Expanded Project Notification Form

Submitted Pursuant to Article 80 of the Boston Zoning Code

380 STUART STREET

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

Submitted by:
John Hancock Insurance Company
197 Clarendon Street
Boston, MA 02116

John Hancock

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

In Association with:
Colliers International
Skidmore Owings & Merrill LLP/ CBT Architects
Goulston & Storrs
Vanasse Hangen Brustlin, Inc.
Nitsch Engineering
Haley & Aldrich, Inc..
Cosentini Associates

September 18, 2015

Colliers INTERNATIONAL

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Epsilon ASSOCIATES INC.

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Table of Contents

Table of Contents

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

Introduction/ Project Description

1.0 INTRODUCTION/ PROJECT DESCRIPTION

1.1 Introduction

John Hancock Insurance Company (the "Proponent"), the U.S. arm of the Canadian insurance firm Manulife Financial Corporation, was founded in Boston and has had a presence in the City for over 150 years. The company has strong civic ties to the City of Boston including a 30-plus year sponsorship of the Boston Marathon and eight years offering the MLK Summer Scholars program to more than 600 Boston teens. John Hancock proposes to redevelop the parcel located at 380 Stuart Street, between Berkeley and Clarendon Streets (the "Project Site") in order to provide future flexibility in meeting the needs of their growing business. The proposed project, to be known as 380 Stuart Street (the "Proposed Project"), consists of an approximately 26-story, environmentally sustainable, Class-A office building containing approximately 615,000 square feet (sf) of office space. The Proposed Project will also include approximately 10,000 sf of ground floor retail/café space, and a four-level, 175-space, below-grade parking garage. The building will function as a new 21st century workspace for John Hancock employees and may also house other commercial tenants.

The Proposed Project will embody bold architecture, continuing John Hancock's commitment to world-class architecture for its buildings in Boston (three of which have received the Boston Society of Architects Harleston Parker Award). The Proposed Project's exterior architecture will be a striking addition to the Stuart Street skyline and will enhance the street level experience. In addition to transforming the streetscape along this mid-block site into a destination with an activated ground floor, the Proposed Project will also generate construction and full-time job opportunities, improved tax revenues for the City of Boston, and numerous other public benefits.

Because the Proposed Project exceeds 50,000 square feet of gross floor area, the Proposed Project is subject to the requirements of Large Project Review pursuant to Article 80B of the Boston Zoning Code (the Code). 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.

1.1.1 Potential Future Pedestrian Connection

Included in this PNF are narrative descriptions and images depicting a potential future pedestrian connector over Stuart Street linking the proposed 380 Stuart Street project and John Hancock's existing office complex. While the Proponent has included these descriptions and depictions of this feature in this PNF, the Proponent envisions this as a potential future addition to the Hancock campus and is not seeking formal review or approval of this component of the project at this time. In the event that the Proponent wishes to move forward with the addition of this pedestrian connector at a future point in time, a supplemental filing will be made to seek formal review of this element by the BRA, Boston Civic Design Commission, and other appropriate agencies.

1.2 Project Identification

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

Address/Location: 380 Stuart Street

Developer: John Hancock Insurance Co
197 Clarendon Street
Boston, MA 02116
Bruce Pearson

Development Management: Colliers International
160 Federal Street
Boston, MA 02110
(617) 330-8000
Yanni K. Tsipis

Architect: Skidmore Owings & Merrill LLP
14 Wall Street
New York, NY 10005
(212) 298-9300
Brian Lee

CBT Architects
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Boston, MA 02114
(617) 262-4354
David Nagahiro
David Hancock
Philip Casey

Legal Counsel: Goulston & Storrs
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Doug Husid

Permitting Consultants:
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3 Clock Tower Place, Suite 250
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(978) 897-7100
Peggy Briggs
Talya Moked

Transportation and Parking Consultant
Vanasse Hangen Brustlin, Inc.
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Boston, MA 02110
(617) 728-7777
Sean Manning
Ryan White

Civil Engineer
Nitsch Engineering
2 Center Plaza, Suite 430
Boston, MA 02108
(617) 338-0063
John Schmid

MEP Engineer
Cosentini Associates
101 Federal Street, #700
Boston, MA 02110
(617) 494-9090
Bob Leber
Bob Hamilton

Geotechnical Consultant:
Haley & Aldrich, Inc.
465 Medford Street
Boston, MA 02129
(617) 886-7400
Steve Kraemer

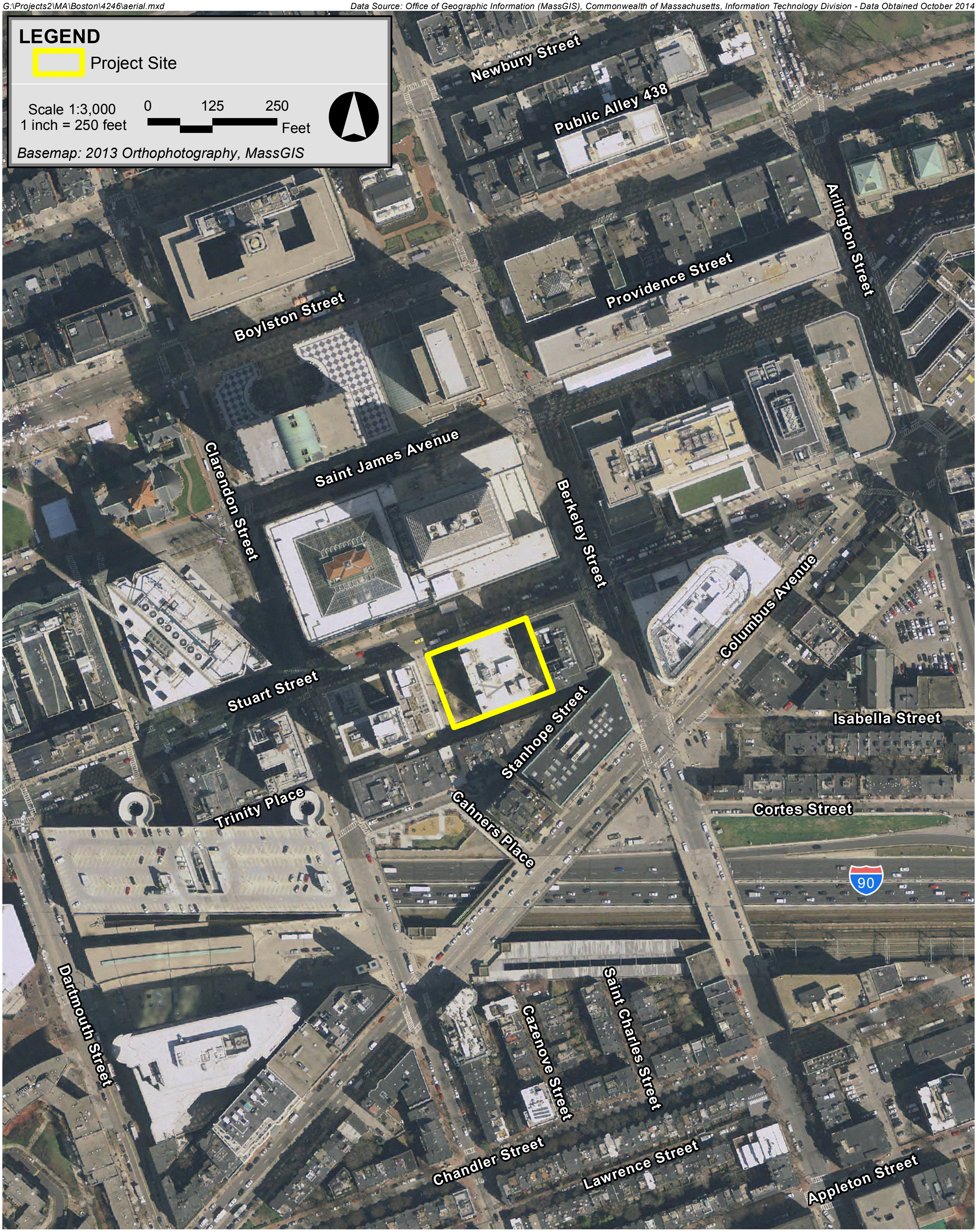
1.3 Project Description

1.3.1 Project Site

The Project Site is located at 380 Stuart Street on the south side of the street between Berkeley and Clarendon Streets in the Stuart Street corridor. The approximately 30,617 square foot Project Site is composed of three parcels, as shown in the site survey in Appendix A, all of which are owned by the Proponent. The existing building on the Project Site, built in 1924, is nine stories tall with approximately 140,000 sf of office space and accessory ground floor uses. See Figure 1-1 for an aerial locus map.

G:\Projects2\MA\Boston\4246\aerial.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014



380 Stuart Street   Boston, Massachusetts

Figure 1-1

Aerial Locus Map

1.3.2 Area Context

Stuart Street runs between Copley Place to the west and Washington Street to the east, and contains a variety of building types that include high-rise office, hotel and residential buildings, as well as parking garages, restaurants and smaller scale commercial businesses. The corridor is known as the City's "high spine" and is home to many mid-rise and high-rise buildings. Figure 1-2 presents the Project Site in the context of the high spine. At the western end of the Stuart Street corridor is the 38-story Boston Marriott Copley Place and the 38-story Westin Hotel at Copley Place; and at the eastern end of the corridor is the 25-story W Boston Hotel and Residences at the corner of Stuart and Tremont streets, and the 29-story Ava Boston residential tower. In between these buildings stand the 33-story Clarendon condominiums and apartments at the corner of Clarendon Street, and the iconic 60-story 200 Clarendon Street, Boston's tallest building, also at the corner of Clarendon Street. To the west, at the corner of Stuart Street and Trinity Place will be a 33-story mixed-use building located at 40 Trinity Place. At the corner of Berkeley and Stuart streets is the new 23-story Liberty Mutual Home Office building. These buildings vary in character, and contribute in their own way to the existing Back Bay skyline which includes Boston's tallest and its most iconic buildings. A major new 47-story residential tower by Simon Properties at Copley Place has been approved by the City and is expected to be added to the skyline along the Stuart Street corridor as well.

1.3.3 Proposed Project

The Proposed Project will provide John Hancock with the flexibility to meet the future needs of their growing business. Approximately 615,000 sf of new Class A commercial office space will occupy a uniquely curved glass structure that will complement the existing and proposed series of towers in the City's high spine. John Hancock employees will occupy a portion of the building; the remainder of the building is expected to be leased for use by third-party commercial office users. Approximately 10,000 sf of ground floor retail/café space will bring new energy to the Stuart Street corridor and an updated streetscape that will dramatically improve the character of the pedestrian environment on this block (see Figure 1-3). The proposed street-level environment is a significant improvement over the existing building, with its first floor consisting of heavy masonry and minimal pedestrian level activity.

To enhance the campus connectivity and create a safe and secure connector for John Hancock employees who will occupy facilities on both sides of Stuart Street, an elevated pedestrian connector featuring transparent glass is envisioned as a potential future addition to connect the existing John Hancock campus on the north side of Stuart Street with the new office facilities on the south side of Stuart Street (see Figure 1-4). The potential future crossing would reduce the number of at-grade mid-bock crossings of Stuart Street by John Hancock employees, eliminating traffic impacts and safety concerns. A tunnel connection would not be feasible because of the dense network of utilities running under Stuart Street.

Figure 1-2

Area Context

Figure 1-3

View from Stuart Street facing Southwest

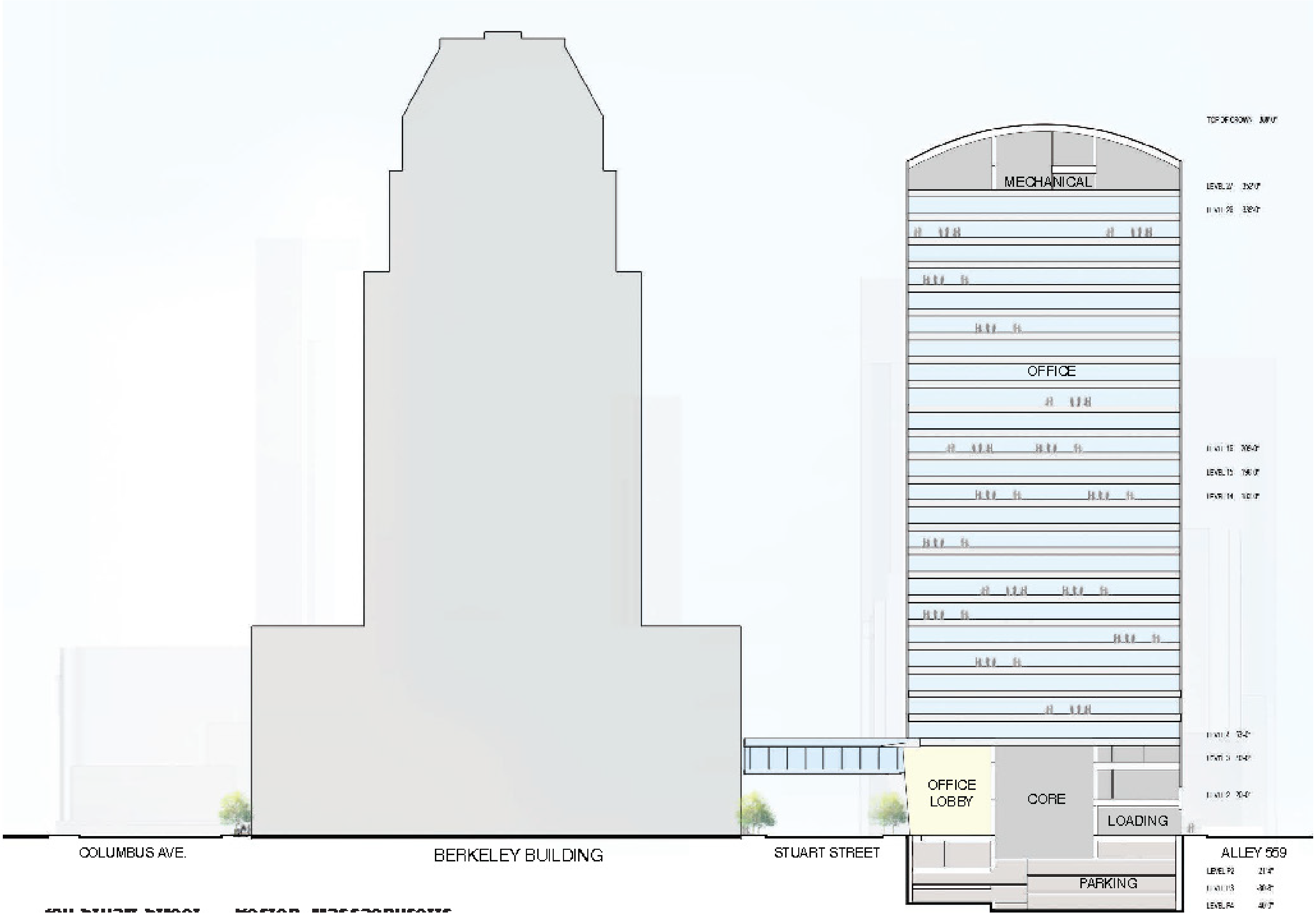


Figure 1-4

North-South Section

The Proposed Project will respect and respond to its urban context by delivering a design that works well at several different scales. At the pedestrian scale, it will offer a one-story pedestrian pathway between blocks that will be lined with retail, tables, chairs, plants, trees and public art. Figure 1-5 presents a site plan illustrating these new public real improvements. On the neighborhood scale, a three-story sculptural gesture at the main entry will announce the building, creating a strong mid- block presence (see Figure 1-6).

At the city scale, the building's bold form will add a dynamic new element to Boston's skyline and act as an extension of the high urban spine (see Figure 1-7).

Approximately 175 below-grade parking spaces will serve the Proposed Project. The Proponent is committed to limiting on-site parking supporting the Proposed Project to only 0.28 spaces per 1,000 sf of building space. This limited parking will promote proactive public transportation, bicycle and pedestrian commuting patterns for employees who work in the Proposed Project.

See Figures 1-8 through 1-13 for floor plans and elevations.

1.3.4 Consistency with the Stuart Street Planning Study

The Proposed Project is located within the Stuart Street Planning Study area, bounded by St. James Avenue to the north, Dartmouth Street to the west, Columbus Avenue and Cortes Street to the south and Arlington Street to the east. The Stuart Street Planning Study was a multi-year planning process involving multiple stakeholders organized to propose development guidelines and zoning recommendations for the Stuart Street Planning Study area. In November 2010, the Stuart Street Planning Study Proposed Development Review Guidelines (henceforth the "Stuart Street Planning Study") were issued, but they have not been formally adopted.

The underlying general goals of the Stuart Street Planning Study are to:

- Provide an area for economic growth and urban vitality;
- Improve the district's quality of character and environmental sustainability; and
- Preserve and protect both the immediate area and adjacent neighborhoods.

The Proposed Project has been design to be consistent with the intent of the Stuart Street Planning Study by:

- Creating high-quality continuous street frontage that will be activated with ground floor retail/café space;

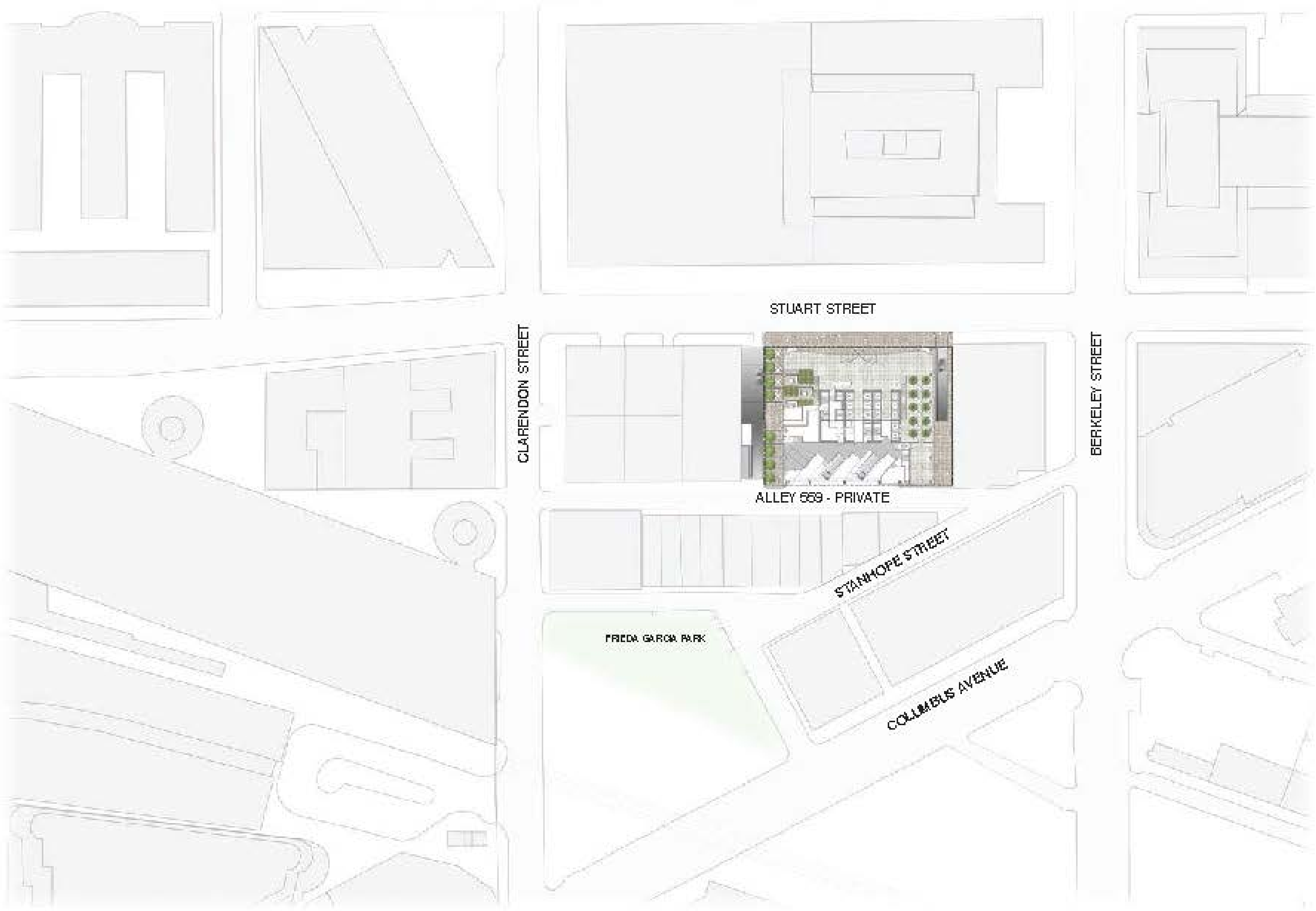


Figure 1-5

Site Plan

380 Stuart Street **Boston, Massachusetts**

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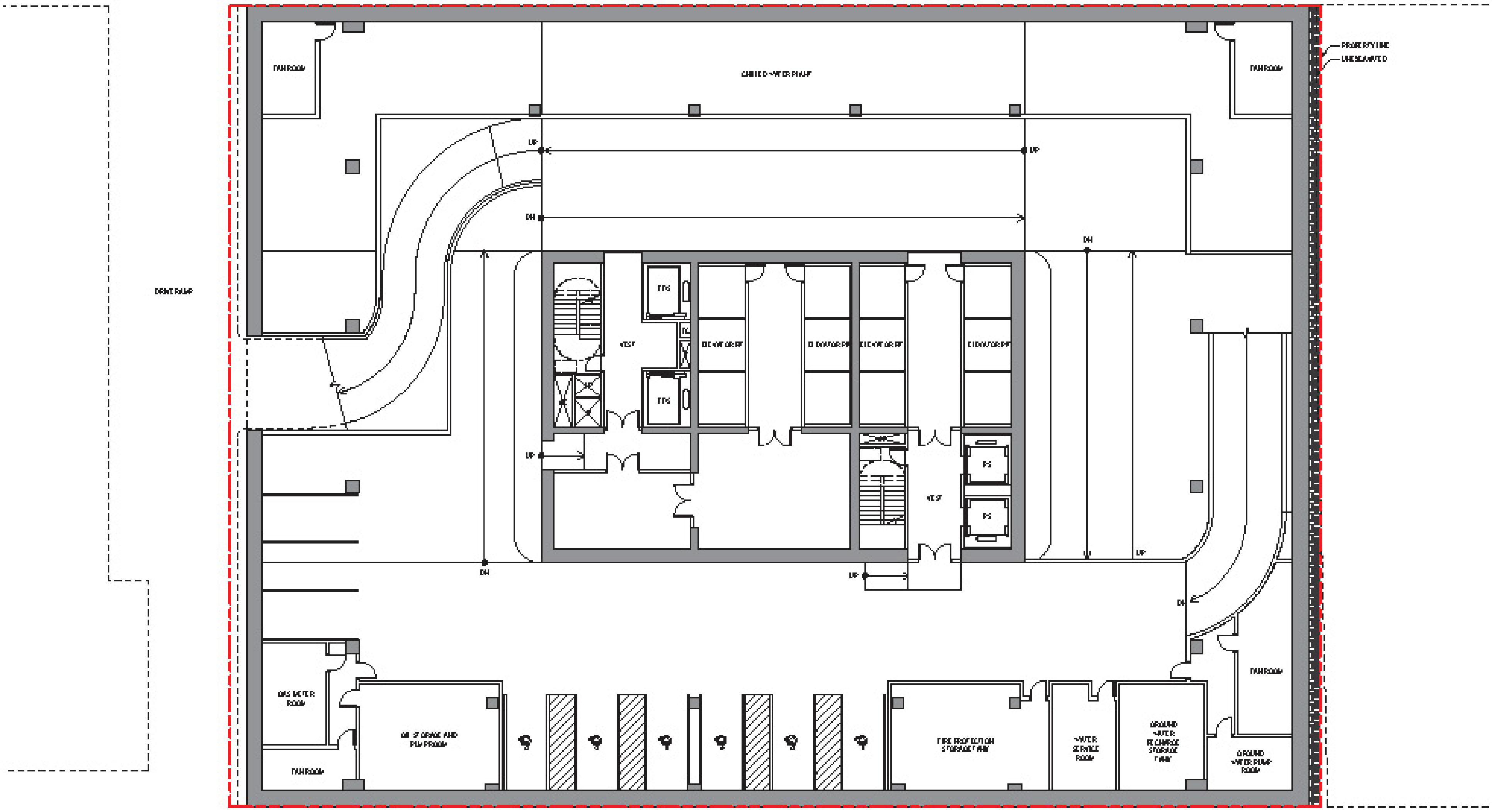
Figure 1-6

View from Stuart Street facing the Proposed Project

380 Street Street **Boston, Massachusetts**

Figure 1-7

View from Boston Common



380 Stuart Street **Boston, Massachusetts**

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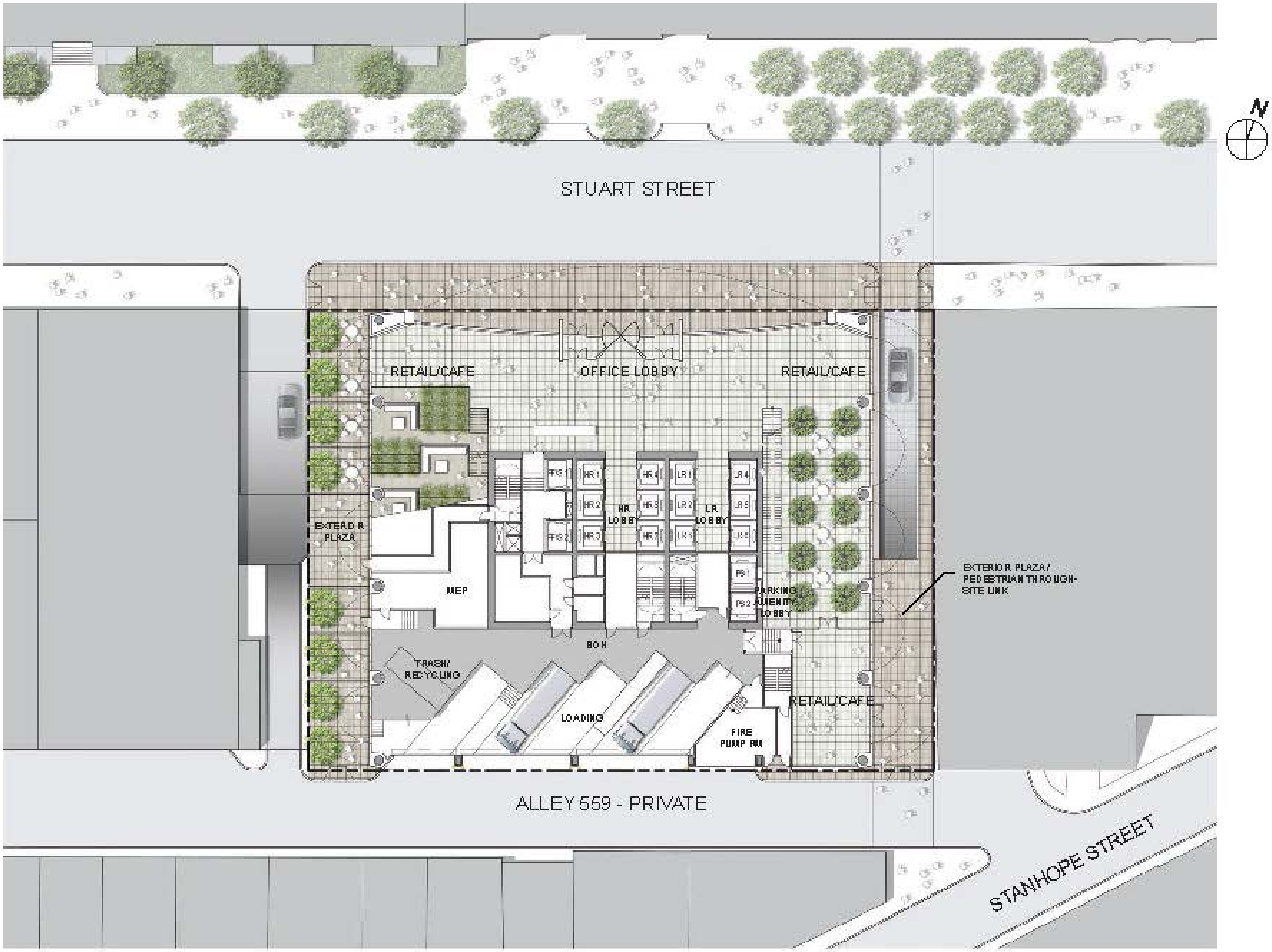
Figure 1-8

Level P1 Floor Plan



380 Stuart Street Boston, Massachusetts

Figure 1-9

Ground Floor Plan

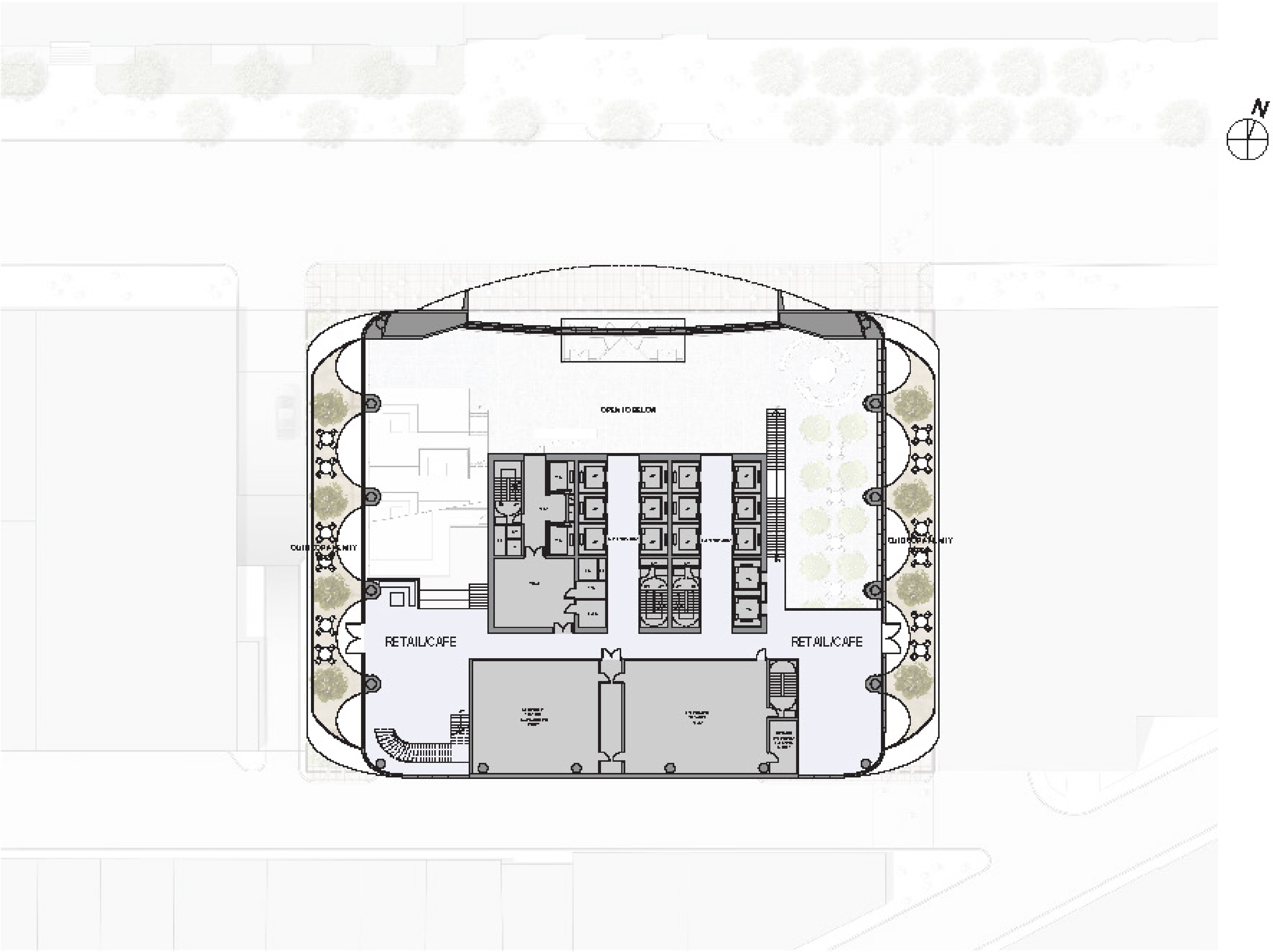


Figure 1-10

Second Floor Plan

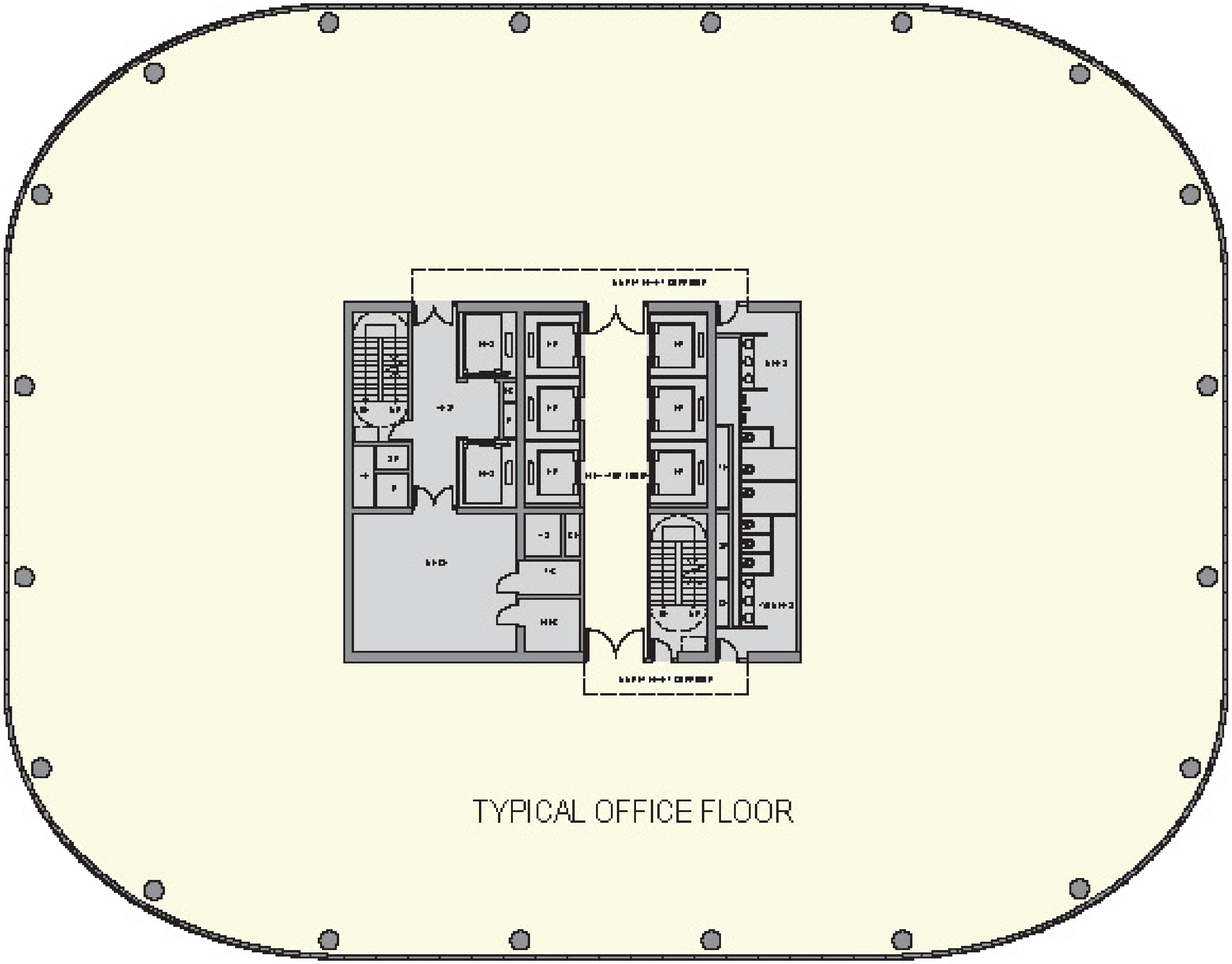
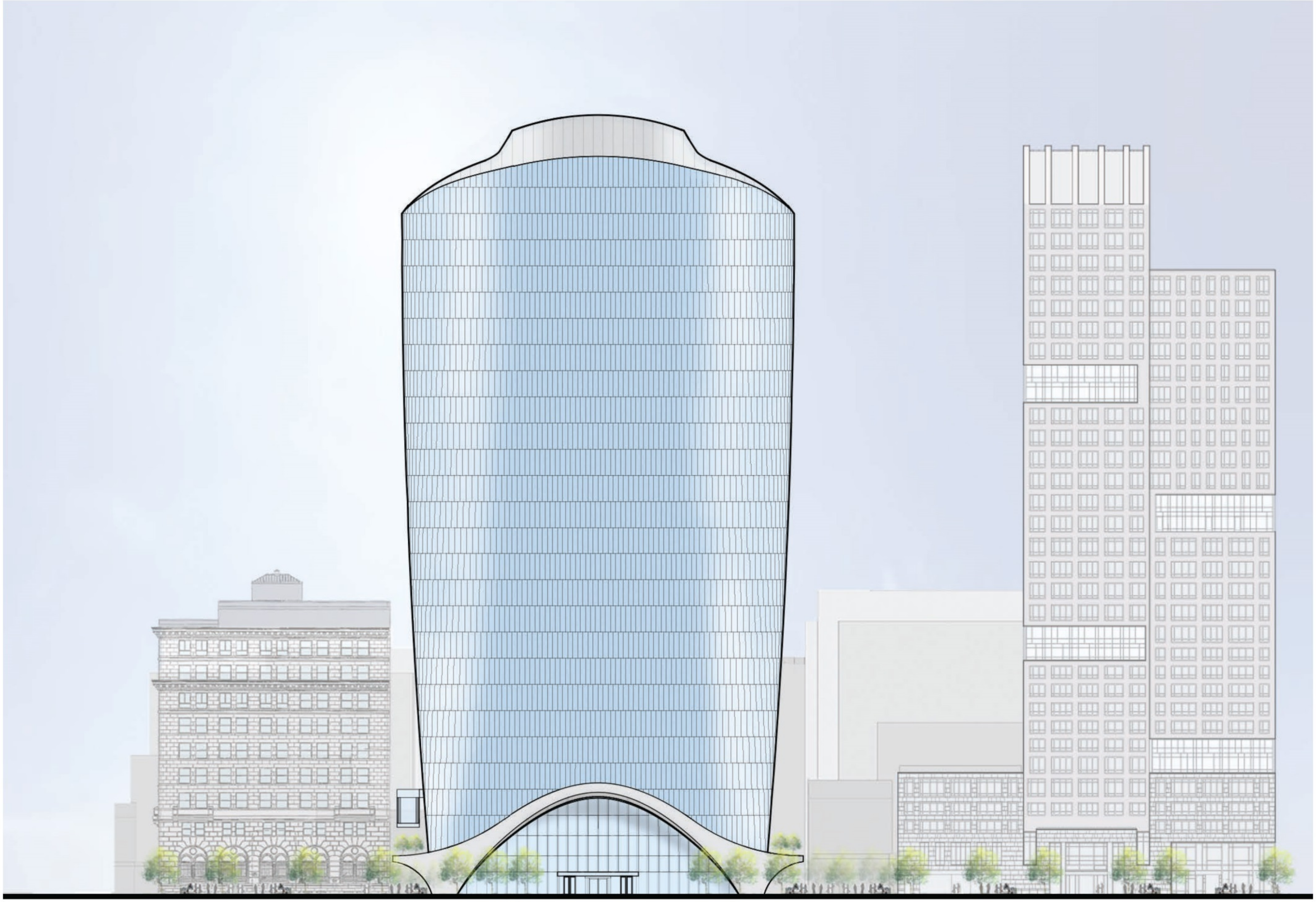


Figure 1-11

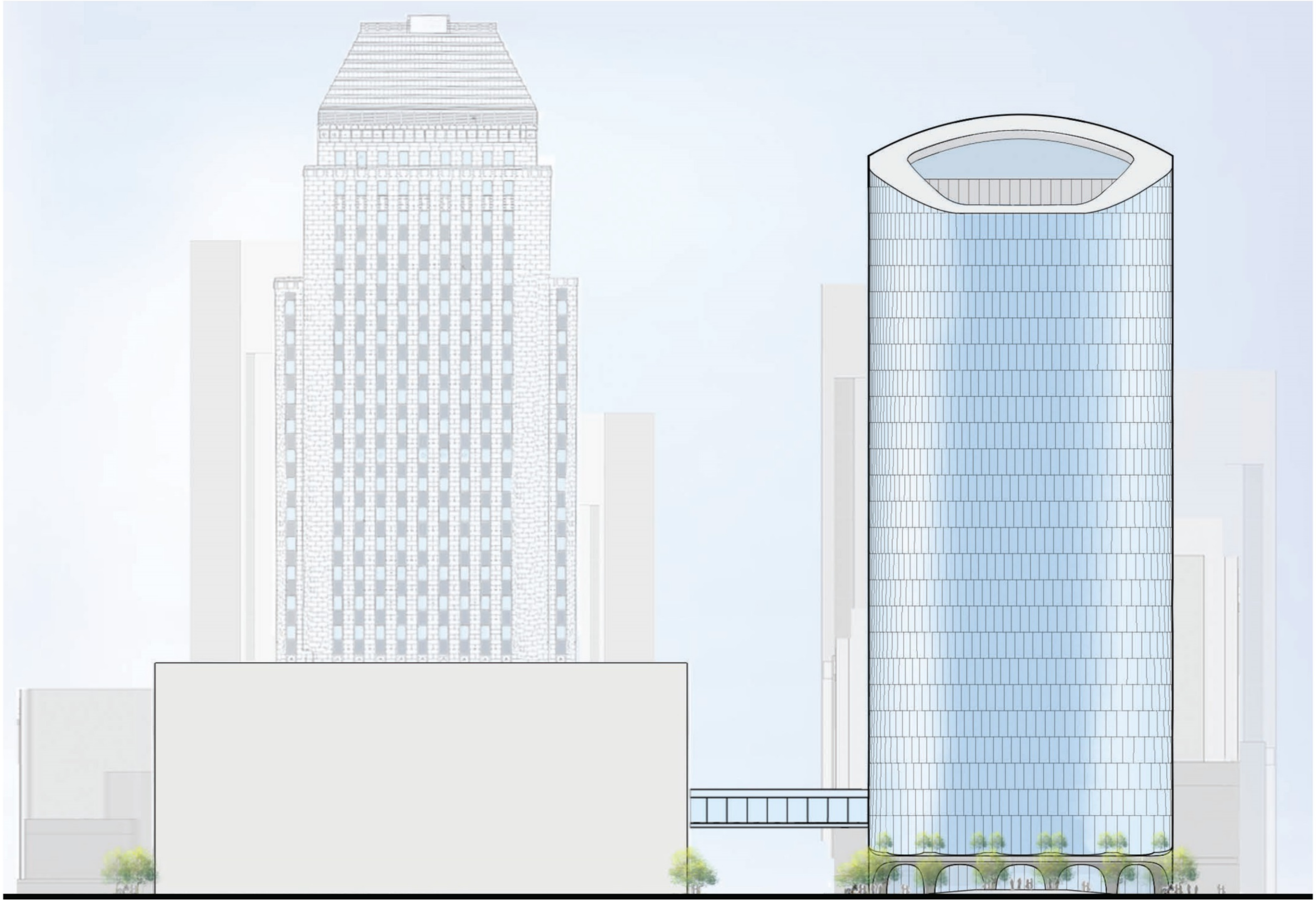
Typical Upper Floor Plan



380 Stuart Street **Boston, Massachusetts**

Figure 1-12

North Elevation



380 Stuart Street **Boston, Massachusetts**

Figure 1-13

West Elevation

- Exceeding the sustainability requirements of Article 37 of the Boston Zoning Code by constructing a building that will be Leadership in Energy and Environmental Design (LEED) certifiable at the Gold level;
- Creating innovative and architecturally bold new workplace opportunities for a variety of business types while enhancing the public realm and creating new pathways through the Stuart Street corridor that do not exist today; and
- Designing the building to minimize wind and shadow impacts on the surrounding neighborhood and civic resources.
- Limiting the parking supply on site to encourage the use of public transportation and implementing a proactive Transportation Demand Management program such that the Proposed Project will not result in any measurable changes to peak hour operating conditions.

1.4 Public Benefits

The development of the Proposed Project will generate myriad public benefits for the surrounding neighborhoods and the City of Boston as a whole, both during construction and on an ongoing basis upon its completion. These public benefits fall into multiple categories, outlined below.

1.4.1 Financial Benefits

The Proposed Project will result in significant financial benefits to the City of Boston and its residents, including:

- Significant additional real estate tax revenues to the City's General Fund, projected to total approximately $5 million of net new tax revenue each year.
- Approximately $5 million in Housing and Job Linkage contributions;
- The creation of approximately 3,000 new full-time employment opportunities within the building; and
- The creation of over 1,500 construction jobs.

1.4.2 Urban Design Benefits

The development of the Proposed Project will help to define the image and design quality of this block of the Stuart Street planning area, and will enhance the overall urban design quality and public realm in the vicinity of the Project Site. Improvements to the public realm will include the following:

- Creation of a new mid-block pedestrian arcade connecting Stuart Street with Stanhope Street;

- Providing approximately 10,000 sf of ground floor retail/café space, which will create pedestrian activity around the Project Site;

- Enhancing the streetscape and the pedestrian experience through the use of lighting and transparent glass on the façade that will blend the boundaries between the indoor and outdoor environments and invite pedestrians into the building lobby; and

- Improving the urban design characteristics and aesthetic character of the Proposed Project's surroundings through the introduction of high-quality architecture to the Project Site.

1.4.3 Smart Growth/Transit-Oriented Development

The Proposed Project is consistent with smart-growth and transit-oriented development principles. In addition to being built on previously developed land, the Proposed Project is located adjacent to the Back Bay Commuter Rail, Amtrak, and Orange Line Station, and therefore concentrates new commercial uses in close proximity to major regional rapid transit, commuter rail, and bus lines that provide easy access to the Project Site from other neighborhoods of the City of Boston and the surrounding region. The Proposed Project will create thousands of new pedestrian trips every day, enlivening the proximate streetscape and providing more foot traffic that will support local businesses and restaurants. For an international corporation that could locate new growth anywhere in the world, locating this new facility in the urban core and in such close proximity to a high density of local and regional public transportation options demonstrates John Hancock's commitment to sustainable, smart growth strategies for its global workforce.

1.5 City of Boston Zoning

1.5.1 Project Scope

As outlined above, the Proposed Project consists of the following development program:

Construction of a new approximately 625,000 square foot commercial office building (the "Proposed Project") at 380 Stuart Street; this new building may, subject to appropriate future approvals, at some future time be connected by an approximately 3,000 sf pedestrian bridge over Stuart Street to the Stuart Street side of the existing building located at 200 Berkeley Street.

1.5.2 *Large Project Review*

Because the Proposed Project involves new construction in excess of 50,000 square feet of Gross Floor Area, the Proposed Project is subject to Large Project Review pursuant to Article 80B of the Boston Zoning Code (the "Code" or "Zoning Code"). Under the Mayor's Executive Order dated October 10, 2000, and amended on April 3, 2001, regarding mitigation for development projects, the Mayor is expected to appoint an Impact Advisory Group to advise the BRA on mitigation measures for projects undergoing Large Project Review.

Also in connection with the Large Project Review, the Proposed Project will be subject to, among other requirements: (i) Boston Civic Design Commission review; (ii) Development Impact Project Exactions under Section 80B-7 of the Code; (iii) the green building requirements of Article 37 of the Code; (iv) the provisions of Article 32, the Groundwater Conservation Overlay District; and (v) the provisions of Article 27D, the Downtown Interim Planning Overlay District ("IPOD").

1.5.3 *Zoning District*

The Project Site is located within the Business 8 ("B-8") Subdistrict, as well as Subdistrict K of the Downtown IPOD, the Restricted Parking Overlay District and the Groundwater Conservation Overlay District. Zoning relief for the Proposed Project will be required. Zoning relief is anticipated to be obtained by an amendment to the Downtown IPOD to allow Planned Development Areas to be adopted for the Project Site. In connection with this amendment of the Downtown IPOD, the Planned Development Area for Planned Development Area No. 1 will be extended to include the Project Site (it currently extends to the mid-point of Stuart Street along the Project Site's frontage) and an Amended and Restated Development Plan for the Planned Development Area No. 1 (the "PDA Plan Amendment") will be adopted.

1.5.4 *Uses*

The Proposed Project's office, retail, service, restaurant, and parking uses and associated accessory uses including, without limitation, conference centers, fitness center and food service uses are all allowed as-of-right in the B-8 Subdistrict. Because the Project Site is located within the Restricted Parking Overlay District, the Proposed Project's accessory parking is a conditional use. As noted above, zoning relief will be obtained via the PDA Plan Amendment. The appropriate number of required off-street parking spaces and off-street loading facilities for the 380 Stuart Street Project will be determined through Large Project Review. The Proposed Project's general conformity of proposed parking, including bicycle parking, to Boston Transportation Department and Stuart Street Planning Study Guidelines (defined below) is addressed in Chapter 2.

1.5.5 Building Dimensions

Project Site. The B-8 District has minimal dimensional requirements, sets no building height limit, and has a maximum FAR of 8.0. The Downtown IPOD sets a maximum building height of 125 feet and an "enhanced" building height of 155 feet and sets a maximum FAR of 8.0 and an "enhanced" FAR of 10.0. The Project Site is located within the Stuart Street Planning Study area and was addressed in the Stuart Street Planning Study Proposed Development Review Guidelines dated November 23, 2010 (the "Stuart Street Planning Study Guidelines"). The Stuart Street Planning Study Guidelines identified the Project Site as being appropriate for building heights of up to 356 feet and an FAR of up to 17.5, provided a project undergoes Large Project Review, meets certain performance criteria, and provides certain public benefits.

As addressed elsewhere in this PNF, while the Stuart Street Planning Study Guidelines have not been adopted or enacted into formal zoning, the Proponent understands the Authority is taking steps to adopt them and eventually enact them as zoning. The Proposed Project has been designed to be generally consistent with the dimensional requirements of the Stuart Street Planning Study Guidelines. For example, while the Proposed Project has a preliminary height of approximately 388 feet, including rooftop mechanicals, the "shoulder" of the Proposed Project building has a preliminary height of approximately 340 feet, in conformance with the Stuart Street Planning Study Guidelines' height requirements and meeting the urban design objectives of the Guidelines such that the Proposed Project will stand "shoulder to shoulder" with the "Old" Hancock building located at 200 Berkeley Street. In addition, while the Proposed Project's preliminary FAR of 20.5 exceeds the Stuart Street Planning Study Guidelines' FAR limit of 17.5, when the existing and proposed gross floor area for the Proposed Project is added to the existing and future gross floor area of the buildings described in the draft PDA Plan Amendment, there is a combined FAR of approximately 9.6, in conformance with the Stuart Street Planning Study Guidelines' FAR limits. The Proponent intends to design the Proposed Project to reflect applicable performance criteria and provide public benefits similar to those that are described in the Stuart Street Planning Study Guidelines and that may eventually be required by final Stuart Street zoning. The Proposed Project's preliminary performance and public benefit criteria are generally summarized as follows.

