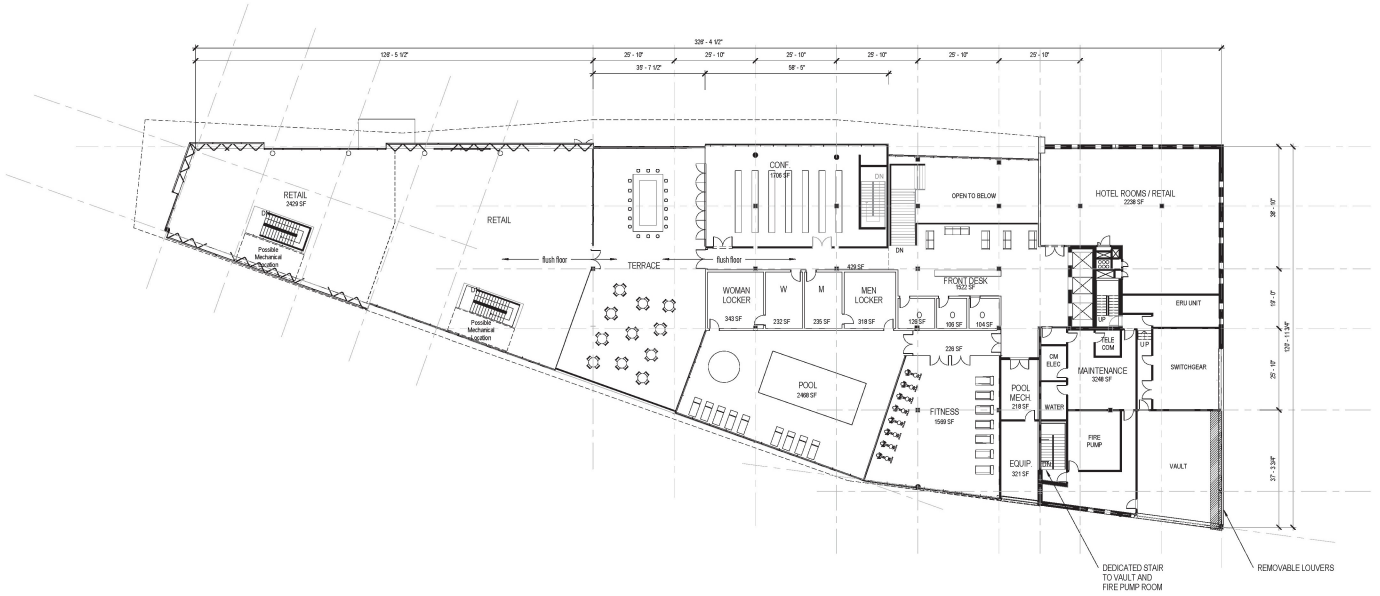
06/25/14

ACCESS AND CIRCULATION

PERKINS +WILL

NORTH

1/16" = 1' - 0"

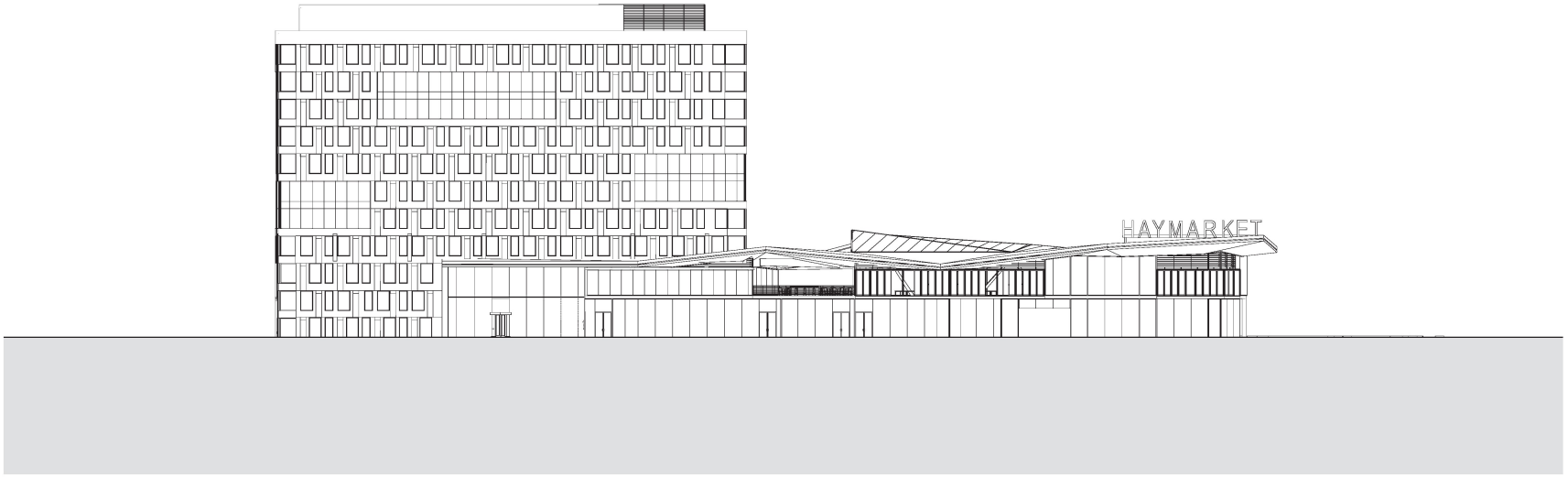


8/1/2014 3:05:24 PM
C:\temp\Parcel 8_Hotel Model 14_VAULT_option A_person.rvt

NORMANDY
REAL ESTATE PARTNERS

SECOND FLOOR

PERKINS
+WILL



2 NORTH ELEVATION
1/16" = 1'-0"

1 SOUTH ELEVATION
1/16" = 1'-0"

ELEVATIONS

PERKINS
+WILL