1. As explained in more detail in Chapter 6, the existing building located at the Project Site does not meet National Register criteria for individual listing.

2. As explained in more detail in Chapter 4, the Proposed Project will incorporate advanced sustainable building technologies, practices, and materials that will achieve certifiable status at a minimum of LEED Gold level, or will meet or exceed comparable environmental standards in effect.

3. The Proposed Project will either: (i) contribute to an existing streetscape/pedestrian and bicycle fund for improved safety, connectivity and beautification of the public realm; or (ii) provide publicly accessible art or provide a donation to the Boston Arts Commission's Fund for Boston Neighborhoods.

4. Above the Proposed Project's base level street wall height, the 380 Stuart Project building: (i) will not exceed 30,000 square feet of Gross Floor Area per floor; (ii) will not exceed 275 feet in length on each planar facet of the building; and (iii) will be set back from each exterior lot line at least 5-15 feet, with an average of greater than 10 feet.

5. As explained in more detail in Section 3.2, the Proposed Project will not cast shadows for more than two hours from 8:00 a.m. through 2:30 p.m., on any day from March 21 through October 21, in a calendar year, on any portion of Copley Square Park. In fact, the Proposed Project's aggregate shadow impacts on Copley Square Park are de minimis.

6. As explained in more detail in Section 3.1, the Proposed Project is not expected to significantly adversely affect pedestrian level winds and there will be no new uncomfortable or dangerous wind conditions created by the Proposed Project's construction.

7. The 380 Stuart Project will provide an information panel locating nearby transportation facilities and bicycle parking with related facilities, along with an transportation demand management program consistent with John Hancock's campus-wide commitment to reducing commuting by personal passenger vehicle.

Notwithstanding generally conformity to the Stuart Street Planning Study Guidelines, zoning relief for the 380 Stuart Project will be required from the building height and FAR requirements of underlying zoning and the Downtown IPOD. Based on the preliminary design, it is possible additional zoning relief may be required for such requirements as building or parapet setbacks. As noted above, zoning relief will be obtained with the PDA Plan Amendment.

1.5.6 Other Requirements

The Proposed Project would require an interim planning permit pursuant to the Downtown IPOD. The 380 Stuart Project would also require a conditional use permit for work in the Groundwater Conservation Overlay District and would require a conditional use permit for the creation of parking spaces in the Restricted Parking Overlay District and will be subject to design review and to certain signage requirements of the Code. Zoning relief for each and all of these items and any other applicable provisions of underlying zoning will be obtained through the PDA Plan Amendment.

1.6 Legal Information

1.6.1 Legal Judgments Adverse to the Proposed Project

The Proponent is unaware of any legal judgments or actions pending that concern the Proposed Project.

1.6.2 History of Tax Arrears on Property

The Proponent is not delinquent in connection with any property owned within the City of Boston.

1.6.3 Site Control/ Public Easements

The Proponent owns the Project Site pursuant to a deed recorded at the Suffolk Registry of Deeds (the "Registry") in Book 16197, Page 298 and filed with the Suffolk Registry District of the Land Court (the "Land Court") as Document No. 463523. See also Certificate of Merger filed with the Land Court as Document No. 652284. Based on the completed survey of the Project Site completed by Harry R. Feldman, Inc. dated December 20, 2002, there are no public easements into, through, or surrounding the Project Site. The Project Site is benefited by certain access easements and rights in Alley No. 559 for access and utilities.

No private agreements with third-party property owners are required to construct the Proposed Project.

1.7 Anticipated Permits

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

Table 1-1 Anticipated Permits and Approvals

Agency	Approval
Boston	
Boston Redevelopment Authority	Article 80B Large Project Review Cooperation Agreement Development Impact Project Agreement Certification of Consistency
Boston Zoning Commission	Text Amendment PDA Development Plan Approval
Boston Civic Design Commission	Design Review
Boston Employment Commission	Boston Residents Construction Employment Agreement
Boston Landmarks Commission	Article 85 Demolition Delay Review

Table 1-1 Anticipated Permits and Approvals (Continued)

Agency	Approval
Boston Water and Sewer Commission	Site Plan Review Water and Sewer Connection Permits Cross Connection Backflow Prevention Approval (as required) Temporary Construction Dewatering Permit
Public Improvements Commission	Pedestrian Easement Acceptance Specific Repair Plan Permit/Agreement for Temporary Earth Retention Systems, Tie-back Systems and Temporary Support of Subsurface Construction (as required) Vertical Discontinuance Permit for Sign, Awning, Hood, Canopy or Marquee (as required)
Boston Transportation Department	Construction Management Plan Transportation Access Plan Agreement
Boston Public Works Department	Curb Cut Permit(s) Street Opening Permit (as required) Street/Sidewalk Occupancy Permit (as required)
Boston Air Pollution Control Commission	Parking Freeze Exemption
Public Safety Commission Committee on Licenses	Permit to Erect and Maintain Garage; Inflammable Storage License
Boston Inspectional Services Department	Demolition Permits Building Permits Certificates of Occupancy
State	
Department of Environmental Protections	Sewer Connection Permit of Self-Certification (as required) Fossil Fuel Utilization Permit (as required) Notice of Demolition/Construction
Massachusetts Water Resources Authority	Temporary Construction Dewatering Permit
Federal	
Environmental Protection Agency	NPDES General Construction Permit
Federal Aviation Administration	Determination of No Hazard to Air Navigation

1.8 Public Participation

In advance of this filing, John Hancock has met with numerous stakeholders (e.g. local elected officials, abutting property owners, and other interested parties) regarding the Proposed Project to ensure that information about the Proposed Project was widely available to interested parties. The submission of this PNF commences the formal regulatory review and community process regarding the Proposed Project.

1.9 Schedule

Construction is anticipated to begin in late 2016 and will finish in early 2019.

Chapter 2.0

Transportation Component

2.0 TRANSPORTATION

2.1 Introduction

This section presents an evaluation and summary of existing and future transportation infrastructure and operations for the Proposed Project. The transportation study has been developed to understand and mitigate the transportation impacts of the Proposed Project and to develop appropriate transportation improvements in Boston's Back Bay neighborhood. This study analyzes the following:

- Vehicle traffic on study area roadways and intersections;
- Parking conditions;
- Loading and service activities;
- Pedestrian and bicycle operations; and
- Public transportation services.

In addition, this study quantifies and assesses the transportation impacts that are expected within the Proposed Project area under future conditions.

The purposes of these analyses are to:

- Define and quantify existing transportation conditions in the Project study area as defined by the BTD;
- Estimate the transportation impacts that will be generated under future conditions based on the anticipated program for the Proposed Project;
- Develop a set of mitigation strategies and improvement measures which will help to lessen the transportation effects of the Proposed Project; and
- Demonstrate that these transportation mitigation efforts will meet or exceed BRA and BTD requirements, and will serve as exceptional public benefits.

The sections below provide an overview of the Proposed Project and a summary of findings of the transportation analysis, including anticipated impacts, proposed mitigation, a discussion of the study methodology, and a description of the study area. Subsequent sections provide detailed discussions of existing and future conditions expected both with and without the Proposed Project.

2.1.1 *Project Overview*

The Proposed Project, located at 380 Stuart Street, includes demolition of the existing office building currently on the site and the construction of an approximately 625,000 square foot office building with ground floor retail/ cafe. As seen in Figure 2-1, the Proposed Project is bounded by Stuart Street to the north, Alley 559 to the south, and existing buildings to the east and west. The Proposed Project will include up to 615,000 sf of office space with 10,000 sf of ground floor retail/café space. A 175-space below-grade parking garage and a pedestrian bridge over Stuart Street to 200 Berkeley will also be constructed.

A summary of the Proposed Project program is presented in Table 2-1.

Table 2-1 380 Stuart Street Project Program Summary

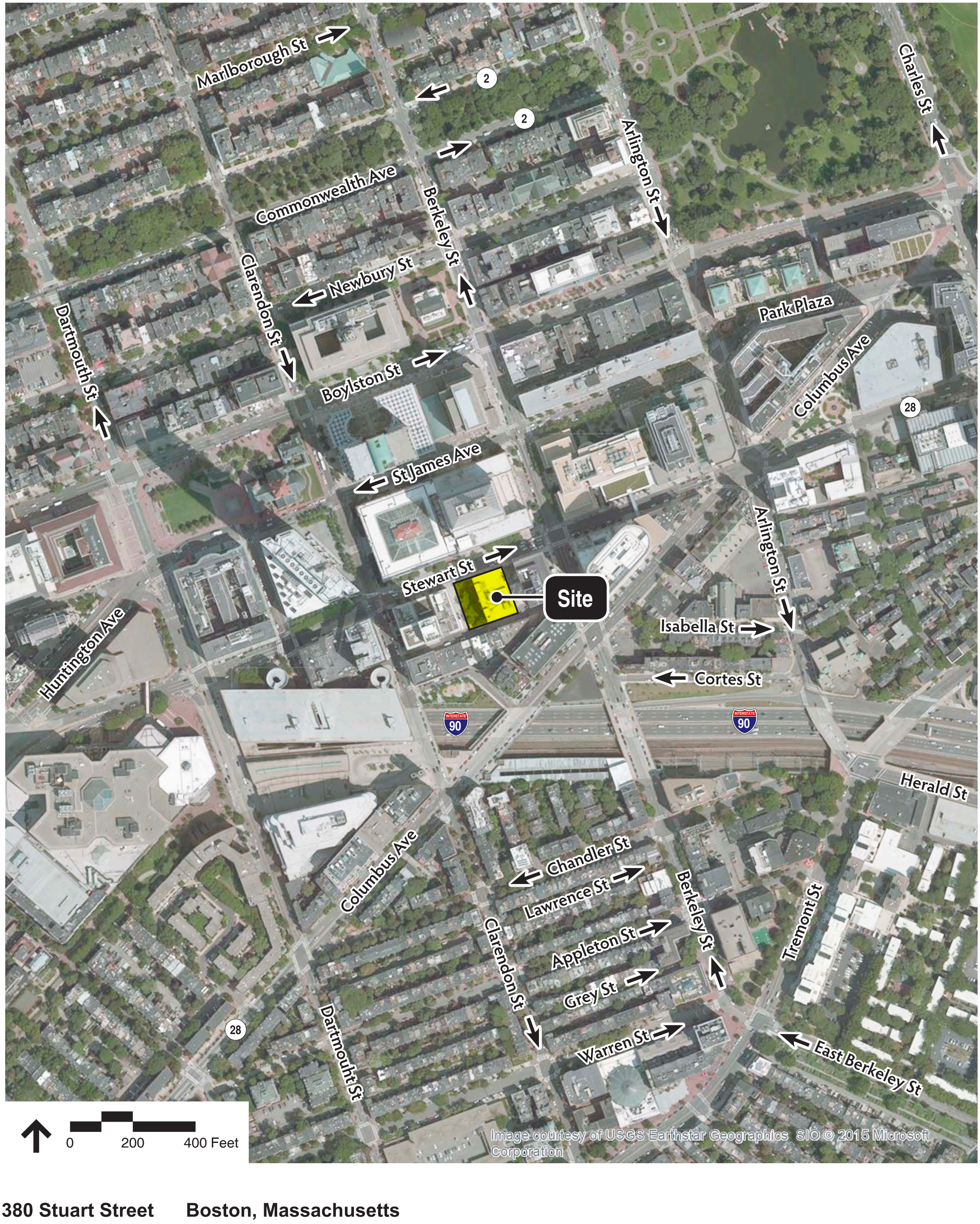
Project Program	Building Size* (GSF)
Office Space	615,000
Ground Floor Retail/cafe	10,000
Existing Building to be Demoed	(-140,000)
Total Net New	485,000
Project Parking	**175 Spaces**

Source: Skidmore, Owings & Merrill
* Zoning gross square footage.

2.1.2 *Summary of Findings and Transportation Mitigation*

The additional traffic generated by the Proposed Project will produce limited impacts to the surrounding transportation infrastructure. This is due, primarily, to the Proposed Project site's central location in the City, which will provide the opportunity for vehicles to make use of multiple access routes to access and exit the site. The Proposed Project's location is also well served by public transit, which further helps to reduce the impact on surround streets. The Proposed Project is not expected to result in any measurable changes to peak hour operating conditions at study area intersections. Figure 2-2 provides an illustrative site plan of the ground floor of the Proposed Project, indicating its key transportation-oriented provisions. Key findings and actions include the following:

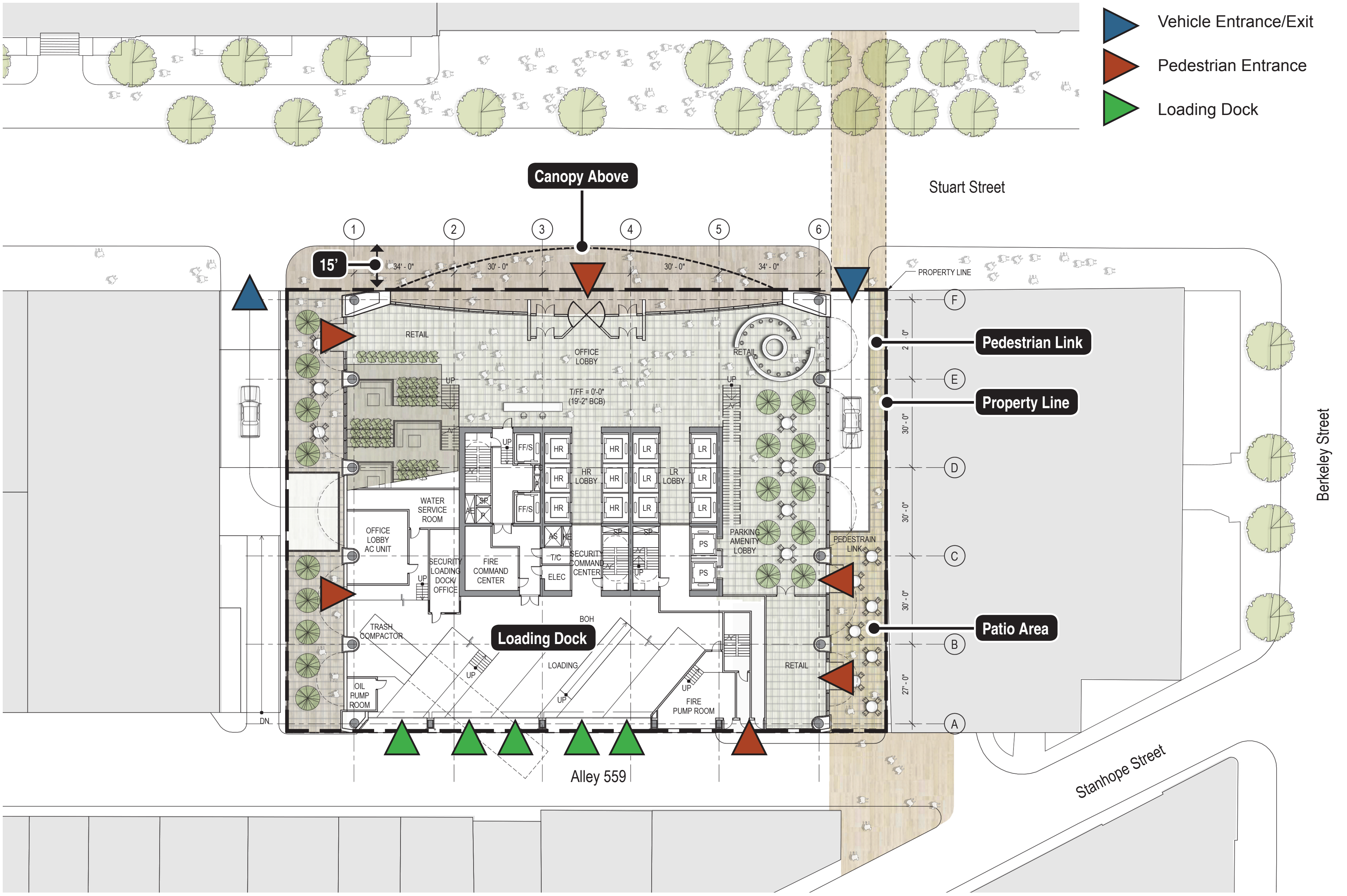
- The Proposed Project is expected to generate approximately 73 entering and 11 exiting vehicle trips during the weekday morning peak hour and approximately 31 entering and 72 exiting vehicle trips during the weekday evening peak hour.
- The traffic generated by the Proposed Project is expected to have minimal impacts on the area's transportation infrastructure with the implementation of the proposed site access plan.



380 Stuart Street **Boston, Massachusetts**

Figure 2-1

Site Location



380 Street Street **Boston, Massachusetts**

Figure 2-2

Site Plan

- The results of the analysis indicate that there will be no changes in level of service (LOS) in the study area as a result of the Proposed Project, with the exception of Stuart Street at Berkeley Street during the weekday morning peak hour which changes from LOS B to LOS C with the Proposed Project in place.

- The Project Site is currently well served by transportation infrastructure, including access to Route I-90 in Copley Square and nearby public transit (Commuter Rail, Orange Line, Green Line, and multiple local and express bus routes).

- The Proponent is committed to limiting on-site parking supporting the Proposed Project to only 0.28 spaces per 1,000 sf of building space. All parking will be located in a 175-space below-grade parking garage. Limited parking will precipitate proactive public transportation, bicycle and pedestrian activity on site.

- Parking garage access will be provided via Stuart Street and an exclusive access ramp along the east side of the site. Vehicles will egress to Stuart Street via one lane of an existing egress ramp along the west side of the site that is shared with the adjacent Clarendon Residences building pursuant to an existing access easement. The access control system will be constructed at the base of the entry ramp providing ample queue space on site to minimize traffic impacts along Stuart Street.

- There will be dedicated off-street loading docks to ensure that loading and service operations are handled internal to the building site and will not impact Stuart Street or other adjacent streets. The dock will have five enclosed bays in the building for deliveries and trash removal. Access to the loading area will be provided via Alley 559, located south of the Project Site. Trucks will generally access the Alley from Berkeley Street and Stanhope Street and egress to Clarendon Street.

- A public pedestrian accessway will be provided along the east side of the site connecting Stuart Street to Alley 559 and Stanhope Street beyond.

- The Proposed Project will improve pedestrian sidewalks adjacent to the Project Site. The building's Stuart Street façade is proposed to be curved which will allow for a wider sidewalk along portions of Stuart Street. New sidewalk along Stuart Street will meet Americans with Disabilities Act and Architectural Access Board (ADA/AAB) standards. If feasible, street trees will be provided along this new sidewalk as well.

- The Proponent will provide covered bicycle storage capacity on site in accordance with the City of Boston Bicycle Guidelines. The Proposed Project will also include public bikes racks to support ground floor retail space and visitors.

- The Proponent will continue to implement its proactive transportation demand management (TDM) plan to continue to encourage its employees to use transit and other alternative forms of transportation. The Proponent will require any future third-party tenants to implement their own proactive TDM plans.

2.1.3 Methodology

The transportation analysis conforms to the BTD's "Transportation Access Plans Guidelines" and uses standard methodologies, including the Institute of Transportation Engineers' trip generation and local travel characteristics as defined in *Access Boston 2000-2010*.

The study was conducted in two distinct stages. The first stage (Existing Conditions) involved a survey and compilation of existing transportation conditions within the study area (defined below) including:

- An inventory of the transportation infrastructure within the defined Project study area;
- Geometric and operational characteristics of study area roadways and intersections;
- Existing traffic control at study area intersections (i.e., traffic signalization, stop signs, one-way streets, etc.);
- Area off-street and on-street parking supply;
- Pedestrian activity along study area roadways, and at study area intersections;
- Bicycle activity and accommodations;
- Public transportation options within the study area, including bus, trolley, commuter rail, and private shuttle bus options; and
- Existing parking operations currently on site.

In the second stage of the study (Evaluation of Long-Term Transportation Impacts), future transportation conditions were projected within the study area. The future No-Build condition includes an assessment of future transportation including background growth on area roadways and intersections, planned transportation infrastructure improvements, and growth related to other proposed projects within the study area (without consideration of the Proposed Project). The future No-Build Condition takes into consideration many of the projects that are planned and/or under construction within the Back Bay/South End area including those listed in Section 2.3.1.2 below. The future Build Condition assesses the No-Build Condition plus estimated traffic generated by the Proposed Project.

Roadway, pedestrian, and transit capacity for morning and evening peak commuter periods were studied and are summarized for the following conditions:

- 2015 Existing Condition;
- 2020 No-Build Condition; and
- 2020 Build Condition.

Specific travel demand forecasts for the Proposed Project were assessed along with future transportation demands due to background traffic growth and traffic growth from other planned or approved projects within the study area. The year 2020 was selected as the horizon year for the purposes of quantifying and assessing future transportation impacts

2.1.4 Study Area

The Project Site, bound by Stuart Street, Alley 559 and existing buildings, is located within Boston's Back Bay neighborhood. The Project study area includes fourteen intersections that have been studied under both existing and future conditions. These intersections, illustrated in Figure 2-3, are listed below:

- Stuart Street/Dartmouth Street
- Stuart Street/Clarendon Street
- Stuart Street/Garage Driveway
- Stuart Street/Berkeley Street
- Stuart Street/Arlington Street/Columbus Avenue
- Alley 559/Clarendon Street
- Alley 559/Garage Driveway
- Stanhope Street/Berkeley Street
- Alley 559/Stanhope Street
- Columbus Avenue/Clarendon Street
- Columbus Avenue/Berkeley Street
- Arlington Street/Tremont Street/Herald Street
- St James Avenue/Clarendon Street
- St James Avenue/Berkeley Street

These study area intersections were evaluated in detail using standard traffic engineering analysis techniques following BTD guidelines to identify incremental impacts of future traffic growth and site-generated traffic.

380 Street Street **Boston, Massachusetts**

Figure 2-3

Study Area Intersections

2.2 Existing Transportation Conditions

This section describes existing transportation conditions, including an overview of roadway conditions, transit operations, pedestrian and bicycle facilities, and general site conditions. A discussion of the existing on- and off-street public parking supply is also provided.

2.2.1 Roadways

Stuart Street

The Proposed Project's main entrance will be located on Stuart Street. All trips entering and exiting the Project Site will travel eastbound on Stuart Street since it is a one-way in the eastbound direction. The roadway provides two one-way eastbound travel lanes that extend from Dartmouth Street in the west to Washington Street in the east. The north side of Stuart Street provides resident parking, meter parking, and handicapped spaces. On the south side of Stuart Street, resident and handicapped spaces are available in front of 380 Stuart Street while parking is not permitted to the west and a cab stand is located to the east. Sidewalks are provided along both sides of the street, and a crosswalk is provided for midblock crossing.

Berkeley Street

Berkeley Street is located east of the Project Site. The roadway provides three, one-way northbound travel lanes that extend from Tremont Street in the south to Storrow Drive in the north. Berkeley Street provides mostly metered parking with some segments of no parking. Sidewalks are provided along both sides of the street.

Clarendon Street

Clarendon Street is located to the west of the Project Site. The roadway operates in a one-way southbound direction with two travel lanes from Storrow Drive to the north and Tremont Street to the south. Metered parking is located along both sides of the street with some no parking sections. Sidewalks are provided along both sides of the street.

2.2.2 Study Area Intersections

Stuart Street/Dartmouth Street

Stuart Street at Dartmouth Street is a four-legged, two-way signalized intersection. Stuart Street is a one-way eastbound roadway and provides a channelized right turn lane, a channelized left turn lane, and three through lanes. Dartmouth Street is one-way northbound and provides two through lanes and a right-turn only lane. Metered parking is available along the east side of the Dartmouth approach, but at all other approaches, parking is prohibited. Additionally, there is a loading zone before the channelized left turn at the Stuart Street approach. Pedestrians are accommodated within the intersection's signalization via concurrent pedestrian phases. Crosswalks are provided across the Stuart Street and Dartmouth Street approaches to the intersection.

Under the 2020 No-Build Condition, Stuart Street at Dartmouth Street will be reconstructed as part of the Copley Place Project. The channelized turns on Stuart Street will be removed, turning the intersection into a more traditional four-way geometric design. The phasing and timing at this intersection is will also be modified to better accommodate the new configuration.

Stuart Street/Clarendon Street

Stuart Street at Clarendon Street is a four-legged, two-way signalized intersection. Stuart Street is a one-way eastbound roadway and provides two through lanes and one through/right lane. Clarendon Street is a one-way southbound roadway and provides one through lane and a shared through/left-turn lane. Parking is prohibited on Stuart Street west of the intersection and permitted to the east of the intersection on both sides of the street. Pedestrians are accommodated within the intersection's signalization via concurrent pedestrian phases. Crosswalks are provided across the Stuart Street and Clarendon Street approaches to the intersection.

Stuart Street/Clarendon Garage Driveway

Stuart Street at the Garage Driveway is a "T" unsignalized intersection. Stuart Street is a one-way eastbound roadway and provides two travel lanes. The Clarendon Garage Driveway currently serves as an entrance and exit driveway for the Clarendon Residences parking garage adjacent to the Project Site, and an access easement benefitting the Proposed Project site currently exists over a portion of this driveway between Stuart Street and Alley #559. Exiting vehicles must stop to oncoming traffic on Stuart Street and can only turn right onto Stuart Street due to the one-way vehicle traffic. The north side of Stuart Street provides resident parking, meter parking, and handicapped spaces. On the south side of Stuart Street, parking is not permitted along the entrance for The Clarendon before the Garage Driveway opening. There are no marked crossings at this intersection, but there are crosswalks provided along Stuart Street and across the Garage Driveway.

Stuart Street/Berkeley Street

Stuart Street at Berkeley Street is a four-legged, two-way signalized intersection. Stuart Street is a one-way eastbound roadway and provides one through lane and one shared through left lane. Berkeley Street is a one-way northbound roadway and provides two through lanes and one shared through/right-turn lane. At the Stuart Street approach, the north side of the street has metered parking, and the south side of the street has a cab stand. At the Berkeley Street approach, there are loading areas for valet and cabs on both sides of the street.

Pedestrians are accommodated within the intersection's signalization via concurrent and exclusive pedestrian phases. Crosswalks are provided across the Stuart Street and Berkeley Street approaches to the intersection.

Stuart Street/Arlington Street/Columbus Avenue

Stuart Street at Arlington Street and Columbus Avenue is a six-legged signalized intersection. Stuart Street is a one-way roadway eastbound with one through lane and one through/right-turn lane. Arlington Street is a one-way southbound roadway and provides two through lanes, one left-turn only lane, and one right-turn only lane. Columbus Avenue is one-way at the southwestbound approach, but it is two-way at the northeastbound approach. The one-way approach provides one through lane, and one shared through/left-turn lane. The two-way approach provides one through lane, and one shared through/right-turn lane. The Stuart Street approach has metered parking along both sides of the street. Parking is prohibited along the Arlington Street approach. The Columbus Avenue southwestbound approach has no parking along the south side of the street, but the north side of the street is used for valet parking storage for the Boston Park Plaza Hotel. The Columbus Avenue northeastbound approach has no parking along the north side of the street, but the south side of the street has metered parking spaces. Pedestrians are accommodated within the intersection's signalization via concurrent and exclusive pedestrian phases. Sidewalks are provided along both sides of all the streets. Crosswalks are provided across the Stuart Street, Arlington Street, and Columbus Avenue approaches to the intersection.

Alley 559/Clarendon Street

Alley 559 at Clarendon Street is a "T" unsignalized intersection. Alley 559 is a two-way private roadway 25 feet in width. Clarendon Street is a one-way southbound roadway with two through lanes. Parking is metered along both sides of the street. A crosswalk is provided across the alley's driveway, but there are no midblock crossings at this unsignalized intersection. Sidewalks are provided along Clarendon Street, but they are not provided along the Alley 559.

Alley 559/Garage Driveway

Alley 559 at the Garage Driveway is a "T" unsignalized intersection. Alley 559 is a two-way private roadway25 feet in width. The Garage Driveway is entrance only at this location, and there is one lane of travel at this driveway. Vehicles can enter by traveling east from Clarendon Street or west from Berkeley Street and Stanhope Street. Parking is not allowed along the Garage Driveway. No pedestrian accommodations, such as crosswalks or sidewalks, are provided at this intersection.

Stanhope Street/Berkeley Street

Stanhope Street at Berkeley Street is a "T" unsignalized intersection. This segment of Stanhope Street is a two-way eastbound/westbound roadway with unmarked lane designation. Berkeley Street is a one-way northbound roadway with three travel lanes. Parking is restricted on Stanhope Street with the exception of commercial vehicles. Berkeley Street has metered parking on both sides of the street leading to this intersection approach. There are sidewalks along all approaches to this intersection. No crosswalks are provided at Stanhope Street or Berkeley Street.

Alley 559/Stanhope Street

Alley 559 at Stanhope Street is an unsignalized intersection where Alley 559 branches off of Stanhope Street. Stanhope Street is two-way at the intersection approach, but it turns into a one-way street after the intersection. Alley 559 is a two-way private roadway 25 feet in width. On both streets, travel lanes are unmarked. Sidewalks are provided along Stanhope Street, but there are no sidewalks along the Alley 559. No crosswalks are provided across the approaches to the intersection.

Columbus Avenue/Clarendon Street

Columbus Avenue at Clarendon Street is a four-legged, three-way signalized intersection. Columbus Avenue is a two-way roadway with a 5 foot median at both approaches. The eastbound approach has one through lane and one shared through/right-turn lane with a shared bike lane. The westbound approach has one shared through/left-turn lane and one through lane with a shared bike lane. The Clarendon Street approach is a one-way roadway in the southbound direction with two through lanes and one shared through/right-turn lane. Columbus Avenue has metered parking along both approaches, and Clarendon Street has metered parking along the east side and no parking along the west side. Pedestrians are accommodated within the intersection's signalization via concurrent and exclusive pedestrian phases. Crosswalks are provided across the Columbus Avenue and Clarendon Street approaches to the intersection.

Columbus Avenue/Berkeley Street

Columbus Avenue at Berkeley Street is a four-legged, three-way signalized intersection. Columbus Avenue is a two-way roadway with an eastbound and westbound approach. The eastbound approach has one through lane with a shared bike lane, one shared through/left-turn lane, and a 5 foot median. There is metered parking at this approach. The westbound approach has one through lane and one shared through/right-turn lane with a shared bike lane with metered parking along the approach. Berkeley Street is a one-way northbound roadway with one through lane, one shared through/left-turn lane, and one shared through/right-turn lane. The west side of the Berkeley Street approach has metered parking and the east side has an MBTA bus stop with no parking allowed. Pedestrians are accommodated within the intersection's signalization via concurrent pedestrian phases. Crosswalks are provided across the Columbus Avenue and Berkeley Street approaches to the intersection.

Arlington Street/Tremont Street/Herald Street

Arlington Street at Tremont Street and Herald Street is a four-legged, three-way signalized intersection. Arlington Street is a one-way southbound roadway with two through lanes, one shared through/left-turn lane, and one shared through/right-turn lane. Parking is prohibited at the Arlington Street approach. Tremont Street is a two-way eastbound/westbound roadway. The eastbound approach has one through lane and one shared through/right-turn lane, and there is no parking allowed at this approach due to an MBTA bus stop. The westbound approach has one through lane and one through/left-turn lane, and parking is prohibited at this approach. Herald Street consists of only accepting lanes and it is one-way in the southbound direction. Pedestrians are accommodated within the intersection's signalization via concurrent and exclusive pedestrian phases. Crosswalks are provided across the Arlington Street, Tremont Street, and Herald Street approaches to the intersection.

St James Avenue/Clarendon Street

St James Avenue at Clarendon Street is a four-legged, two-way signalized intersection. St James Avenue is a one-way westbound roadway with two through lanes and a shared through/left-turn lane. Clarendon Street is a one-way southbound roadway with one through lane and one shared through/right-turn lane. No parking is allowed on St James Avenue. There is a no parking zone on the east side of the Clarendon Street approach, and the west side of Clarendon Street has a handicapped parking zone and metered parking. Pedestrians are accommodated within the intersection's signalization via concurrent pedestrian phases. Crosswalks are provided across all four legs of the intersection.

St James Avenue/Berkeley Street

St James Avenue at Berkeley Street is a four-legged, three-way signalized intersection. St James Avenue is a one-way westbound roadway with one through lane and one shared through/right-turn lane. The roadway, however, turns into a two-way street to the west of this intersection and has one eastbound accepting lane. Berkeley Street is a one-way northbound roadway with one through lane, one shared through/left-turn lane, and one shared through/right-turn lane. There is metered parking along both sides of the street at the St James Avenue approach and the Berkeley Street approach. Pedestrians are accommodated within the intersection's signalization via concurrent and exclusive pedestrian phases. Crosswalks are provided along all four legs of the intersection.

2.2.3 Traffic Data Collection

To estimate the existing traffic flow at the study area intersections, turning movement counts (TMCs) were conducted in May 2015. The TMCs collected vehicle (passenger and heavy vehicles), bicycle, and pedestrian volumes at the study area intersections. The morning (8:00 - 9:00 AM) and evening (4:45 – 5:45 PM) peak hour vehicle volumes are presented in Figure 2-4 and Figure 2-5.

2.2.4 Pedestrians

Sidewalks along the roadway network near the Project Site are in good condition, with the exception of the Alley 559, which only has sidewalks along some portions of the street. Striped crosswalks and pedestrian signals are available at all of the signalized intersections. High levels of pedestrians were observed throughout the study area. Figure 2-6 shows the pedestrian volumes at the study area intersections for the morning peak hour, and Figure 2-7 shows the pedestrian volumes for the evening peak hour.

Pedestrian volumes in front of the Project Site along Stuart Street were approximately 425 during the morning peak hour and 475 during the evening peak hour. To the east of the site, a combined 1,320 pedestrians crossed both north/south crosswalks at Stuart Street at Clarendon Street during the morning peak hour and 1,490 during the evening peak hour. This area is highly populated with commuters due to the office buildings surrounding the Project Site.

2.2.5 Bicycles

Bicycle volumes were collected throughout the study area during the morning and evening peak hours. Figure 2-8 highlights the weekday morning bicycle volumes with roughly 8 bicyclists traveling along Stuart Street adjacent to the Project Site. Weekday evening bicycle volumes can be found in Figure 2-9, showing 10 bicycles traveling along Stuart Street.

The highest volume of bicycle activity within the study area is located along Columbus Avenue. Columbus Avenue is the only street within the study area that provides bike facilities (portions of bike lane and portions of sharrows).

2.2.6 Public Transportation

The Project Site is currently served by several Massachusetts Bay Transportation Authority's (MBTA) public transportation services as shown in Figure 2-10. Numerous MBTA bus routes are within a half-mile distance from the Project Site and are accessible by walking. The Orange Line's Back Bay Station is the closest subway stop to the site, located slightly over a quarter-mile to the southwest. The Green Line's Arlington Station to the northeast and Copley Station to the northwest are both located three-tenths of a mile from the site. Eight local bus routes and four express bus routes serve the study area.

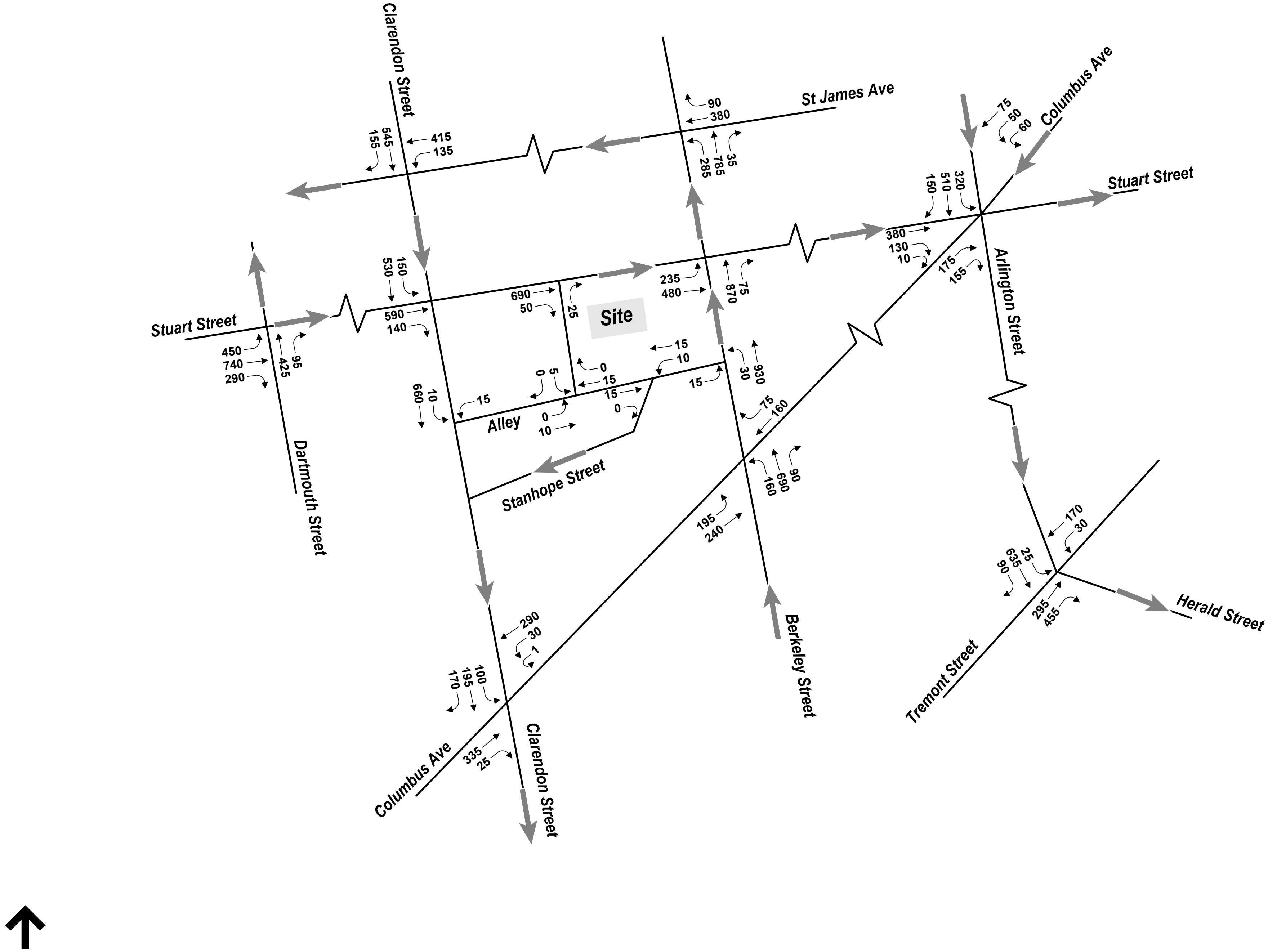
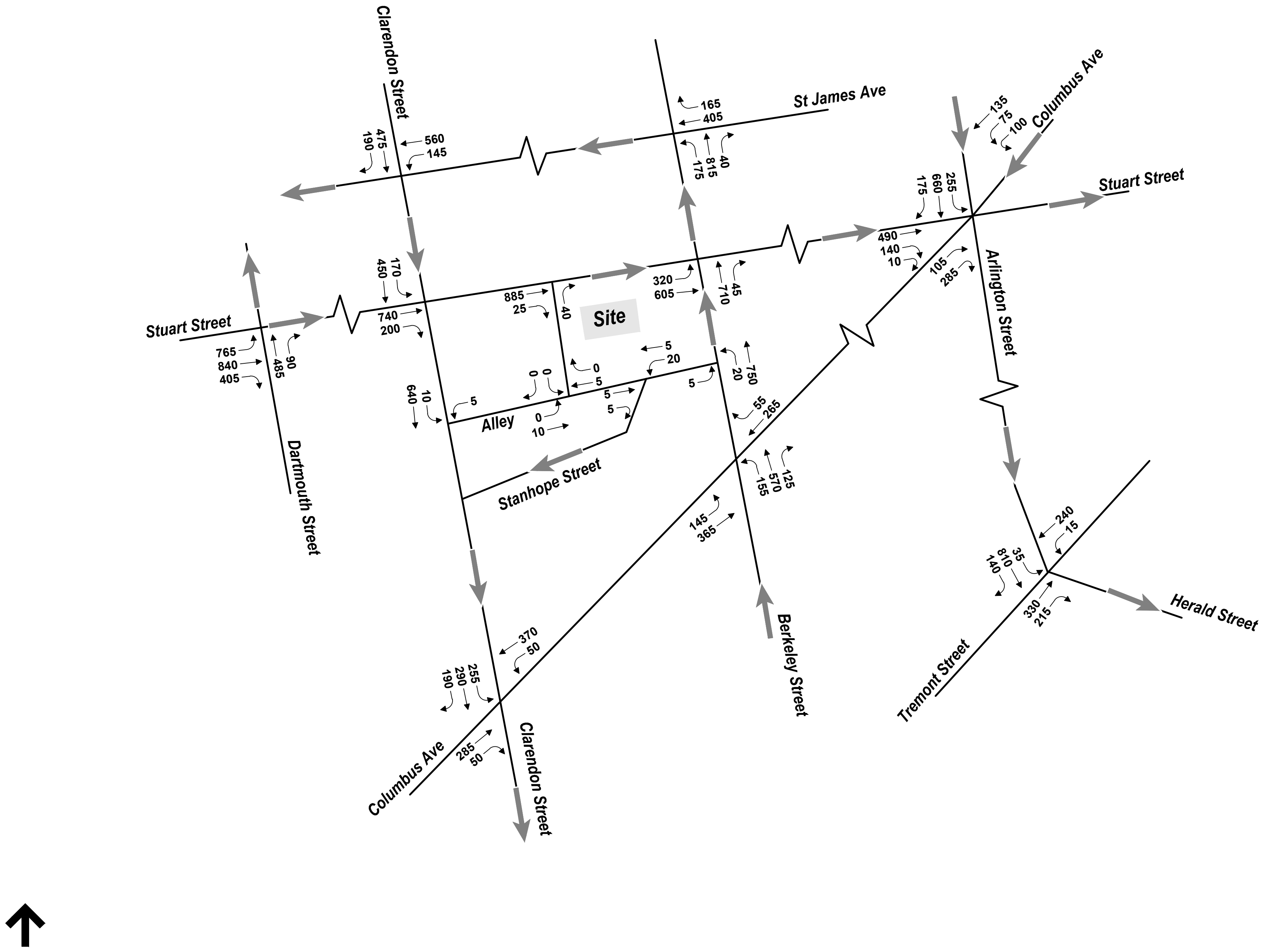


Figure 2-4

2015 Existing Condition Traffic Volumes - Morning Peak Hour



380 Stuart Street **Boston, Massachusetts**

Figure 2-5

2015 Existing Condition Traffic Volumes - Evening Peak Hour

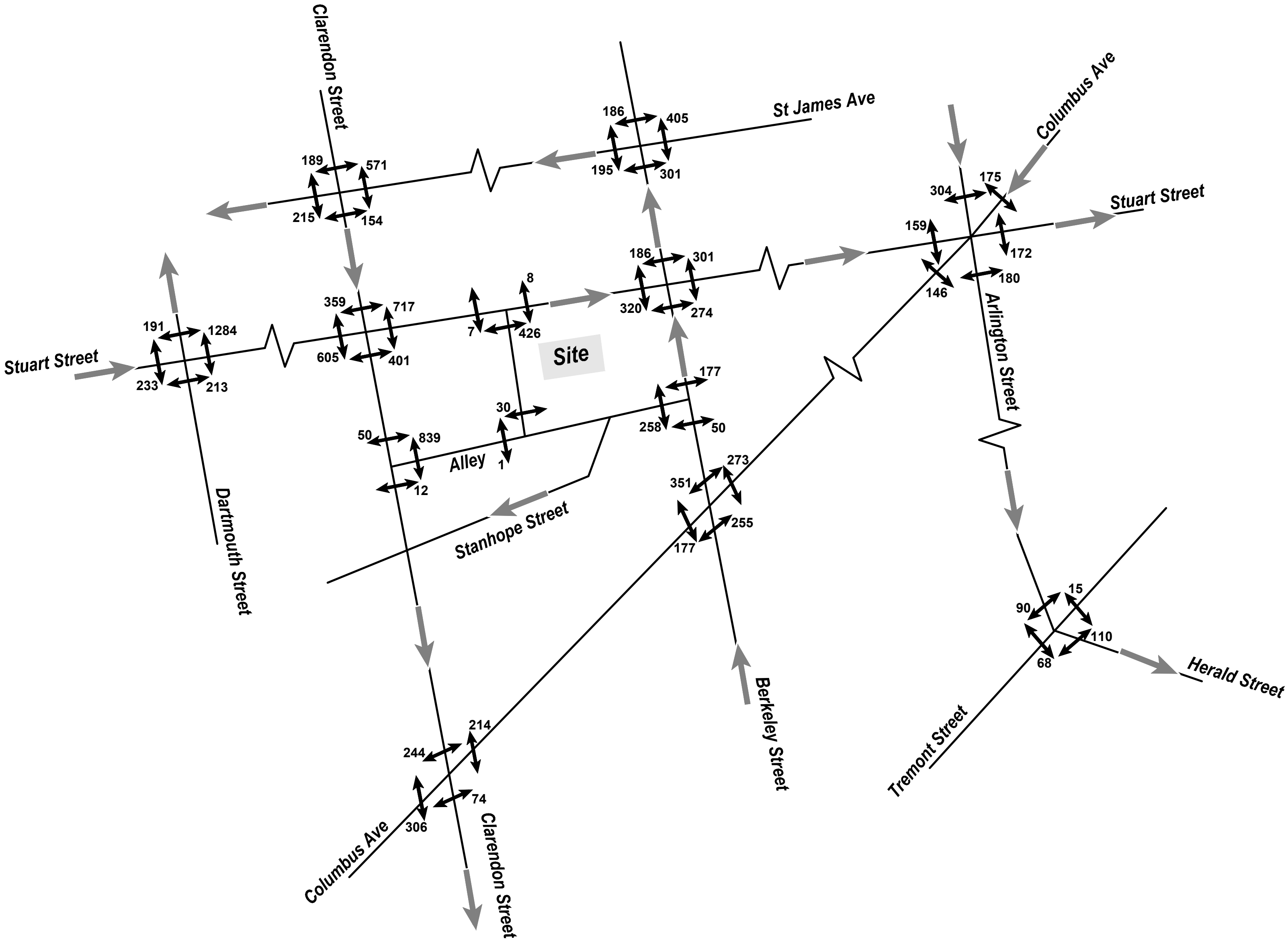
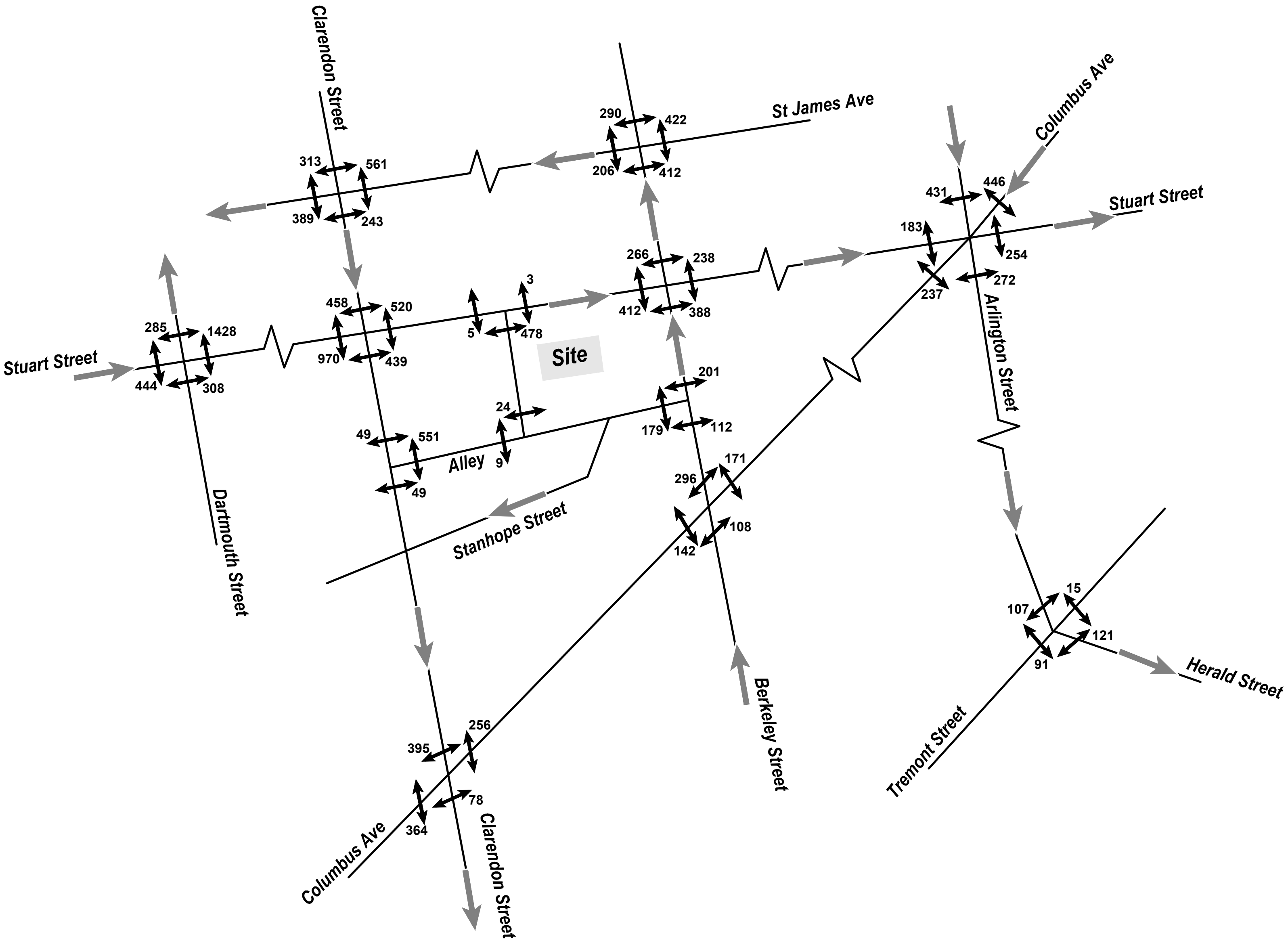


Figure 2-6

2015 Existing Condition Pedestrian Volumes - Morning Peak Hour



380 Stuart Street **Boston, Massachusetts**

Figure 2-7

2015 Existing Condition Pedestrian Volumes - Evening Peak Hour

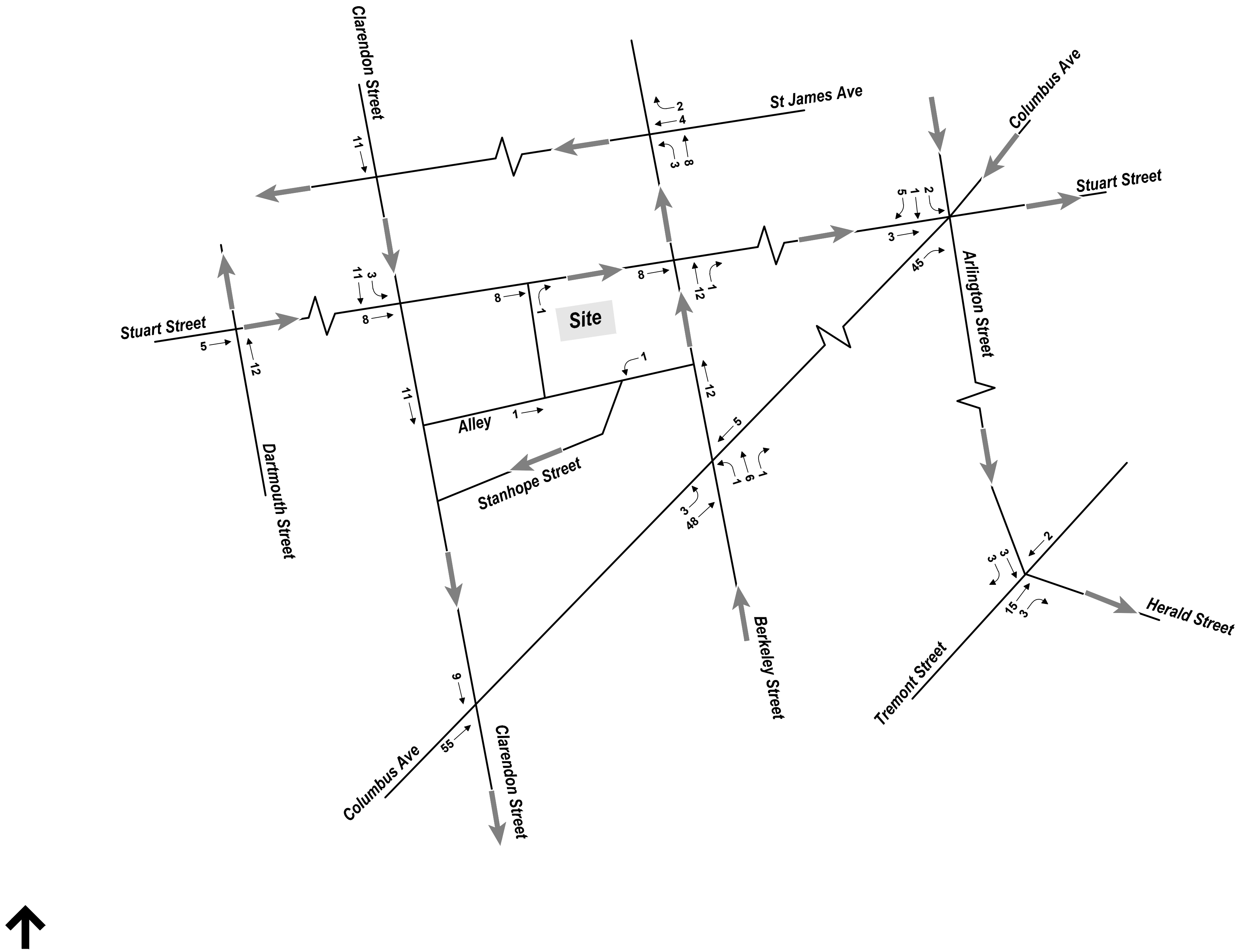


Figure 2-8

2015 Existing Condition Bicycle Volumes - Morning Peak Hour

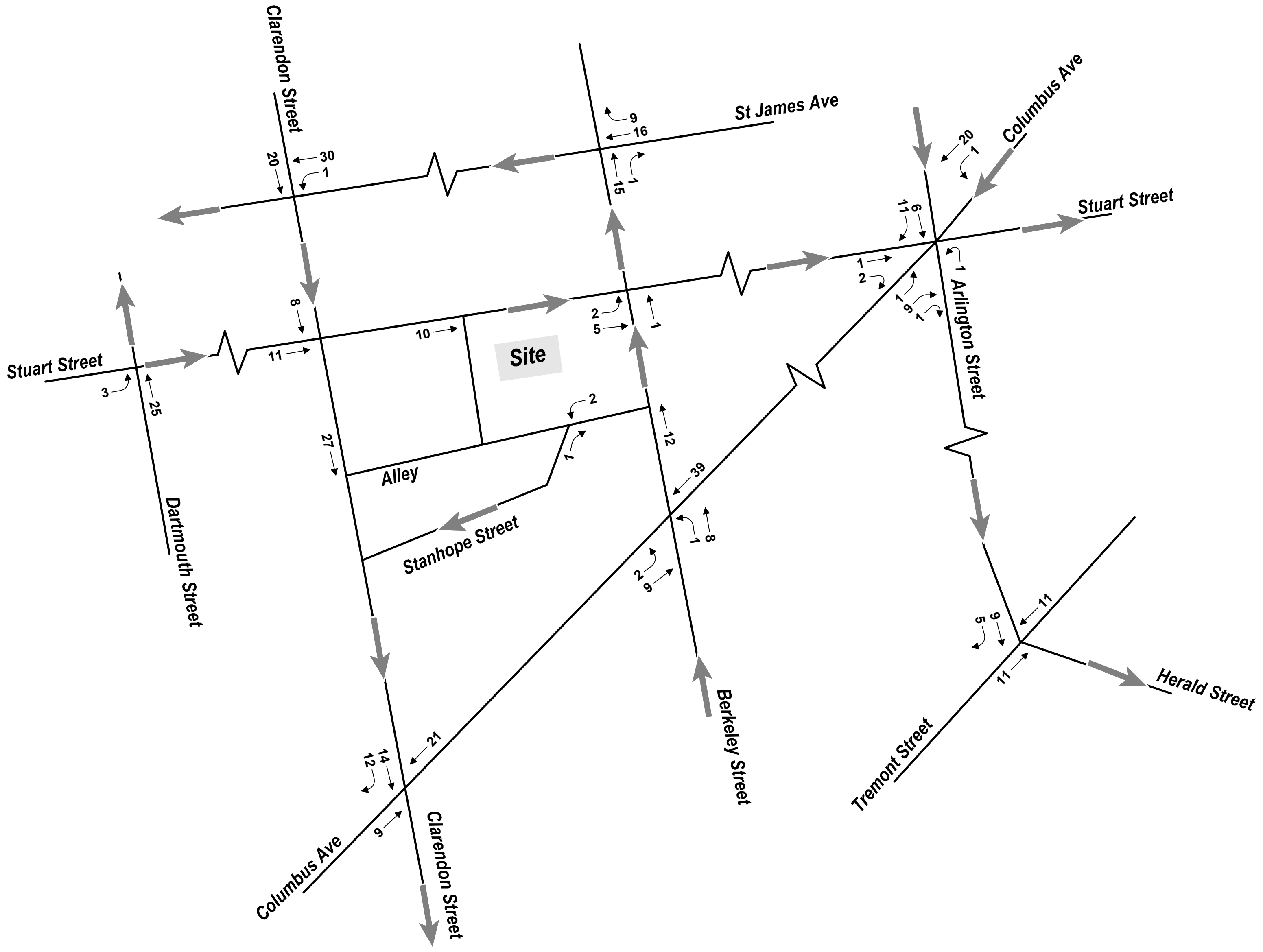


Figure 2-9

2015 Existing Condition Bicycle Volumes - Evening Peak Hour

Figure 2-10

Public Transportation

The stop nearest the site is one-tenth of a mile north of the Project Site at St James Avenue at Clarendon Street. This bus stop services the 9, 39, 55, 57, 504, and 553 bus routes. Additionally, multiple Commuter Rail lines are accessible from the Project Site via the Back Bay Station. Peak period frequencies/headways for MBTA services are summarized in Table 2-2.

Table 2-2 MBTA Service

Transit Line/Route	Origin/Destination	Rush-Hour Frequency (minutes)
Route 9	City Point – Copley Square via Broadway Station	5 – 10
Route 10	City Point – Copley Square via Andrew Station & B.U. Medical Center	20 – 25
Route 39	Forest Hills Station – Back Bay Station via Huntington Avenue	6 – 10
Route 43	Ruggles Station – Park & Tremont Streets via Tremont Street	12 – 18
Route 55	Jersey & Queensbury – Copley Square or Park & Tremont Streets via Ipswich Street	16 – 30
Route 170	Central Square, Waltham – Dudley Square	25 – 60
Route 502 (Express)	Watertown – Copley Square via Newton Corner & Mass. Pike	8 – 12
Route 503 (Express)	Brighton Center – Copley Square via Oak Square & Mass. Pike	15 – 40
Route 504 (Express)	Watertown/Newton Corner – Downtown via Mass. Pike	10 – 12
Green Line – Arlington Station or Copley Station	Park Street – Boston College (B), North Station – Cleveland Circle (C), Park Street – Riverside (D), Lechmere – Heath Street (E)	6 – 7
Orange Line – Back Bay Station	Oak Grove – Forest Hills	6
Commuter Rail	South Station – Framingham/Worcester, Needham, Franklin, Providence/Stoughton	Schedule Varies

Source: MBTA Summer 2015

A description of each MBTA bus and subway line that services the Project Site is provided below:

Route 9 - City Point – Copley Square via Broadway Station

This route connects Copley Square in the Back Bay with South Boston via the Broadway Station. The nearest bus stop to the Project Site is located at the corner of St James Avenue at Clarendon Street. Various stops along the route connect to the Green Line, Red Line, and Silver Line. The bus route runs on the weekdays from 5:15 AM to 1:15 AM with 5-10 minute headways during peak hours. On Saturday, service runs from 5:10 AM to 1:15 AM, and Sunday services is from 6:00 AM to 1:15 AM.

Route 10 - City Point – Copley Square via Andrew Station & B.U. Medical Center

This route connects Copley Square in the Back Bay with City Point in South Boston via the Andrew Station and B.U. Medical Center. The nearest bus stop to the Project Site is located at the corner of St James Avenue at Dartmouth Street. Stops along the route connect to the Green Line, Orange Line, Red Line, Silver Line, and Commuter Rail. The bus route runs on the weekdays from 4:55 AM to 1:30 AM with 20-25 minute headways during peak hours. On Saturday, service runs from 6:15 AM to 1:15 AM, and on Sunday, service is from 6:00 AM to 1:10 AM.

Route 39 - Forest Hills Station – Back Bay Station via Huntington Avenue

This route connects the Back Bay area with the Forest Hills Station in Jamaica Plain via Huntington Avenue. Forest Hills Station is the southern ending point for the Orange Line. The nearest bus stop to the Project Site is located at the corner of St James Avenue at Dartmouth Street. Various stops along this route connect to the Orange Line and Commuter Rail. The bus route runs on weekdays from 4:40 AM to 2:45 AM with 6-10 minute headways during peak hours. On Saturday, the bus route runs from 4:40 AM to 2:45 AM, and on Sunday, service is from 5:45 AM to 1:20 AM.

Route 43 - Ruggles Station – Park & Tremont Streets via Tremont Street

This route connects the Park Street Station and surrounding Boston Common area with the Ruggles Station. The nearest bus stop to the Project Site is located at the corner of Tremont Street at Herald Street. Stops along the bus route connect to the Green Line, Orange Line, Red Line, and Commuter Rail. The weekday service runs from 5:00 AM to 12:50 AM with 12-18 minute headways during peak hours. On Saturday, the bus route runs from 5:20 AM to 1:05 AM, and Sunday service is from 6:15 AM to 1:00 AM.

Route 55 - Jersey & Queensbury – Copley Square or Park & Tremont Streets via Ipswich Street

This route connects the Park Street and Tremont Street intersection by the Boston Common and Copley Square to the Fenway/Kenmore area via Ipswich Street. The nearest bus stop to the Project Site is located at the corner of St James Avenue and Clarendon Street. Various stops along the bus route connect to the Green Line, Red Line, and Silver Line. The weekday service runs from 5:50 AM to 11:10 PM with 16-30 minute headways during peak hours. On Saturday, the service runs from 6:00 AM to 11:10 PM, and Sunday service is from 8:15 AM to 11:10 PM.

Route 170 - Central Square, Waltham – Dudley Square

This route connects Central Square in Waltham to Dudley Square in Lower Roxbury. The nearest bus stop to the Project Site is located at the Back Bay Station. Stops along this route connect to the Orange Line, Silver Line, and Commuter Rail. Route 170 only offers two trips outbound from Boston (6:15 PM and 6:40 PM) and two trips inbound from Waltham (3:55 PM and 4:55 PM). There is no service on weekends and holidays.

Route 502 - (Express) Watertown – Copley Square via Newton Corner & Mass. Pike

This route connects the Watertown Yard Station in Watertown to Copley Square via Newton Corner and the Massachusetts Turnpike. The nearest bus stop to the Project Site is located at the corner of Stuart Street at Dartmouth Street. Stops along this route connect to the Orange Line and Commuter Rail. The weekday service runs from 6:45 AM to 7:22 PM with 8-12 minute headways during peak hours. There is no weekend service.

Route 503 - (Express) Brighton Center – Copley Square via Oak Square & Mass. Pike

This route connects Brighton Center to Copley Square in Boston via Oak Square and the Massachusetts Turnpike. The nearest bus stop to the Project Site is located at the corner of Stuart Street and Dartmouth Street. Stops along this route connect to the Green Line, Orange Line, and Commuter Rail. The weekday service runs from 6:40 AM to 9:30 AM and 4:20 PM to 7:30 PM with 15-30 minute headways during peak hours. There is no weekend service.

Route 504 - (Express) Watertown/Newton Corner – Downtown via Mass. Pike

This route connects the Watertown Yard Station in Watertown and Newton Corner in Newton to the Financial District in downtown Boston. The nearest stop to the Project Site is located at the corner of Stuart Street at Dartmouth Street. Stops along this route connect to the Orange Line and Commuter Rail. The weekday service runs from 6:20 AM to 8:10 PM with 10-12 minute headways during peak hours. Saturday service is from 7:30 AM to 8:05 PM, and there is no service for this route on Sunday.

Green Line – B, C, D, E Lines

The Green Line has four routes that travel through Boston and then branch off to serve the surrounding communities. The B Line extends to Boston College in Brighton, the C Line extends to Cleveland Circle in Brighton, and the D Line extends to Riverside Station in Newton. The nearest stop to the Project Site is located at either the corner of Arlington Street and Boylston Street (Arlington Station) or the corner of Dartmouth Street and Boylston

Street (Copley Station). The weekday service runs from 5:00 AM to 2:05 AM with 6-7 minute headways during rush hour. On Saturday, service runs from 4:50 AM to 2:00 AM, and Sunday service is from 5:30 AM to 12:45 AM.

Orange Line – Oak Grove/Forest Hills

The Orange Line connects Oak Grove in Malden to Forest Hills in Jamaica Plain. The nearest stop to the Project Site is located at the Back Bay Station on Dartmouth Street. The weekday service runs from 5:15 AM to 1:50 AM with 6 minute headways during peak hours. On Saturday, service runs from 5:15 AM to 1:50 AM, and Sunday service is from 6:00 AM to 12:35 AM.

Commuter Rail - South Station – Framingham/Worcester, Needham, Franklin, Providence/Stoughton Lines

The Back Bay Station on Dartmouth Street services the Framingham/Worcester, Needham, Franklin, and Providence/Stoughton Lines. The trains depart from South Station in Boston and end at their respective route destinations. Schedule information varies according to the time of day, day of the week, and destination.

2.2.7 Existing Parking

Existing curb regulations in the vicinity of the Project Site primarily include meter and handicap parking on Stuart Street, valet and meter parking along Berkeley Street, commercial parking along the streets directly behind the Project Site, and restricted parking with areas of meter parking along Clarendon Street. These and the surrounding on-street parking regulations within a one-quarter mile of the site are presented in Figure 2-11.

There are several off-street public parking garages within the study area. The public parking options located within the study area are presented in Figure 2-12. Within the study area, there are approximately 4,217 spaces in parking garages and approximately 207 spaces in surface lots.

2.2.8 Crash Analysis

A detailed crash analysis was conducted to identify potential vehicle accident trends and/or roadway deficiencies in the traffic study area. The most current vehicle accident data for the traffic study area intersections were obtained from the Massachusetts Department of Transportation for the years 2010 to 2012. A summary of the study area intersections vehicle accident history is presented in Table 2-3.

Table 2-3 Vehicular Crash Summary

	Stuart Street at:					St James Ave at Berkeley St	St James Ave at Clarendon St	Arlington St at Tremont St/Herald St	Columbus Ave at Berkeley St
	Arlington St/ Columbus St	Berkeley St	Clarendon St	Dartmouth St	Garage Driveway				
Currently Signalized?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
MassHighway ACR	0.76	0.76	0.76	0.76	0.58	0.76	0.76	0.76	0.76
MassHighway CCR	0.31	0.20	0.05	0.06	0.09	0.21	0.06	0.18	0.29
Exceeds?	No	No	No	No	No	No	No	No	No
Year									
2010	6	3	0	1	0	1	1	1	2
2011	3	1	1	0	0	2	0	2	2
2012	0	0	0	1	1	1	0	1	2
Total	9	4	1	2	1	4	1	4	6
Collision Type									
Angle	3	2	1	0	0	1	0	3	3
Head-on	0	0	0	0	0	0	0	0	0
Rear-end	0	0	0	1	0	0	0	0	0
Rear-to-Rear	0	0	0	0	0	0	0	0	0
Sideswipe, opposite direction	0	0	0	0	0	0	0	0	0
Sideswipe, same direction	1	0	0	0	1	0	1	0	0
Single vehicle crash	2	0	0	0	0	0	0	0	1
Unknown	3	2	0	1	0	3	0	1	2
Total	9	4	1	2	1	4	1	4	6
Crash Severity									
Fatal injury	0	0	0	0	0	0	0	1	0
Non-fatal injury	3	0	0	2	0	2	0	1	3

Table 2-3 Vehicular Crash Summary (Continued)

	Stuart Street at								
	Arlington St/ Columbus St	Berkeley St	Clarendon St	Dartmouth St	Garage Driveway	St James Ave at Berkeley St	St James Ave at Clarendon St	Arlington St at Tremont St/Herald St	Columbus Ave at Berkeley St
Property damage only (none injured)	1	1	1	0	0	0	0	2	2
Unknown	5	3	0	0	1	2	1	0	1
Total	9	4	1	2	1	4	1	4	6
Time of Day									
Weekday, 7:00 AM - 9:00 AM	1	1	0	0	0	1	0	1	1
Weekday, 4:00 PM - 6:00 PM	1	0	0	0	0	1	1	0	0
Saturday, 11:00 AM - 2:00 PM	1	0	0	0	0	0	0	0	1
Weekday, other time	4	2	1	1	1	1	0	1	2
Weekend, other time	2	1	0	1	0	1	0	2	2
Total	9	4	1	2	1	4	1	4	6
Pavement Conditions									
Dry	6	3	1	1	1	1	1	2	4
Wet	1	0	0	0	0	1	0	1	1
Snow	0	0	0	0	0	0	0	0	0
Ice	0	0	0	0	0	0	0	0	0
Unknown	2	1	0	1	0	2	0	1	1
Total	9	4	1	2	1	4	1	4	6
Non Motorist									
Total	0	0	0	0	0	0	0	0	0

Source: MassDOT Crash Data

380 Stuart Street **Boston, Massachusetts**

Figure 2-11

Summary of Existing On-Street Parking

	Location	Spaces
①	The Westin-Copley Place	250 Spaces
②	Dartmouth Street Garage	697 Spaces
③	IMPARK Parking	70 Spaces
④	Clarendon Street Parking	2,000 Spaces
⑤	Back Bay Garage	1.000 Spaces
⑥	Isabella Lot	52 Spaces
⑦	10 St. James Avenue Garage	200 Spaces
⑧	GENERAL trading Company	84 Spaces
⑨	SP Plus Parking	71 Spaces

\# Garage

\# Surface Lot

Figure 2-12

Summary of Existing Off-Street Parking

Crash rates are calculated based on the number of accidents at an intersection and the average volume of traffic traveling through the intersection on a daily basis. These rates are compared to the MassDOT District averages to identify if certain intersections have safety issues that should be looked into further. The Project Study Area is located in District 6 which has a crash rate of 0.76 for signalized intersections. This means that on average 0.76 accidents occur per million vehicles entering a signalized intersection in District 6. For unsignalized intersections, the crash rate for District 6 is 0.58 accidents per million vehicles. From the crash analysis it was determined that none of the study intersections exceeds the MassDOT District 6 average for both signalized and unsignalized intersections.

Of the reported accidents, nearly 69 percent occurred during a weekday outside the traditional peak morning and evening travel periods of 7:00 AM – 9:00 AM and 4:00 PM – 6:00 PM. The majority of accidents occurred during dry pavement conditions. The severity of accidents ranged from non-fatal injuries to property damage, with one fatality recorded. If a study intersection was found to have no recorded crashes from 2010 to 2012, it was not included in the analysis.

2.3 Future Transportation Conditions

Two future conditions scenarios were evaluated for a future five-year time horizon (2020) to assess the potential Project-related traffic impacts: the No-Build and Build Condition. These future conditions are summarized in the sections below.

2.3.1 2020 No-Build Condition

The 2020 No-Build Condition was developed to evaluate future transportation conditions in the traffic study area without consideration of the Proposed Project. In accordance with BTD guidelines, this future analysis year represents a five-year horizon (2020) from existing conditions (2015). The No-Build Condition provides insight into future traffic conditions resulting from regional growth and traffic generated by specific planned projects that are expected to affect the local roadway network.

2.3.1.1 General Background Growth

In order to account for general background growth of area traffic, an annualized growth rate was developed and applied to the existing condition peak hour traffic volumes to reasonably account for future traffic growth in the study area.

An annualized growth rate of half a percent (0.5%) per year between 2015 and 2020 was applied to the 2015 Existing Condition. This growth rate accounts for regional growth outside of the Back Bay neighborhood and is consistent with recent traffic studies for other developments within the area.

2.3.1.2 Area Development Projects

In addition to the background growth rate, traffic projections for several specific and applicable Article 80-submitted projects were incorporated into the development of the No-Build Condition. These include the following development projects:

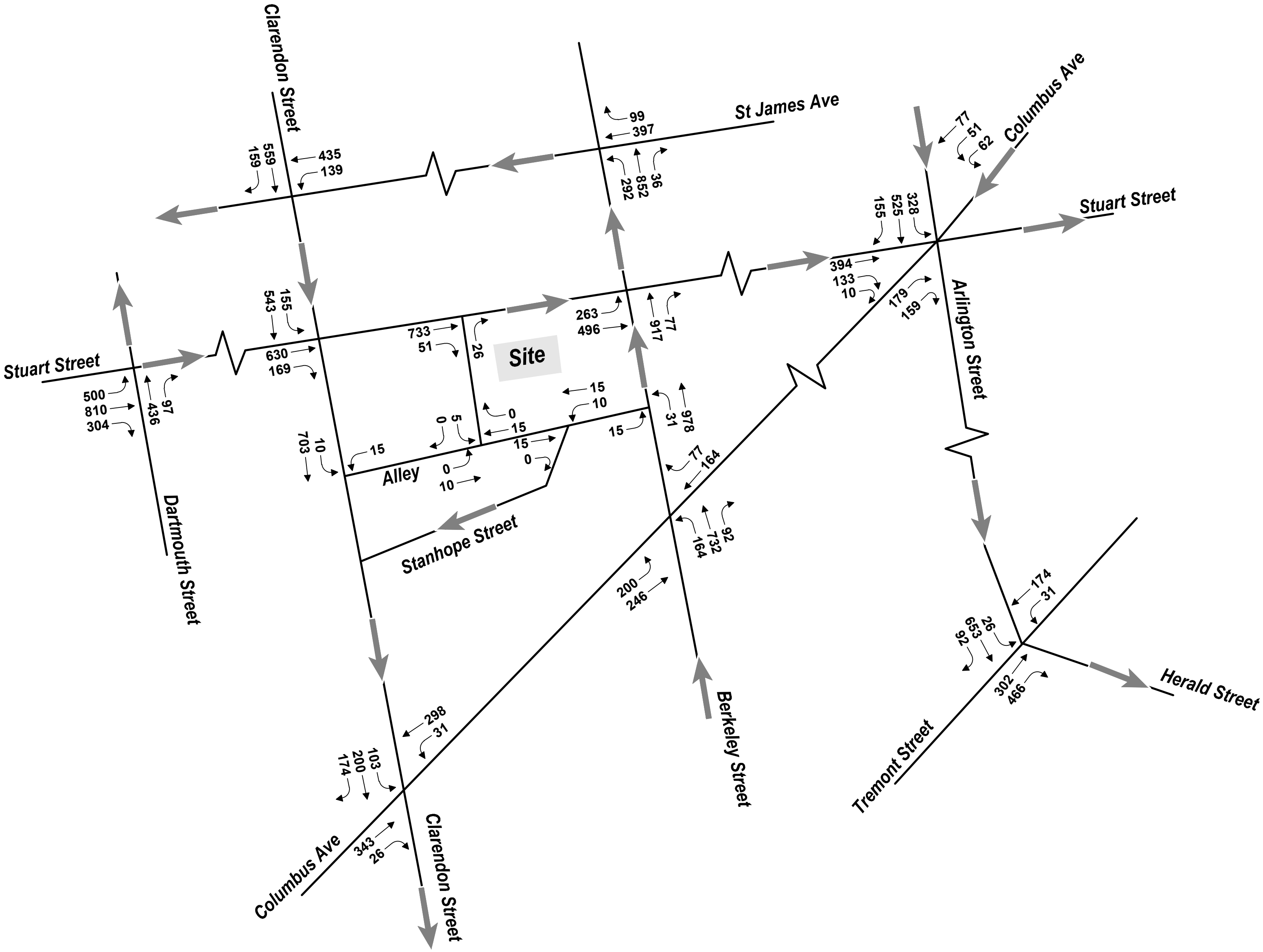
- 40 Trinity Place – Construction of a 33-story mixed-use building including a hotel, residential space, restaurants, and expansion space for the University Club.
- 350 Boylston Street – Mixed-use office and retail development that includes 200,000 square feet of office, 15,000 square feet of retail and restaurant, and 6,000 square feet for a fitness center/spa.
- 500 Boylston Street – Redevelopment of a courtyard space into a six-story and 79,300 square foot building with office and retail.
- Copley Place – Building expansion to include approximately 542 residential units with 680,000 total square feet, 45,000 square feet for retail expansion, 70,000 square feet for other retail, restaurants, and atrium within a 52-story building at 569 feet high. This project also includes modifications to the Stuart Street at Dartmouth Street lane configuration and intersection geometry.

2.3.1.3 2020 No-Build Traffic Volumes

The 2015 Existing Condition volumes were adjusted to 2020 using a growth rate of half of a percent per year. The applicable projects that are either planned, approved and/or under construction were then added to these adjusted volumes to create the 2020 No-Build Condition weekday morning and evening peak hour traffic volumes. Figure 2-13 and Figure 2-14 present the 2020 No-Build Condition traffic volume networks for the weekday morning and evening peak hours, respectively.

2.3.2 2020 Build Condition

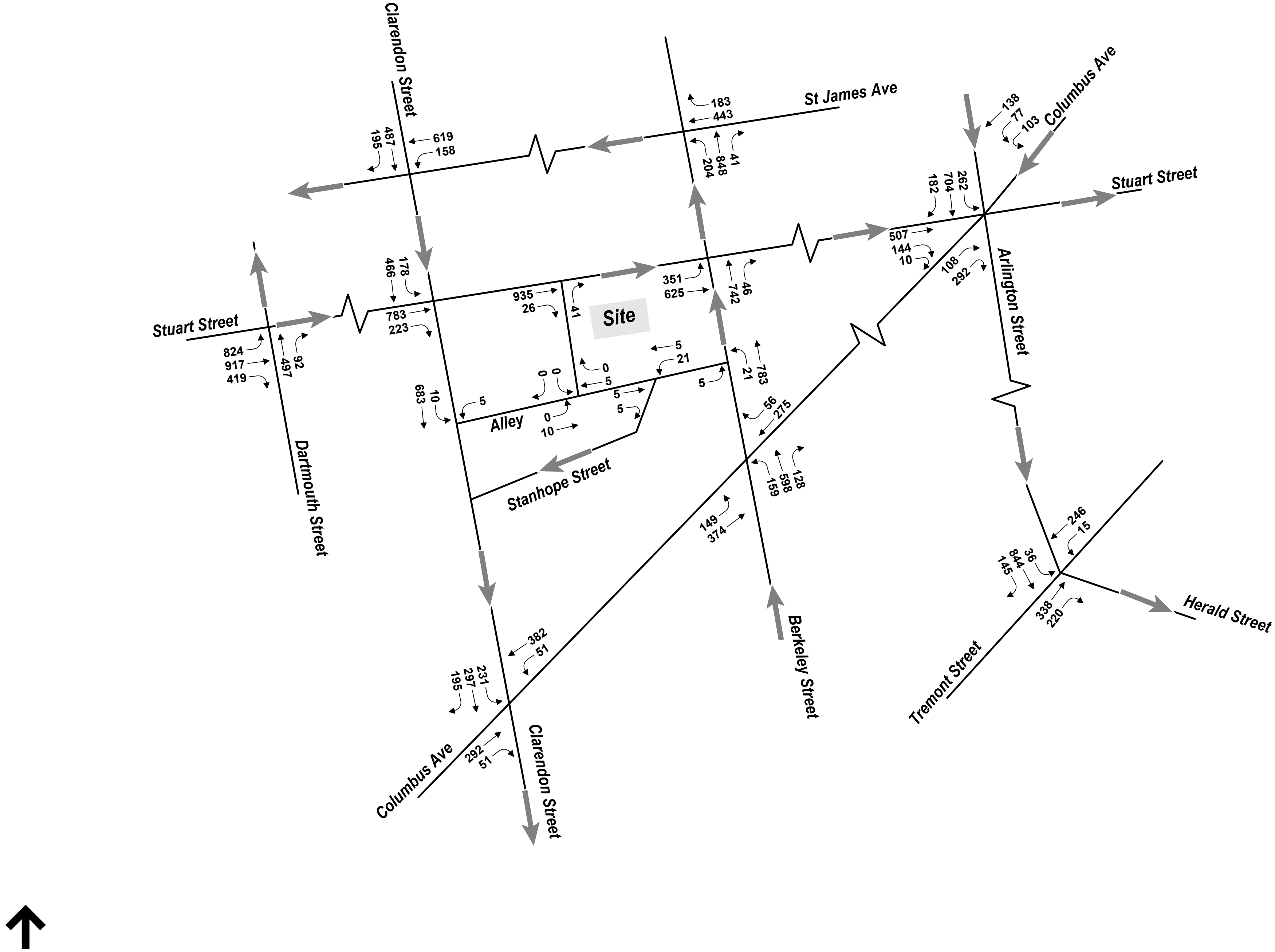
The 2020 Build Condition traffic volumes for study area roadways were developed by estimating Project-generated traffic volumes, distributing these volumes, and assigning them to the Study Area roadways. The traffic volumes expected to be generated by the Proposed Project were added to the 2020 No-Build Condition traffic volumes to create the 2020 Build Condition traffic volume networks. The following sections describe the procedures used to develop the Build Condition traffic volume networks.



380 Stuart Street **Boston, Massachusetts**

Figure 2-13

2020 No-Build Condition Traffic Volumes - Morning Peak Hour



380 Stuart Street **Boston, Massachusetts**

Figure 2-14

2020 No-Build Condition Traffic Volumes - Evening Peak Hour

2.3.2.1 Project-Generated Traffic Volumes

To estimate traffic impacts of the Proposed Project, it is necessary to determine the traffic volumes expected to be generated by the Proposed Project. The process on how this volume estimate is calculated is described below.

2.3.2.1.1 Unadjusted Trip Generation

The trip generation for the Proposed Project was based on standard Institute of Transportation Engineers (ITE) trip rates published in ITE's *Trip Generation, 9th Edition*. ITE's Land Use Code (LUC) General Office Building (710) and Quality Restaurant (931) were used to estimate the new trips generated by the Proposed Project. Other LUCs were examined for the retail/café space (LUC 852 – Convince Store and LUC 936 – Coffee/Donut Shop), but none contained enough studies/data for a viable trip estimate. A summary of unadjusted trip generation for the Proposed Project is presented below in Table 2-4.

Table 2-4 Unadjusted Project Generated Vehicle Trips

		Office	Restaurant	Total
Daily	In	2,701	450	3,151
	Out	2,701	450	3,151
	Total	5,402	900	6,302
Morning Peak Hour	In	706	5	711
	Out	96	3	99
	Total	802	8	810
Evening Peak Hour	In	130	50	180
	Out	637	25	662
	Total	767	75	842

Source: *ITE Trip Generation, 9th Edition, 2012*

To remain conservative in this traffic analysis, it should be noted that no trip generation credit was taken for the existing trips generated by the existing 370-380 Stuart Street building (a 140,000 square foot building). All trip generation estimates for the Proposed Project are for the full program as if the existing site was currently vacant.

National Household Travel Survey vehicle occupancy rates (VOR) of 1.13 persons per vehicle was applied to office trips and 1.8 persons per vehicle was applied to restaurant trips to determine person-trips rates. These trips are presented in Table 2-5.

Table 2-5 Project Generated Person Trips

		Office	Restaurant	Total
Daily	In	3,053	810	3,863
	Out	3,053	810	3,863
	Total	6,106	1,620	7,726
Morning Peak Hour	In	798	9	807
	Out	108	6	114
	Total	906	15	921
Evening Peak Hour	In	178	90	268
	Out	720	44	764
	Total	898	134	1,032

Source: *ITE Trip Generation, 9th Edition, 2012*

As quantified in Table 2-5, the Proposed Project is anticipated to generate 7,726 daily person trips based on ITE methodology, which includes 921 person trips during the weekday morning peak hour and 1,032 person trips during the evening peak hour.

2.3.2.1.2 Adjusted Trip Generation

Trip generation estimates presented in Table 2-5 do not include any adjustments to reflect public transit, walking trips, or bicycling trips that are characteristic of an urban downtown location. This mode-share calculation is critical to the evaluation of overall Project-related traffic impacts as there will be a mixture of automobile travel, public transit, and walk/bike trips to the Project Site.

As previously discussed, the 380 Stuart Street Project will benefit from MBTA bus, transit, and commuter rail services. There will also be a measurable component of walking and bicycling trips to and from the surrounding neighborhood and within Back Bay.

Typically, mode shares are based on the BTD reference documents published under the *Access Boston 2000-2010* initiative. However, since the Proponent has a significant employment presence within the Back Bay for years and has been an active member in the community during this time, empirical mode share data was used for the office portion. These office space mode shares were taken from the Massachusetts Department of Environmental Protection (DEP) Rideshare Regulation's Summary of Commute Data from November 2014. BTD mode share for Zone 4 were used for the retail/café portion of the trip generation. The mode shares splits for the trip generation estimate are provided in Table 2-6.

Table 2-6 Mode Shares

	Auto	Transit	Walk/Bike/ Other
Office			
Daily	10%	71%	19%
AM/PM Peaks	10%	71%	19%
Retail/Restaurant			
Daily	33%	21%	46%
AM/PM Peaks	33%	31%	36%

Source: John Hancock 2014 Mass DEP Rideshare Report (Office Use), BTD Guidelines Zone 4 (Restaurant Use)

The adjusted trip generation estimates are presented in Table 2-7. As shown, the Proposed Project is expected to generate a total of 84 new vehicle trips (73 entering, and 11 exiting) during the weekday morning peak hour, and a total of 103 new vehicle trips (31 entering, and 72 exiting) during the weekday evening peak hour. On a daily basis, the Proposed Project is expected to generate 840 new vehicle-trips (420 entering, and 420 exiting) on a weekday.

Table 2-7 Trip Generation by Mode

		Auto (vehicle)	Transit (person)	Walk/Bike/ Other (person)
Daily	In	420	2,338	953
	Out	420	2,338	953
	Total	840	4,676	1,906
Morning Peak Hour	In	73	569	155
	Out	11	79	23
	Total	84	648	178
Evening Peak Hour	In	31	133	61
	Out	72	525	153
	Total	103	658	214

2.3.2.1.3 Auto Trip Distribution

Having estimated increases in auto trips associated with the Proposed Project, the next step in the analysis involves the assignment of these trips to the local roadway network based on geographic distribution of Proposed Project traffic. The directional distribution of Project traffic is a function of several variables. These include the relative locations and densities of population, competing uses, existing travel patterns, and the efficiency of the roadways leading to the site.

Trip distribution patterns were developed based on BTD's guidelines for Zone 4 trip distribution data. This distribution is summarized in Figure 2-15.

Trip distribution was based on BTD's guidelines for Zone 4. These guidelines provide information on where area residents work and where area employees live.

2.3.2.2 2020 Build Traffic Volumes

The Proposed Project generated trips were then assigned to the Proposed Project's driveway/garage ramps. The resulting trips are illustrated in Figures 2-16 and Figure 2-17 for the morning peak hour and evening peak hour, respectively.

These Proposed Project generated trips were then added to the 2020 No-Build Condition traffic networks. The resulting 2020 Build Condition networks are shown in Figure 2-18 and Figure 2-19 for both the morning and evening peak hours. A comprehensive operational and level of service (LOS) analysis of all study area intersections is presented in the following sections.

2.3.2.3 Pedestrians/Bicycles

As shown previously in Table 2-7, the Proposed Project is expected to generate 178 morning peak hour pedestrian/bicycle/other trips and 214 evening peak hour pedestrian/bicycle/other trips. It is expected that many employees will choose to walk or bike to one of many amenities and destinations within the Back Bay neighborhood. It is

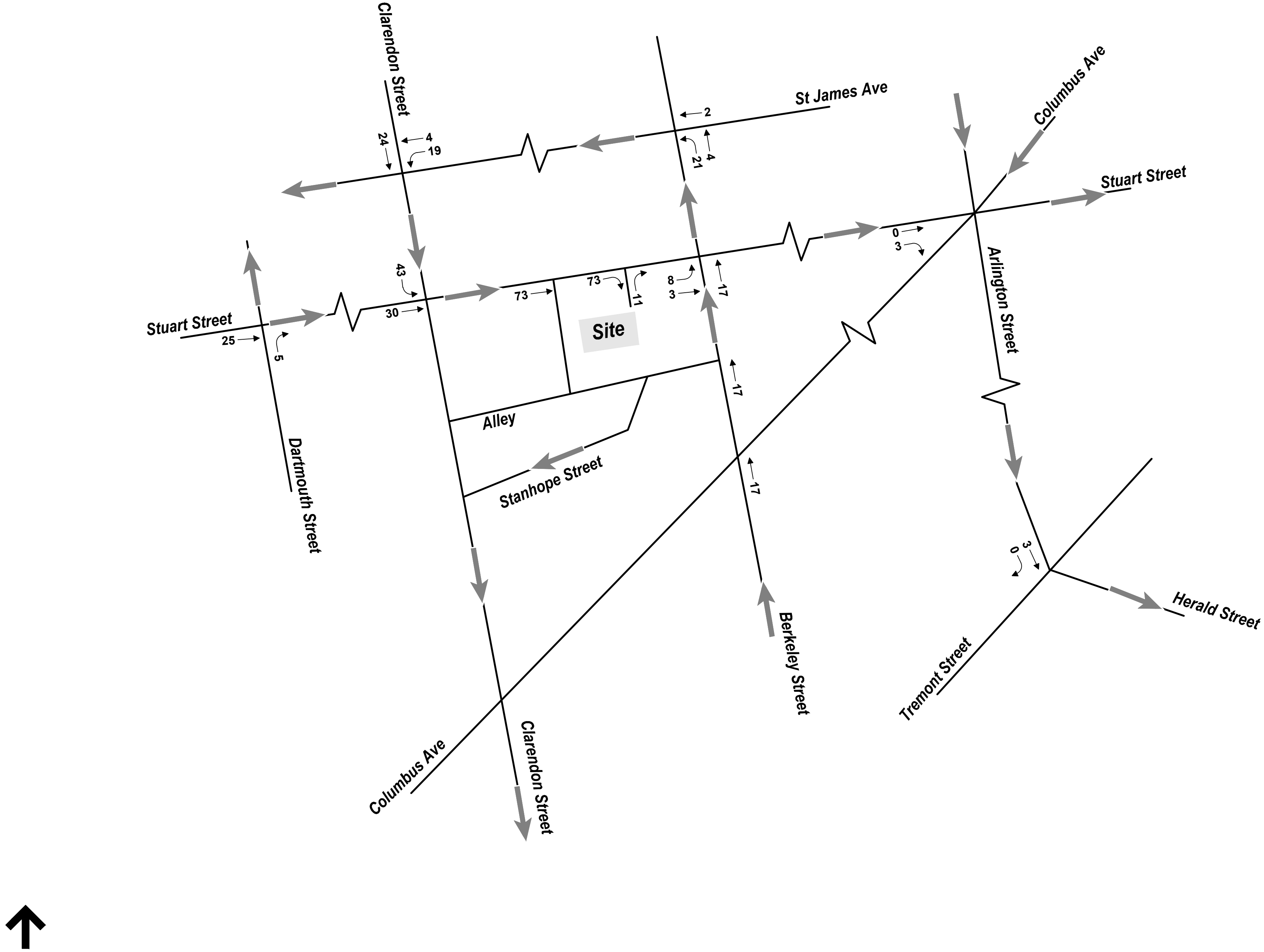
2.3.2.4 Transit

As shown previously in Table 2-7, the Proposed Project is expected to generate a total of 648 transit trips during the morning peak hour and 658 transit trips during the evening peak hour. As discussed previously, this Project Site is well served by existing transit infrastructure. The transit trips generated by the Proposed Project will be able to easily access the Orange Line, the Green Line, local bus routes, express bus routes and the Commuter Rail at Back Bay Station.

380 Stuart Street **Boston, Massachusetts**

Figure 2-15

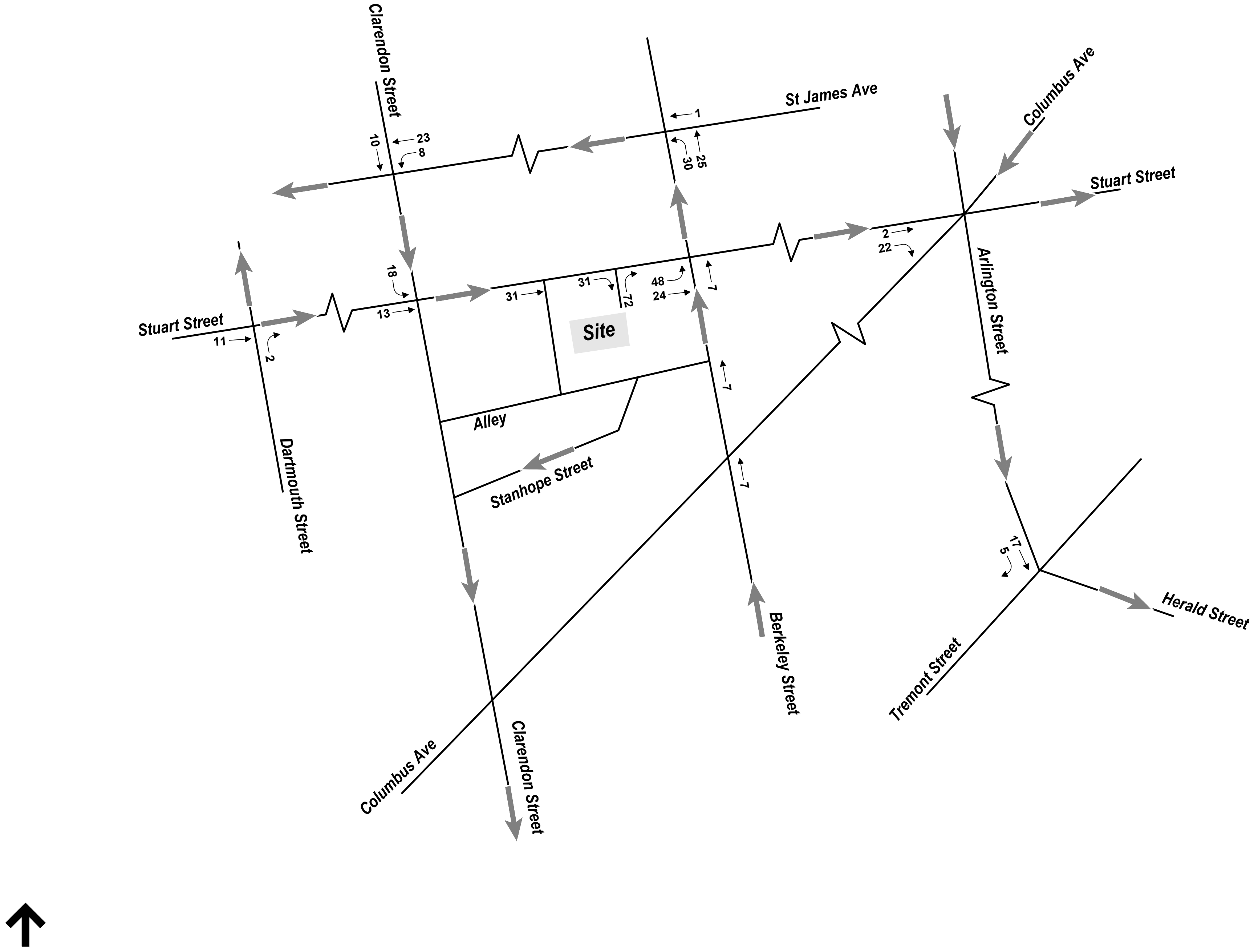
Trip Distribution



380 Stuart Street **Boston, Massachusetts**

Figure 2-16

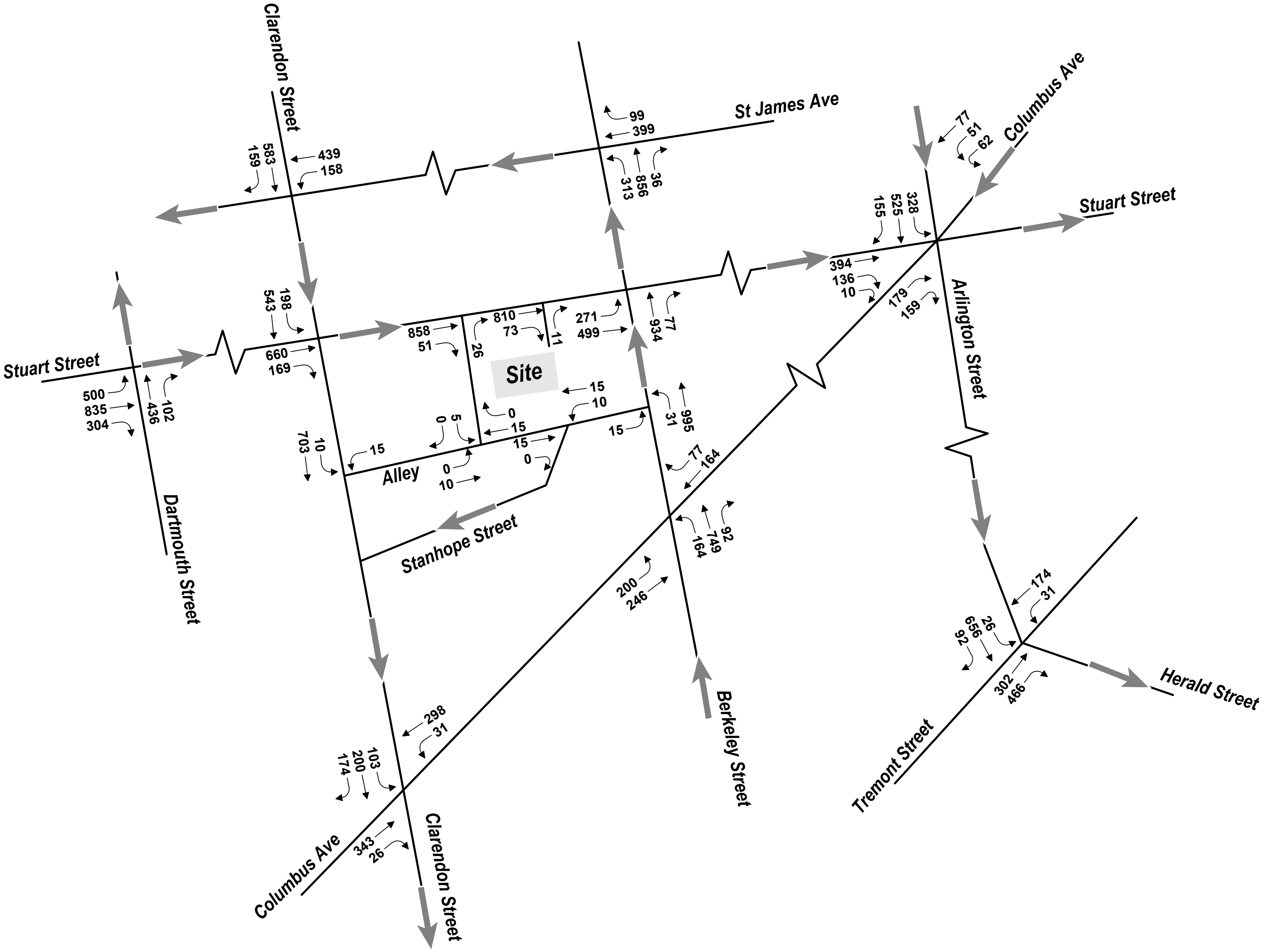
Project Generated Traffic Volumes - Morning Peak Hour



380 Stuart Street **Boston, Massachusetts**

Figure 2-17

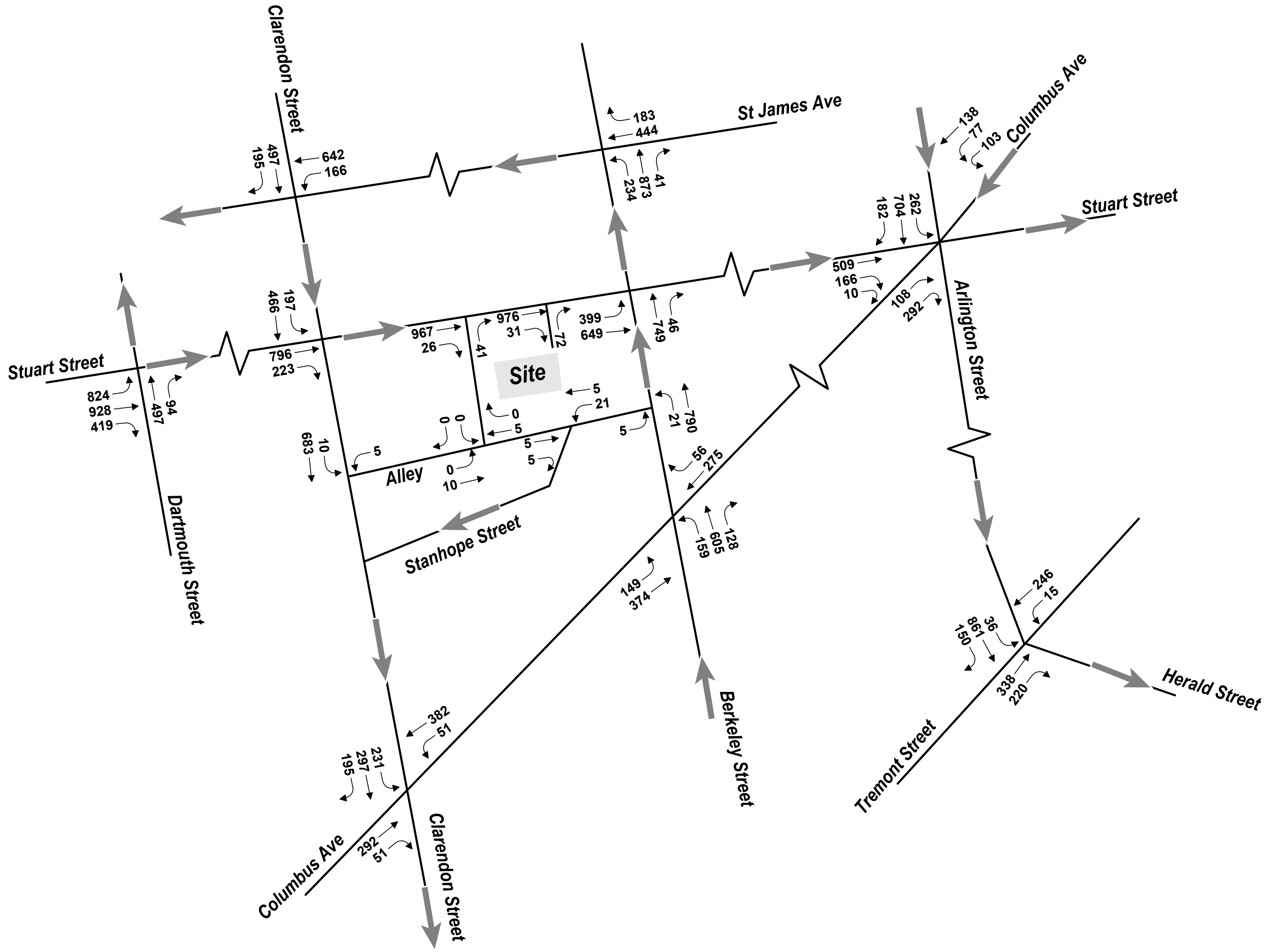
Project Generated Traffic Volumes - Evening Peak Hour



380 Stuart Street **Boston, Massachusetts**

Figure 2-18

2020 Build Condition Traffic Volumes - Morning Peak Hour



380 Stuart Street **Boston, Massachusetts**

Figure 2-19

2020 Build Condition Traffic Volumes - Evening Peak Hour

2.3.2.5 Loading and Service

All loading and service operations will be accommodated by dedicated off-street loading docks. These docks are internal to the building site and will not impact adjacent streets. The dock will have five enclosed bays in the building for deliveries and trash removal. Access to the loading area will be provided via Alley 559, located south of the Project Site. Trucks will generally access the Alley from Berkeley Street via Stanhope Street and will egress to Clarendon Street.

Whenever possible, loading and service activities will occur during off-peak hours. Permanent “No Idling” signs will be posted in the loading area. A loading dock manager will be on-site to manage loading operations throughout the day.

2.3.2.6 Transportation Demand Management

Consistent with the City’s goals to reduce auto-dependency, the Proposed Project and its Proponent will continue to proactively incorporate TDM measures to encourage alternative modes of transportation. TDM measures are most often directed at commuter travel, which is the purpose of the majority of the trips destined to the site.

The following discusses an array of TDM measures that could be implemented. A description of the TDM elements is presented in this section along with information on how those elements aid Project users – notably employees, visitors, and café patrons getting to and from the Proposed Project. Measures being considered as part of the Proposed Project include:

- Provide secure bicycle storage for building tenants and their employees and visitors in accordance with the City of Boston Bicycle Guidelines.
- Bike racks will be provided at select locations within the Project Site. The racks will be securely mounted and feature current designs to properly secure bikes of all kinds. These racks will be located at centralized locations to serve the proposed retail/café elements (both customers and employees).
- A space for a car-sharing service will be provided, such as ZipCar®, within the new garage.
- Space on site for an EV charging station will be provided within the new garage.
- Preferential parking for alternative-fueled and/or hybrid vehicles will be provided.

- Office and retail tenants will be encouraged to provide employer subsidies to employees who purchase monthly or multiple trip transit passes.

- Office and retail tenants will be encouraged to provide a guaranteed ride home program, in conjunction with MassRIDES, to eliminate an often-cited deterrent to carpool and vanpool participation.

- Potential office and retail tenants will be encouraged to offer direct deposit payment for monthly transit passes to employees.

- An on-site Transportation Coordinator will be designated to oversee parking and loading operations as well as to promote alternative transportation measures. The person assigned to this role will coordinate with office and retail tenants to help promote a reduced reliance on single-occupant motor-vehicle travel to the Project Site. To that end, the TDM measures identified in the following sections will be implemented under the direction and supervision of this person. The duties of the transportation coordinator may include, but not be limited to:

  - Acting as a liaison with office and retail employers and MassRIDES.

  - Assisting office and retail employees and residents with ride matching and transportation planning.

  - Disseminating information on alternate modes of transportation and developing transportation related marketing and education materials, including a website. This includes posting relevant public transit information potentially at an outdoor kiosk included as part of the Proposed Project. This would include, but is not limited to, providing transit information such as maps and schedules to new residents and tenants in an orientation package.

  - Developing and maintaining information pertaining to pedestrian and cycling access to and from the Project Site.

  - Encouraging tenants to provide on-site transit pass sales to employees.

All TDM measures will be formalized in the TAPA to be executed with BTD.

2.4 Traffic Operations Analysis

Consistent with BTD's guidelines, *Synchro 8* software was used to model level of service (LOS) operations at the study area intersections. LOS is a qualitative measure of control delay at an intersection providing an index to the operational qualities of a roadway or intersection.

LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating condition. LOS D is typically considered acceptable. LOS E indicates that vehicles experience significant delay and queuing while LOS F suggests unacceptable delays for the average vehicle. LOS thresholds differ for signalized and unsignalized intersections. Longer delays at signalized intersections than at unsignalized intersections are perceived as acceptable.

Table 2-8 below presents the level of service threshold criteria as defined in the 2010 Highway Capacity Manual (HCM).

Table 2-8 Level of Service Criteria

Level of Service	Un-signalized Intersection Control Delay (sec/veh)	Signalized Intersection Control Delay (sec/veh)
LOS A	0-10	≤ 10
LOS B	> 10-15	> 10-20
LOS C	> 15-25	> 20-35
LOS D	> 25-35	> 35-55
LOS E	> 35-50	> 55-80
LOS F	> 50	> 80

Source: 2010 HCM

Adjustments were made to the Synchro model to include characteristics of each intersection, such as geometry, signal timings, heavy vehicles, bus operations, parking activity, and pedestrian crossings. The LOS results of the analyses are summarized for each intersection in Table 2-9 for the Existing, No-Build, and Build conditions. Detailed results including delay by movement, queuing and volume-to-capacity ratio are presented below in Tables 2-10 through 2-21 and the detailed Synchro results are presented in *Appendix B*.

The traffic model includes a conservative approach to future traffic trends by forecasting an increase in background traffic and assigning specific known development projects to the study area as required by the BTD.

Level of service analyses for the 2020 Build Condition, as shown in Table 2-9, indicate that the development of the Project Site and its associated traffic cause minimal changes in overall LOS at the signalized intersections analyzed. As can be expected in an urban area, several of the study area intersections operate with long delays either on some of their individual approaches or for the entire intersection, with or without the Proposed Project.

Under the Build Condition, the Proponent intends to create a garage entrance ramp along Stuart Street, within the limits of the site. This new unsignalized garage driveway at Stuart Street will operate at LOS A for both morning and evening peak hours.

Table 2-9 Intersection Level of Service (LOS) Summary

	AM Peak Hour Operations			PM Peak Hour Operations		
Intersection	Existing	No-Build	Build	Existing	No-Build	Build
Stuart Street / Dartmouth Street	B	B	B	B	C	C
Stuart Street / Clarendon Street	A	B	B	B	B	B
Stuart Street / Garage Driveway	A	A	A	A	A	A
Stuart Street / Berkeley Street	B	B	C	C	C	C
Stuart Street / Arlington Street / Columbus Avenue	E	E	E	F	F	F
Alley 559 / Clarendon Street	A	A	A	A	A	A
Alley 559 / Garage Driveway	-	-	-	-	-	-
Stanhope Street / Berkeley Street	A	A	A	A	A	A
Alley 559 / Stanhope Street	-	-	-	-	-	-
Columbus Avenue / Clarendon Street	C	C	C	C	C	C
Columbus Avenue / Berkeley Street	C	C	C	C	C	C
Arlington Street / Tremont Street / Herald Street	D	D	D	C	C	C
St James Avenue / Clarendon Street	C	C	C	C	C	C
St James Avenue / Berkeley Street	B	B	B	C	C	C
Stuart Street at Site Driveway	-	-	A	-	-	A

Table 2-10 Existing Condition (2015) Signalized Intersection LOS Summary – AM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Signalized Intersections				
Stuart Street at Dartmouth Street	**B**	**12.6**	**0.41**	-
EB Stuart Street Left	A	3.6	0.37	118
EB Stuart Street Thru	B	13.3	0.37	134
EB Stuart Street Right	B	12.8	0.25	42
NB Dartmouth Street Thru	B	19.8	0.40	129
NB Dartmouth Street Right	B	18.6	0.23	42
Stuart Street at Clarendon Street	**A**	**9.8**	**0.47**	-
EB Stuart Street Thru	B	13.4	0.51	76
EB Stuart Street Right	A	4.2	0.17	9
SB Clarendon Street Thru/Right	A	7.8	0.47	60
Stuart Street at Berkeley Street	**B**	**17.5**	**0.57**	-
EB Stuart Street Thru/Left	B	10.3	0.64	65
NB Berkeley Street Thru/Right	C	23.0	0.85	#195
Stuart Street at Arlington Street and Columbus Avenue	**E**	**67.1**	**0.74**	-
EB Stuart Street Thru/Right	E	62.7	0.93	#307
SB Arlington Street Left	D	49.1	0.79	#377
SB Arlington Street Thru	D	36.9	0.63	240
SB Arlington Street Right	C	34.4	0.42	158
NE Columbus Avenue Right	F	169.5	1.21	#273
SW Columbus Avenue Thru/Left	D	44.4	0.51	108
Columbus Avenue at Clarendon Street	**C**	**27.5**	**0.51**	-
EB Columbus Avenue Thru/Right	C	28.1	0.67	285
WB Columbus Avenue Thru/Left	C	22.9	0.35	150
SB Clarendon Street Left/Thru/Right	C	29.9	0.08	199
Columbus Avenue at Berkeley Street	**C**	**21.3**	**0.59**	-
EB Columbus Avenue Thru/Left	A	2.5	0.46	25
WB Columbus Avenue Thru/Right	B	17.8	0.23	63
NB Berkeley Street Left/Thru/Right	C	31.0	0.79	220

Table 2-10 Existing Condition (2015) Signalized Intersection LOS Summary – AM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Arlington Street at Tremont Street and Herald Street	**D**	**37.9**	**0.58**	-
EB Arlington Street Thru/Left	C	25.8	0.48	167
EB Arlington Street Right	C	23.1	0.21	83
NB Tremont Street Thru	C	32.9	0.62	267
NB Tremont Street Right (defacto)	E	67.6	0.98	#523
SB Tremont Street Thru/Left	C	24.1	0.22	81
St James Avenue at Clarendon Street	**C**	**20.1**	**0.47**	-
WB St James Avenue Thru/Left	C	23.2	0.36	m110
SB Clarendon Street Thru/Right	B	17.6	0.57	195
St James Avenue at Berkeley Street	**B**	**16.1**	**0.51**	-
WB St James Ave	C	20.2	0.43	153
NB Berkeley Street Left/Thru/Right	B	14.2	0.79	51

Table 2-11 Existing Condition (2015) Unsignalized Intersection LOS Summary – AM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Unsignalized Intersections				
Stuart Street at Garage Driveway	(unsignalized)			
EB Stuart Street Thru	-	0.0	0.30	0
NB Garage Driveway Right	C	18.6	0.11	9
Alley 559 at Clarendon Street	(unsignalized)			
WB Alley 559 Left	F	127.0	0.42	38
SB Clarendon Street Thru/Left	A	2.2	0.05	4
Stanhope Street at Berkeley Street	(unsignalized)			
NB Berkeley Street Thru/Left	A	1.5	0.03	3
NE Stanhope Street Left	C	24.7	0.10	8

Table 2-12 Existing Condition (2015) Signalized Intersection LOS Summary – PM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Signalized Intersections				
Stuart Street at Dartmouth Street	**B**	**13.5**	**0.59**	-
EB Stuart Street Left	A	6.7	0.58	236
EB Stuart Street Thru	B	15.2	0.40	140
EB Stuart Street Right	B	15.0	0.31	47
NB Dartmouth Street Thru	B	18.4	0.42	151
NB Dartmouth Street Right	B	17.0	0.26	47
Stuart Street at Clarendon Street	**B**	**11.9**	**0.47**	-
EB Stuart Street Thru	A	7.3	0.50	55
EB Stuart Street Right	A	4.0	0.23	16
SB Clarendon Street Thru/Right	B	20.0	0.47	208
Stuart Street at Berkeley Street	**C**	**20.4**	**0.58**	-
EB Stuart Street Thru/Left	C	23.2	0.78	359
NB Berkeley Street Thru/Right	B	17.2	0.65	102
Stuart Street at Arlington Street and Columbus Avenue	**F**	**171.7**	**0.91**	-
EB Stuart Street Thru/Right	F	90.2	1.04	#390
SB Arlington Street Left	D	35.0	0.56	242
SB Arlington Street Thru	D	37.3	0.72	296
SB Arlington Street Right	C	32.2	0.43	169
NE Columbus Avenue Right	F	133.2	1.02	#180
NE Columbus Avenue Hard Right (defacto)	F	767.1	2.55	#518
SW Columbus Avenue Thru	F	159.7	1.01	#234
SW Columbus Avenue Left (defacto)	F	188.3	1.22	#304
Columbus Avenue at Clarendon Street	**C**	**27.8**	**0.56**	-
EB Columbus Avenue Thru/Right	D	40.1	0.79	#336
WB Columbus Avenue Thru/Left	C	27.9	0.67	#182
SB Clarendon Street Left/Thru/Right	C	21.6	0.80	171
Columbus Avenue at Berkeley Street	**C**	**26.8**	**0.58**	-
EB Columbus Avenue Thru/Left	C	24.2	0.47	m207
WB Columbus Avenue Thru/Right	B	16.6	0.27	94
NB Berkeley Street Left/Thru/Right	C	32.1	0.78	209

Table 2-12 Existing Condition (2015) Signalized Intersection LOS Summary – PM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Arlington Street at Tremont Street and Herald Street	**C**	**28.7**	**0.51**	**-**
EB Arlington Street Thru/Left	C	24.8	0.54	207
EB Arlington Street Right	C	22.3	0.29	117
NB Tremont Street Thru/Right	D	36.6	0.74	237
SB Tremont Street Thru/Left	C	27.4	0.33	104
St James Avenue at Clarendon Street	**C**	**22.7**	**0.49**	**-**
WB St James Avenue Thru/Left	C	30.0	0.48	m189
SB Clarendon Street Thru/Right	B	14.7	0.50	155
St James Avenue at Berkeley Street	**C**	**20.5**	**0.51**	**-**
WB St James Ave	C	20.6	0.47	161
NB Berkeley Street Left/Thru/Right	C	20.4	0.84	86

Table 2-13 Existing Condition (2015) Unsignalized Intersection LOS Summary – PM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Unsignalized Intersections				
Stuart Street at Garage Driveway	(unsignalized)			
EB Stuart Street Thru	-	0.0	0.37	0
NB Garage Driveway Right	C	24.0	0.19	17
Alley 559 at Clarendon Street	(unsignalized)			
WB Alley 559 Left	D	25.1	0.07	5
SB Clarendon Street Thru/Left	A	0.8	0.02	1
Stanhope Street at Berkeley Street	(unsignalized)			
NB Berkeley Street Thru/Left	A	1.1	0.21	1
NE Stanhope Street Left	C	17.0	0.04	3

All of the study intersections, with the exception of Stuart Street at Arlington Street and Columbus Avenue, operate at a level LOS D or greater. Stuart Street at Arlington Street and Columbus Avenue operates at LOS E during AM peak hour and LOS F during PM peak hour. This intersection experiences high traffic volumes at all approaches during both the AM and PM peak hours. Additionally, the complex intersection configuration creates delays that are especially significant along Columbus Avenue northbound and southbound.

Table 2-14 No-Build Condition (2020) Signalized Intersection LOS Summary – AM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Signalized Intersections				
Stuart Street at Dartmouth Street	**B**	**17.1**	**0.63**	-
EB Stuart Street Left	A	6.2	0.55	183
EB Stuart Street Thru	B	18.9	0.69	314
EB Stuart Street Right	C	21.9	0.57	#151
NB Dartmouth Street Thru	B	19.9	0.41	133
NB Dartmouth Street Right	C	20.4	0.42	78
Stuart Street at Clarendon Street	**B**	**13.2**	**0.50**	-
EB Stuart Street Thru	B	17.1	0.54	130
EB Stuart Street Right	B	19.2	0.20	m37
SB Clarendon Street Thru/Right	A	7.9	0.48	62
Stuart Street at Berkeley Street	**B**	**19.3**	**0.61**	-
EB Stuart Street Thru/Left	B	10.9	0.68	67
NB Berkeley Street Thru/Right	C	25.8	0.89	#280
Stuart Street at Arlington Street and Columbus Avenue	**E**	**70.3**	**0.76**	-
EB Stuart Street Thru/Right	E	65.7	0.95	#322
SB Arlington Street Left	D	51.8	0.82	#392
SB Arlington Street Thru	D	37.8	0.65	248
SB Arlington Street Right	D	35.0	0.44	163
NE Columbus Avenue Right	F	180.4	1.24	#280
SW Columbus Avenue Thru/Left	D	44.6	0.52	111
Columbus Avenue at Clarendon Street	**C**	**28.3**	**0.52**	-
EB Columbus Avenue Thru/Right	C	29.0	0.69	293
WB Columbus Avenue Thru/Left	C	24.2	0.36	m153
SB Clarendon Street Left/Thru/Right	C	30.2	0.81	203

Table 2-14 No-Build Condition (2020) Signalized Intersection LOS Summary – AM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Columbus Avenue at Berkeley Street	**C**	**21.5**	**0.61**	**-**
EB Columbus Avenue Thru/Left	A	2.8	0.48	26
WB Columbus Avenue Thru/Right	B	18.6	0.24	64
NB Berkeley Street Left/Thru/Right	C	30.7	0.81	235
Arlington Street at Tremont Street and Herald Street	**D**	**39.8**	**0.60**	**-**
EB Arlington Street Thru/Left	C	26.0	0.49	172
EB Arlington Street Right	C	23.2	0.21	84
NB Tremont Street Thru	C	33.4	0.63	274
NB Tremont Street Right (defacto)	E	73.9	1.01	#543
SB Tremont Street Thru/Left	C	24.2	0.23	82
St James Avenue at Clarendon Street	**C**	**20.7**	**0.49**	**-**
WB St James Avenue Thru/Left	C	24.1	0.37	m112
SB Clarendon Street Thru/Right	B	17.9	0.59	203
St James Avenue at Berkeley Street	**B**	**17.6**	**0.55**	**-**
WB St James Ave	C	20.6	0.45	163
NB Berkeley Street Left/Thru/Right	B	16.2	0.85	m99

Table 2-15 No-Build Condition (2020) Unsignalized Intersection LOS Summary – AM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Unsignalized Intersections				
Stuart Street at Garage Driveway	(unsignalized)			
EB Stuart Street Thru	-	0.0	0.32	0
NB Garage Driveway Right	C	18.7	0.12	10
Alley 559 at Clarendon Street	(unsignalized)			
WB Alley 559 Left	F	133.8	0.44	39
SB Clarendon Street Thru/Left	A	2.2	0.05	4

Table 2-15 No-Build Condition (2020) Unsignalized Intersection LOS Summary – AM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Stanhope Street at Berkeley Street	(unsignalized)			
NB Berkeley Street Thru/Left	A	1.5	0.03	3
NE Stanhope Street Left	B	14.0	0.05	4

Table 2-16 No-Build Condition (2020) Signalized Intersection LOS Summary – PM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Signalized Intersections				
Stuart Street at Dartmouth Street	**C**	**25.5**	**0.93**	-
EB Stuart Street Left	C	33.7	0.97	#710
EB Stuart Street Thru	B	15.7	0.44	155
EB Stuart Street Right	D	42.1	0.80	#124
NB Dartmouth Street Thru	B	18.5	0.43	155
NB Dartmouth Street Right	B	18.6	0.42	80
Stuart Street at Clarendon Street	**B**	**12.5**	**0.50**	-
EB Stuart Street Thru	A	8.0	0.53	60
EB Stuart Street Right	A	5.2	0.25	21
SB Clarendon Street Thru/Right	C	20.5	1.03	218
Stuart Street at Berkeley Street	**C**	**21.4**	**0.61**	-
EB Stuart Street Thru/Left	C	25.0	0.82	376
NB Berkeley Street Thru/Right	B	17.2	0.68	106
Stuart Street at Arlington Street and Columbus Avenue	**F**	**179.0**	**0.94**	-
EB Stuart Street Thru/Right	F	101.6	1.08	#408
SB Arlington Street Left	D	35.6	0.57	250
SB Arlington Street Thru	D	39.2	0.77	321
SB Arlington Street Right	C	32.7	0.45	177
NE Columbus Avenue Right	F	141.8	1.05	#186
NE Columbus Avenue Hard Right (defacto)	F	794.8	2.61	#531
SW Columbus Avenue Thru	F	128.0	1.03	#238
SW Columbus Avenue Left (defacto)	F	204.2	1.26	#316

Table 2-16 No-Build Condition (2020) Signalized Intersection LOS Summary – PM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Columbus Avenue at Clarendon Street	**C**	**27.8**	**0.56**	-
EB Columbus Avenue Thru/Right	D	41.2	0.81	#348
WB Columbus Avenue Thru/Left	C	29.0	0.70	#207
SB Clarendon Street Left/Thru/Right	B	19.9	0.79	144
Columbus Avenue at Berkeley Street	**C**	**27.0**	**0.60**	-
EB Columbus Avenue Thru/Left	C	24.6	0.49	m212
WB Columbus Avenue Thru/Right	B	17.2	0.28	97
NB Berkeley Street Left/Thru/Right	C	32.0	0.79	220
Arlington Street at Tremont Street and Herald Street	**C**	**29.1**	**0.52**	-
EB Arlington Street Thru/Left	C	25.2	0.56	217
EB Arlington Street Right	C	22.5	0.30	121
NB Tremont Street Thru/Right	D	37.3	0.76	244
SB Tremont Street Thru/Left	C	27.5	0.34	107
St James Avenue at Clarendon Street	**C**	**23.6**	**0.52**	-
WB St James Avenue Thru/Left	C	30.9	0.54	m207
SB Clarendon Street Thru/Right	B	14.9	0.51	162
St James Avenue at Berkeley Street	**C**	**22.3**	**0.55**	-
WB St James Ave	C	21.4	0.52	182
NB Berkeley Street Left/Thru/Right	C	22.9	0.89	#105

Table 2-17 No-Build Condition (2020) Unsignalized Intersection LOS Summary – PM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Unsignalized Intersections				
Stuart Street at Garage Driveway	(unsignalized)			
EB Stuart Street Thru	-	0.0	0.39	0
NB Garage Driveway Right	C	24.3	0.20	18

Table 2-17 No-Build Condition (2020) Unsignalized Intersection LOS Summary – PM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Alley 559 at Clarendon Street	(unsignalized)			
WB Alley 559 Left	D	25.5	0.07	5
SB Clarendon Street Thru/Left	A	0.7	0.02	1
Stanhope Street at Berkeley Street	(unsignalized)			
NB Berkeley Street Thru/Left	A	1.1	0.02	2
NE Stanhope Street Left	C	17.3	0.04	3

The intersections are minimally affected by the additional traffic volumes due to background growth and surrounding projects. During the AM peak hour, Stuart Street at Clarendon Street experiences a slight decrease in performance from LOS A to LOS B due to increased volume on Stuart Street. In the PM peak hour, Stuart Street at Dartmouth Street decreases from LOS B to LOS C. Stuart Street left and right turn performance is reduced, and this is potentially due to the removal of the channelized lane configuration as part of the Copley Place project.

Table 2-18 Build Condition (2020) Signalized Intersection LOS Summary – AM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Signalized Intersections				
Stuart Street at Dartmouth Street	**B**	**17.2**	**0.65**	**-**
EB Stuart Street Left	A	6.3	0.56	187
EB Stuart Street Thru	B	19.2	0.70	325
EB Stuart Street Right	C	21.9	0.57	#151
NB Dartmouth Street Thru	B	19.9	0.41	133
NB Dartmouth Street Right	C	20.9	0.45	85
Stuart Street at Clarendon Street	**B**	**13.7**	**0.53**	**-**
EB Stuart Street Thru	B	17.7	0.57	138
EB Stuart Street Right	C	20.6	0.20	m37
SB Clarendon Street Thru/Right	A	8.4	0.25	65
Stuart Street at Berkeley Street	**C**	**20.9**	**0.62**	**-**
EB Stuart Street Thru/Left	B	12.8	0.69	84
NB Berkeley Street Thru/Right	C	27.0	0.91	#289

Table 2-18 Build Condition (2020) Signalized Intersection LOS Summary – AM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Stuart Street at Arlington Street and Columbus Avenue	**E**	**70.6**	**0.76**	-
EB Stuart Street Thru/Right	E	67.2	0.96	#325
SB Arlington Street Left	D	51.8	0.82	#392
SB Arlington Street Thru	D	37.8	0.65	248
SB Arlington Street Right	D	35.0	0.44	163
NE Columbus Avenue Right	F	180.4	1.24	#280
SW Columbus Avenue Thru/Left	D	44.6	0.52	111
Columbus Avenue at Clarendon Street	**C**	**28.3**	**0.52**	-
EB Columbus Avenue Thru/Right	C	29.0	0.69	293
WB Columbus Avenue Thru/Left	C	24.2	0.36	m152
SB Clarendon Street Left/Thru/Right	C	30.1	0.81	203
Columbus Avenue at Berkeley Street	**C**	**21.5**	**0.62**	-
EB Columbus Avenue Thru/Left	A	3.0	0.49	26
WB Columbus Avenue Thru/Right	B	18.9	0.24	64
NB Berkeley Street Left/Thru/Right	C	30.5	0.81	240
Arlington Street at Tremont Street and Herald Street	**D**	**39.8**	**0.60**	-
EB Arlington Street Thru/Left	C	25.7	0.49	173
EB Arlington Street Right	C	23.2	0.21	84
NB Tremont Street Thru	C	33.4	0.63	274
NB Tremont Street Right (defacto)	E	73.9	1.01	#543
SB Tremont Street Thru/Left	C	24.2	0.23	82
St James Avenue at Clarendon Street	**C**	**20.9**	**0.51**	-
WB St James Avenue Thru/Left	C	24.1	0.39	m113
SB Clarendon Street Thru/Right	B	18.3	0.61	213
St James Avenue at Berkeley Street	**B**	**18.0**	**0.55**	-
WB St James Ave	C	20.6	0.45	163
NB Berkeley Street Left/Thru/Right	B	16.9	0.87	m135

Table 2-19 Build Condition (2020) Unsignalized Intersection LOS Summary – AM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Unsignalized Intersections				
Stuart Street at Garage Driveway	(unsignalized)			
EB Stuart Street Thru	-	0.0	0.37	0
NB Garage Driveway Right	C	20.1	0.13	11
Alley 559 at Clarendon Street	(unsignalized)			
WB Alley 559 Left	F	130.5	0.43	38
SB Clarendon Street Thru/Left	A	2.2	0.05	4
Stanhope Street at Berkeley Street	(unsignalized)			
NB Berkeley Street Thru/Left	A	1.5	0.03	3
NE Stanhope Street Left	B	12.8	0.04	3
Stuart Street at Site Driveway	(unsignalized)			
EB Stuart Street Thru/Right	-	0.0	0.35	0
NB Site Driveway Right	A	9.0	0.01	1

Table 2-20 Build Condition (2020) Signalized Intersection LOS Summary – PM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Signalized Intersections				
Stuart Street at Dartmouth Street	**C**	**25.5**	**0.93**	**-**
EB Stuart Street Left	C	33.7	0.97	#710
EB Stuart Street Thru	B	15.7	0.45	157
EB Stuart Street Right	D	42.1	0.80	#124
NB Dartmouth Street Thru	B	18.5	0.43	155
NB Dartmouth Street Right	B	18.7	0.42	83
Stuart Street at Clarendon Street	**B**	**12.7**	**0.51**	**-**
EB Stuart Street Thru	A	8.1	0.54	61
EB Stuart Street Right	A	4.9	0.25	20
SB Clarendon Street Thru/Right	C	20.8	0.50	224
Stuart Street at Berkeley Street	**C**	**24.1**	**0.64**	**-**
EB Stuart Street Thru/Left	C	29.7	0/89	#427
NB Berkeley Street Thru/Right	B	17.2	0.69	107

Table 2-20 Build Condition (2020) Signalized Intersection LOS Summary – PM Peak Hour (Continued)

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Stuart Street at Arlington Street and Columbus Avenue	**F**	**182.4**	**0.95**	-
EB Stuart Street Thru/Right	F	117.3	1.12	#431
SB Arlington Street Left	D	35.6	0.57	250
SB Arlington Street Thru	D	39.2	0.77	321
SB Arlington Street Right	C	32.7	0.45	177
NE Columbus Avenue Right	F	141.8	1.05	#186
NE Columbus Avenue Hard Right (defacto)	F	794.8	2.61	#531
SW Columbus Avenue Thru	F	171.2	1.03	#316
SW Columbus Avenue Left (defacto)	F	204.2	1.26	#238
Columbus Avenue at Clarendon Street	**C**	**27.8**	**0.56**	-
EB Columbus Avenue Thru/Right	D	41.2	0.81	#348
WB Columbus Avenue Thru/Left	C	29.0	0.70	#207
SB Clarendon Street Left/Thru/Right	B	19.9	0.79	147
Columbus Avenue at Berkeley Street	**C**	**27.2**	**0.60**	-
EB Columbus Avenue Thru/Left	C	24.7	0.49	m212
WB Columbus Avenue Thru/Right	B	17.3	0.28	97
NB Berkeley Street Left/Thru/Right	C	32.1	0.79	223
Arlington Street at Tremont Street and Herald Street	**C**	**29.2**	**0.53**	-
EB Arlington Street Thru/Left	C	25.4	0.58	222
EB Arlington Street Right	C	22.7	0.31	125
NB Tremont Street Thru/Right	D	37.3	0.76	244
SB Tremont Street Thru/Left	C	27.5	0.34	107
St James Avenue at Clarendon Street	**C**	**24.3**	**0.54**	-
WB St James Avenue Thru/Left	C	31.9	0.56	m211
SB Clarendon Street Thru/Right	B	15.1	0.52	167
St James Avenue at Berkeley Street	**C**	**24.8**	**0.57**	-
WB St James Ave	C	21.4	0.52	182
NB Berkeley Street Left/Thru/Right	C	26.7	0.92	m#125

Table 2-21 Build Condition (2020) Unsignalized Intersection LOS Summary – PM Peak Hour

Intersection	LOS	Delay (sec.)	V/C Ratio	95th % Queue (feet)
Unsignalized Intersections				
Stuart Street at Garage Driveway	(unsignalized)			
EB Stuart Street Thru	-	0.0	0.40	0
NB Garage Driveway Right	C	24.7	0.20	18
Alley 559 at Clarendon Street	(unsignalized)			
WB Alley 559 Left	D	25.3	0.07	5
SB Clarendon Street Thru/Left	A	0.3	0.28	1
Stanhope Street at Berkeley Street	(unsignalized)			
NB Berkeley Street Thru/Left	A	0.2	0.22	2
NE Stanhope Street Left	C	17.3	0.04	3
Stuart Street at Site Driveway	(unsignalized)			
EB Stuart Street Thru/Right	-	0.0	0.42	0
NB Site Driveway Right	A	9.7	0.09	8

The study intersections show no change in performance from the 2020 No-Build Condition to the 2020 Build Condition, and all of the LOS values remain constant for both the AM and PM peak hours. The traffic volumes generated by the Proposed Project will not greatly affect the surrounding area intersections.

2.5 Construction Management

The Proponent will develop a detailed evaluation of potential short-term construction-related transportation impacts including construction vehicle traffic, parking supply and demand, and pedestrian access. Detailed construction management plans will be developed and submitted to the BTD for their approval. These plans will detail construction vehicle routing and staging.

2.5.1 Construction Vehicle Traffic

Construction vehicles will be necessary to move construction materials to and from the Project Site. Every effort will be made to reduce the noise, control fugitive dust, and minimize other disturbances associated with construction traffic. Truck staging and laydown areas for the Proposed Project will be carefully planned. The need for site occupancy (lane closures) along roadways adjacent to the Project Site is not known at this time.

2.5.2 Construction Parking Issues

Contractors will be encouraged to devise access plans for their personnel that de-emphasize auto use (such as seeking off-site parking, provide transit subsidies, on-site lockers, etc.) Construction workers will also be encouraged to use public transportation to access the Project Site because no new parking will be provided for them. Because of the construction workers early arrival/departure (typically 7:00AM-3:00PM) schedule, a conflict for on-street parking is not anticipated.

2.5.3 Pedestrian Access During Construction

During the construction period, pedestrian activity adjacent to the sites may be impacted by sidewalk closures. A variety of measures will be considered and implemented to protect the safety of pedestrians. Temporary walkways, appropriate lighting, and new directional and informational signage to direct pedestrians around the construction sites will be provided. After construction is complete, finished pedestrian sidewalks will be permanently reconstructed to meet ADA standards around the new facilities. Any damage as a result of construction vehicles or otherwise will be repaired per City standards.

Chapter 3.0

Environmental Review Component

3.0 ENVIRONMENTAL REVIEW COMPONENT

3.1 Wind

3.1.1 Introduction

A pedestrian wind study was conducted by Rowan Williams Davies & Irwin Inc. (RWDI) for the proposed development located at 380 Stuart Street in Boston, Massachusetts. The objective of the study was to assess the impact that the Proposed Project may have on existing local pedestrian conditions around the study site and to provide recommendations for minimizing adverse effects.

This analysis was completed using physical modeling of a 1:400 scale model of the Proposed Project and surroundings. The wind conditions quantified through this work were compared against the BRA criteria. This report describes the methods and summarizes the results of the wind tunnel simulations.

The wind analysis shows that with the Proposed Project, the overall wind conditions expected in the surrounding area are largely similar in the No Build and Build Conditions. Locations where wind comfort levels are reduced are generally offset by locations where wind comfort levels are improved. The Proposed Project will not result in additional uncomfortable annual wind conditions. Wind conditions surrounding the Project Site are expected to be comfortable for the intended uses.

3.1.2 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.

3.1.3 Methodology

The scale model of the Proposed Project was constructed using information provided by the design team. As shown in Figures 3.1-1 and 3.1-2, the wind tunnel model included the proposed development and all relevant surrounding buildings and topography within a 1500 foot radius of the study site. Two configurations of the site were modeled to represent:

- No Build Configuration: includes the existing building, in the presence of all existing and approved surroundings, and nearby marcescent trees; and,

- Build Configuration: includes the proposed 380 Stuart Street Project in the presence of all existing and approved surroundings.

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 81 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 5 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 combined with long-term meteorological data, recorded during the years from 1993 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 3.1-3 through 3.1-5 present wind roses that summarize the annual and seasonal wind climates in the area. The left wind rose in Figure 3.1-3, for example, summarizes the spring (March, April, and May) wind data. In general, the prevailing winds at this time of year originate from the west-northwest, northwest, west, south-southwest and east-southeast. In the case of strong winds, however, the most common wind directions are northeast, west and west-northwest. Figure 3.1-4 presents the wind roses for the fall and winter months.

On an annual basis (Figure 3.1-5), the most common wind directions are those between south-southwest and northwest. Winds from the east and east-southeast are also relatively common. In the case of strong winds, northeast and west-northwest are the dominant wind directions.

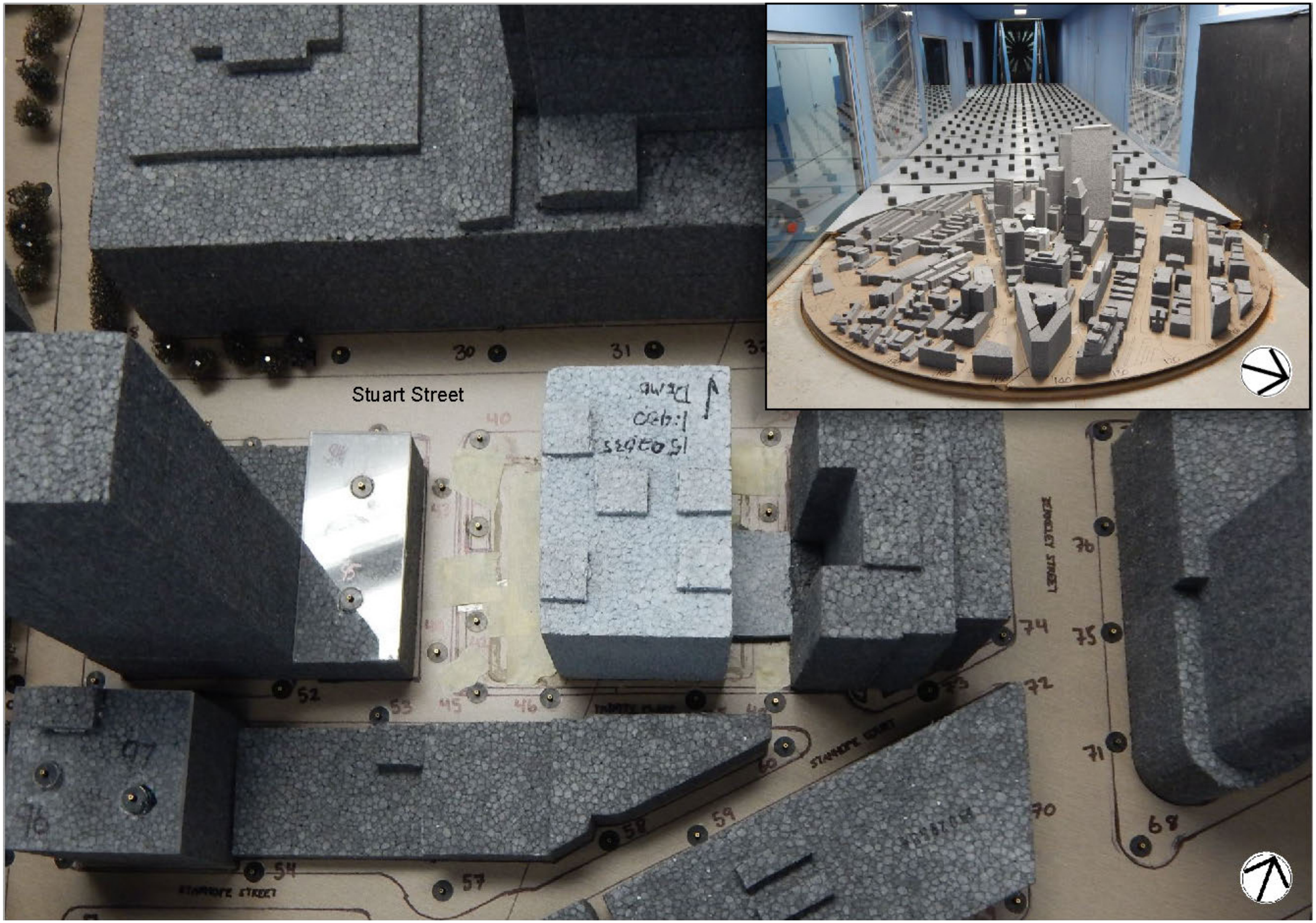


Figure 3.1-1

No Build Configuration

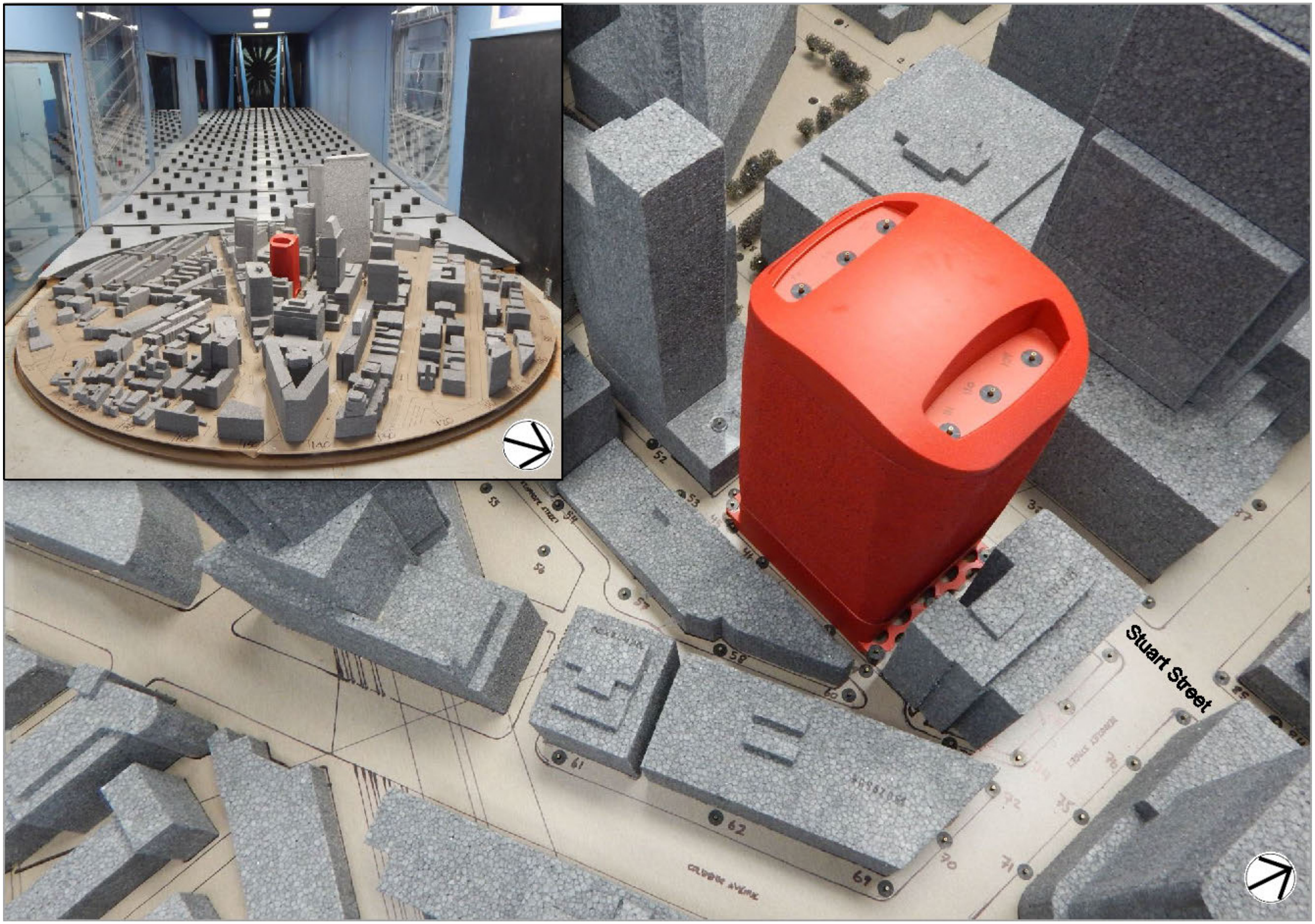
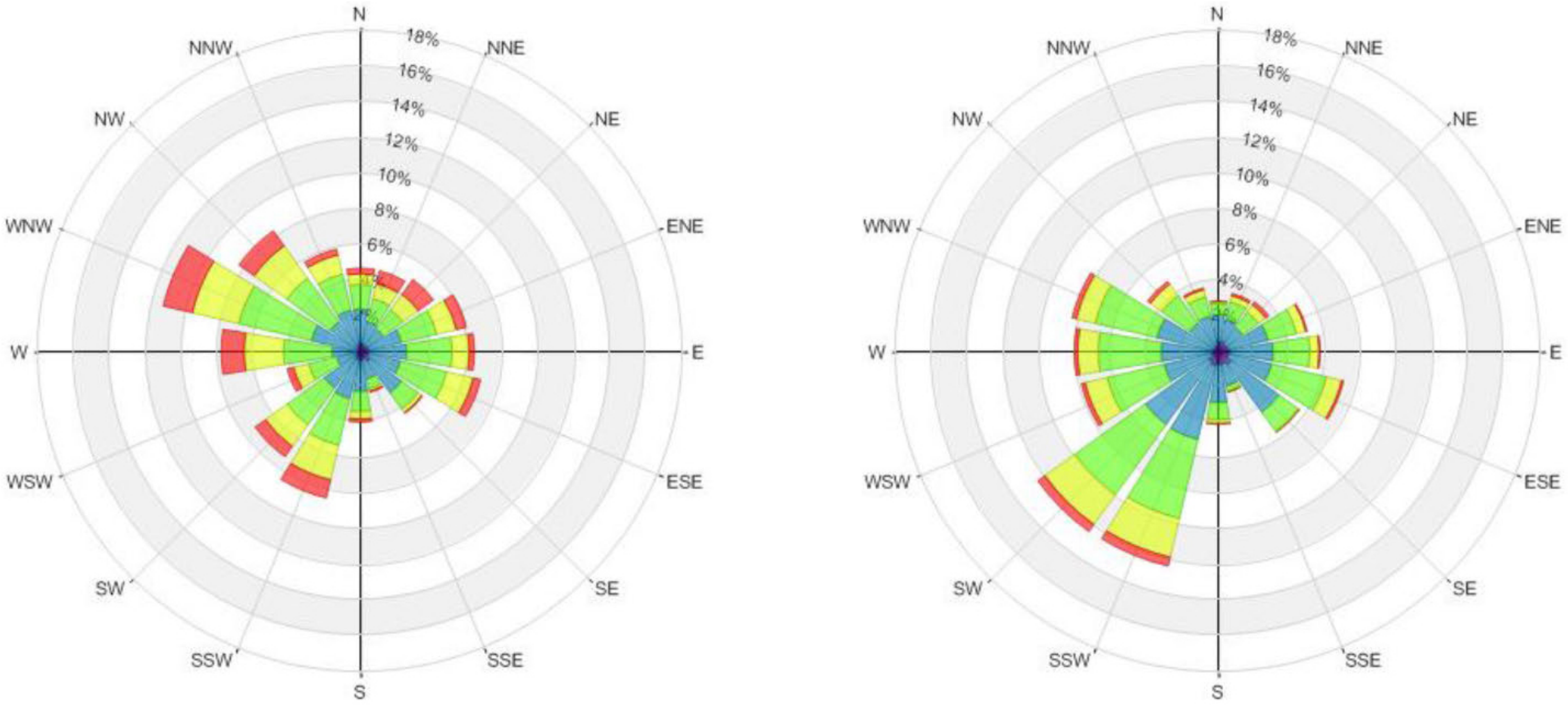


Figure 3.1-2

Build Configuration



Spring
(March - May)

Summer
(June - August)

	Wind Speed (mph)	Probability (%)	
		Spring	Summer
	Calm	2.5	2.8
🟪	1-5	6.3	9.0
🟦	6-10	28.6	38.6
🟩	11-15	33.0	34.8
🟨	16-20	19.4	12.2
🟥	>20	10.2	2.6

Figure 3.1-3

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1993-2013)

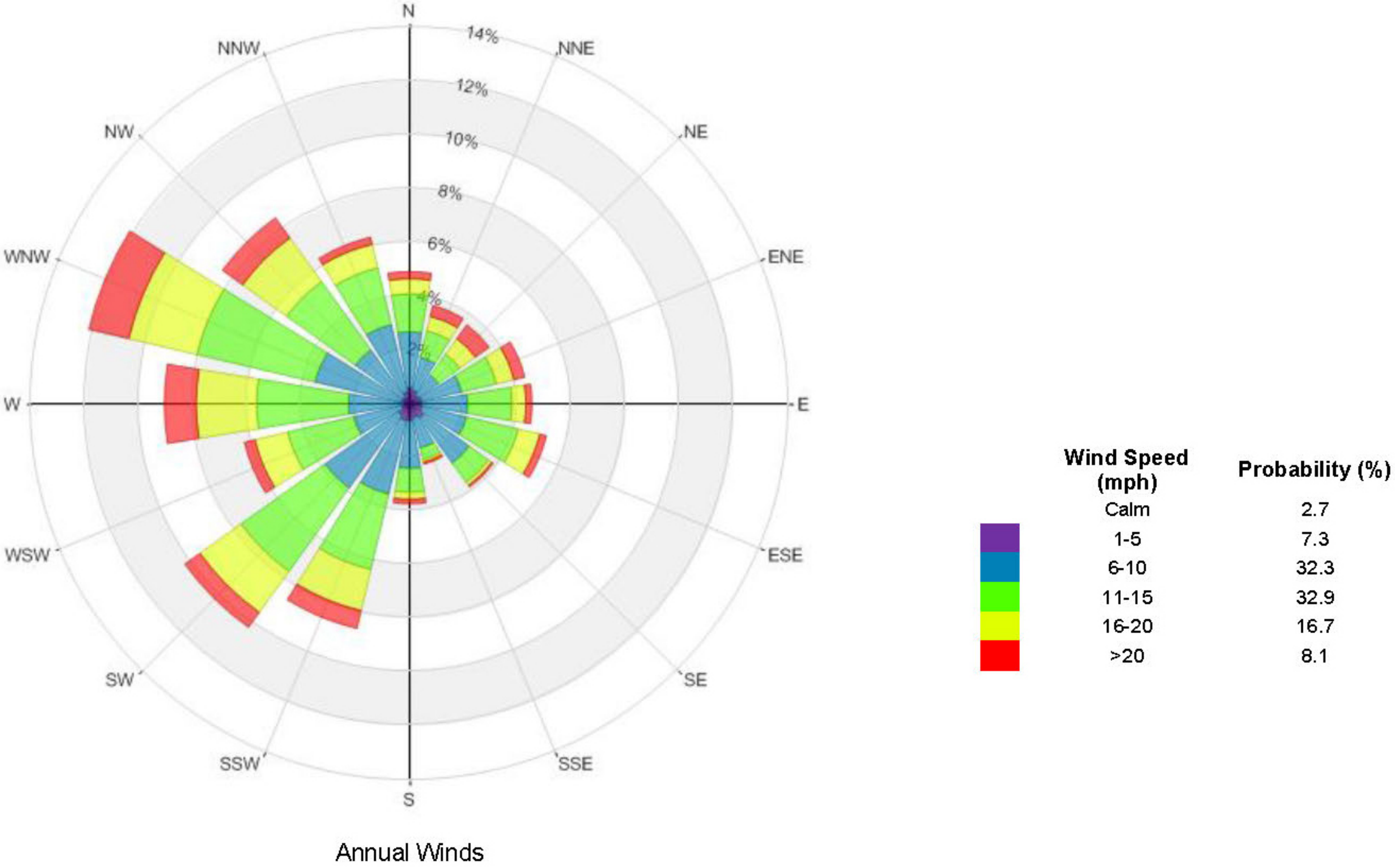
Fall
(September - November)

Winter
(December - February)

	Wind Speed (mph)	Probability (%) Fall	Probability (%) Winter
	Calm	3.1	2.4
🟪	1-5	8.0	6.1
🟦	6-10	34.2	27.6
🟩	11-15	32.7	30.9
🟨	16-20	15.2	20.1
🟥	>20	6.8	13.0

Figure 3.1-4

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1993-2013)



	Wind Speed (mph)	Probability (%)
	Calm	2.7
🟪	1-5	7.3
🟦	6-10	32.3
🟩	11-15	32.9
🟨	16-20	16.7
🟥	>20	8.1

Figure 3.1-5

Directional Distribution (%) of Winds (Blowing From) Boston Logan International Airport (1993-2013)

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. 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 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.

3.1.4 Pedestrian Wind Comfort Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root-mean-square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second standard used by the BRA is based on the work of Melbourne[1] and is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking, as shown in Table 3.1-1.

The criteria are shown in terms of benchmarks for the one-hour mean speed exceeded one percent of the time (*i.e.*, the 99-percentile mean wind speed).

Table 3.1-1 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.

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

---

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

3.1.5 Results

Table 1 in Appendix C presents the mean and effective gust wind speeds for each season, as well as those averaged annually. Table 2 in Appendix C presents the change in mean wind speed categories from the No Build to Build condition for each grade level test location. Figures 3.1-6 through 3.1-9 graphically depict the mean wind conditions from Table 1 at each wind measurement location based on the annual winds only. Figure 3.1-10 is a graphical representation of the mean speed category changes from No Build to Build configuration presented in Table 2. Typically the summer and fall winds tend to be more comfortable than the annual winds, while the winter and spring winds are less comfortable than the annual winds. The following discussion of pedestrian wind comfort is based on the annual winds for each configuration tested, except where noted.

3.1.5.1 Effective Gust Criterion

The effective gust criterion was met at all locations in the immediate vicinity of the Project Site. To the west of the tower, three locations in the No Build configuration (Locations 6, 17, and 18 in Figure 3.1-6) and four locations in the Build configuration (Locations 1, 6, 17, and 18 in Figure 3.1-7) exceed this criterion. However, these exceedances are due to the tall neighboring buildings to the west and are not impacted by the Proposed Project.

Along St. James Avenue, Location 1 exceeded the effective gust criterion in the Build configuration (at 32 mph) but did not exceed in the No Build configuration (at 31 mph). This change was due to typical variability between wind tunnel tests rather than the addition of the proposed building.

3.1.5.2 Mean Speed Criterion

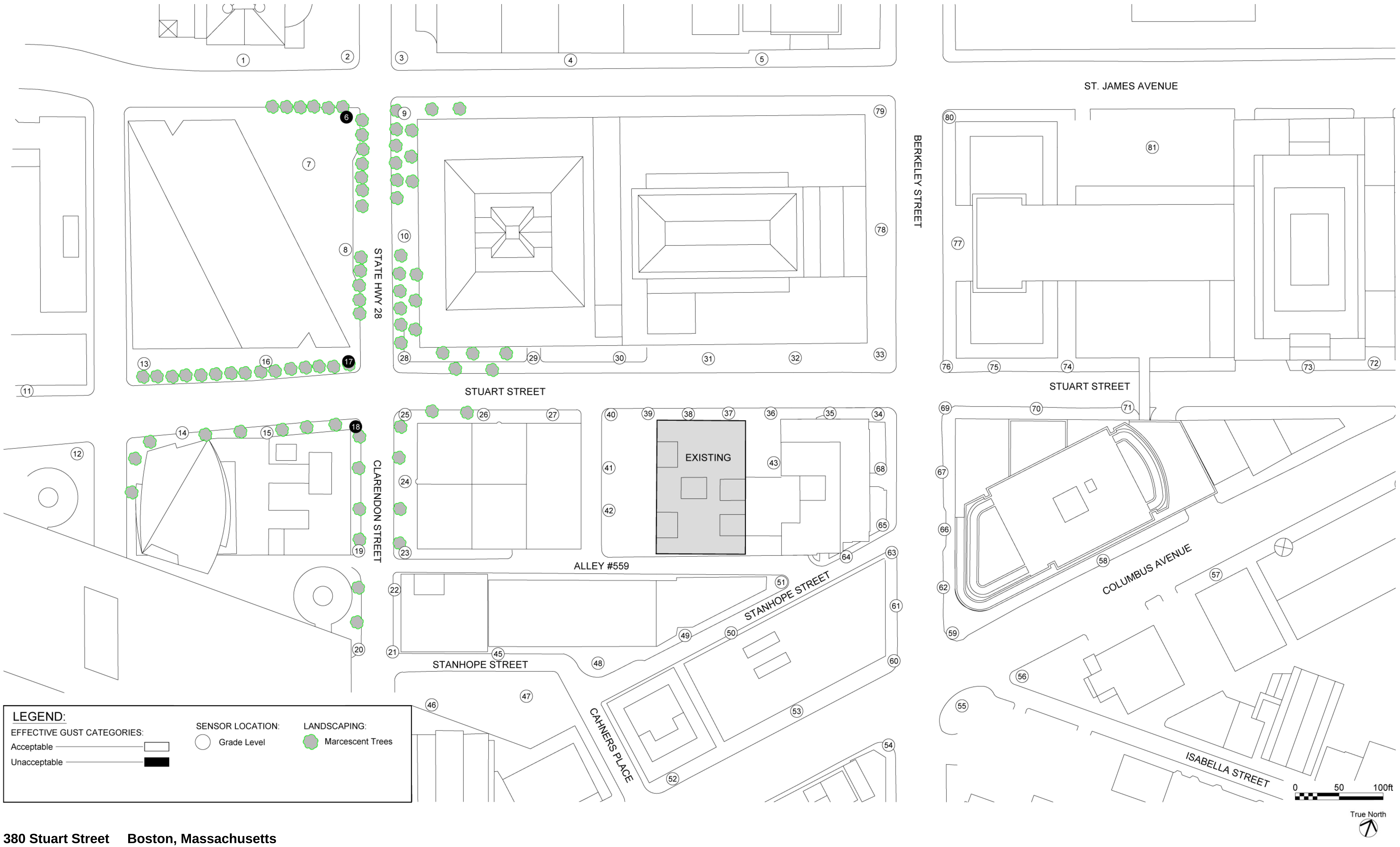
A mean speed categorization of walking is considered appropriate for sidewalks. Lower wind speeds conducive to standing are preferred at building entrances. Wind conditions comfortable for sitting are desired around patios during the summer when the areas would be in use.

No Build Configuration

As shown in Figure 3.1-8, wind conditions are expected to be comfortable for walking or better in the vicinity of the Project Site. Along the south side of Stuart Street, conditions are generally suitable for more passive activities such as standing or sitting. Uncomfortable conditions are anticipated to the west, near the tall neighboring buildings.

Build Configuration

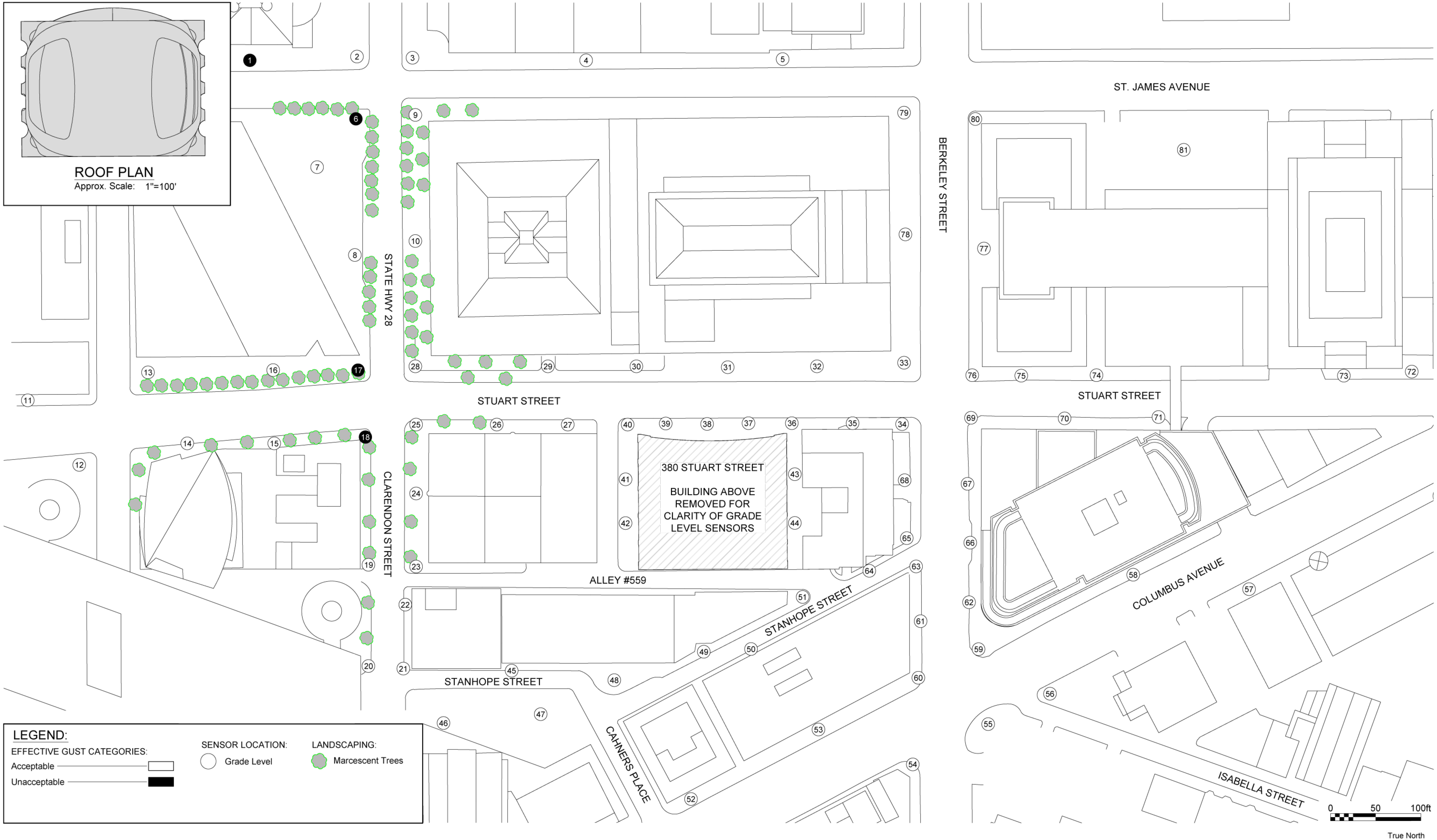
With the addition of the Proposed Project, wind conditions are expected to remain similar to those in the No Build configuration (Figure 3.1-9). Wind speeds are predicted to increase to the north of the building along the south side of Stuart Street; however, they would



380 Stuart Street Boston, Massachusetts

Figure 3.1-6

Pedestrian Wind Conditions – Effective Gust – No Build



380 Stuart Street **Boston, Massachusetts**

Figure 3.1-7

Pedestrian Wind Conditions – Effective Gust – Build

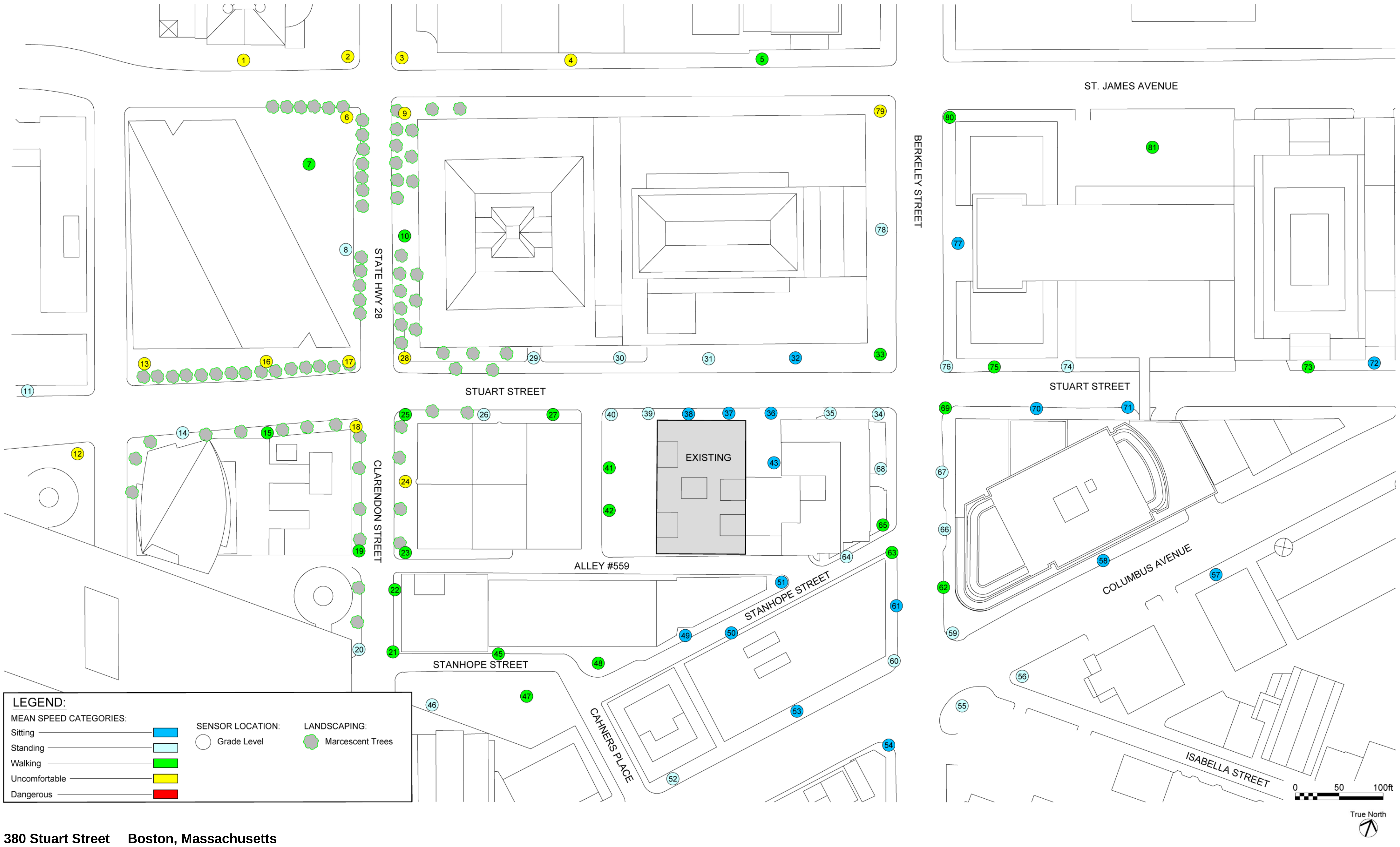
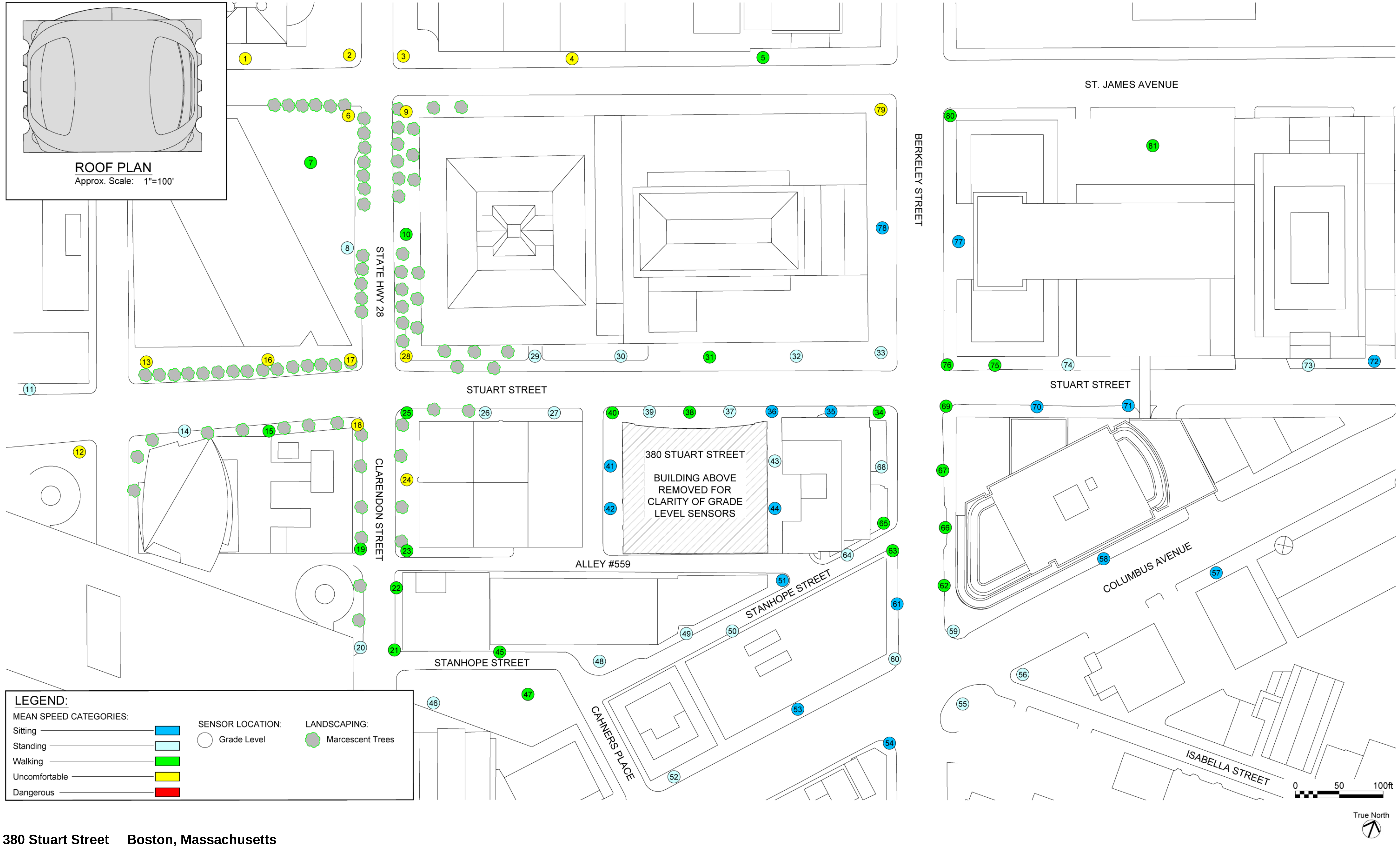


Figure 3.1-8

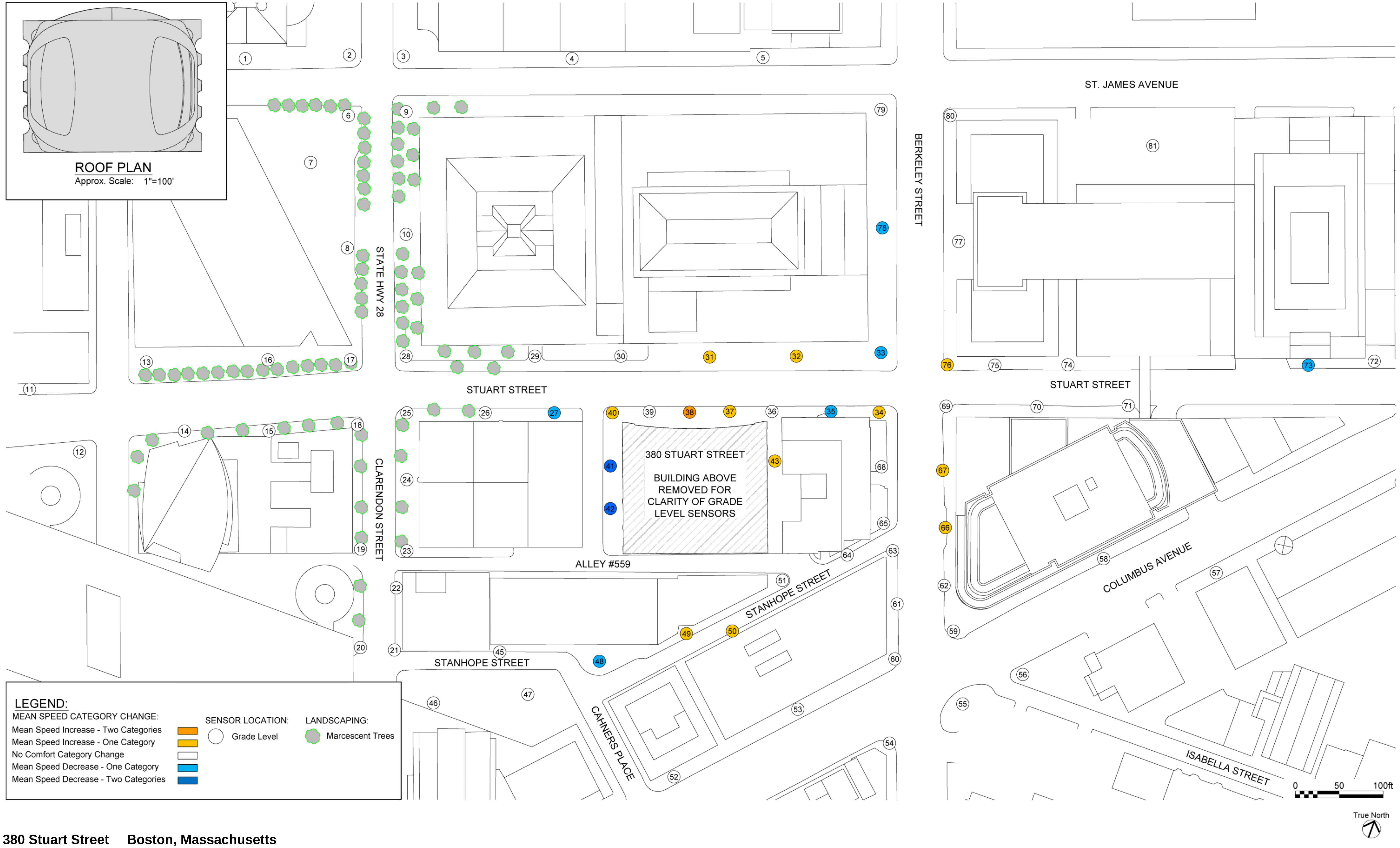
Pedestrian Wind Conditions – Mean Speed – No Build



380 Stuart Street **Boston, Massachusetts**

Figure 3.1-9

Pedestrian Wind Conditions – Mean Speed – Build



380 Stuart Street **Boston, Massachusetts**

Figure 3.1-10

Pedestrian Wind Conditions – Mean Speed Category Change – No Build to Build remain comfortable for walking or better, which is suitable for a sidewalk environment. Some wind conditions to the east along Berkeley Street are expected to improve marginally due to the added sheltering effect caused by the proposed tower. The area immediately in front of the Proposed Project, which will be comfortable for walking in the Build condition, will be the subject of further study to further mitigate the Proposed Project's wind impacts.

Wind conditions comfortable for standing are generally desired at building entrances where pedestrians are apt to linger. Locations 37 through 39 in Figure 3.1-9 represent the main entrance to the development. Here, conditions are expected to be comfortable for walking at Location 38, but comfortable for standing near the ends of the entranceway (Locations 37 and 39). This is considered acceptable, because during windy conditions pedestrians have the option to remain in the lower-wind speed areas.

It is our understanding that in the areas beneath the canopies to the west and east of the tower, patio areas are planned in addition to vehicle ramps. During the summer when the patios would be in use, wind conditions are expected to be comfortable for sitting at all potential patio areas (see Table 1 in Appendix C). These predicted conditions are considered ideal.

3.1.5.3 Conclusion

The wind analysis shows that with the Proposed Project, the overall wind conditions expected in the surrounding area are largely similar in the No Build and Build Conditions. Locations where wind comfort levels are reduced are generally offset by locations where wind comfort levels are improved. The Proposed Project will not result in additional uncomfortable annual wind conditions. Wind conditions surrounding the Project Site are expected to be comfortable for the intended uses.

The Proposed Project team took into account the history of concerns about wind conditions in the vicinity of the Project Site at the very outset of the design process. The unusual curved shape of the Proposed Project is a large-scale response to the sensitivity toward adverse wind conditions in the Stuart Street area caused by the 200 Clarendon building. Additional large-scale architectural measures such as the large entry canopy, covered pedestrian areas on either side of the Proposed Project at the ground level, and the use of compound curvilinear building geometry in both horizontal and vertical sections of the building's massing all help to mitigate the wind impacts of the Proposed Project. In this regard, the Proposed Project is uniquely sensitive to concerns about wind impacts in the area and its bold architectural form is a direct result of the Proposed Project team's sensitivity to this critical neighborhood issue.

3.2 Shadow

3.2.1 Introduction and Methodology

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

The shadow analysis presents the existing shadow and new shadow that would be created by the Proposed Project, illustrating the incremental impact of the Proposed 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. Results of the shadow impact study are discussed in the following sections, and are supported by Figures 3.2-1 through 3.2-14 included at the end of this Section.

3.2.2 Vernal Equinox (March 21)

At 9:00 a.m. during the vernal equinox, shadow from the Proposed Project will be cast in a northwesterly direction. New shadow will be cast onto a small portion of Stuart Street and its sidewalks adjacent to the Project Site. New shadow from the Proposed Project will also fall onto a portion of the Trinity Church rooftop, as well as onto a small portion of Copley Square Park adjacent to the Church.

As the day progresses, the shadows become shorter, falling to the north. At 12:00 p.m., new shadow from the Proposed Project will be cast onto a portion of the Old John Hancock building rooftop. No new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces.

At 3:00 p.m., shadow will extend to the northeast. New shadow from the Proposed Project will be cast onto a portion of Berkeley Street and its sidewalks as well as a small portion of Stuart Street and its sidewalks adjacent to the Liberty Mutual building. New shadow will also be cast onto the rooftop of Loews Boston, which is abutting the site to the east.

3.2.3 Summer Solstice (June 21)

At 9:00 a.m. during the summer solstice, shadow will be cast in a westerly direction. New shadow from the Proposed Project will be cast onto a small portion of Clarendon Street and its sidewalks. Some new shadows will fall onto the adjacent buildings immediately to the west and north of the Proposed Project.

As the day progresses, the shadows become shorter and swing to the north. At 12:00 p.m., new shadow from the Proposed Project will be cast onto Stuart Street and its sidewalks adjacent to the Project Site.

At 3:00 p.m., shadow will extend to the northeast. New shadow from the Proposed Project will be cast onto the rooftop of Loews Boston, which is abutting the site to the east, as well as onto a portion of the Berkeley Street sidewalk adjacent to the Liberty Mutual tower.

At 6:00 p.m., most of the area is under existing shadow. No new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces.

No material shadow is cast at any time of day onto any of the area's open spaces.

3.2.4 Autumnal Equinox (September 21)

At 9:00 a.m., during the autumnal equinox, shadow will be cast in a northwesterly direction. New shadow from the Proposed Project will be cast onto a portion of Stuart Street and its sidewalks adjacent to the Project Site, and onto a small portion of St. James Avenue and its northern sidewalk, adjacent to the Trinity Church. Some new shadows will fall onto the adjacent buildings immediately to the west and north of the Proposed Project.

At 12:00 p.m., shadow will be cast to the north. New shadow from the Proposed Project will be cast onto Stuart Street and its sidewalks adjacent to the Project Site, as well as onto a portion of the Old John Hancock building rooftop.

At 3:00 p.m., new shadow will extend to the northeast. New shadow from the Proposed Project will be cast onto a portion of Berkeley Street and its sidewalks as well as a small portion of Stuart Street and its sidewalks adjacent to the Liberty Mutual building. New shadow will also be cast onto the rooftop of Loews Boston, which is abutting the site to the east.

At 6:00 p.m., most of the area is under existing shadow. New shadow from the Proposed Project will be cast onto a small portion of the Loews Boston rooftop, as well as onto a small portion of Washington Street adjacent to the Tufts Medical Center.

No material shadow is cast at any time of day onto any of the area's open spaces.

3.2.5 Winter Solstice (December 21)

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

At 9:00 a.m., shadow will be cast in a northwesterly direction. New shadow from the Proposed Project will be cast onto a portion of Stuart Street and its sidewalks adjacent to the Project Site, and onto a portion of the rooftops immediately to the north of the Proposed Project.

At 12:00 p.m., shadow will extend to the north. New shadow from the Proposed Project will be cast onto Stuart Street and its sidewalks adjacent to the Project Site, as well as onto a portion of the Old John Hancock building rooftop. Minimal new shadow will also be cast onto the street and sidewalks at the intersection of Berkeley Street and St James Avenue.

At 3:00 p.m., much of the area is under existing shadow. New shadows will be cast to the northeast onto some building rooftops. No new shadow will be cast onto nearby streets, sidewalks, bus stops, or public open spaces.

No material shadow is cast at any time of day onto any of the area's open spaces.

3.2.6 Lack of Shadow Impacts on Open Spaces

The Proposed Project complies fully with both the Boston Common Shadow Legislation and the Boston Public Garden Shadow Legislation.

The Proposed Project does not cast any new shadow on the Commonwealth Avenue Mall.

The Proposed Project briefly casts a *de minimus* area of shadow on Copley Square adjacent to the Trinity Church during the months of March and September between 8:30 a.m. and 9:00 a.m. No other shadows are cast on Copley Square during any other times of the year. This new shadow, much of which falls on the hardscape area along Boylston Street, is fully in conformance with the shadow restrictions proposed as part of the Stuart Street Planning Study and has no impact on the usability or health of the Copley Square lawn area or other plantings within Copley Square.

3.2.7 Conclusions

New shadow from the Proposed Project will largely fall on portions of the immediate surrounding roadways and sidewalks on Stuart Street, Berkeley Street, and Clarendon Street. Typical of a densely built urban area, some new shadow will also be cast on the rooftops of adjacent buildings to the west, north, and east of the Proposed Project. No material new shadow, as defined in applicable regulations, from the Proposed Project will fall on any of the area's existing open spaces.

In general, much of the new shadow cast by the Proposed Project falls within existing shadows already cast by existing buildings. For this reason, the Proposed Project will have very few net new shadow impacts. In no cases will the Proposed Project's shadow impacts have any effect on the health, quality, or serviceability of any public open spaces, historic resources, or other important public resources.

380 Stuart Street **Boston, Massachusetts**

Figure 3.2-1

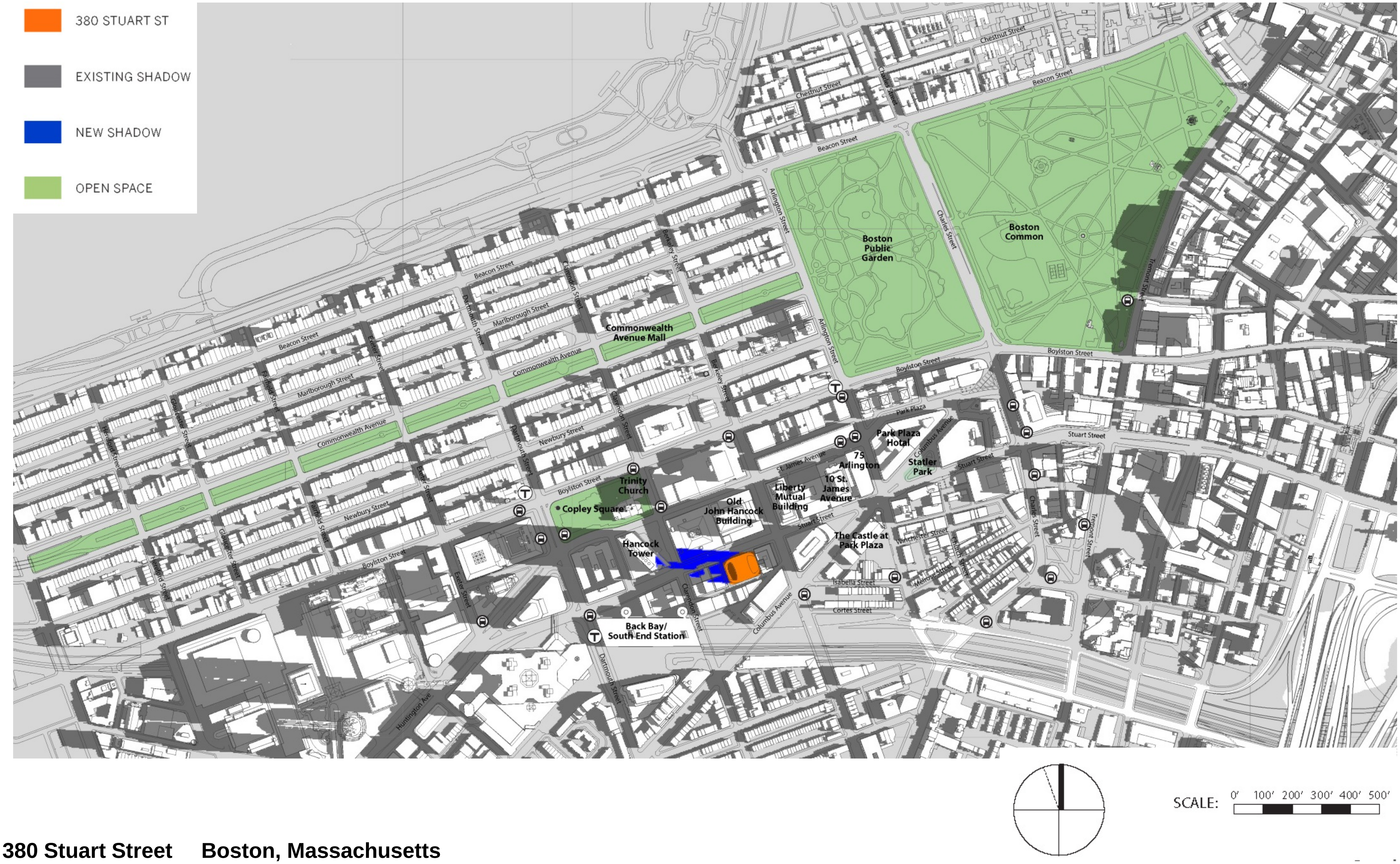
Shadow Study: March 21, 9:00 a.m.

Figure 3.2-2

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

Figure 3.2-3

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



380 Stuart Street **Boston, Massachusetts**

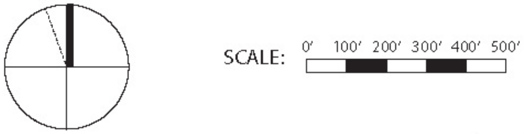
SOM cbt

Figure 3.2-4

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

Figure 3.2-5

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



380 Stuart Street **Boston, Massachusetts**

SOM cbt

Figure 3.2-6

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

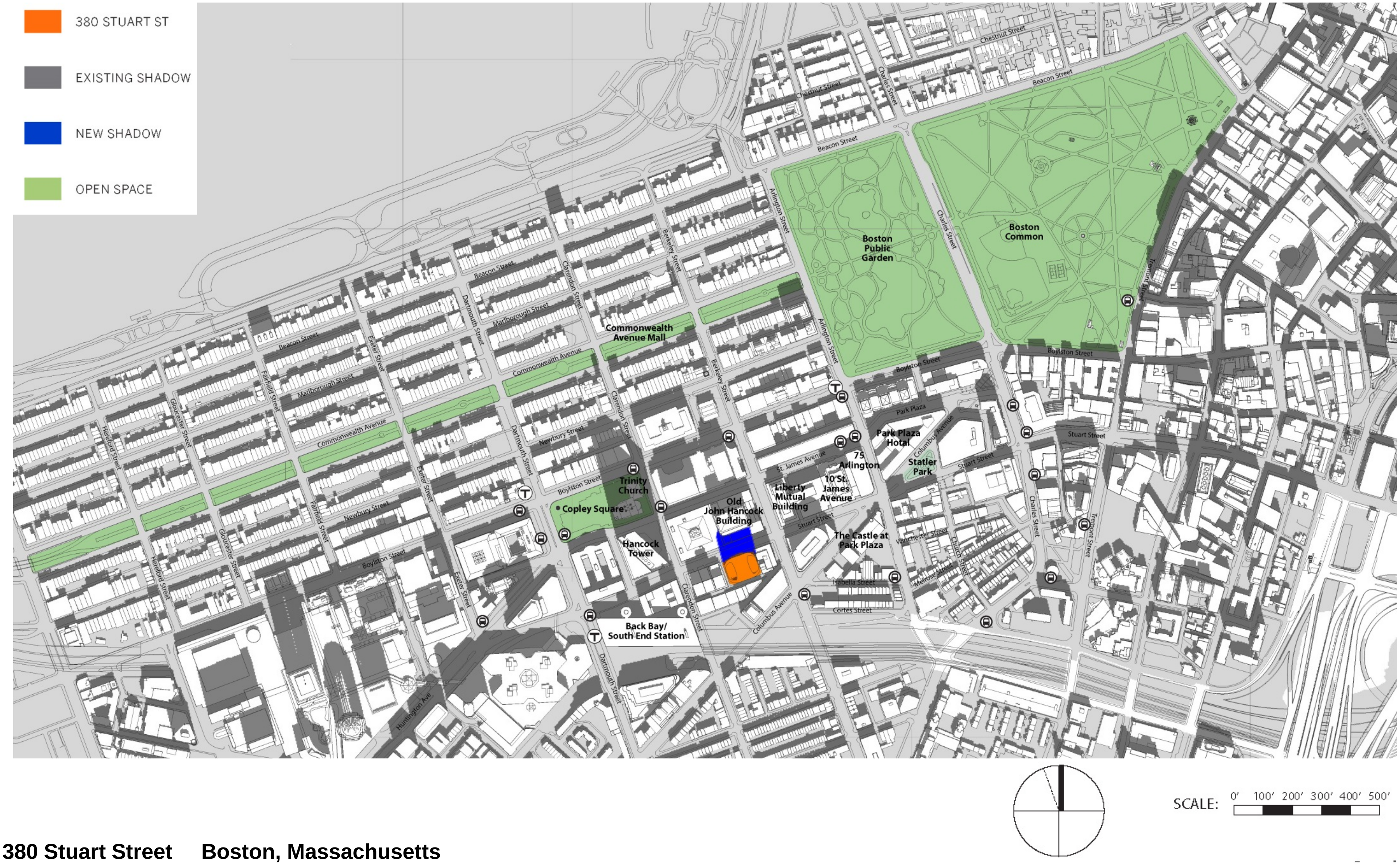
380 Stuart Street   Boston, Massachusetts

Figure 3.2-7

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

Figure 3.2-8

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



380 Stuart Street Boston, Massachusetts

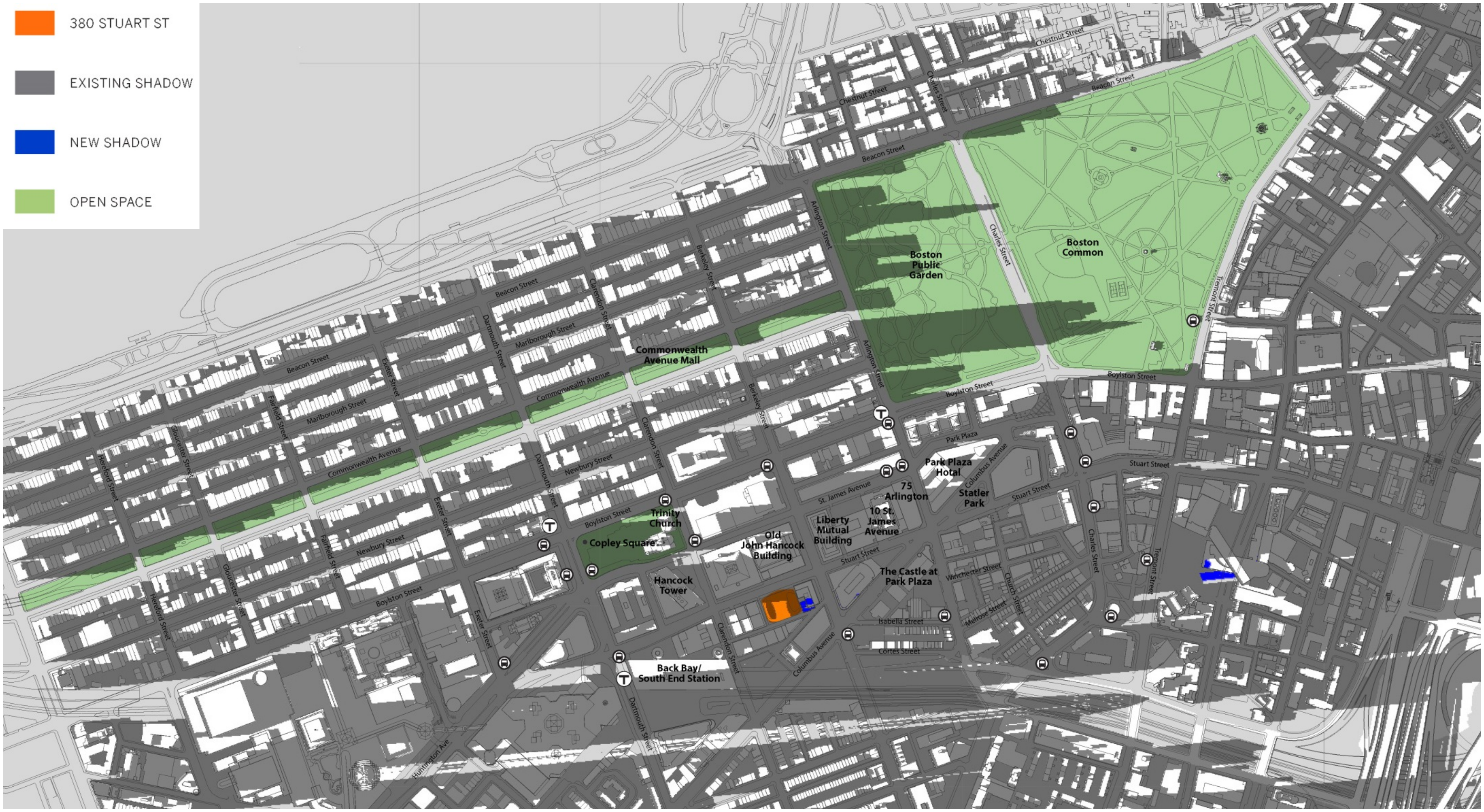
SOM cbt

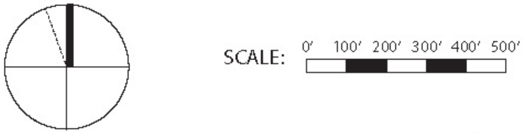
Figure 3.2-9

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

Figure 3.2-10

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





380 Stuart Street **Boston, Massachusetts**

Figure 3.2-11

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

380 Stuart Street **Boston, Massachusetts**

Figure 3.2-12

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

Figure 3.2-13

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

380 Stuart Street **Boston, Massachusetts**

SOM cbt

Figure 3.2-14

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

3.3 Daylight Analysis

3.3.1 Introduction

The purpose of the daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching the streets and the sidewalks in the immediate vicinity of a project site. A daylight analysis for the Proposed Project considers the existing and proposed conditions, and daylight obstruction values for the surrounding area.

3.3.2 Methodology

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

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

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

One viewpoint from Stuart Street was chosen to evaluate the daylight obstruction for the Existing and Proposed Conditions, as this is the only major building façade fronting a public way. The viewpoint and area context viewpoints were taken in the following locations and are shown on Figure 3.3-1.

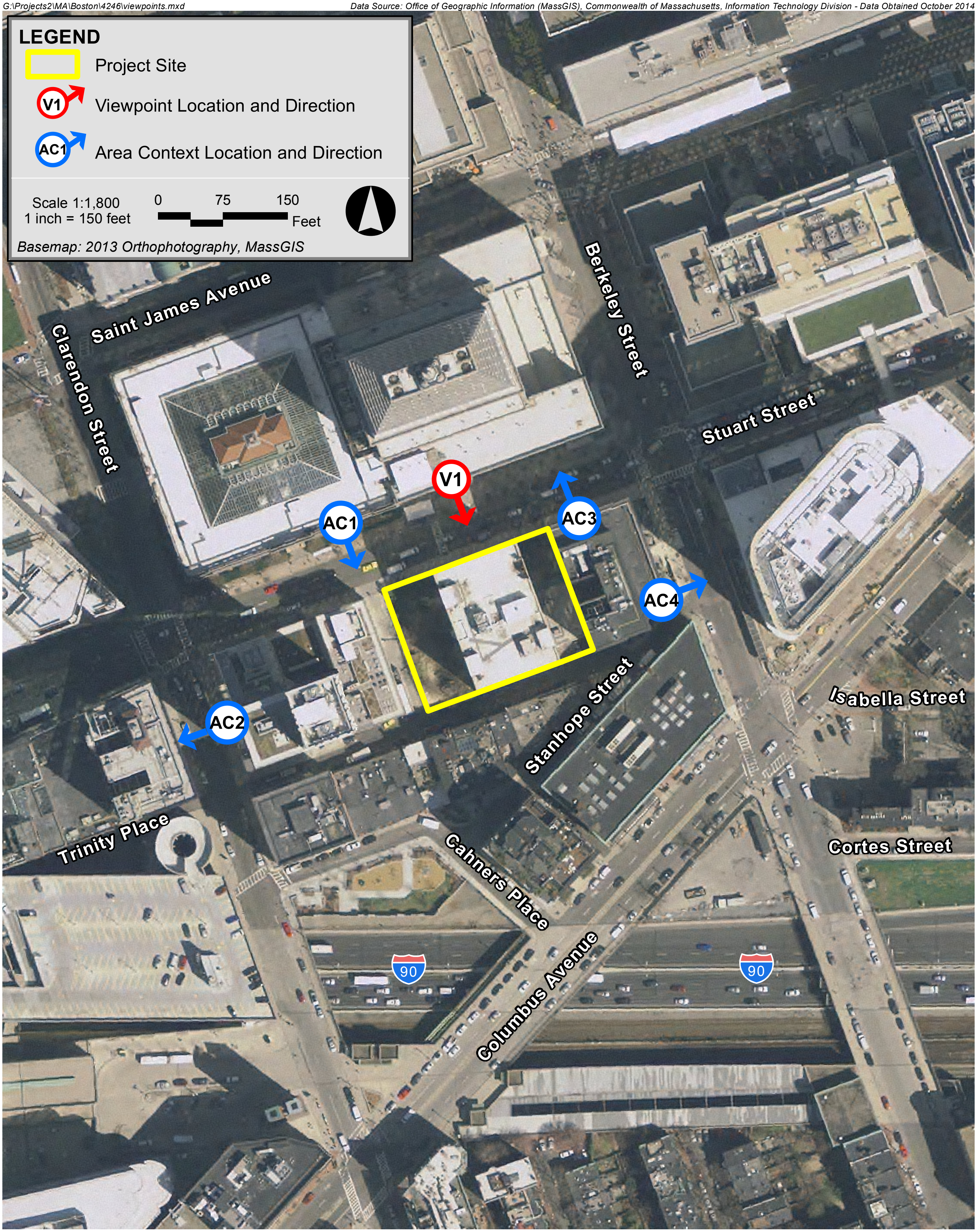
- **Viewpoint 1:** View from Stuart Street facing southeast toward the Project Site.
- **Area Context Viewpoint AC1:** View from Stuart Street facing southeast toward 400 Stuart Street.

---

[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\4246\viewpoints.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014



380 Stuart Street **Boston, Massachusetts**

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Figure 3.3-1
Viewpoint Locations

- **Area Context Viewpoint AC2:** View from Clarendon Street facing west toward 140 Clarendon Street.

- **Area Context Viewpoint AC3:** View from Stuart Street facing north toward the building at 200 Stuart Street.

- **Area Context Viewpoint AC4:** View from Berkeley Street facing northeast toward 157 Berkeley Street.

3.3.3 Results

The results for each viewpoint are described in Table 3.3-1. Figures 3.3-2 and 3.3-3 illustrate the BRADA results for each analysis.

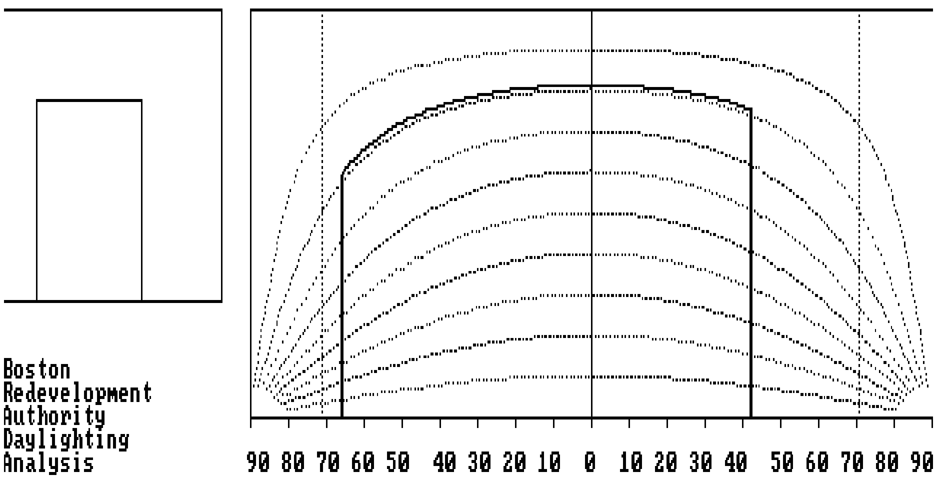
Table 3.2-1 Daylight Analysis Results

Viewpoint Locations		Existing Conditions	Proposed Conditions
Viewpoint 1	View from Stuart Street facing southeast toward the Project Site.	62.4%	93.7%
Area Context Points			
AC1	View from Stuart Street facing southeast toward 400 Stuart Street.	74.3%%	N/A
AC2	View from Clarendon Street facing west toward 140 Clarendon Street.	90.8%	N/A
AC3	View from Stuart Street facing north toward the building at 200 Berkeley Street.	70.3%	N/A
AC4	View from Berkeley Street facing northeast toward 157 Berkeley Street.	87.1%	

Stuart Street – Viewpoint 1

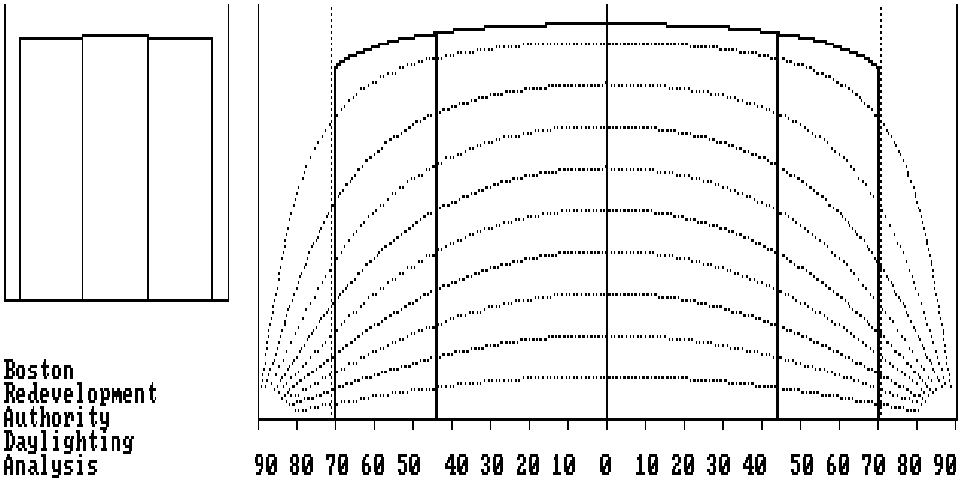
Stuart Street runs along the northwestern edge of the Project Site. Viewpoint 1 was taken from the center of Stuart Street looking directly southeast toward the Project Site. The Project Site is currently occupied by a nine-story office building with a playground on a portion of the Project Site, and has an existing daylight obstruction value of 62.4%. The Proposed Project will increase the daylight obstruction value to 93.7%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

Existing Condition



Obstruction of daylight by the building is 62.4 %

Proposed Condition

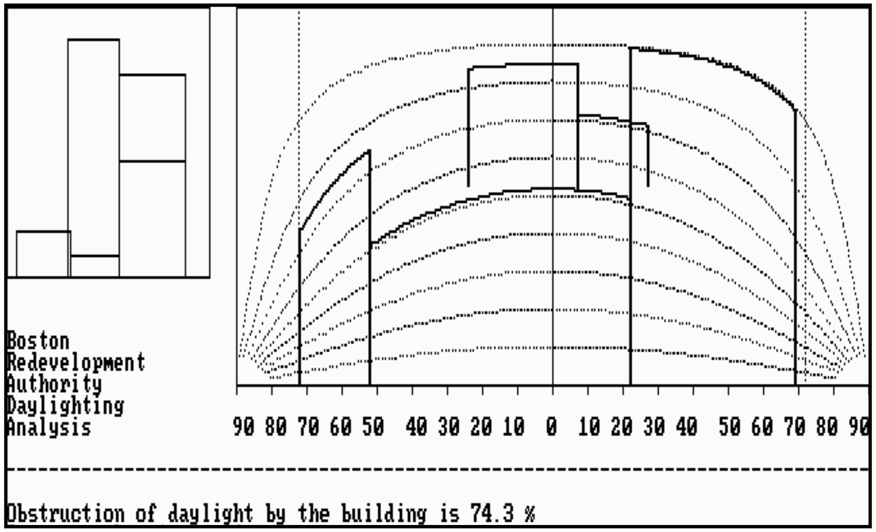


Obstruction of daylight by the building is 93.7 %

View from Stuart Street facing southeast toward the Project site

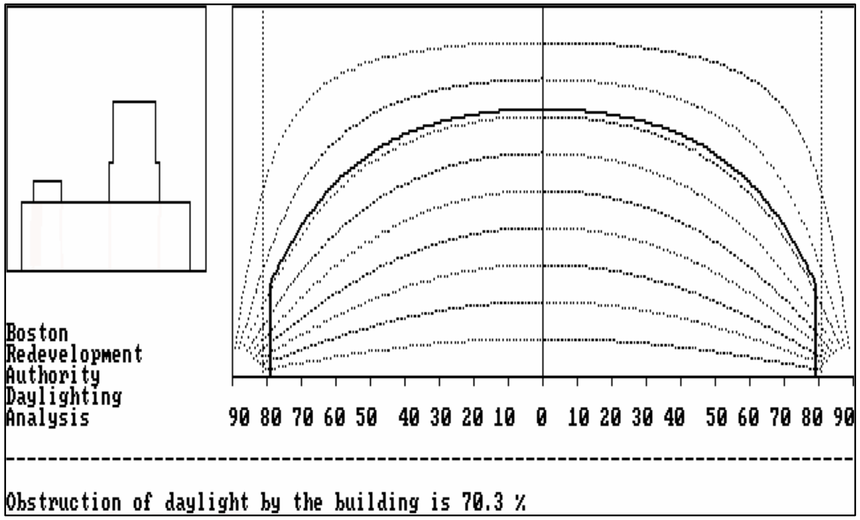
Figure 3.3-2

Daylight Analysis: Existing and Proposed Conditions



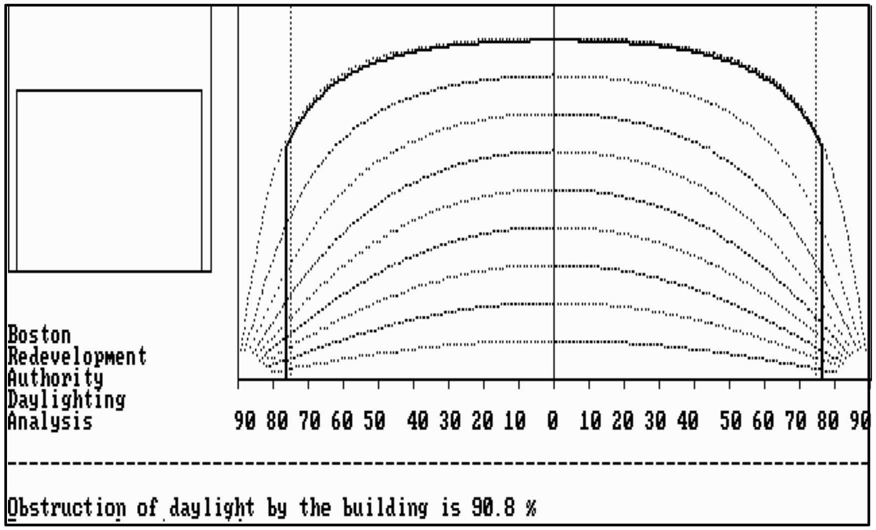
Obstruction of daylight by the building is 74.3 %

Area Context Viewpoint (AC1): View from Stuart Street facing southeast toward 400 Stuart Street



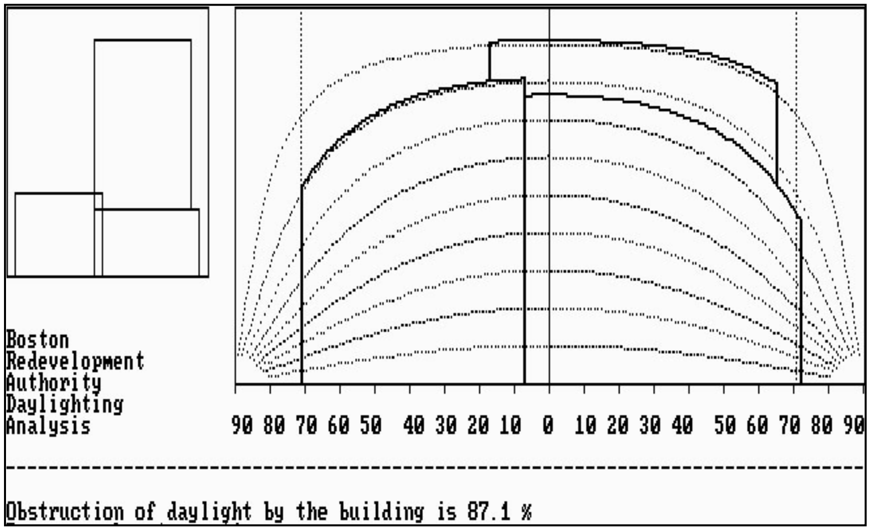
Obstruction of daylight by the building is 70.3 %

Area Context Viewpoint (AC3): View from Stuart Street facing north toward the building at 200 Berkeley Street



Obstruction of daylight by the building is 90.8 %

Area Context Viewpoint (AC2): View from Clarendon Street facing west toward 140 Clarendon Street



Obstruction of daylight by the building is 87.1 %

Area Context Viewpoint (AC4):View from Berkeley Street facing northeast toward 157 Berkeley Street

Figure 3.3-3

Daylight Analysis: Area Context Viewpoints

Area Context Views

The Project Site is located in an area characterized primarily by retail, residential, commercial, cultural, and institutional uses. The Proposed Project area is densely populated and includes buildings ranging between one and 62 stories. To provide a larger context for a specific comparison of daylight conditions, obstruction values were calculated from three viewpoints as listed in Table 4.3-1 above. The daylight conditions ranged between 70.3 percent (AC3) to 90.8 percent (AC2) adjacent to the Project Site. Daylight obstruction values for the Proposed Project are generally consistent with the Area Context values.

3.3.4 Conclusions

The daylight analysis conducted for the Proposed Project describes existing and proposed daylight obstruction conditions at the Project Site and in the surrounding area. The results of the BRADA analysis indicate that while the development of the Proposed Project will result in increased daylight obstruction over existing conditions, although the resulting conditions will be within the range of existing daylight obstruction values in the Proposed Project area, and typical of such densely built developed urban areas.

3.4 Solar Glare

As currently designed, the majority of the Proposed Project's exterior elevations will be glazed with low visual reflectivity glass. The Proposed Project is not expected to cause any significant solar glare impacts on the surrounding buildings, pedestrian areas, or roadways. Building details and design elements will be presented to the BRA and the Boston Civic Design Commission as the design progresses. Should there be a design change toward using more reflective glass, then a solar glare analysis will be undertaken to evaluate whether the glazing will have any negative impacts on surrounding areas.

3.5 Air Quality Analysis

An air quality analysis has been conducted to determine the impact of pollutant emissions from mobile sources generated by the Proposed Project. Specifically, a microscale analysis was performed to evaluate the potential air quality impacts of carbon monoxide (CO) resulting from traffic flow around the Proposed 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).

3.5.1 National Ambient Air Quality Standards and Background Concentrations

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

3.5.1.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the US Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM10 and PM2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS are listed in Table 3.5-1. 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 were applied when comparing to the modeling results for this Proposed Project.

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

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

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

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

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

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

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

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

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

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

Massachusetts Ambient Air Quality Standards (MAAQS) are codified in 310 CMR 6.04, and generally follow the NAAQS but are not identical (highlighted in **bold** in Table 3.5-1 above.

3.5.1.2 Background Concentrations

To estimate background pollutant levels representative of the area, the most recent air quality monitor data reported by the MassDEP in their Annual Air Quality Reports was obtained for 2012 to 2014. The 3-hour and 24-hour SO_2 values are no longer reported in the annual reports. Data for these pollutant and averaging time combinations were obtained from the U.S. EPA's AirData website.

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

Background concentrations were determined from the closest available monitoring stations to the proposed development. All pollutants are not monitored at every station, so data from multiple locations are necessary. The closest monitor is at Kenmore Square in Boston, roughly 1.3 miles west of the Proposed Project location. However this site samples for all but Lead and Ozone. The next closest site is at Harrison Avenue, roughly 1.4 miles south-southwest of the Proposed Project. This site samples for the remaining pollutants. A summary of the background air quality concentrations are presented in Table 3.5-2.

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

Pollutant	Averaging Time	2012	2013	2014	Background Concentration (μg/m^3)	NAAQS	Percent of NAAQS
SO_2 (1)(6)	1-Hour (5)	34.584	31.44	25.414	30.5	196.0	16%
	3-Hour	27.772	36.418	24.628	36.4	1300.0	3%
	24-Hour	14.148	15.72	13.1	15.7	365.0	4%
	Annual	4.8994	2.62	2.4628	4.9	80.0	6%
PM-10	24-Hour	28	50.0	53	53.0	150.0	35%
	Annual	15.7	19.0	14.9	19.0	50.0	38%
PM-2.5	24-Hour (5)	22.1	18.0	14.6	18.2	35.0	52%
	Annual (5)	9.03	8.0	6.02	7.7	12.0	64%
NO_2 (3)	1-Hour (5)	92.12	90	92.12	91.5	188.0	49%
	Annual	35.908	33.4	32.2796	35.9	100.0	36%
CO (2)	1-Hour	1489.8	1489.8	1489.8	1489.8	40000.0	4%
	8-Hour	1031.4	1031.4	1031.4	1031.4	10000.0	10%
Ozone (4)	8-Hour	153.114	115.817	106.002	153.1	147.0	104%
Lead	Rolling 3-Month	0.014	0.006	0.014	0.014	0.15	9%

Notes:
From 2012-2014 EPA's AirData Website
(1) SO_2 reported ppb. Converted to μg/m3 using factor of 1 ppm = 2.62 μg/m3.
(2) CO reported in ppm. Converted to μg/m3 using factor of 1 ppm = 1146 μg/m3.
(3) NO_2 reported in ppb. Converted to μg/m3 using factor of 1 ppm = 1.88 μg/m3.
(4) O_3 reported in ppm. Converted to μg/m3 using factor of 1 ppm = 1963 μg/m3.
(5) Background level is the average concentration of the three years.
(6) The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

Air quality in the vicinity of the Project Site is generally good, with all local background concentrations found to be well below the NAAQS.

For use in the microscale analysis, background concentrations of CO in ppm were required. The corresponding maximum background concentrations in ppm were 1.3 ppm (1,490 $\mu g/m^3$) for one-hour and 0.9 ppm (1,031 $\mu g/m^3$) for eight-hour CO.

3.5.2 Methodology

3.5.2.1 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 Proposed Project followed the procedure outlined in U.S. EPA's intersection modeling guidance.[4]

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.

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

Baseline (2015) and future year (2020) 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.

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 1.3 ppm (one-hour) and 0.9 ppm (eight-hour), as provided by MassDEP, to determine total air quality impacts due to the Proposed 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.[5]

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

Intersection Selection

As stated previously, a "microscale" analysis is typically required for the Project at intersections 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.

Two signalized intersections included in the traffic study meet the above conditions (see Chapter 2). The traffic volumes and LOS calculations provided in Chapter 2 form the basis of evaluating the traffic data versus the microscale thresholds. The intersections found to meet the criteria for inclusion in the microscale analysis are:

- the intersection of Columbus Avenue, Arlington Street, and Stuart Street; and,
- the intersection of Tremont Street, Arlington Street, and Herald Street.

Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2015 existing conditions, and the 2020 No Build and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peak.

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

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 (2015) and build year (2020) are provided by MassDEP.

All link types for the modeled intersection were input into MOVES. Idle emission factors are obtained from factors for a link average speed of 0 miles per hour (mph). Moving emissions are calculated based on speeds at which free-flowing vehicles travel through the intersection as stated in traffic modeling (SYNCHRO) reports. A speed of 30 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively. Roadway emissions factors were obtained from MOVES using EPA guidance.[6]

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

Receptors & Meteorology Inputs

Sets of up to roughly 220 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 intersections are presented in Figures 3.5-1 and Figure 3.5-2.

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[7], 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.[8]

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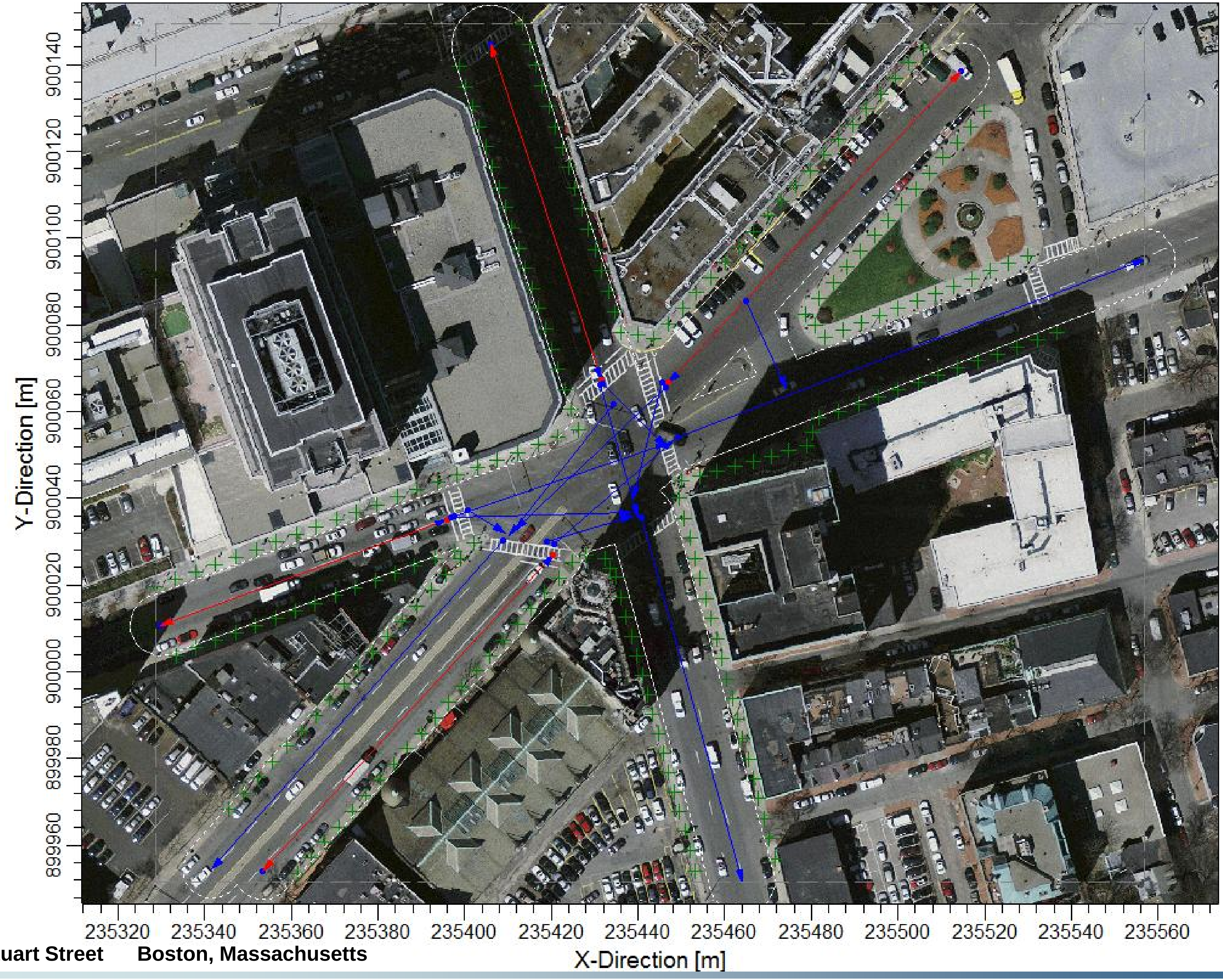
[6] U.S. EPA, 2010. Using MOVES in Project-Level Carbon Monoxide Analyses. EPA-420-B-10-041

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

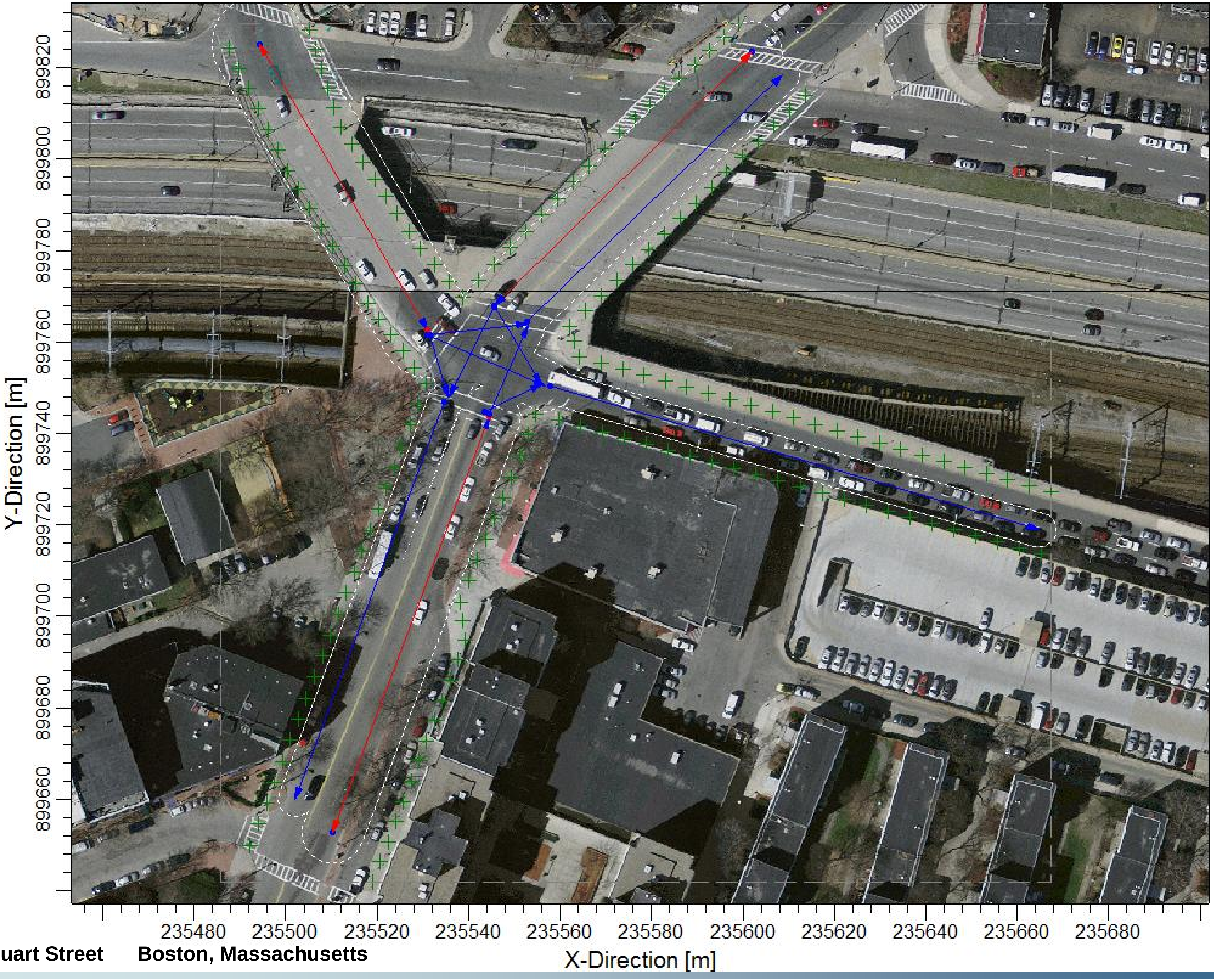
[8] U.S. EPA, *User's Guide for CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. EPA –454/R-92-006 (Revised), September 1995.



380 Stuart Street **Boston, Massachusetts**

Figure 3.5-1

Link and Receptor Locations for CAL3QHC modeling of Intersection of Columbus Ave., Arlington St., & Stuart St.



380 Stuart Street **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 3.5-2

Link and Receptor Locations for CAL3QHC modeling of Intersection of Tremont St., Arlington St., & Herald St.

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 0.9 to estimate eight-hour concentrations.[9] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs.

3.5.3 Air Quality Results

The results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3.5-3 through 3.5-5 for the 2015 and 2020 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.9.[10]

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 Proposed Project for the modeled conditions (0.4 ppm) plus background (1.3 ppm) is 1.7 ppm for the PM peak cases at the intersection of Columbus Avenue, Arlington Street, and Stuart Street. The highest eight-hour traffic-related concentration predicted in the area of the Proposed Project for the modeled conditions (0.4 ppm) plus background (0.9 ppm) is 1.3 ppm for 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.

Table 3.5-3 Summary of Microscale Modeling Analysis (Existing 2015)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Columbus Avenue, Arlington Street, and Stuart Street	AM	0.3	1.3	1.6	35
	PM	0.4	1.3	1.7	35
Tremont Street, Arlington Street, and Herald Street	AM	0.3	1.3	1.6	35
	PM	0.3	1.3	1.6	35

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

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

Table 3.5-3 Summary of Microscale Modeling Analysis (Existing 2015) (Continued)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
8-Hour					
Columbus Avenue, Arlington Street, and Stuart Street	AM	0.3	0.9	1.2	9
	PM	0.4	0.9	1.3	9
Tremont Street, Arlington Street, and Herald Street	AM	0.3	0.9	1.2	9
	PM	0.3	0.9	1.2	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 3.5-4 Summary of Microscale Modeling Analysis (No-Build 2020)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Columbus Avenue, Arlington Street, and Stuart Street	AM	0.2	1.3	1.5	35
	PM	0.3	1.3	1.6	35
Tremont Street, Arlington Street, and Herald Street	AM	0.2	1.3	1.5	35
	PM	0.2	1.3	1.5	35
8-Hour					
Columbus Avenue, Arlington Street, and Stuart Street	AM	0.2	0.9	1.1	9
	PM	0.3	0.9	1.2	9
Tremont Street, Arlington Street, and Herald Street	AM	0.2	0.9	1.1	9
	PM	0.2	0.9	1.1	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 3.5-5 Summary of Microscale Modeling Analysis (Build 2020)

Intersection	Peak	CAL3QHC Modeled CO Impacts (ppm)	Monitored Background Concentration (ppm)	Total CO Impacts (ppm)	NAAQS (ppm)
1-Hour					
Columbus Avenue, Arlington Street, and Stuart Street	AM	0.2	1.3	1.5	35
	PM	0.3	1.3	1.6	35
Tremont Street, Arlington Street, and Herald Street	AM	0.2	1.3	1.5	35
	PM	0.3	1.3	1.6	35
8-Hour					
Columbus Avenue, Arlington Street, and Stuart Street	AM	0.2	0.9	1.1	9
	PM	0.3	0.9	1.2	9
Tremont Street, Arlington Street, and Herald Street	AM	0.2	0.9	1.1	9
	PM	0.3	0.9	1.2	9

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

3.5.4 Conclusions

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.

3.6 Stormwater/Water Quality

See Section 7.2 of this PNF.

3.7 Flood Hazard Zones/ Wetlands

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the site located in the City of Boston - Community Panel Number 25025C 0077 G indicates the FEMA Flood Zone Designations for the site area. The map shows that the Proposed Project is outside of the 500-year flood zone. A "preliminary" revised floodplain map for the site area was recently released by FEMA (Map Number 25025C 0077 J) which indicates the Proposed Project will remain outside of the 500-year flood zone.

The site does not contain wetlands.

3.8 Geotechnical Impacts

This section describes subsurface soil and groundwater conditions at the Proposed Project site, planned below-grade construction activities, and mitigation measures for protection of adjacent structures and maintaining groundwater levels in the Site vicinity during below-grade construction.

3.8.1 Site Conditions

The site is abutted by Stuart Street to the north, an existing nine-story building to the east (350 Stuart Street, the Loews Hotel, the former Boston Police Headquarters Building), private alley No. 559 to the south, and 400 Stuart Street (The Clarendon), a 33-story residential building to the west. The site is currently occupied by a 9-story office building with a portion of the ground floor serving as a daycare center; a one-story building at 370 Stuart Street (also used by the daycare); various outdoor surfaces; and a small four-space paved surface parking lot.

The existing outdoor portions of the site are relatively flat, from approximately El. 17 (Boston City Base Datum, BCB) along Alley 559 to El. 19 along Stuart Street. Information on the existing site and abutting buildings is listed In Table 3.8-1 below:

Table 3.8-1 Existing Site and Abutting Buildings

Building	Foundation	Other Information
380 Stuart Street	Concrete caissons belled in marine clay (~45 ft depth)	Single basement
The Clarendon	Load Bearing Elements in bedrock	Four-level below-grade parking
Loews Hotel	Concrete caissons belled in marine clay (~45 ft depth)	Single basement and partial sub-basement

Other buildings in the vicinity of the site are supported on a variety of foundation systems, including deep end-bearing concrete drilled shafts or piles, and wood piles and belled concrete caissons founded in the upper marine clay. Municipal utilities are present beneath surrounding streets and sidewalks.

3.8.2 Surface Soil and Bedrock Conditions

Based on available subsurface data, subsurface soil strata present at the site are listed below in Table 3.8-2, in order of increasing depth below ground surface:

Table 3.8-2 Subsurface Soil and Bedrock Strata

Generalized Strata	Approximate Thickness (Feet)
Miscellaneous Fill	25
Organic Deposits	15
Marine Clay	65
Glacial Till	5
Bedrock	—

3.8.3 Groundwater

Groundwater levels in the vicinity of the site are monitored by the Boston Groundwater Trust (BGwT) in observation wells typically located in the public sidewalks. Groundwater levels reported by the BGwT in wells near the site between 1999 and 2015 have ranged from El. 1 to El. 4, approximately 14 to 17 feet below ground surface.

Observed levels are somewhat below those that would be considered "naturally-occurring". Groundwater levels in the area could be influenced by leakage into and out of sewers, storm drains and other below grade structures, as well as environmental factors such as precipitation, season, and temperature.

3.8.4 Proposed Construction

The Proposed Project includes construction of a 26-story office building with four levels of below-grade parking. The building is planned to be supported on reinforced concrete Load Bearing Elements (LBE's) bearing in bedrock. The lowest basement floor is designed as a pressure-relieved concrete slab-on-grade. Basement construction will include excavation extending to the limits of the property on the north and south sides, and about 2 feet on the east and west sides to avoid impacts to the foundations of the adjacent buildings to remain. Excavation will be performed to a depth of approximately 44 feet below street grade (about El. -25 BCB) within an engineered lateral earth support system, terminating within the marine clay deposit.

The below-grade construction is designed to be watertight and to not adversely affect (i.e., lower) short-term or long-term groundwater levels. A stiff, watertight excavation lateral support system will be installed prior to excavation to limit ground movements outside the excavation, to protect adjacent facilities, and to maintain groundwater levels outside the excavation by creating a groundwater "cutoff" between the excavation and the surrounding ground. The system is planned to consist of a continuous reinforced concrete diaphragm wall ("slurry wall") installed around the entire site perimeter from ground surface down into the marine clay stratum, which will isolate the excavation and future basement from the groundwater table. The diaphragm walls will be supported by an internal bracing system.

Some pre-excavation and backfilling will be performed in a narrow trench along the building perimeter to remove obstructions prior to installing the excavation support system and foundations.

The diaphragm walls will also serve as the permanent basement walls, embedded into the marine clay subgrade soils to form an essentially watertight envelope around the basement, permanently isolated from the shallow groundwater table. Any penetrations through the diaphragm walls (such as for utilities) will be sealed. Water stops will be installed between diaphragm wall sections for water-tightness.

Temporary dewatering will be required inside the excavation during excavation and foundation construction to remove "free" water from the soils to be excavated as well as precipitation. The essentially watertight excavation support wall will prevent withdrawal of groundwater from outside the excavation. In the unlikely event that leakage occurs through the walls, it will be promptly sealed by pressure grouting of the wall.

A temporary construction dewatering permit will be obtained from governing agencies prior to discharge of temporary dewatering effluent from the site. Testing of the effluent will be conducted prior to and during discharge to confirm compliance with all permit requirements.

3.8.5 Potential Impacts during Below-grade Construction and Mitigation Measures

Potential impacts during excavation and foundation construction include temporary lowering of area groundwater levels, ground vibrations, noise, and ground movements outside of the excavation. The foundation design and construction will be conducted to control and limit potential adverse impacts, especially to adjacent structures and to groundwater levels using methods that have been proven successful on many similar projects in Boston including the recently completed Liberty Mutual project less than one block away at 157 Berkeley Street.

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

- The Proposed Project team will conduct studies, prepare designs and specifications, and monitor the contractor's performance for conformance to the Proposed Project's contract documents with specific attention to protecting nearby structures and facilities, and preventing groundwater lowering. As described above, the below-grade portion of the building is designed to be watertight and isolated from the groundwater table. Selection and design of the excavation support system will be made with careful attention to mitigating adverse temporary and long-term effects outside the site.

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

- Performance criteria will be established for protection of groundwater levels during construction in the vicinity of the Proposed Project. The contractor will be required to plan and implement all necessary steps during the work to not lower groundwater levels outside the limits of the site. The feasibility of recharging temporary dewatering effluent into the ground will be investigated during the design of the Proposed Project.

- To support the efforts of the Groundwater Trust, monitoring data for existing and new groundwater observation wells collected during construction will be provided to the Groundwater Trust on a periodic basis.

- The design will comply fully with Article 32 of the Boston Zoning Code and will recharge the required volume of water into the ground in the vicinity of the Project Site. This recharge system will help to replenish groundwater levels in the area of the Proposed Project, thereby aiding protection of nearby wood-pile supported buildings. Presently, the Proponent is proposing up to three injection wells within the public sidewalks. The Proposed Project will capture rainfall from all roof areas and drain it into a holding tank. From the holding tank, the water will be pumped into the recharge well system.

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

3.8.6 Groundwater Conservation Overlay District

The Project Site is located within the Groundwater Conservation Overlay District (GCOD) as established by Article 32 of the City of Boston Zoning Code. Accordingly, the Project's design will incorporate the required systems to store and recharge stormwater. The Proponent has met with the Boston Groundwater Trust to present the proposed groundwater recharge system and is committed to working with the Groundwater Trust to ensure that the Proposed Project has no adverse impact on nearby groundwater levels, and in fact benefits the surrounding area by channeling stormwater into the groundwater table, instead of into the BWSC sewer system as is the case today. As noted above, stormwater will be recharged into the groundwater table by means of an array of injection wells, which have proven to be an effective method of recharging groundwater with rainfall collected on a building's roof.

3.9 Solid and Hazardous Waste

3.9.1 Hazardous Waste

Soil and groundwater at a portion of the property have been impacted by a historic release of heating oil from a 5,000 gallon UST which required assessment and remediation under the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Previous environmental investigations conducted at the site included a Phase I site investigation and a Phase II investigation. Remedial activities were conducted in 1991 to remove oil-contaminated soil and groundwater from the site. Some residual levels of oil remain in the soil and groundwater. In 2013, the Proponent performed a Method 3 Risk Characterization, which concluded that a condition of "no significant risk" of harm to human health exists at the site. The site achieved regulatory closure under the MCP in 2013 with the filing of a Class A-2 Response Action Outcome (RAO) Statement. An Activity and Use Limitation (AUL) is not required to maintain a condition of no significant risk.

Prior to construction of the existing building, historic uses of the property included a railroad yard, Boston Edison Company transformer station and an at-grade paved parking lot. When a portion of the site was converted to a playground in 1989, the top 4 feet of soil was removed and replaced with clean soil.

Based on conditions of shallow fill soils at other nearby sites, it is likely that site urban fill materials contain certain compounds at levels that exceed applicable MCP reportable concentrations. The contaminants are likely the result of historical site use, fills brought to the site and the presence of ash and demolition debris in the fill. The anticipated conditions are commonly present on similar sites throughout Boston, and are not expected to represent any unusual concern or requirements in connection with the proposed development.

In accordance with normal practices, the Proponent will be conducting testing to characterize and classify the soil within the proposed excavation limits, for off-site removal to appropriate facilities, and to characterize any remaining soil for risk assessment purposes. Materials excavated during construction of the development will be managed in accordance with all applicable regulatory requirements including a Release Abatement Measure (RAM) under the MCP. Response actions conducted under the RAM in conjunction with Proposed Project construction are expected to result in achievement of a Permanent Solution under the MCP.

3.9.2 Operation Solid and Hazardous Waste Generation

The Proposed Project will generate solid waste typical of commercial and retail/café 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 Proposed Project will generate approximately 855 tons of solid waste per year.

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

3.9.3 Recycling

A dedicated recyclables storage and collection program will facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. The recycling program will be fully developed in accordance with LEED standards as described in Chapter 4, as well as John Hancock's corporate recycling program that is in use in all of John Hancock's offices in Boston.

3.10 Noise Impacts

3.10.1 Introduction

A sound level assessment was conducted which included a baseline sound monitoring program to measure existing sound levels in the vicinity of the Project Site, computer modeling to predict operational sound levels from mechanical equipment associated with the Proposed Project, and a comparison of future Proposed Project sound levels to applicable City of Boston Zoning District Noise Standards.

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

3.10.2 Noise Terminology

There are several ways in which sound (noise) levels are measured and quantified, all of 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.[11] 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 described with a single number. Two methods are used for describing variable sounds, exceedance levels and the equivalent level, both of which are derived from a large number of moment-to-moment, A-weighted sound-level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value of 0 to 100 percent. Several sound-level metrics that are commonly reported in community noise studies are described below.

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

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

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

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[11] *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.

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

- L_{eq}, the equivalent level, 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. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by occasional loud, intrusive noises.

- 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 Proposed 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 (American National Standards Institute (ANSI) S1.11, 1986). To facilitate the noise-control design process, the estimates of noise levels in this analysis are also presented in terms of octave-band sound pressure levels. Octave-band measurements and modeling are used in assessing compliance with the City of Boston noise regulations.

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 Proposed Project as though the emissions will be steady and continuous, described most accurately by the L_{90} exceedance level.

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3.10.3 Noise Regulations and Criteria

The City of Boston has both a noise ordinance and noise regulations. Chapter 16 §26 of the Boston Municipal Code sets the general standard for noise that is unreasonable or excessive: louder than 50 decibels between the hours of 11:00 p.m. and 7:00 a.m., or louder than 70 decibels at all other hours. The Boston Air Pollution Control Commission (APCC) has adopted regulations based on the city's ordinance - "Regulations for the Control of Noise in the City of Boston", which distinguish among residential, business, and industrial districts in the city. In particular, APCC Regulation 2 is applicable to the sounds from the Proposed Project and is considered in this noise study.

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

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

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

Notes:

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

3.10.4 Existing Conditions

A background noise level survey was conducted to characterize the existing "baseline" acoustical environment in the vicinity of the Proposed Project, located within the Back Bay neighborhood of Boston. Existing noise sources in the vicinity of the Project Site currently include: vehicular traffic along local roadways (including Stuart Street, Clarendon Street, and Berkeley Street); mechanical noise (i.e. air conditioning units, exhaust vents); birds; occasional aircraft; vegetation rustle (nighttime only); and the general city soundscape.

3.10.4.1 Noise Monitoring Methodology

Since noise impacts from the Proposed Project on the community will be highest when background noise levels are the lowest, the study was designed to measure community noise levels under conditions typical of a "quiet period" for the area. Daytime measurements were scheduled to avoid peak traffic conditions. Sound level measurements were made on Thursday, August 13, 2015 during the daytime (11:00 a.m. to 1:00 p.m.) and on Wednesday, August 19, 2015 during nighttime hours (12:00 a.m. to 1:30 a.m.). All measurements were 20 minutes in duration.

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

3.10.4.2 Noise Monitoring Locations

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

- **Location 1** is located at the northwest corner of the Project Site on Stuart Street, representative of the closest residential use west of the Proposed Project (i.e. The Clarendon).

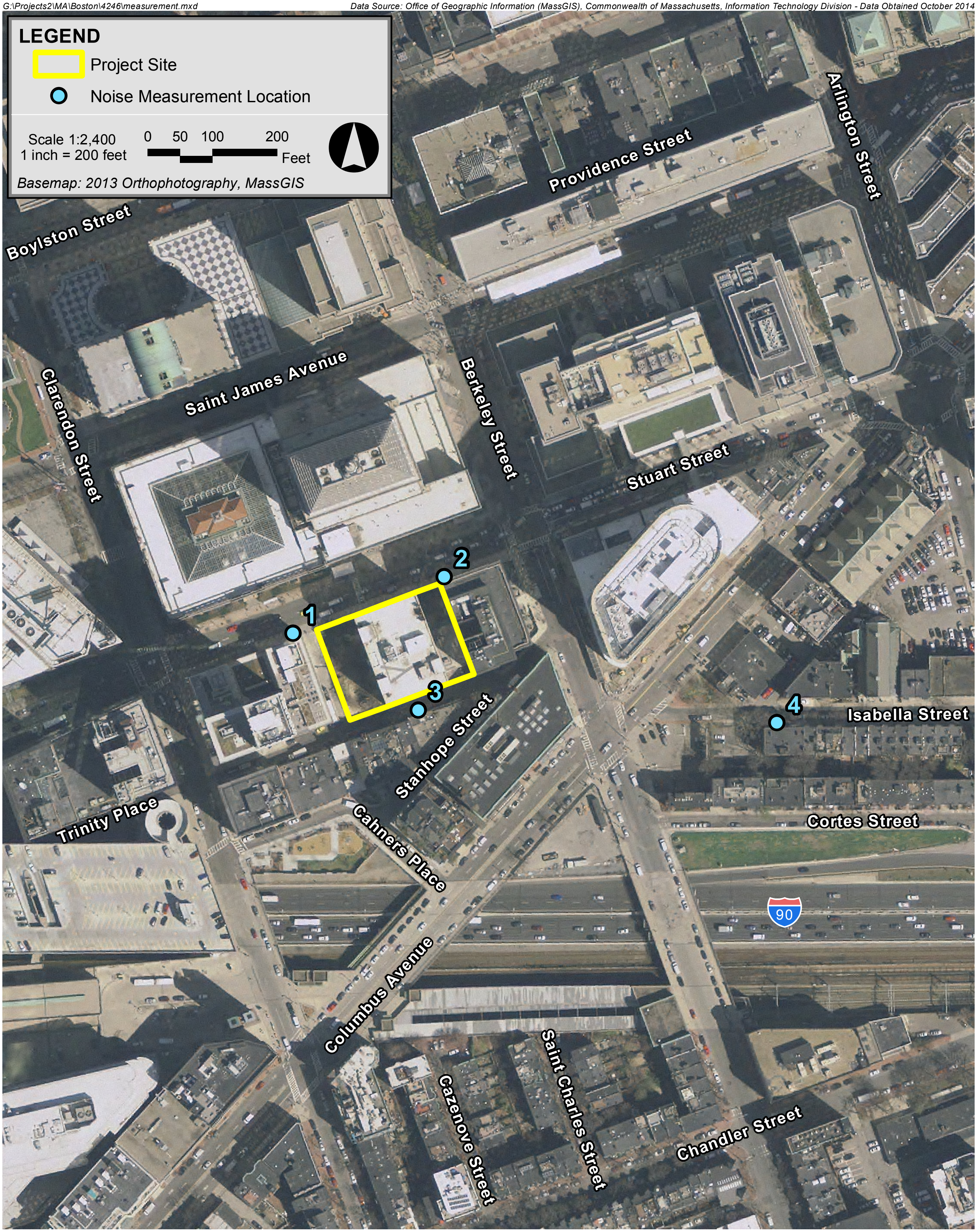
- **Location 2** is located at the northeast corner of the Project Site on Stuart Street, representative of the closest residential use east of the Proposed Project (i.e. The Loews Hotel).

- **Location 3** is located at the north side of the structure addressed 19 Stanhope Street, representative of the closest residential receptors south of the Proposed Project along Alley 559.

- **Location 4** is located at the northwest corner of 34 Isabella Street, representative of the residential receptors east of the Proposed Project.

G:\Projects2\MA\Boston\4246\measurement.mxd

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014



380 Stuart Street   Boston, Massachusetts

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Figure 3.10-1

Noise Measurement Locations

Table 3.10-2 Summary of Measured Background Noise Levels – August 13, 2015 (Daytime) & August 19, 2015 (Nighttime)

Location	Period	Start Time	L_{eq}	L_{max}	L_{10}	L_{50}	L_{90}	L_{90} Sound Pressure Levels by Octave-Band								
								31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
			dBA	dBA	dBA	dBA	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB
ST-1	Day	11:18 AM	68	80	72	65	62	70	68	64	61	58	57	53	46	34
ST-2	Day	11:41 AM	68	79	71	66	62	70	67	63	61	59	57	52	47	35
ST-3	Day	12:06 PM	62	76	63	62	61	68	63	62	60	58	57	52	46	35
ST-4	Day	12:32 PM	61	71	64	60	58	66	62	58	56	54	53	48	44	30
ST-1	Night	12:00 AM	63	75	67	59	57	62	63	60	57	54	52	49	43	33
ST-2	Night	12:22 AM	67	86	68	60	57	61	62	58	59	55	52	48	44	32
ST-3	Night	12:45 AM	61	74	61	61	60	61	62	59	60	58	55	52	47	39
ST-4	Night	1:08 AM	55	65	56	55	54	58	60	57	53	52	49	45	40	33

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

Weather Conditions:

	Date	Temp	RH	Sky	Wind
Daytime	Thursday, August 13, 2015	81 °F	41%	Mostly sunny	W @ 2-6 mph
Nighttime	Wednesday, August 19, 2015	76 °F	75%	Clear	W @ 2-5 mph

Monitoring Equipment Used:

	Manufacturer	Model	S/N
Sound Level Meter	Larson Davis	LD831	1992
Microphone	Larson Davis	377B20	112340
Preamp	Larson Davis	PRM831	016258
Calibrator	Larson Davis	Cal200	2853
Calibrator	Norsonic	1251	32059

3.10.4.3 Noise Monitoring Equipment

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

3.10.4.4 Measured Background Noise Levels

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

- The daytime residual background (L_{90} dBA) measurements ranged from 58 to 62 dBA;
- The nighttime residual background (L_{90} dBA) measurements ranged from 54 to 60 dBA;
- The daytime equivalent level (L_{eq} dBA) measurements ranged from 61 to 68 dBA;
- The nighttime equivalent level (L_{eq} dBA) measurements ranged from 55 to 67 dBA;

3.10.5 Future Conditions

3.10.5.1 Overview of Potential Project Noise Sources

The Proposed Project will consist of the redevelopment of the parcel located at 380 Stuart Street, between Berkeley and Clarendon Streets. A 26-story Class-A office building with a below-grade parking garage is planned for the site. The primary sources of continuous sound exterior to the Proposed Project will consist of ventilation, heating, cooling, and emergency power noise sources. Multiple noise sources will be located on the rooftops and there will be an exhaust fan which will discharge along southern facade of the building.

Table 3.10-3 provides an anticipated list of the major sources of sound within the Proposed Project. Sound power levels used in the acoustical modeling of each piece of equipment are presented in Table 3.10-4. Sound power level data were provided by the manufacturer of each piece of equipment except for the emergency generator. The sound power levels for the components of the emergency generator were calculated using the sound-pressure levels provided by the manufacturer at reference distances.

The Proposed Project includes various noise-control measures that are necessary to achieve compliance with the applicable noise regulations. As the design progresses, it is anticipated that mechanical equipment may change; however, appropriate measures will be taken to ensure compliance with the City Noise Standards. Mitigation in the form of a silencer will be installed for the loading dock and garage fans. The energy recovery units (ERUs) will be located within a mechanical penthouse consisting of a combination of structural walls and acoustical louvers. The sound levels from the cooling towers will be mitigated either through a sound mitigation package supplied by the vendor or through the selection of quieter equipment from an alternate manufacturer. The emergency generator sound levels will be controlled using an enclosure with an exhaust silencer. To further limit impacts from the standby generator, its required periodic, routine testing will be conducted during daytime hours, when background sound levels are highest. A summary of the noise mitigation proposed for the Project is presented below in Table 3.10-5.

Table 3.10-3 Modeled Noise Sources

Noise Source	Quantity	Approximate Location	Size/Capacity
Garage Intake Fan	2	Roof (20′ tier)	15,000 CFM
Garage Exhaust Fan	2	Roof (20′ tier)	15,000 CFM
Loading Dock Fan	1	Southern façade; 10′ AGL	3,000 CFM
Energy Recovery Unit	2	Mechanical Room (339′ tier)	40,000 / 44,456 CFM
Cooling Tower	3	Roof (339′ tier)	539-ton
Emergency Generator	2	Roof (339′ tier)	800 kW

Table 3.10-4 Modeled Sound Power Levels per Noise Source

Noise Source	Broadband (dBA)	Sound Level (dB) per Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Garage Intake Fan[1]	80	87[6]	87	83	78	79	75	69	62	54
Garage Exhaust Fan[1]	80	87[6]	87	83	78	79	75	69	62	54
Loading Dock Fan[2]	74	78[6]	78	75	72	70	69	66	61	55
Energy Recovery Unit[3]	96	91[6]	91	95	99	95	89	85	82	78
Cooling Tower[4]	102	106[6]	106	105	104	101	96	91	86	80
Emergency Generator – Mechanical[5]	116	108[6]	108	113	112	111	113	109	105	100
Emergency Generator – Exhaust[5]	121	85[6]	85	111	121	117	116	115	106	87

Notes:

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

1. Greenheck QEI-36-I-50 15,000 CFM fan
2. Greenheck QEI-16-I-10 3,000 CFM fan
3. Sound levels include supply, exhaust, and casing.
4. Marley NC8405TLN2
5. Caterpillar 800 kw generator
6. No data provided by manufacturer. Octave band sound level assumed to be equal to dB level in 63 Hz band.

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

Noise Source	Form of Mitigation	Sound Level (dB) per Octave Band Center Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Garage Intake Fan	Silencer[1]	6[8]	12	20	29	34	31	22	15	10
Garage Exhaust Fan	Silencer[1]	6[8]	12	20	29	34	31	22	15	10
Loading Dock Fan	Silencer[2]	3[8]	7	12	23	29	32	27	24	17
Energy Recovery Unit	Enclosure – Walls[3]	3[8]	6[8]	12	14	19	19	20	27	13[8]
Energy Recovery Unit	Enclosure – Acoustical Louvers[4]	2[8]	5	7	11	12	13	14	12	9
Cooling Tower	Alternative/Modified Unit[5]	0	0	0	1	3	3	3	1	0
Emergency Generator - Mechanical	Enclosure[6]	5[8]	10	12	14	24	32	40	42	44
Emergency Generator - Exhaust	Silencer[7]	7[8]	15	34	31	30	20	20	20	20

Notes:

1. Vibro-Acoustics Silencer Model CD-LV-F1, 96″ length, accounts for self-generated noise.
2. Vibro-Acoustics Silencer Model CD-LV-F1, 48″ length, accounts for self-generated noise.
3. Transmission loss for 26 gauge metal wall panels with no insulation.
4. Transmission loss for IAC Noishield® Model R louvers.
5. The Proponent will consult with the manufacturer to identify mitigation options to achieve at least the attenuation values presented or select a unit from an alternate manufacturer meeting the mitigated modeled sound levels.
6. Pritchard Brown enclosure.
7. Silex JB-12 silencer.
8. Estimated sound level reduction.

3.10.5.2 Noise Modeling Methodology

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

3.10.5.3 Future Sound Levels – Nighttime

The analysis of sound levels at night considered all of the mechanical equipment without the emergency generator running, to simulate typical nighttime operating conditions at nearby receptors. Six modeling locations were included in the analysis. Locations A through D are similar to measurement Locations 1 through 4. Two additional modeling locations, E and F, were added for additional residential or institutional uses in the vicinity of the Proposed Project. The modeling receptors, which correspond to the residential/institutional uses in the community, are depicted in Figure 3.10-2. The predicted exterior Project-only sound levels range from 40 to 47 dBA at nearby receptors. The City of Boston Residential limits have been applied to each of these locations. Predicted sound levels from Project-related equipment are within the broadband and octave-band nighttime limits under the City Noise Standards at the modeling locations. The evaluation is presented in Table 3.10-6.

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

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Residential	42	53	52	49	46	40	34	27	23	13
B	Residential	43	55	50	48	47	41	34	28	24	15
C	Residential	43	56	53	49	47	41	34	28	24	19
D	Residential	40	46	46	46	45	39	32	25	17	0
E	Institutional	47	52	52	53	51	45	39	31	21	0
F	Residential	41	51	49	49	46	39	32	25	17	0
City of Boston Limits	Residential	50	68	67	61	52	46	40	33	28	26

3.10.5.4 Future Sound Levels – Daytime

As noted above, the emergency generator will only operate during the day for brief, routine testing when the background sound levels are high, or during an interruption of power from the electrical grid. A second analysis combined noise from the Proposed Project's mechanical equipment and its emergency generator to reflect worst-case conditions. The sound levels were calculated at the same receptors as in the nighttime analysis, and then were evaluated against daytime limits. The predicted exterior Project-only daytime sound

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014

380 Stuart Street **Boston, Massachusetts**

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Figure 3.10-2

Noise Modeling Locations

levels range from 43 to 50 dBA at nearby receptors. Predicted sound levels from Project-related equipment are within the daytime broadband and octave-band limits under the City Noise Standards at each of the modeling locations. This evaluation is presented in Table 3.10-7.

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

Modeling Location ID	Zoning / Land Use	Broadband (dBA)	Sound Level (dB) per Octave Band Center Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
A	Residential	43	53	52	50	47	40	35	31	24	13
B	Residential	43	55	50	48	47	41	35	30	24	15
C	Residential	44	57	53	50	47	41	37	34	26	19
D	Residential	44	48	47	48	46	40	38	35	21	0
E	Institutional	50	54	52	54	52	46	45	41	26	0
F	Residential	48	52	50	50	48	41	44	42	28	0
City of Boston Limits	Residential	60	76	75	69	62	56	50	45	40	38

3.10.6 Conclusions

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

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

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

3.11 Construction Impacts

3.11.1 Introduction

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

Proper pre-planning with the City and neighborhood will be essential to the successful construction of the Proposed 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 Proposed Project, the Proponent will provide the name, telephone number and address of a contact person to communicate with on issues related to the construction.

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

3.11.2 Construction Methodology/Public Safety

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

3.11.3 Construction Schedule

The Proponent anticipates that the Proposed Project will commence construction in mid-late 2016 and will be completed in early 2019.

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

3.11.4 Construction Staging/Access

Information regarding access to the site and construction staging areas will be provided in the CMP.

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

3.11.5 Construction Mitigation

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

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

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

3.11.6 Construction Employment and Worker Transportation

The number of workers required during the construction period will vary. It is anticipated that approximately 1,500 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 the appropriate Construction Employment Agreement with the City of Boston prior to commencing construction of the Proposed Project.

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

3.11.7 Construction Truck Routes and Deliveries

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

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

3.11.8 Construction Air Quality

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

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

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

3.11.9 Construction Noise

The Proponent is committed to mitigating noise impacts from the construction of the Proposed 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;
- 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; and
- Turning off idling equipment.

3.11.10 Construction Vibration

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

3.11.11 Construction Waste

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

3.11.12 Protection of Utilities

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

3.11.13 Rodent Control

A rodent extermination certificate will be filed with each building permit application for the Proposed 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 Proposed Project, in compliance with the City's requirements.

3.11.14 Wildlife Habitat

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

Chapter 4.0

Sustainable Design and Climate Change

4.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE PREPAREDNESS

4.1 Sustainable Practices

John Hancock, the U.S. arm of Manulife Financial, applies a range of policies, programs, and initiatives to increase the efficiency of their business operations and minimize the company's impact on the environment. Environmental performance of their real estate operations are managed through the use of a proprietary, web-based utility consumption reporting (UCR) system. The UCR system tracks energy and water use, as well as building waste collection and diversion rates. As the UCR system relies on utility data, it is used primarily in the commercial office properties such as the Proposed Project.

The Proponent also continues to search for ways to reduce total annual paper consumption and increase use of sustainably sourced paper. They have a number of programs in place that encourage employees to reduce the amount of office paper they use, and are also migrating customers to the use of paperless statements. As a result of these efforts, office paper consumption per employee has decreased by 42 per cent since 2010. The average recycled content in all purchased paper has declined from 53 percent in 2010 to 39 percent in 2014.

4.2 Sustainable Design

The Proponent is acutely aware of the environmental and economic benefits that can be realized through environmentally sustainable building design. All new office building developments target Leadership in Energy and Environmental Design (LEED) Gold level as the basis of design, with a focus on reducing operational energy consumption. This is achieved by installing energy efficient equipment and systems, implementing advanced building controls systems and combining them with high-performance building enclosures. Designs also specify high levels of durability for equipment to improve performance, reducing the need for replacement and the related cost and waste over the whole building life cycle. This approach focuses on reducing the operational life cycle costs of buildings and the waste they generate, reflecting their long-term approach to investing.

To comply with Article 37, 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. The Proposed Project will use LEED v4 BD+C: Core and Shell as the rating system 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.

This section contains a preliminary LEED Checklist and a description of the Proposed Project's sustainability strategies. The checklist will be updated regularly as the design develops and engineering assumptions are substantiated. Presently the Proponent is striving to be certified at the Gold level with 62 points targeted.

Sustainable Sites, Location and Transit

As a previously developed site in an urban area, the Proposed Project will create new development opportunities without impacting the natural environment. It will therefore earn a credit for site selection. It will also increase the density of the site compared to its existing conditions and will earn an additional credit for development density. The Project Site's location in a vibrant urban neighborhood will also provide users with easy access to numerous community amenities such as shops and restaurants, museums, parks, plazas and public transportation.

John Hancock encourages its employees to take advantage of public transportation. A high percentage of the company's employees already use public transportation to get to and from their Boston campus. The Proposed Project will be located near several public transportation options such as the commuter rail, subway and local bus routes. Furthermore, the Proposed Project will provide bicycle storage and changing rooms. This will make it easy for John Hancock employees to continue to build on their sustainable commuting culture.

For those who do choose to commute by car, preferred parking will be provided for low-emitting and fuel efficient vehicles. All parking will be located below grade rather than on the surface of the site to reduce heat island effects. Light-colored, high-albedo roofs will be used to further reduce heat island effects and solar heat gain.

The Proposed Project will explore implementation of a state-of-the-art rainwater management system. This system will collect rainwater on the site and store this resource in tanks below ground to reuse in the building as process water.

Water Efficiency

The Proposed Project will utilize low-flow plumbing fixtures to reduce indoor water use, and will target an overall potable water use savings of 35% from the calculated baseline use. It will also practice responsible landscape design and incorporate the use of indigenous plants to reduce outdoor water use. Furthermore, the Proposed Project will earn a credit for building-level water metering.

Energy and Atmosphere

The Proposed Project will utilize multiple energy efficiency measures including: high performance building envelope, high efficiency condensing type hot water boilers, high efficiency magnetic bearing centrifugal water cooled chillers, daylight harvesting, ventilation air energy recovery, high efficiency lighting fixtures, condenser water heat recovery heat pumps, etc. The Proposed Project's energy performance is expected to exceed the ASHRAE baseline by at least 30%.

An independent commissioning agent with documented commissioning authority experience will conduct a design review of the building energy systems before, during and after the construction process, including the review of contractor submittals in parallel with the design architect and engineer. A commissioning agent will later develop a systems manual that provides future operating staff the information needed to understand and optimally operate the building energy system and will review with staff and occupants within 10 months after the building's substantial completion.

Materials and Resources

A demolition and construction waste management plan will be implemented during construction of the Proposed Project to divert a high percentage of waste material from landfills. Every effort will also be made to procure locally sourced and manufactured construction materials. Additionally, construction materials used for the Proposed Project will contain significant percentages of recycled or rapidly renewable content. Specifically, the Proposed Project intends to use recycled structural steel, aluminum, glass, glazing and concrete materials where possible. Convenient areas for the collection and storage of recyclable materials will also reduce operational waste once the building is complete by encouraging building occupants to recycle.

Indoor Environmental Quality

The Proposed Project will prioritize the use of healthy and sustainable design strategies and materials indoors to ensure a high quality work environment for all building occupants. The Proposed Project will earn a credit for the use of low-emitting materials to preserve indoor air quality. During construction an indoor air quality (IAQ) management plan will be implemented to protect mechanical systems from contamination. Additionally, finishes, adhesives and sealants used in the core will be specified to meet standards for low volatile organic compounds (VOCs). The MEP systems will be design to assure thermal comfort of the building occupants.

The exterior skin of the building will also be designed to enhance the indoor environment. Generous windows of vision glass will provide occupants on every floor with access to natural daylighting and far-reaching views of the city, waterfront and region.

Innovation in Design

The Project team has identified several innovation credits that is may pursue.

Sustainable Wastewater Management – This credit would be earned by encouraging water reuse, reduction and recovery.

Clean Construction – This credit would be earned by minimizing community health and climate impacts caused by diesel engine emissions during construction.

Purchasing – Lamps – This credit would be earned by establishing and maintaining a toxic material source reduction program that reduces the amount of mercury brought into the building through lamps.

Green Building Education – This credit would be earned by providing public education spaces and/or programs that focus on green building strategies and solutions.

4.3 Notable Sustainable Design Strategy

One of the Proposed Project's many notable sustainable design strategies is its stormwater management system. This comprehensive system will collect, store and reuse rainwater from the site to ease the burden on the regional sewer system, reduce the use of potable water and recharge the local groundwater table. Specifically, this system will capture rainfall from all roof areas and drain it into a large, underground holding tank. A robust system of groundwater recharge wells located outside of the building's footprint will then reintroduce the collected rainwater into the local water table. This will help to address a critical neighborhood concern that groundwater levels are often too low. A portion of the collected rainwater may also be reused as process water on site. Together, these measures will divert a significant amount of water from the City's sewer system.

The Proposed Project also takes a unique approach to the design of the building's exterior skin. The building's exterior skin will been carefully tuned to its solar orientation. This sustainable design strategy will simultaneously reduce the impacts of solar heat gain while maximizing natural daylighting inside the building.

4.4 Climate Change Preparedness

4.4.1 Introduction

The Proposed Project team examined two areas of concern related to climate change: drought conditions and increased number of high-heat days. Due to the Proposed Project's location, elevation and topography, the Project Site is not considered susceptible to the impacts of a reasonably-assumed sea level rise. It is also unlikely to experience extreme flooding in the case of large storms. However, the Proposed Project will be designed to adapt to extreme weather events, should the need arise.

Specifically, the building will be equipped with on-site backup electrical generators that will allow the building to remain occupied for an extended period of time. These generators and other mission critical services will be raised several floors above the ground plane to ensure that they remain operational even in the case of flooding.

A copy of the preliminary Climate Change Checklist is included in Appendix E.

4.4.2 Drought Conditions

Under a global high emissions scenario that would increase the potential climate change impacts, 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 Proposed Project's susceptibility to drought conditions, the landscape design is anticipated to incorporate native and adaptive plant materials which require low or no irrigation and are known for their ability to withstand adverse conditions. As discussed above, the Proposed Project's comprehensive rainwater management system will collect, store and reuse rainwater from the site to reduce the use of potable water. Plumbing fixtures will be specified to achieve a reduction in water use through low-flow water-closets, low-flow showers, and low-flow sinks.

4.4.3 High Heat Days

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 Proposed Project design will incorporate a number of measures to minimize the impact of high temperature events. The building will feature a high efficiency building envelope, the building's exterior skin will be tuned to its solar orientation, and the building will feature triple glazed glass to maximize thermal efficiency. The Proposed Project will also specify a high albedo roof to minimize the heat island effect.

Energy modeling for the Proposed Project has not yet been completed; however, as indicated on the LEED Checklist, the Proponent will strive to reduce the Proposed Project's overall energy demand and greenhouse gas emissions that contribute to global warming. The Proposed Project's proposed TDM program described in Section 2.3.2.6 will also help to lessen fossil fuel consumption.

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[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.

LEED v4 for BD+C: Core and Shell

Project Checklist

Project Name: 380 Stuart St Office Building Development
Date: 7/30/2015 DRAFT

Y	?	N			
1			Credit	Integrative Process	1

17	23	0	**Location and Transportation**		40
	20		Credit	LEED for Neighborhood Development Location	20
2			Credit	Sensitive Land Protection	2
	3		Credit	High Priority Site	3
6			Credit	Surrounding Density and Diverse Uses	6
6			Credit	Access to Quality Transit	6
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

3	7	1	**Sustainable Sites**		11
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
	2		Credit	Site Development - Protect or Restore Habitat	2
	1		Credit	Open Space	1
	3		Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
		1	Credit	Light Pollution Reduction	1
	1		Credit	Tenant Design and Construction Guidelines	1

6	4	1	**Water Efficiency**		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
3	3		Credit	Indoor Water Use Reduction	6
	1	1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

15	3	15	**Energy and Atmosphere**		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
6			Credit	Enhanced Commissioning	6
7	1	10	Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
	2		Credit	Demand Response	2
		3	Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
		2	Credit	Green Power and Carbon Offsets	2

5	6	3	**Materials and Resources**		14
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
	3	3	Credit	Building Life-Cycle Impact Reduction	6
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	1		Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

8	2	0	**Indoor Environmental Quality**		10
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
2			Credit	Enhanced Indoor Air Quality Strategies	2
3			Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
1	2		Credit	Daylight	3
1			Credit	Quality Views	1

6	0	0	**Innovation**		6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

1	2	1	**Regional Priority**		4
	1		Credit	Regional Priority: Optimize Energy Performance (at least 8 points)	1
1			Credit	Regional Priority: Rainwater Management (at least 2 points)	1
	1		Credit	Regional Priority: Indoor Water Use Reduction (at least 4 points)	1
		1	Credit	Regional Priority: Specific Credit	1

62	47	21	**TOTALS**	Possible Points:	130

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

Chapter 5.0

Urban Design

5.0 URBAN DESIGN

5.1 Site Description

Located at 380 Stuart Street, the Project Site sits between Boston's Back Bay neighborhood and the South End neighborhood in the heart of Boston's "high spine." This mid-block site is situated on Stuart Street halfway between Berkley Street and Clarendon Street.

This central location places the site in the proximity of a number of historic buildings and notable public places (see Figure 5-1). It is located directly across the street from the "Old" John Hancock building located at 200 Berkeley Street and diagonally across the street from the present John Hancock Tower located at 200 Clarendon Street. On the other side of the John Hancock Tower is one of the Back Bay's greatest gems: Copley Square. This unique public plaza acts as the civic, social and cultural center of the neighborhood. The beautiful and historic Trinity Church sits on one end of the plaza while the other end is anchored by the breathtaking Boston Public Library.

The Project Site is also located just a few blocks from both the Public Garden and Boston Common. It is also less than a quarter mile from the picturesque Commonwealth Avenue Mall. Furthermore, the site offers seamless connections to a number of nearby neighborhoods, such as Bay Village and the South End, and their inviting residential streetscapes. It is also located just a short walk from both Chinatown and the Financial District.

This transit-oriented site is just one block away from Back Bay Station, offering easy access to the Orange Line, Commuter Rail and Amtrak, as well as several different MBTA buses. It is also just a five minute walk from the Green Line at Copley Station. The site is located just off of Interstate 90 and a short drive from Interstate 93, offering easy vehicular connections to the greater metropolitan area.

This approximately 30,617 square foot, well-connected site is currently occupied by a 140,000 square foot nine-story office building and a small, gated outdoor area. While part of the John Hancock company campus, the existing building is not considered a historic or architecturally significant building, having been rated "Not Eligible for Individual Listing" (formerly Category V) by the Boston Landmarks Commission.

To the west of the Project Site is the Clarendon, a mixed-use development that includes apartments, condominiums, retail, a restaurant and a U.S. Post Office. The parcel on the east side of the Proposed Project is home to the Loews Hotel.

Figure 5-1

Neighborhood Context

The new building proposed at 380 Stuart Street will continue John Hancock's honorable tradition of social and economic investment and great architecture. In addition to adding a unique new form to the city skyline, the Proposed Project represents a $350 million investment in the local economy. It will create approximately 1,500 construction jobs. It will also provide $900,000 in job training funds and $4.5 million of affordable housing funds. Finally, the proposed office tower will provide approximately $5 million more in real estate taxes each year to the City than the existing building on the site.

5.2 Urban Design Concept

The Proposed Project reflects John Hancock's commitment to invest in the City of Boston and its people by creating new opportunities for employment, community building, education, and civic engagement. In addition to sponsoring the Boston Marathon and offering MLK Summer Scholarships to approximately 600 Boston teenagers each year, John Hancock invests heavily in its own facilities in the City. Over the past ten years alone, John Hancock has invested well over $300 million in its Boston facilities to create buildings and built forms that benefit both their business and the City of Boston as a whole. These investments, which historically have included Boston landmarks like the John Hancock Tower, have redefined the skyline and become a symbol of the City of Boston and its strength and integrity.

The 380 Stuart Street Project is a building about Boston. Its proposed design celebrates the city by generating a sense of place within the Back Bay neighborhood, providing a functional, efficient working environment, and introducing long-term energy efficiency opportunities that reduce environmental impact. The building's form emphasizes simplicity, efficiency, amenities, and high performance. In this way, it makes central the interests of the neighborhood and the city at large, creating a better current and future Boston.

The Proposed Project will transform this unique infill site into a vibrant urban destination in keeping with the character of the area and supporting Boston's future as a green, global and connected city. The design of the groundplane will enhance the visual identity and experience of walking through the Stuart Street corridor. This approach extends to the creation of spaces that provide important places for people to meet, recreate and socialize. The value of a well-designed and high-quality public realm is critical to creating a setting for vibrant urban setting and increasing the economic value of proximate properties.

The Proposed Project energizes Stuart Street with a terraced, activated multi-story winter garden at street level. The light-filled space houses the office lobby and provides ample space for conferencing suites in a multitude of arrangements. It also provides spaces for public-facing amenities that will help invigorate this block of Stuart Street, such as retail, restaurant, and health and wellness businesses. The base of the building is designed to maximize visual transparency and provide a sense of connection with the public realm along Stuart Street. The terraced layout of the interior lobby spaces reinforces this by further opening the interior of the building to the street and allowing deeper sunlight penetration to the front of the building from the south. Exterior pocket parks flank the building's East and West faces and will act as interior amenity extensions, as well as a direct through-block connection from Stuart Street to Stanhope Street on the east side of the site, providing activation to the public realm and improving connectivity among the adjacent uses and amenities.

A combination of program and contextual response drives the shape of the building itself. The corners of the building progressively round in shape as the tower rises. The building also tapers gently inward at the east and west facades to allow for open space at ground level adjacent to the lobby to facilitate the pedestrian through-site link, outdoor amenity space, and room for vehicular circulation. The resulting building is an elegant contribution to the skyline that does not seek to overwhelm its neighboring context.

The office floorplates allow for efficient, functional workspaces that cater to current market expectations. At the same time, their design anticipates future workplace demands by maximizing flexibility in order to provide for alternative workspace configurations. The design keeps these goals in mind, prioritizing flexibility, mobility, connectivity, and access to amenities. Lease spans are optimized on all sides and kept within the range of 40′ – 50′ in depth. The central core, designed to maximize floorplate efficiency, also minimizes the loss of leasable floor space in a multi-tenant configuration. A high performance, triple-glazed façade wraps the building's exterior, providing expansive views in all directions.

With millions of square feet of Energy Star and LEED Certified space under ownership, John Hancock is deeply committed to environmental sustainability in the built environment. 380 Stuart Street is to pursue a LEED-NC Gold Certification and high levels of energy and water efficiency to distinguish itself as Class A Office space that exceed the local Stretch Energy Code as well as ASHRAE 90.1 2013.

The Proposed Project will celebrate and embrace the design principles established by the Stuart Street Planning Study. The Proposed Project therefore aims to achieve the following urban design goals:

- Expand and enhance the public realm with a thoughtfully designed public space and a through-block connection;
- Create a welcoming streetscape with active ground floor uses;
- Respect and respond to the site's unique urban context;
- Provide a new symbol of leadership and innovation through bold urban design;
- Design and foster a truly sustainable building and community.

5.3 Urban Design Details

The Proposed Project will achieve these goals in the following ways.

5.3.1 Public Realm

As recommended by the Stuart Street Planning Study, the Proposed Project will provide a grade-level through-block connection from Stuart Street to Stanhope Street. This connection will be located on the east side of the building's base and will include the opportunity for both outdoor and partially indoor routes to maximize pedestrian comfort (see Figure 5-2). The base of the building will curve inward to create a protected, open-air connection, which will be accessible through the building's enclosed, climate controlled lobby. As an open air connection, this welcoming pedestrian pathway will present no barriers to frequent use by workers, residents and visitors traveling through the neighborhood (see Figures 5-3 and 5-4).

The Proposed Project will also include a multi-story public lobby with a large glass façade on Stuart Street. The upper floor of the lobby volume on the building's south elevation facing Stanhope Street will be partially glazed with windows above the upper floors of the lower buildings to the south of Alley 559. This open and transparent lobby design will allow sunlight from the south side of the site to penetrate through the edges of the building and out onto Stuart Street, creating a warm and walkable streetscape (see Figure 5-5). This large public lobby will also offer opportunities for one or more major public art installations, consistent with the Stuart Street Guidelines.

Finally, the Proposed Project will include two large exterior balconies on the second floor of the lobby that will provide intimate spaces for outdoor meetings and conversations as well as spaces for rest and relaxation. They will also incorporate trees and plantings to create visual and programmatic connections from one end of the block to the other.

5.3.2 Ground Floor

The Proposed Project will create an active and continuous street wall, as recommended by the Stuart Street Planning Study. The main entry will be clearly defined by a curved and sculptural building canopy element that will help to mitigate pedestrian level wind impacts. The use of light and transparent glass on the façade will blend the boundaries between the indoor and outdoor environments and invite pedestrians into the building lobby rather than the more traditional commercial office approach of treating the lobby wall as a security barrier (see Figure 5-6).

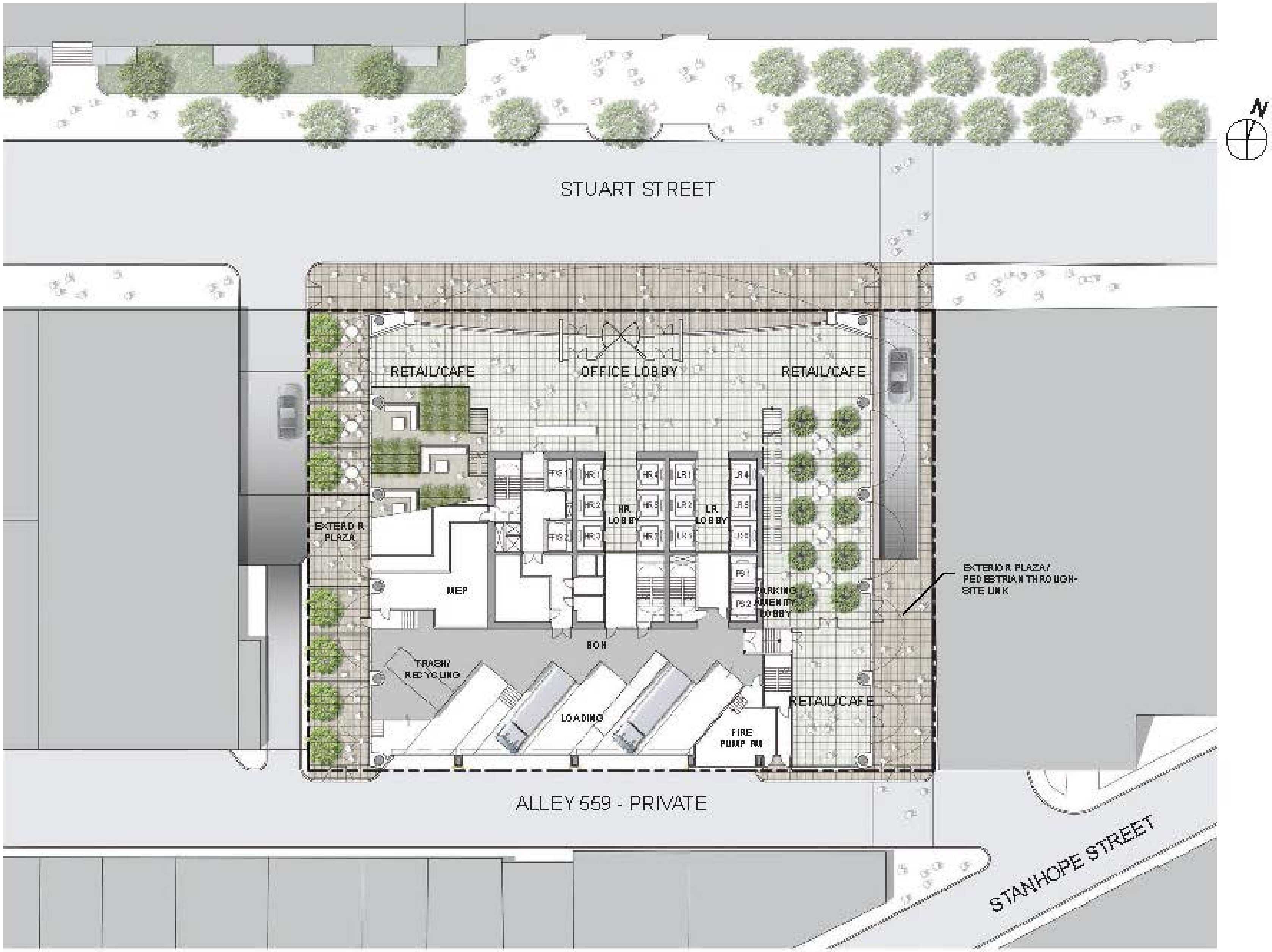


Figure 5-2

Ground Floor Plan

Figure 5-3

Pedestrian Connection

Figure 5-4

Pedestrian Connection

Figure 5-5

View from inside the Lobby

Figure 5-6

View Stuart Street facing the Proposed Project

The ground floor of the building will also include several opportunities for retail/café uses to further enliven the streetscape environment along Stuart Street and within the building's public lobby. The emphasis of these modestly scaled spaces will be to serve the building's occupants with food and beverage amenities that will also serve the public at large in an inviting, attractive, and year-round setting. Because the existing conditions along the Project Site offer no public amenity whatsoever, the Proposed Project's café offerings will significantly enhance the public realm and pedestrian experience on this block of Stuart Street. It is contemplated that one of the proposed café spaces will also be accessible directly from the Stanhope Street pedestrian pathway, which is expected to become a significant commuter amenity similar to the 10 St. James atrium, also designed by the Proposed Project architect, Skidmore Owings Merrill.

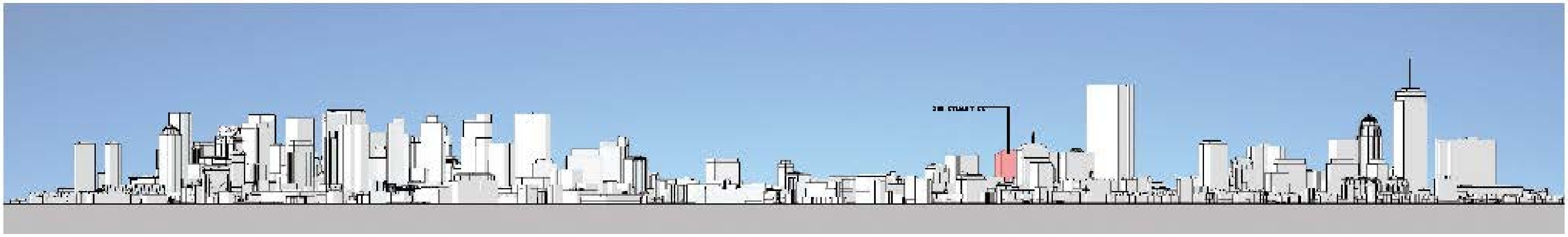
5.3.3 Urban Context

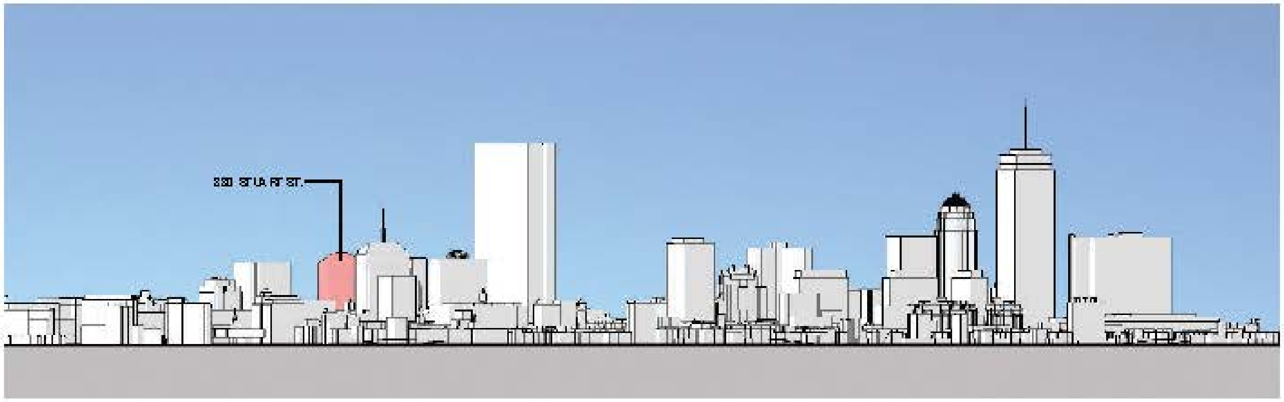
The Proposed Project will respect and respond to its urban context by delivering a design that works well at several different scales. At the pedestrian scale, it will offer a one-story pedestrian pathway between blocks that will be lined with café uses, tables, chairs, plants, trees and possibly public art. On the neighborhood scale, a three-story sculptural gesture at the main entry will announce the building, creating a strong mid-block presence but with a gesture that is of a more traditional and pedestrian scale. At the city scale, the building's bold form will add a dynamic new element to Boston's skyline and act as an extension of the high urban spine even while it maintains a highly contextual height and massing that is respectful of its neighbors and the beacon of the Old Hancock building located across the street (see Figure 5-7).

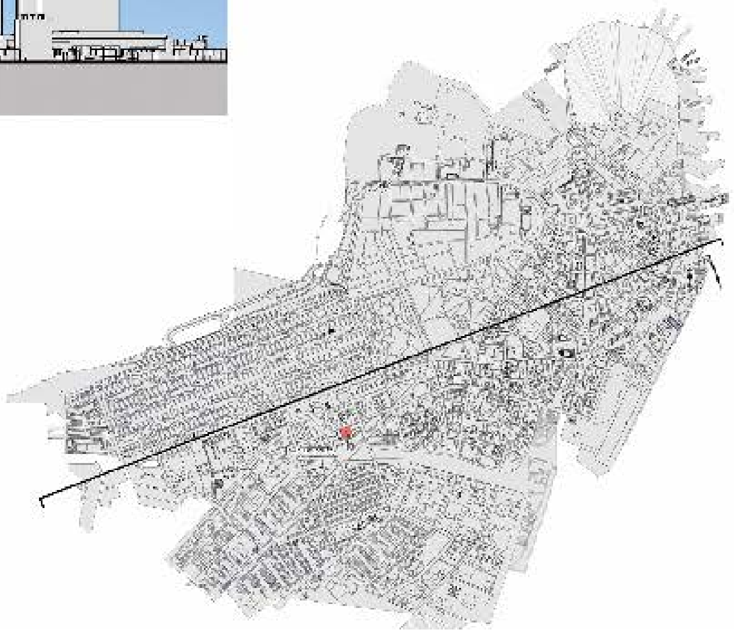
The Proposed Project's design also carefully considers any potential impacts on the quality of urban life in and around the building. The building's overall massing and crown element have been shaped to ensure that the building casts no net new shadow on Boston Common or Commonwealth Avenue Mall and no material new shadow on Copley Square, in full accordance with the Stuart Street Guidelines. This respectful building massing will allow residents, workers and visitors to continue to enjoy these valuable public amenities.

Furthermore, the building's corners have been designed as curves to mitigate wind impacts on the surrounding areas. The design does not create any "uncomfortable" or "dangerous" wind conditions and will not have any impact on wind in any of the nearby residential neighborhoods.

Overall, the Proposed Project represents a highly contextual addition to the Stuart Street corridor in a manner that is especially sensitive to environmental impacts and the quality of the public realm in the immediate vicinity of the Project Site.







380 Street Street **Boston, Massachusetts**

Figure 5-7

Proposed Project in the Boston Skyline

5.3.4 Design Excellence

John Hancock is committed to excellence in design in Boston. Hancock is the only private property owner in the city's history whose buildings have won three of the Boston Society of Architects Harleston Parker Awards for the best new building in Boston. John Hancock's hope is that the Proposed Project continues to embody this tradition of architectural excellence and innovation in its home city. The Proposed Project's distinct rounded top and gradually tapering base will create an iconic new element in the city skyline. This innovative design and the quality of the building systems embodied in the new building will reflect John Hancock's commitment to boldness in architecture and environmental sustainability.

Chapter 6.0

Historic and Archaeological Resources

6.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section describes the historic and archaeological resources within and in the vicinity of the Project Site and provides an assessment of the potential Project-related impacts.

6.1 Project Site

The Project Site, located in the Back Bay neighborhood of Boston, is located within the Park Square – Stuart Street Historic Area. The property is bounded by Stuart Street to the north, Alley 559 to the south, 154 Berkeley Street (the Lowes Hotel) to the east and 390 Stuart Street to the west. The Project Site consists of approximately 30,617 sf of land developed with a nine story commercial building.

Located on the Project Site is the Pettingell-Andrews Company Building constructed in 1924-1925, and designed by Boston based architect Thomas M. James. The building was constructed by the W. M. Evatt Company of Boston. The Classical Revival style building is nine stories, eight by five bays and consists of cast stone with limestone, brick and granite trim. The building's façade (north elevation) retains some its original architectural features while the east and west elevations have been substantially modified during a 1990s reconstruction of the exterior. The south (rear) elevation while generally intact lacks significant detail consisting of cast stone with brick at window openings.

The Park Square – Stuart Street Historic Area is included in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth, and has been identified as being eligible for listing in the National Register of Historic Places. Roughly bounded by Trinity Place, St. James Avenue, Clarendon, Boylston, and Stuart streets, Columbus Avenue, and Park Plaza, the Park Square – Stuart Street Historic Area represents an early twentieth-century extension of Boston's downtown business district, with numerous high-rise structures constructed on the site of the former sixteen-acre Boston & Providence Railroad yard. In 2007, the Park Square – Stuart Street Historic Area was considered for National Register listing; however, due to objections from property owners within the proposed district, the designation did not move forward.

The Project Site is located in an area predominantly of large multi-story steel frame and masonry buildings with first floor retail spaces and large storefront windows and upper stories serving as residences or offices. In addition to mixed-use buildings, there are institutional buildings such as Trinity Church and the Boston Public Library nearby. Dates of construction range from the late 19th-century through the late 20th-century. Brick, cast stone and stone along with metal panels and single pane and multi-light windows are common building materials in the area.

6.2 Historic Resources within the Vicinity of the Project Site

The Project Site is located within and in the vicinity of several historic resources included in the Inventory of Historic and Archaeological Assets of the Commonwealth and listed in the State and National Registers of Historic Places. Table 6-1 identifies these resources and their locations are depicted in Figure 6-1.

Table 6-1 Historic Resources in the Vicinity of the Project Site

No.	Historic Resource	Address	Designation*
A	Back Bay Historic District	Roughly bounded by Arlington, Providence, St. James, Exeter, and Boylston Streets, Charlesgate East, and the Charles River	NRDIS
B	Back Bay Architectural District	Roughly bounded by Back St., Embankment Rd. and Arlington St., Boylston St. and Charlesgate East	LHD
C	Park Square – Stuart Street Historic Area	Roughly bound by Park Sq., Columbus Ave., Clarendon St., James Ave., Providence St., and Boylston St.	Inventory
D	Bay Village Historic District	Roughly Bounded by Piedmont, Winchester, Melrose, Fayette, and Tremont Sts.	LHD
E	South End Landmark District	Roughly bound by Claremont St. Mass. Tpke., East Berkley St., Camden St.	LHD
F	Boston Public Gardens	Bounded by Beacon, Charles, Arlington and Boylston Sts.	NRDIS, NHL, LL
G	South End District	Roughly bound by Claremont St. Columbus Ave. Mass. Tpke., East Berkley St., Northampton St.	NRDIS
H	South End Landmark District Protection Area	Roughly bound by Mass. Tpke., Tremont St. Interstate 93 East Berkley St., Camden St.	LHD
1	New Old South Church	645 Boylston St.	NRIND, NRDIS, NHL, LHD
2	Boston Public Library	700 Boylston St.	NRIND, NRDIS, NHL, LL
3	Trinity Church	206 Clarendon St.	NRIND, NRDIS, NHL
4	Trinity Rectory	233 Clarendon St.	NRIND, NRDIS, LHD
5	Street Clock	439 Boylston St.	NRDIS, LHD, LL
6	Berkeley Building	416-426 Boylston St.	NRDIS, LL
7	YWCA	140 Clarendon St.	NRIND

Table 6-1 Historic Resources in the Vicinity of the Project Site (Continued)

No.	Historic Resource	Address	Designation*
8	Youth's Companion Building	140-144 Berkeley St and 195-215 Columbus Ave.	NRIND
9	Armory of the First Corps of Cadets	97-105 Arlington St. and 130 Columbus Ave.	NRIND, LL
10	Arlington Street Church	Corner of Arlington and Boylston Sts.	NRIND, NRDIS, LL
11	Park Square Office Building	1-59 St. James Ave.	Inventory
12	Statler (Park Plaza) Hotel / Office Building	54-78 Arlington St.	Inventory
13	John Hancock Building	190-200 Berkeley St.	Inventory
14	Consolidated Building	100 Arlington St.	Inventory
15	Paine Furniture Company Building	75-81 Arlington St.	NRIND
16	Salada Tea Building	330 Stuart St.	Inventory
17	Pope / Cahner's Building	219-223 Columbus Ave.	Inventory
18	Publisher's Building	131 Clarendon St.	Inventory
19	U.S. Post Office, Back Bay Branch	390 Stuart St.	Inventory
20	Boston Police Headquarters	154 Berkley St.	Inventory
21	Commercial Building	129-133 Columbus Ave. / 306-306 Stuart St.	Inventory
22	Hancock Garage	100 Clarendon St.	Inventory
23	First Baptist Church	110 Commonwealth Ave.	NRIND, NRDIS

*Designation Legend

NRIND	Individually listed on the National Register of Historic Places
NRDIS	National Register of Historic Places historic district
NRDOE	Determined eligible for inclusion in the National Register of Historic Places
NHL	National Historic Landmark
LHD	Local Historic District
LL	Local Landmark
Inventory	Included in Inventory of Historic and Archaeological Assets of the Commonwealth

6.3 Archaeological Resources Within the Project Site

According to MHC's online mapping system of historic and archaeological resources, no known archaeological resources are within the Project Site. The Proposed Project involves construction in a densely developed urban area previously disturbed and then developed with a multi-story office building; therefore impacts to archaeological resources are not anticipated.

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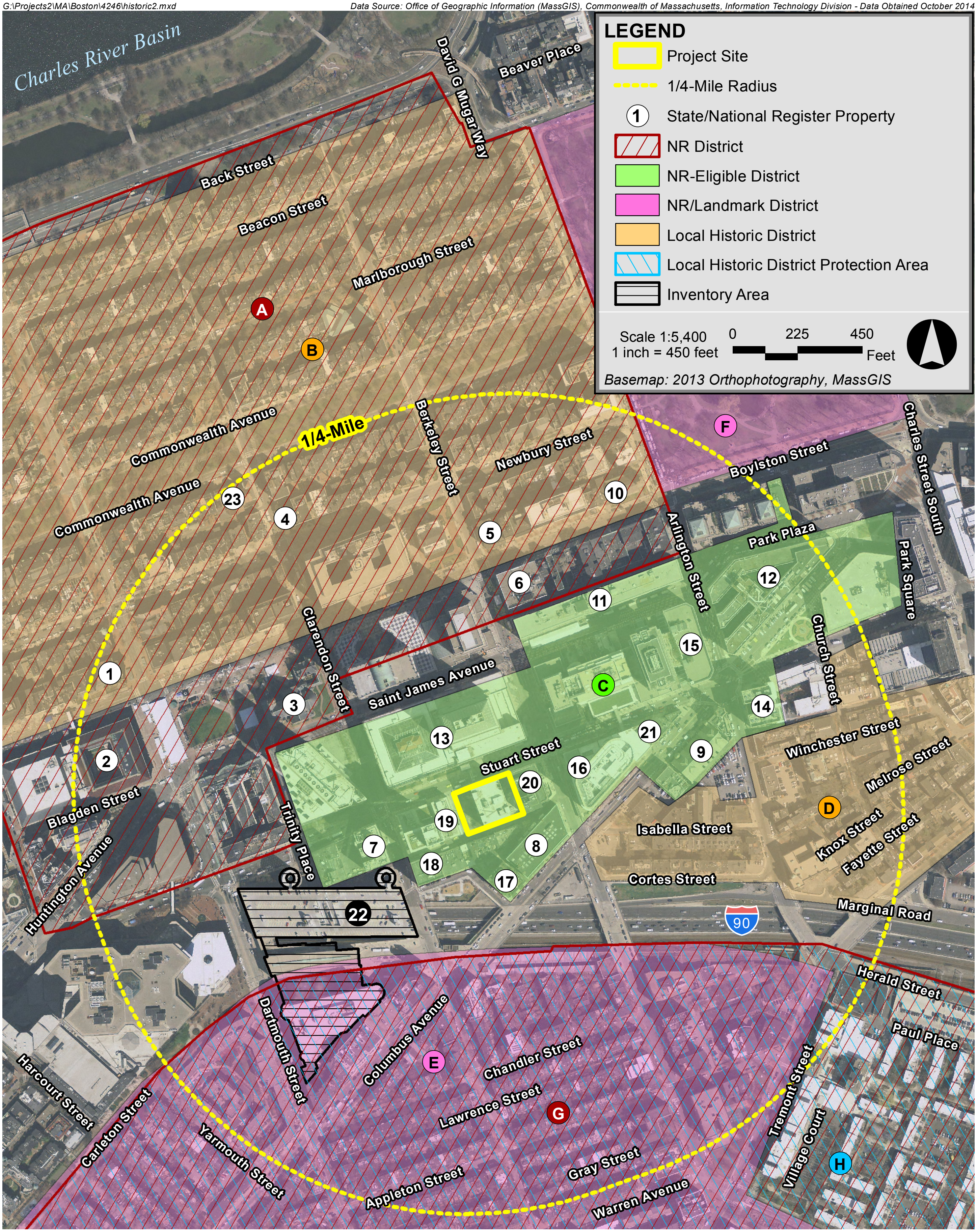
Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014



380 Stuart Street **Boston, Massachusetts**

Epsilon
ASSOCIATES INC.

Figure 6-1
Historic Resources

6.4 Potential Impacts to Historic Resources

6.4.1 New Construction

The Proposed Project requires the removal of the existing Pettingell-Andrews Company Building and construction of an approximately 26-story, office building containing approximately 615,000 square feet (sf) of office space. Constructed in 1925, the building was been substantially modified during the 1990 reconstruction of the exterior. The reconstruction has compromised its architectural character and historic integrity; therefore the building is not among the important historic resources within the area and is not an exceptional architectural example.

The Project will include approximately 10,000 sf of ground floor retail/café space, and a four-level, 175-space, below-grade parking garage. The proposed building will be highly transparent utilizing a glazed exterior and multi-story lobby. Exterior pocket parks will flank the building's east and west elevations contributing to the sense of openness and green space, as well as a direct through-block connection from Stuart Street to Stanhope Street on the east side of the site.

The Proposed Project will be in keeping with the size and scale of other existing multi-story buildings in the area. The Proposed Project will be shorter in height than 200 Berkeley Street to the north, taller than 13-19 Stanhope Street to the south, taller than 154 Berkeley Street to the east and comparable in height to The Clarendon Residences to the west. The corners of the building grow progressively rounder in shape as the tower rises, reducing its mass and preserving view corridors around the site. The building also tapers gently inward at the east and west elevations creating greater depth from the adjacent buildings. The Proposed Project will be a complimentary contribution to the overall Back Bay context.

The Proposed Project is in keeping with the scale and massing of the Park Square – Stuart Street Historic Area, and will enhance the pedestrian level streetwall along Stuart Street. The modern design will distinguish it from the surrounding construction, honoring the building's historic context, while the scale and massing will keep the building consistent with the surrounding neighborhood. The Proposed Project will contribute to the architectural evolution and diversity of styles seen in the Park Square – Stuart Street Historic Area.

6.4.2 Visual Impacts to Historic Resources

As the Proposed Project involves the removal of the existing nine story building and construction of a new 26-story building, the Proposed Project will have a visual influence on the neighborhood. However, the proposed building will be in keeping with the scale and massing of the surrounding built environment, thereby reducing its visual impact when viewed in context. The Proposed Project will also create a consistent and highly transparent streetwall along Stuart Street that does not exist today.

6.4.3 Shadow Impacts to Historic Resources

Shadow impacts to the historic resources will be minimal. As illustrated in the shadow study diagrams (Figures 3.2-1 to 3.2-14), during isolated time periods the Proposed Project will cast new shadow on areas within the National Register listed Back Bay Historic District and the Park Square – Stuart Street Historic Area.

As depicted in the shadow study diagrams, the majority of the net new shadow will largely be limited to three buildings, 200 Berkeley Street to the northeast; 154 Berkeley Street to the east; and 197 Clarendon to the northwest. Additionally, at isolated times minimal new net shadow will be cast on 206 Clarendon Street (Trinity Church) and 175 Berkley Street (Liberty Mutual). The additional new shadow on the nearby historic resources will not significantly impact the historic or architectural character of these historic properties and will have no effect on serviceability or maintenance of these resources.

6.4.4 Wind Impacts to Historic Resources

The Proposed Project entails the construction of a new building taller than the existing building occupying the Project Site, and as such some changes in existing wind patterns will occur, as outlined in Section 3.1. However, wind impacts to historic resources in the vicinity of the Project Site are expected to be either unchanged or minimally changed from the current conditions, and no new uncomfortable or dangerous annual wind conditions on public ways will be created by the Proposed Project's construction.

6.5 Status of Project Reviews with Historical Agencies

6.5.1 Boston Landmarks Commission Review

The existing building on the Project Site is over 50 years of age; therefore, the proposed demolition of the building is subject to review by the Boston Landmarks Commission (BLC) under Article 85 of the Boston Zoning Code. At the appropriate time, the Proponent will submit an Article 85 application with the BLC for its review and consideration.

6.5.2 Massachusetts Historical Commission

No state or federal funding, licensing, permits and/or approvals requiring review by the MHC are anticipated. In the event that a state or federal action is identified as required for the Proposed Project, an MHC Project Notification Form will be filed for the Proposed Project in compliance with State Register Review (950 CMR 71.00) and/or Section 106 of the National Historic Preservation Act (36 CFR 800).

Chapter 7.0

Infrastructure

7.0 INFRASTRUCTURE

This section describes the capacity of the existing water, sewage, and drainage utility infrastructure surrounding the Project Site and explains how these systems will service the Proposed Project.

7.1 System Connections

The Proponent will coordinate the design of the proposed water, drainage, and sewer connections with the Boston Water and Sewer Commission (BWSC). The appropriate permits and approvals will be acquired prior to construction. Utility connections will be designed to minimize adverse effects within the surrounding area, including existing operations. Based on the analysis herein, there is adequate drainage and sewage capacity in the area to accommodate the Proposed Project. Results of pending BWSC flow tests will determine if there is sufficient water supply in the existing infrastructure to accommodate the Proposed Project.

7.2 Sewage and Stormwater Systems

7.2.1 Existing Conditions

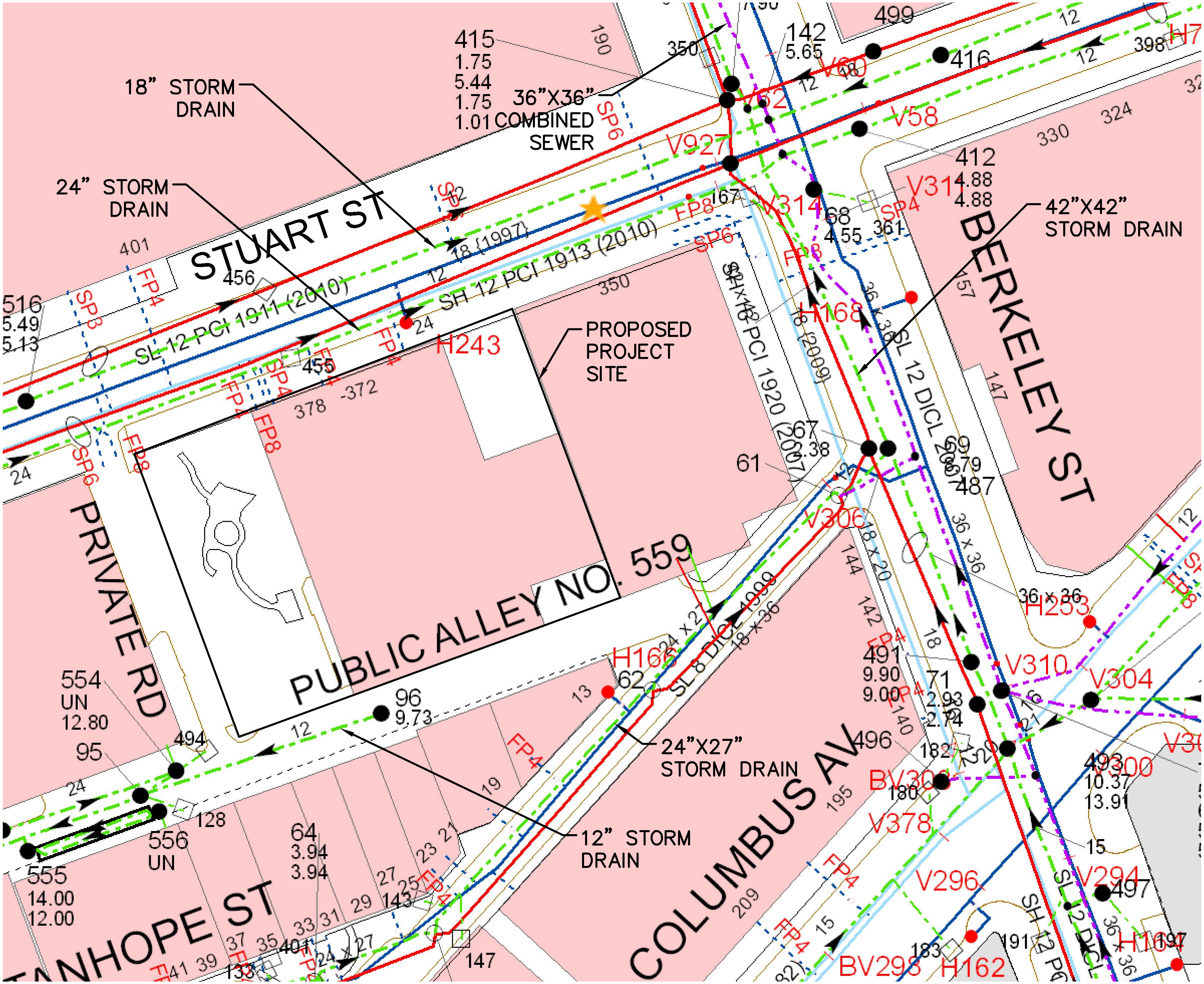
The existing sewer and drainage system infrastructure that services the Project Site and surrounding area is owned and operated by the BWSC (see Figure 7-1 and Figure 7-2):

- Two 12-inch sanitary sewers exist within Stuart Street, one on the north side and one on the south side. These two sewers connect to an 18-inch sanitary sewer in Berkeley Street. This sanitary sewer ultimately flows to the Deer Island Waste Water Treatment Plant.

- An 18-inch X 36-inch sanitary sewer exists within Stanhope Street. This sewer connects to an 18-inch sanitary sewer in Berkeley Street. This sanitary sewer ultimately flows to the Deer Island Waste Water Treatment Plant.

- Two storm drains exist within Stuart Street, a 24-inch pipe on the south side and an 18-inch pipe on the north side. These two storm drains connect to a 36-inch x 36-inch combined sewer in Berkeley Street. This combined sewer ultimately flows to the Deer Island Waste Water Treatment Plant.

- A 12-inch storm drain exists in Public Alley No. 559 behind the building which flows into the 24-inch storm drain on Stuart Street.

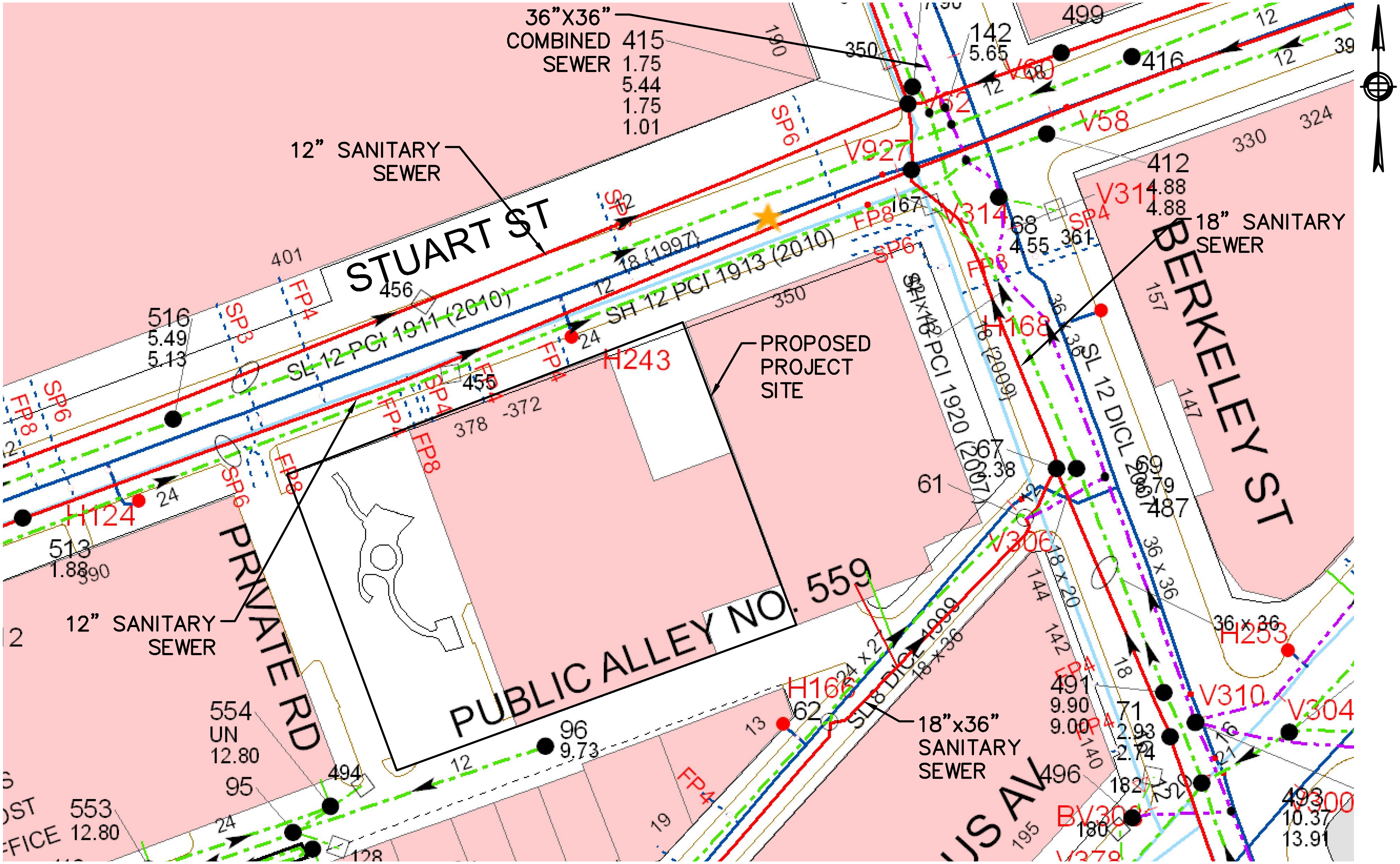


380 Stuart Street **Boston, Massachusetts**

Nitsch Engineering

Figure 7-1

Existing Storm Drainage System



380 Street Street   Boston, Massachusetts

Nitsch Engineering

Boston, Massachusetts

Figure 7-2

Existing Sanitary Sewer System

- A 24-inch x 27-inch storm drain exists within Stanhope Street. This line appears to connect to a 42-inch x 42-inch storm drain within Berkeley Street, and in times of high flow, overflows to the 36-inch x 36-inch combined sewer in Berkeley Street. The storm drain in Berkeley Street connects to the combined sewer near Providence Street, and both mains ultimately flow to the Deer Island Waste Water Treatment Plant.

Sewer flows from the existing building likely flow to the southern 12-inch sanitary sewer in Stuart Street. Storm drainage from the existing building and the park likely connect to the 24-inch storm drain in Stuart Street.

7.2.2 Sewage Generation

Existing and proposed sewage generation rates are provided in Tables 7-1 and 7-2, respectively. These rates were estimated using Massachusetts State Environmental Code (Title 5) 310 CMR 15.203. Based on these estimates, the Proposed Project is expected to increase the total effluent sewage discharge from the Project Site by 36,882 gallons per day (GPD). Since the proposed effluent discharge rate exceeds 15,000 GPD, the Proponent anticipates that BWSC will require Inflow and Infiltration mitigation. The Inflow and Infiltration mitigation payment will be received by BWSC 90 days prior to activation of the water service.

Table 7-1 Existing Sewage Generation

Use	Area (sf)	Units	Sewage Generation Rate (GPD)	Total (GPD)
Office	116,570	116,570 sf	75 / 1,000 sf	8,743
Daycare	27,432	100 people	10 / person	1,000
Total				**9,743**

Table 7-2 Proposed Sewage Generation

Use	Area (sf)	Units	Sewage Generation Rate (GPD)	Total (GPD)
Office	615,000	615,000	75 / 1,000 sf	46,125
Retail	10,000	10,000 sf	50 / 1,000 sf	500
Total				**46,625**

7.2.3 Sanitary Sewer System Capacity Analysis

The Proponent has analyzed the existing sanitary sewer and combined sewer mains in Stuart Street and Berkeley Street to determine whether they are of sufficient capacity to accommodate the Proposed Project (see Table7-3). Pipe diameters and inverts were obtained from the Existing Conditions Plan prepared by Feldman Land Surveyors (dated May 1, 2015) as well as from wastewater system maps obtained from the BWSC Engineering Desk. Flow capacity was analyzed using Manning's equation.

Based on available information, the 18-inch sanitary sewer main between manholes 411 and 415 in Berkeley Street has a reverse slope; a slope of 0.001 feet/foot was used to approximate the hydraulic capacity of this main for purposes of performing the calculations in Table 7-3. Results indicate the minimum hydraulic capacity of the systems is located along the 12-inch sewer main within Stuart Street, which has a capacity of 1.25 million gallons per day (MGD). Based on the proposed peak flow estimate, the Proposed Project will not significantly burden the existing sewage system (see Table 7-3).

Table 7-3 Sewer Hydraulic Capacity Analysis

Manhole (BWSC Number)	Size (inch)	Slope	Manning's Roughness Coefficient (n)	Existing Capacity (MGD)	Existing Capacity (CFS)	Proposed Peak Flow to Main (MGD)
513 to 411	12	0.001	0.013	0.81	1.25	0.05
411 to 415*	18	0.001	0.013	2.15	3.32	0.05
415 to 455	18	0.003	0.013	3.61	5.59	0.05

* A minimum slope of 0.001 feet/foot was assumed for calculation.

7.2.4 Sewer/Stormwater Connections

In accordance with BWSC requirements, the Proposed Project's sewage and stormwater flows will be maintained separately and will be connected to the appropriate respective mains. The sanitary sewer service for the site will likely connect to the 12-inch sanitary sewer main in Stuart Street. Storm drainage from the site will likely connect to the 12-inch storm drain in Public Alley No. 559.

7.2.5 Sewer and Stormwater Mitigation

The Project will require Site Plan approval from BWSC.

To minimize sewage generation, the Proposed Project will meet applicable code requirements for the installation of low-flow fixtures.

In terms of stormwater, the Proposed Project is located in the Groundwater Conservation Overlay District. In order to comply with Article 32 of the City of Boston Zoning Code, the Proposed Project is required to infiltrate the first inch of runoff over the site impervious area. This will be accomplished by installing a recharge system in Public Alley No. 559, pending Public Improvements Commission approval. This system will consist of recharge wells designed to infiltrate one-inch of runoff over a 72-hour period. The stormwater recharge system will improve the quality of stormwater leaving the site. The Proposed Project is located in the Charles River Watershed. Although storm drainage from the Proposed Project currently flows to the Deer Island Waste Water Treatment Plant, if the system is separated in the future, the recharge system will provide phosphorous treatment prior to discharging to the Charles River.

7.2.6 DEP Stormwater Management Policy Standards

In March 1997, the Department of Environmental Protection DEP adopted a new Stormwater Management Policy to address non-point source pollution. In 1997, the Massachusetts DEP 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. No new untreated stormwater will be directly discharged to, nor will erosion be caused to wetlands or waters of the Commonwealth as a result of stormwater discharges related to the Proposed Project.

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

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

Standard #3: Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

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

Standard #4: For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when: Suitable nonstructural practices for source control and pollution prevention are implemented; Stormwater management best management practices (BMPs) are sized to capture the prescribed runoff volume; and Stormwater management BMPs are maintained as designed.

Compliance: The proposed design will comply with this standard. Within the Proposed Project's limit of work, there will be mostly roof, landscaping, parking and pedestrian areas. Any 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 and/or recharge systems 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 there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

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

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

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

Standard #8: Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

Compliance: The Proposed 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 Proposed Project will comply with this standard. An O&M Plan including long-term BMP operation requirements will be prepared for the 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 Proposed Project will comply with this standard. There will be no illicit connections associated with the Proposed Project.

7.3 Water Supply System

7.3.1 Existing Conditions

Under existing conditions, the Project Site has both domestic and fire service connections. Water is delivered through interconnected network water distribution systems designated as Southern Low Service (SL) and Southern High Service (SH): SL systems are generally used to meet domestic water needs and street hydrant demand; SH systems are generally used as the main supply to the low-pressure service system and supply water for building fire protection systems. The SL and SH systems are integrally connected to form loops that allow major water demands to be fed from more than one direction. Looping allows each distribution system to function at optimum efficiency and provides a measure of safety and redundancy in the event of a water main break.

Adjacent to the Project Site is (see Figure 7-3):

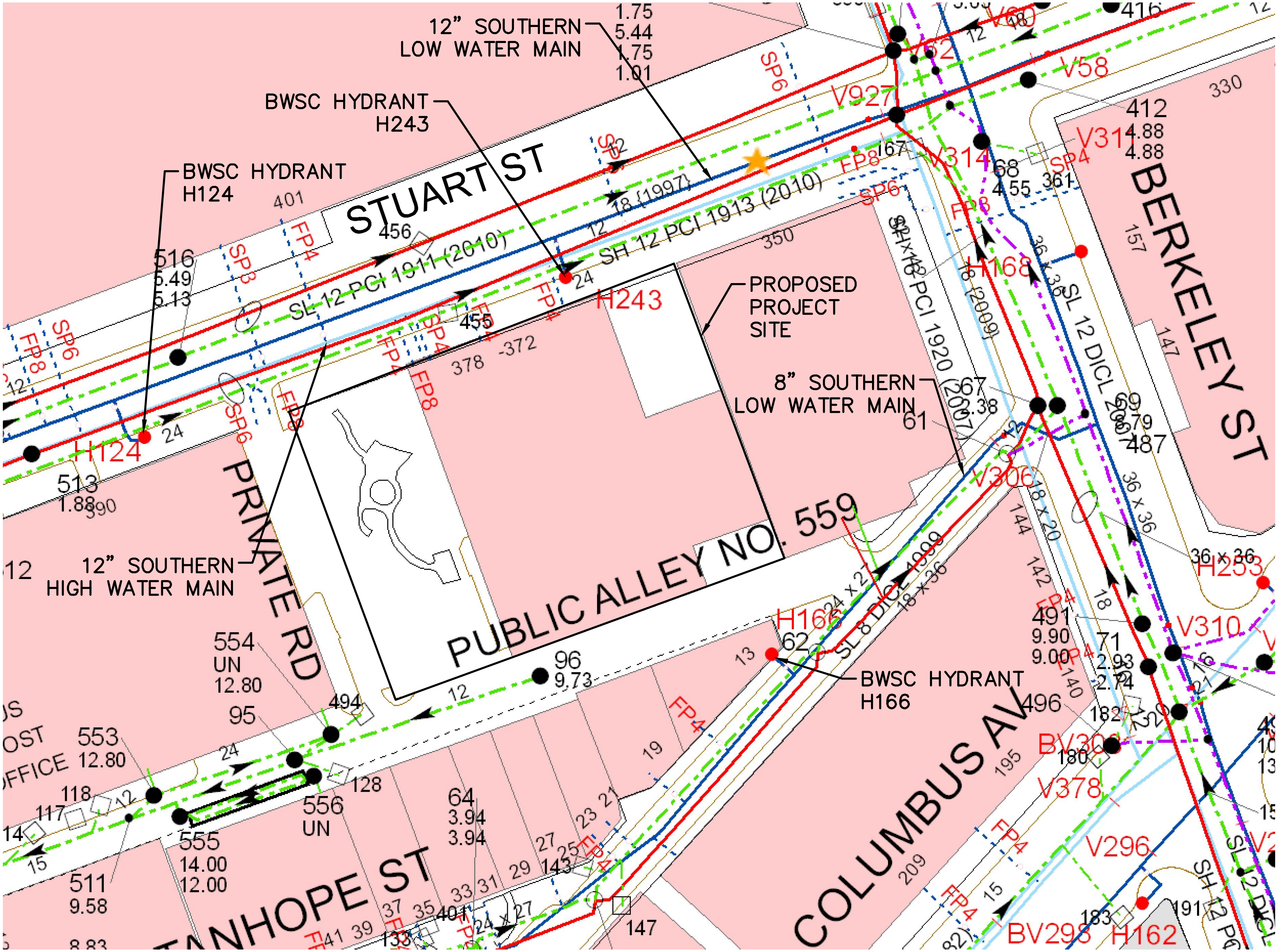
- A 12-inch SL water main in Stuart Street
- A 12-inch SH water main in Stuart Street
- An eight-inch SL water main in Stanhope Street

Domestic water for the existing building and park is likely connected to the 12-inch SL water main in Stuart Street. Fire protection for the building and park appears to be provided by multiple fire pipes from the 12-inch SH main in Stuart Street.

Two existing hydrants are located on Stuart Street near the Project Site. There is also an existing hydrant located on Stanhope Street near the Project Site. Nitsch Engineering has requested hydrant flow test results from the BWSC for hydrants H124, H243, and H166 on Stuart Street and Stanhope Street. As hydrant flow data needs to be less than one year old to be used for design, new hydrant flow tests will be requested by Nitsch Engineering. Previous hydrant flow test results were requested from BWSC by Nitsch Engineering, but have not been received to date.

7.3.2 Anticipated Water Consumption

The increase in average daily water demand associated with the Proposed Project is based on the Proposed Project's increase in estimated sewage generation. A conservative factor of 1.1 (10%) is applied to the increase in estimated average daily wastewater flows calculated with 310 CMR 15.00 values to account for consumption, system losses and other usages to estimate an average daily water demand. The Proposed Project's average potable water demand is anticipated to be 51,288 GPD.



380 Street Street   Boston, Massachusetts

Figure 7-3

Existing Water System

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

7.3.3 Water System Connections

The Proponent anticipates that water system connections will be made to the 12-inch SL main in Stuart Street for domestic water and the 12-inch SH main in Stuart Street for fire protection. The Proposed Project is a high-rise, and will require two fire protection services. To provide isolation of each service at the main, a new gate valve will be installed between the services. Water connections will be reviewed and coordinated with the BWSC to determine the most appropriate connections. Existing water connections not used by the Proposed Project will be cut and capped at the main.

7.4 Additional Utility Connections

The Project Site is serviceable from electric, telephone, cable, and gas services located within Stuart Street and Stanhope Street. Proposed utility connections will be coordinated with the appropriate utility providers.

7.5 Utility Protection During Construction

Existing public and private infrastructure located within nearby public rights-of-way will be protected during Proposed 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 Proposed Project.

Chapter 8.0

Coordination with other Governmental Agencies

8.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES

8.1 Architectural Access Board Requirements

The Proposed 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.

8.2 Massachusetts Environmental Policy Act (MEPA)

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

8.3 Massachusetts Historical Commission

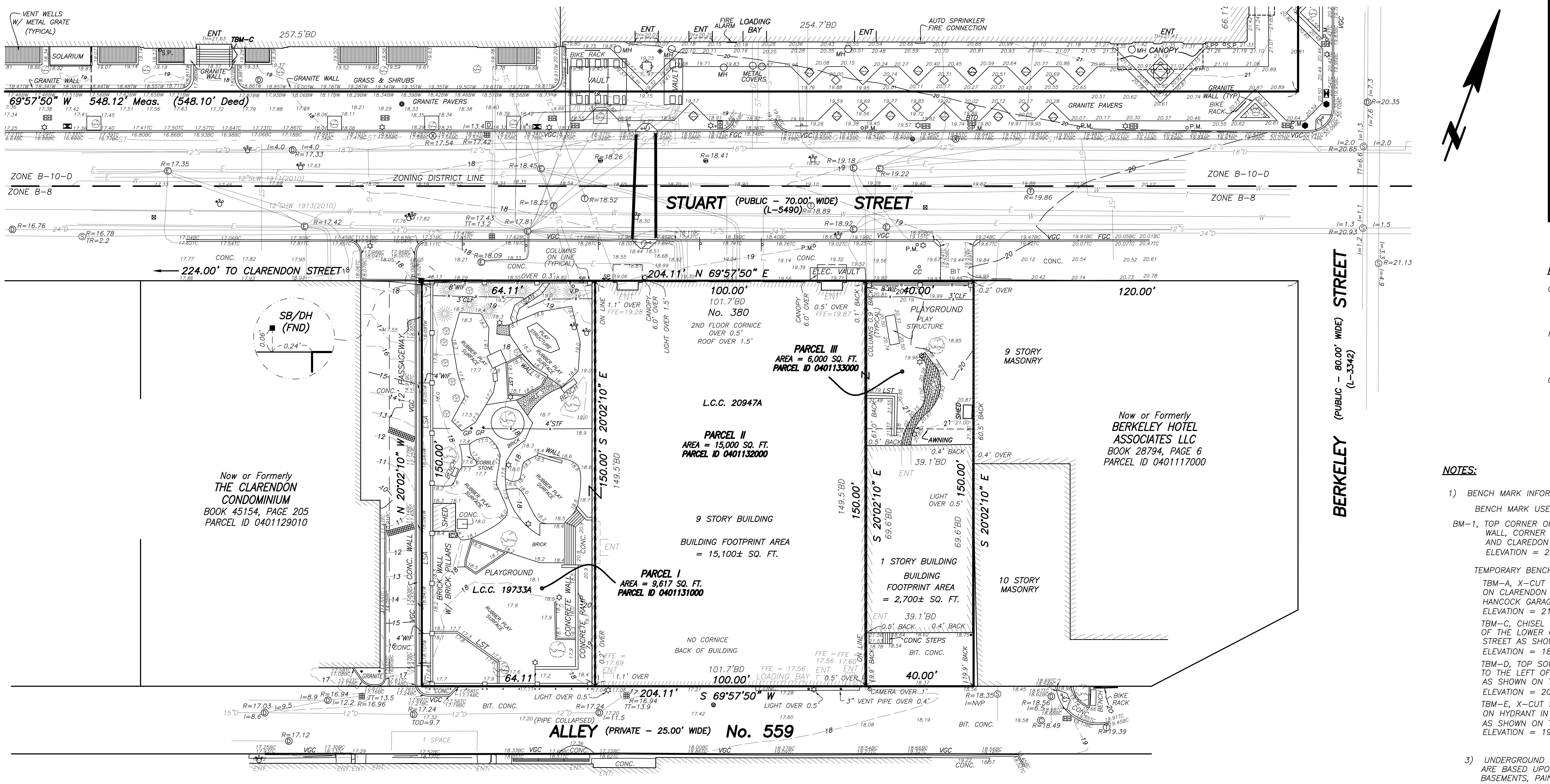
The Proponent does not anticipate that the Proposed Project will require any state or federal licenses, permits or approvals, and does not anticipate utilizing any state or federal funds. Therefore, review by the Massachusetts Historical Commission (MHC) is not anticipated at this time. In the event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

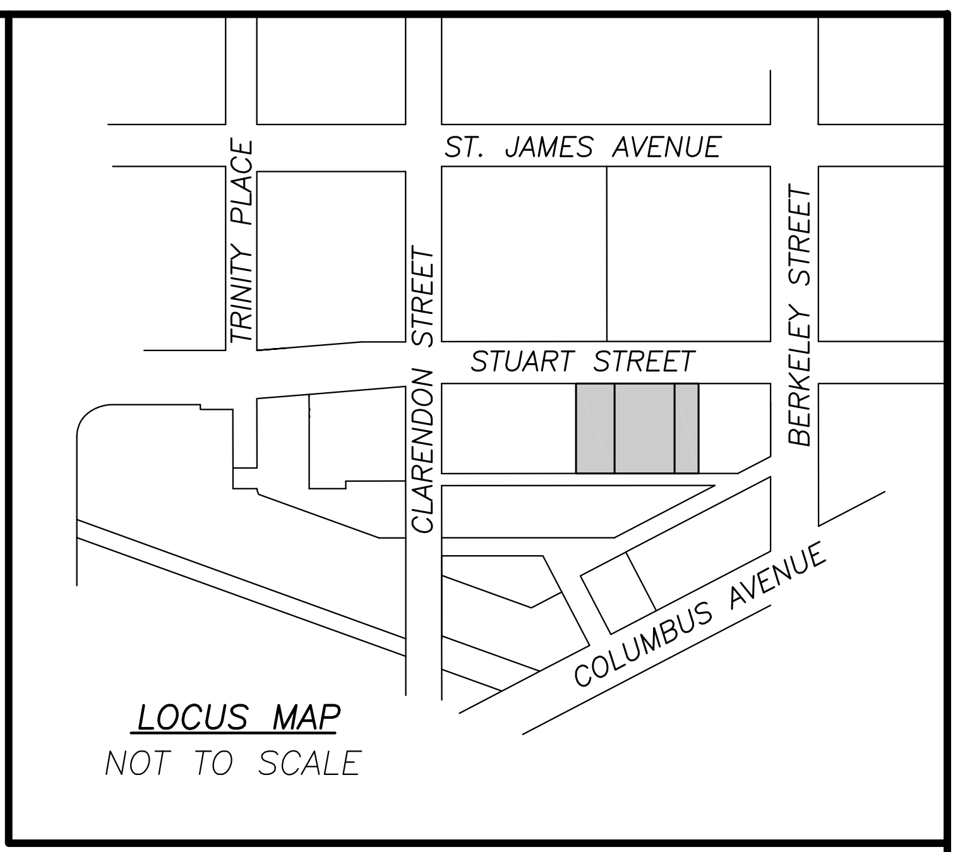
8.4 Boston Civic Design Commission

The Proposed Project will comply with the provisions of Article 28 of the Boston Zoning Code. This PNF, along with other design-specific materials prepared in accordance with the applicable provisions of Article 28, will be submitted to the Boston Civic Design Commission for review by the Proponent.

Appendix A

Site Survey





LOCUS MAP
NOT TO SCALE

REFERENCES

COUNTY REGISTRY OF DEEDS

BOOK 16197, PAGE 298
PLAN IN BOOK 8114, PAGE 558

MASSACHUSETTS LAND COURT

LCC 20947-A
CERTIFICATE OF TITLE #104043

CITY OF BOSTON ENGINEERING DEPARTMENT

PLAN NO. L-5490
PLAN NO. L-3342

NOTES:

1) BENCH MARK INFORMATION:

BENCH MARK USED :

BM-1, TOP CORNER OF 3' HIGH CONCRETE WALL, CORNER OF COLUMBUS AVENUE AND CLAREDON STREET AT M.B.T.A. STATION. ELEVATION = 28.79 (BOSTON CITY BASE).

TEMPORARY BENCH MARKS SET :

TBM-A, X-CUT SET HYDRANT BOLT BEFORE "OPEN" ON CLARENDON STREET IN FRONT OF THE JOHN HANCOCK GARAGE AS SHOWN ON THE PLAN.
ELEVATION = 21.76

TBM-C, CHISEL SQUARE SET ON THE RIGHT OUTER CORNER OF THE LOWER GRANITE STEP IN FRONT OF 197 CLARENDON STREET AS SHOWN ON THE PLAN.
ELEVATION = 18.81

TBM-D, TOP SOUTHWEST CORNER, OF GRANITE PLANTER TO THE LEFT OF THE DOORWAY AT 130 CLARENDON STREET AS SHOWN ON THE PLAN.
ELEVATION = 20.34

TBM-E, X-CUT SET ON NORTHERN MOST FLANGE BOLT, ON HYDRANT IN FRONT OF YWCA, 140 CLARENDON STREET. AS SHOWN ON THE PLAN.
ELEVATION = 19.19

3) UNDERGROUND UTILITY SERVICE CONNECTIONS TO BUILDINGS ARE BASED UPON LIMITED VISIBLE OBSERVATIONS IN THE BASEMENTS, PAINT MARKS ON THE SURFACE OF THE GROUND AND VARIOUS PLANS SUPPLIED BY JOHN HANCOCK FINANCIAL SERVICES. THESE UTILITY SERVICE CONNECTIONS ARE NOT GUARANTEED TO BE COMPLETE OR CORRECT AND ARE FOR LEGAL PURPOSES ONLY.

2) ELEVATIONS SHOWN REFER TO BOSTON CITY BASE.

LEGEND:

✿	DECIDUOUS TREE
✳	CONIFEROUS TREE
❀	BUSH
Ⓦ	WESTERN UNION MANHOLE
Ⓢ	SEWER MANHOLE
Ⓓ	DRAIN MANHOLE
Ⓣ	TELEPHONE MANHOLE
Ⓒ	CABLE TV MANHOLE
Ⓜ	MBTA MANHOLE
ⓧ	STEAM MANHOLE
Ⓔ	ELECTRIC MANHOLE
Ⓦ	WATER MANHOLE
○MH	MANHOLE
●	MONITORING WELL
♿	HANDICAP RAMP
♁	GAS SHUT OFF
♁	WATER SHUT OFF
⊠	BOSTON WATER METER
□	CATCH BASIN
⦶	CATCH BASIN-ROUND
☼	LIGHT POLE

□D	DRAIN
⚲	HYDRANT
—○	SIGN
WIF	WROUGHT IRON FENCE
STF	STOCKADE FENCE
⬢	TRAFFIC SIGNAL
ENT	ENTRANCE
○P.M.	PARKING METER
○	PARKING METER POST
○S.P.	STAND PIPE
○V.P.	VERTICAL PIPE
♁	CENTRAL ARTERY TUNNEL CONTROL
♁	STEAM GATE
⊠	TRAFFIC CONTROL BOX
BD	BUILDING DIMENSION
•	BOLLARD
▭	ELECTRIC HANDHOLE
VGC	VERTICAL GRANITE CURB
GB	GATE BOX
SB/DH	STONE BOUND W/ DRILL HOLE
—— X ——	FENCE
—— S ——	SANITARY SEWER
—— D ——	DRAIN
—— T ——	TELEPHONE

BC	BOTTOM OF CURB
BIT	BITUMINOUS
BW	BOTTOM OF WALL
CLF	CHAIN LINK FENCE
CONC	CONCRETE
ENT	ENTRANCE
I=	INVERT ELEVATION
INACC.	INACCESSIBLE
LST	LANDSCAPE TIMBER
NVP	NO VISIBLE PIPES
R=	RIM ELEVATION
TC	TOP OF CURB
TOD	TOP OF DEBRIS
TOW	TOP OF WATER
TT=	TOP OF TRAP
—— W ——	WATER
—— G ——	GAS
—— ST ——	STEAM
—— FO ——	FUEL OIL
—•—•—•—	METAL HAND RAIL
—— E ——	ELECTRIC
—— C ——	CABLE TV

I CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL FIELD SURVEY AND THE LATEST RECORD PLANS, DEEDS AND CERTIFICATES OF TITLE.

KARL A. MCCARTHY, PLS (MA# 38714)
kam@feldmansurveyors.com

DATE

TOPOGRAPHIC PLAN
#368- #382 STUART STREET
JOHN HANCOCK LIFE INSURANCE COMPANY
BOSTON, MASS.

FELDMAN LAND SURVEYORS
112 SHAWMUT AVENUE
BOSTON, MASS. 02118

MAY 1, 2015
PHONE: (617)357-9740
www.feldmansurveyors.com

FELDMAN
LAND SURVEYORS

20 0 10 20 40 80
SCALE: 1"=20'

RESEARCH	FIELD CHIEF	PROJ MGR	APPROVED	SHEET NO. 1 OF 1
CALC PHB II	CADD PHB II	FIELD CHECKED	CRD FILE	JOB NO. 14534

FILENAME: S:\PROJECTS\14500s\14534\DWG\14534-A_TOPO.dwg

Appendix B

Transportation

Available Upon Request

Appendix C

Wind

Table 1: Mean Speed and Effective Gust 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	25		Uncomfortable	33		Unacceptable
		Summer	22		Uncomfortable	29		Acceptable
		Fall	23		Uncomfortable	31		Acceptable
		Winter	23		Uncomfortable	32		Unacceptable
		Annual	23		Uncomfortable	31		Acceptable
	B	Spring	25		Uncomfortable	33		Unacceptable
		Summer	22		Uncomfortable	29		Acceptable
		Fall	23		Uncomfortable	31		Acceptable
		Winter	23		Uncomfortable	32		Unacceptable
		Annual	23		Uncomfortable	32		Unacceptable
2	A	Spring	22		Uncomfortable	32		Unacceptable
		Summer	17		Walking	24		Acceptable
		Fall	20		Uncomfortable	29		Acceptable
		Winter	24		Uncomfortable	34		Unacceptable
		Annual	21		Uncomfortable	31		Acceptable
	B	Spring	22		Uncomfortable	32		Unacceptable
		Summer	17		Walking	24		Acceptable
		Fall	20		Uncomfortable	29		Acceptable
		Winter	24		Uncomfortable	34		Unacceptable
		Annual	22		Uncomfortable	31		Acceptable
3	A	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	20		Uncomfortable	28		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
4	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	21		Uncomfortable	29		Acceptable
	B	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	27		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	21		Uncomfortable	29		Acceptable

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

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
5	A	Spring	18		Walking	25		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	20		Uncomfortable	27		Acceptable
		Annual	18		Walking	24		Acceptable
6	A	Spring	27		Uncomfortable	36		Unacceptable
		Summer	18		Walking	25		Acceptable
		Fall	24		Uncomfortable	32		Unacceptable
		Winter	25		Uncomfortable	34		Unacceptable
		Annual	24		Uncomfortable	33		Unacceptable
	B	Spring	28		Dangerous	37		Unacceptable
		Summer	19		Walking	25		Acceptable
		Fall	24		Uncomfortable	32		Unacceptable
		Winter	25		Uncomfortable	34		Unacceptable
		Annual	24		Uncomfortable	33		Unacceptable
7	A	Spring	19		Walking	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	26		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	19		Walking	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	20		Uncomfortable	29		Acceptable
		Annual	19		Walking	27		Acceptable
8	A	Spring	16		Walking	24		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	15		Standing	24		Acceptable
		Summer	12		Sitting	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		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.

<u>Configurations</u>

A – No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
9	A	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
	B	Spring	21		Uncomfortable	29		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	21		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
10	A	Spring	19		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	24		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
11	A	Spring	14		Standing	21		Acceptable
		Summer	10		Sitting	16		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	21		Acceptable
	B	Spring	14		Standing	22		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	14		Standing	22		Acceptable
12	A	Spring	21		Uncomfortable	30		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	24		Uncomfortable	34		Unacceptable
		Annual	21		Uncomfortable	30		Acceptable
	B	Spring	22		Uncomfortable	31		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	20		Uncomfortable	29		Acceptable
		Winter	24		Uncomfortable	35		Unacceptable
		Annual	22		Uncomfortable	31		Acceptable

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

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust 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	20		Uncomfortable	27		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	25		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
14	A	Spring	16		Walking	22		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	11		Sitting	16		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
15	A	Spring	19		Walking	27		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	26		Acceptable
		Annual	18		Walking	25		Acceptable
	B	Spring	19		Walking	27		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	17		Walking	23		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	17		Walking	25		Acceptable
16	A	Spring	22		Uncomfortable	30		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	21		Uncomfortable	28		Acceptable
		Winter	25		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	30		Acceptable
	B	Spring	22		Uncomfortable	30		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	25		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	30		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
17	A	Spring	26		Uncomfortable	37		Unacceptable
		Summer	19		Walking	27		Acceptable
		Fall	23		Uncomfortable	33		Unacceptable
		Winter	26		Uncomfortable	36		Unacceptable
		Annual	24		Uncomfortable	34		Unacceptable
	B	Spring	26		Uncomfortable	36		Unacceptable
		Summer	19		Walking	27		Acceptable
		Fall	23		Uncomfortable	33		Unacceptable
		Winter	26		Uncomfortable	36		Unacceptable
		Annual	24		Uncomfortable	34		Unacceptable
18	A	Spring	24		Uncomfortable	32		Unacceptable
		Summer	18		Walking	24		Acceptable
		Fall	22		Uncomfortable	30		Acceptable
		Winter	27		Uncomfortable	35		Unacceptable
		Annual	23		Uncomfortable	32		Unacceptable
	B	Spring	24		Uncomfortable	33		Unacceptable
		Summer	18		Walking	24		Acceptable
		Fall	22		Uncomfortable	30		Acceptable
		Winter	27		Uncomfortable	36		Unacceptable
		Annual	24		Uncomfortable	32		Unacceptable
19	A	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	21		Uncomfortable	29		Acceptable
		Annual	19		Walking	26		Acceptable
	B	Spring	20		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	22		Uncomfortable	29		Acceptable
		Annual	19		Walking	26		Acceptable
20	A	Spring	15		Standing	24		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	26		Acceptable
		Annual	15		Standing	24		Acceptable
	B	Spring	15		Standing	24		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	17		Walking	26		Acceptable
		Annual	15		Standing	24		Acceptable

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

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
21	A	Spring	19		Walking	28		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	18		Walking	27		Acceptable
		Winter	20		Uncomfortable	30		Acceptable
		Annual	18		Walking	27		Acceptable
	B	Spring	19		Walking	28		Acceptable
		Summer	17		Walking	24		Acceptable
		Fall	18		Walking	27		Acceptable
		Winter	20		Uncomfortable	30		Acceptable
		Annual	19		Walking	28		Acceptable
22	A	Spring	17		Walking	26		Acceptable
		Summer	14		Standing	22		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	16		Walking	25		Acceptable
	B	Spring	17		Walking	27		Acceptable
		Summer	14		Standing	22		Acceptable
		Fall	16		Walking	25		Acceptable
		Winter	18		Walking	28		Acceptable
		Annual	17		Walking	26		Acceptable
23	A	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	20		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	19		Walking	27		Acceptable
		Annual	17		Walking	24		Acceptable
24	A	Spring	22		Uncomfortable	30		Acceptable
		Summer	16		Walking	22		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	29		Acceptable
	B	Spring	22		Uncomfortable	31		Acceptable
		Summer	16		Walking	23		Acceptable
		Fall	20		Uncomfortable	28		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	30		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.

<u>Configurations</u>

A – No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust 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	22		Uncomfortable	30		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	19		Walking	27		Acceptable
	B	Spring	23		Uncomfortable	31		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	27		Acceptable
		Winter	20		Uncomfortable	28		Acceptable
		Annual	19		Walking	27		Acceptable
26	A	Spring	16		Walking	26		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	15		Standing	23		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	24		Acceptable
	B	Spring	15		Standing	24		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	15		Standing	24		Acceptable
		Annual	14		Standing	22		Acceptable
27	A	Spring	17		Walking	25		Acceptable
		Summer	13		Standing	20		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	27		Acceptable
		Annual	17		Walking	25		Acceptable
	B	Spring	15	-12%	Standing	23		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14	-12%	Standing	22		Acceptable
		Winter	16	-11%	Walking	25		Acceptable
		Annual	15	-12%	Standing	23		Acceptable
28	A	Spring	24		Uncomfortable	34		Unacceptable
		Summer	18		Walking	24		Acceptable
		Fall	22		Uncomfortable	30		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	31		Acceptable
	B	Spring	24		Uncomfortable	34		Unacceptable
		Summer	17		Walking	24		Acceptable
		Fall	21		Uncomfortable	30		Acceptable
		Winter	24		Uncomfortable	33		Unacceptable
		Annual	22		Uncomfortable	31		Acceptable

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

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust 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	13		Standing	20		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	17		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	16	+23%	Walking	23	+15%	Acceptable
		Summer	12	+33%	Sitting	17	+21%	Acceptable
		Fall	14	+27%	Standing	21	+24%	Acceptable
		Winter	16	+45%	Walking	23	+35%	Acceptable
		Annual	15	+36%	Standing	22	+29%	Acceptable
38	A	Spring	11		Sitting	18		Acceptable
		Summer	8		Sitting	13		Acceptable
		Fall	10		Sitting	15		Acceptable
		Winter	10		Sitting	16		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	19	+73%	Walking	28	+56%	Acceptable
		Summer	15	+88%	Standing	22	+69%	Acceptable
		Fall	18	+80%	Walking	26	+73%	Acceptable
		Winter	21	+110%	Uncomfortable	31	+94%	Acceptable
		Annual	19	+90%	Walking	28	+75%	Acceptable
39	A	Spring	14		Standing	23		Acceptable
		Summer	11		Sitting	18		Acceptable
		Fall	13		Standing	21		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	14		Standing	22		Acceptable
	B	Spring	16	+14%	Walking	24		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
40	A	Spring	15		Standing	24		Acceptable
		Summer	12		Sitting	19		Acceptable
		Fall	14		Standing	22		Acceptable
		Winter	16		Walking	25		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	16		Walking	25		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	26		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
41	A	Spring	17		Walking	25		Acceptable
		Summer	14		Standing	21		Acceptable
		Fall	16		Walking	24		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	17		Walking	25		Acceptable
	B	Spring	10	-41%	Sitting	16	-36%	Acceptable
		Summer	8	-43%	Sitting	12	-43%	Acceptable
		Fall	10	-38%	Sitting	15	-38%	Acceptable
		Winter	11	-39%	Sitting	16	-38%	Acceptable
		Annual	10	-41%	Sitting	15	-40%	Acceptable
42	A	Spring	19		Walking	26		Acceptable
		Summer	15		Standing	22		Acceptable
		Fall	17		Walking	25		Acceptable
		Winter	19		Walking	28		Acceptable
		Annual	18		Walking	26		Acceptable
	B	Spring	11	-42%	Sitting	17	-35%	Acceptable
		Summer	9	-40%	Sitting	15	-32%	Acceptable
		Fall	10	-41%	Sitting	16	-36%	Acceptable
		Winter	11	-42%	Sitting	17	-39%	Acceptable
		Annual	10	-44%	Sitting	16	-38%	Acceptable
43	A	Spring	10		Sitting	15		Acceptable
		Summer	8		Sitting	11		Acceptable
		Fall	9		Sitting	13		Acceptable
		Winter	11		Sitting	15		Acceptable
		Annual	10		Sitting	14		Acceptable
	B	Spring	15	+50%	Standing	21	+40%	Acceptable
		Summer	12	+50%	Sitting	16	+45%	Acceptable
		Fall	14	+56%	Standing	20	+54%	Acceptable
		Winter	17	+55%	Walking	24	+60%	Acceptable
		Annual	15	+50%	Standing	21	+50%	Acceptable
44	A	Data not available						
	B	Spring	11	-21%	Sitting	16	-24%	Acceptable
		Summer	10		Sitting	14	-18%	Acceptable
		Fall	10	-29%	Sitting	16	-20%	Acceptable
		Winter	11	-27%	Sitting	16	-27%	Acceptable
		Annual	10	-29%	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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust 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	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	14	+40%	Standing	20	+25%	Acceptable
		Summer	11	+22%	Sitting	15	+15%	Acceptable
		Fall	13	+30%	Standing	19	+27%	Acceptable
		Winter	16	+45%	Walking	22	+29%	Acceptable
		Annual	14	+40%	Standing	20	+25%	Acceptable
50	A	Spring	12		Sitting	19		Acceptable
		Summer	10		Sitting	17		Acceptable
		Fall	11		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	19		Acceptable
	B	Spring	14	+17%	Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13	+18%	Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	13		Standing	20		Acceptable
51	A	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
	B	Spring	11		Sitting	17		Acceptable
		Summer	9		Sitting	13		Acceptable
		Fall	10		Sitting	15		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
52	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	13		Standing	19		Acceptable
	B	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	13		Standing	20		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
53	A	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
	B	Spring	13		Standing	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
54	A	Spring	12		Sitting	18		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	11		Sitting	16		Acceptable
		Winter	12		Sitting	19		Acceptable
		Annual	11		Sitting	17		Acceptable
	B	Spring	8	-33%	Sitting	14	-22%	Acceptable
		Summer	7	-22%	Sitting	11	-21%	Acceptable
		Fall	8	-27%	Sitting	13	-19%	Acceptable
		Winter	8	-33%	Sitting	15	-21%	Acceptable
		Annual	8	-27%	Sitting	13	-24%	Acceptable
55	A	Spring	14		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	14		Standing	21		Acceptable
		Summer	11		Sitting	17		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	22		Acceptable
		Annual	13		Standing	20		Acceptable
56	A	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	15		Standing	22		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	13		Standing	19		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

Effective Gust Criteria

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust 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	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	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
62	A	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	16		Walking	22		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	17		Walking	23		Acceptable
	B	Spring	18		Walking	25		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	16		Walking	23		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	17		Walking	24		Acceptable
63	A	Spring	18		Walking	24		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	17		Walking	24		Acceptable
		Summer	14		Standing	20		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	16		Walking	23		Acceptable
64	A	Spring	15		Standing	21		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	16		Walking	22		Acceptable
		Summer	13		Standing	19		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	15		Standing	22		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

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

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

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
69	A	Spring	19		Walking	26		Acceptable
		Summer	17		Walking	22		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	19		Walking	26		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	18		Walking	25		Acceptable
		Winter	18		Walking	26		Acceptable
		Annual	18		Walking	25		Acceptable
70	A	Spring	11		Sitting	17		Acceptable
		Summer	8		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	19		Acceptable
		Annual	10		Sitting	17		Acceptable
	B	Spring	12		Sitting	19	+12%	Acceptable
		Summer	9	+12%	Sitting	14		Acceptable
		Fall	11		Sitting	18	+12%	Acceptable
		Winter	13	+18%	Standing	21	+11%	Acceptable
		Annual	12	+20%	Sitting	19	+12%	Acceptable
71	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	19		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	20		Acceptable
		Annual	12		Sitting	18		Acceptable
72	A	Spring	9		Sitting	14		Acceptable
		Summer	6		Sitting	10		Acceptable
		Fall	8		Sitting	13		Acceptable
		Winter	9		Sitting	14		Acceptable
		Annual	8		Sitting	13		Acceptable
	B	Spring	9		Sitting	14		Acceptable
		Summer	7	+17%	Sitting	11		Acceptable
		Fall	9	+12%	Sitting	14		Acceptable
		Winter	9		Sitting	15		Acceptable
		Annual	9	+12%	Sitting	14		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.

<u>Configurations</u>

A – No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting: ≤ 12 mph
Comfortable for Standing: > 12 and ≤ 15 mph
Comfortable for Walking: > 15 and ≤ 19 mph
Uncomfortable for Walking: > 19 and ≤ 27 mph
Dangerous Conditions: > 27 mph

<u>Effective Gust Criteria</u>

Acceptable: ≤ 31 mph
Unacceptable: > 31 mph

Table 1: Mean Speed and Effective Gust 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	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	20		Acceptable
		Winter	17		Walking	23		Acceptable
		Annual	16		Walking	21		Acceptable
	B	Spring	16		Walking	22		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	14		Standing	21		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	15		Standing	22		Acceptable
74	A	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	13		Standing	20		Acceptable
		Winter	14		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
	B	Spring	14		Standing	21		Acceptable
		Summer	12		Sitting	18		Acceptable
		Fall	14		Standing	20		Acceptable
		Winter	15		Standing	21		Acceptable
		Annual	14		Standing	20		Acceptable
75	A	Spring	19		Walking	26		Acceptable
		Summer	17		Walking	23		Acceptable
		Fall	17		Walking	24		Acceptable
		Winter	17		Walking	24		Acceptable
		Annual	18		Walking	24		Acceptable
	B	Spring	20		Uncomfortable	27		Acceptable
		Summer	18		Walking	23		Acceptable
		Fall	18		Walking	24		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	18		Walking	25		Acceptable
76	A	Spring	16		Walking	23		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		Acceptable
		Annual	15		Standing	23		Acceptable
	B	Spring	16		Walking	23		Acceptable
		Summer	14		Standing	19		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	16		Walking	24		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			**Mean Wind Speed**			**Effective Gust Wind Speed**		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
77	A	Spring	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	11		Sitting	17		Acceptable
		Summer	9		Sitting	14		Acceptable
		Fall	10		Sitting	16		Acceptable
		Winter	11		Sitting	17		Acceptable
		Annual	10		Sitting	16		Acceptable
78	A	Spring	14		Standing	20		Acceptable
		Summer	11		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	13		Standing	18		Acceptable
	B	Spring	13		Standing	20		Acceptable
		Summer	10		Sitting	15		Acceptable
		Fall	12		Sitting	18		Acceptable
		Winter	13		Standing	19		Acceptable
		Annual	12		Sitting	18		Acceptable
79	A	Spring	21		Uncomfortable	28		Acceptable
		Summer	16		Walking	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	23		Uncomfortable	31		Acceptable
		Annual	20		Uncomfortable	28		Acceptable
	B	Spring	20		Uncomfortable	28		Acceptable
		Summer	15		Standing	21		Acceptable
		Fall	19		Walking	26		Acceptable
		Winter	22		Uncomfortable	30		Acceptable
		Annual	20		Uncomfortable	27		Acceptable
80	A	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	16		Walking	23		Acceptable
		Summer	12		Sitting	17		Acceptable
		Fall	15		Standing	21		Acceptable
		Winter	17		Walking	25		Acceptable
		Annual	16		Walking	22		Acceptable

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

<u>Configurations</u>

A – No Build
B – Build

<u>Mean Wind Speed Criteria</u>

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

<u>Effective Gust Criteria</u>

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 1: Mean Speed and Effective Gust Categories – Multiple Seasons

BRA Criteria			Mean Wind Speed			Effective Gust Wind Speed		
Loc.	Config.	Season	Speed(mph)	%Change	RATING	Speed(mph)	%Change	RATING
81	A	Spring	16		Walking	24		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	18		Walking	25		Acceptable
		Annual	16		Walking	23		Acceptable
	B	Spring	16		Walking	23		Acceptable
		Summer	13		Standing	18		Acceptable
		Fall	15		Standing	22		Acceptable
		Winter	18		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

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Effective Gust Criteria

Acceptable:	≤ 31 mph
Unacceptable:	> 31 mph

Table 2: Mean Speed Category Change – Annual Winds

Location	BRA Comfort Category		Change in Comfort Category
	No Build	Build	
1	Uncomfortable	Uncomfortable	No Change
2	Uncomfortable	Uncomfortable	No Change
3	Uncomfortable	Uncomfortable	No Change
4	Uncomfortable	Uncomfortable	No Change
5	Walking	Walking	No Change
6	Uncomfortable	Uncomfortable	No Change
7	Walking	Walking	No Change
8	Standing	Standing	No Change
9	Uncomfortable	Uncomfortable	No Change
10	Walking	Walking	No Change
11	Standing	Standing	No Change
12	Uncomfortable	Uncomfortable	No Change
13	Uncomfortable	Uncomfortable	No Change
14	Standing	Standing	No Change
15	Walking	Walking	No Change
16	Uncomfortable	Uncomfortable	No Change
17	Uncomfortable	Uncomfortable	No Change
18	Uncomfortable	Uncomfortable	No Change
19	Walking	Walking	No Change
20	Standing	Standing	No Change
21	Walking	Walking	No Change
22	Walking	Walking	No Change
23	Walking	Walking	No Change
24	Uncomfortable	Uncomfortable	No Change
25	Walking	Walking	No Change
26	Standing	Standing	No Change
27	Walking	Standing	Decreases One Category
28	Uncomfortable	Uncomfortable	No Change
29	Standing	Standing	No Change
30	Standing	Standing	No Change
31	Standing	Walking	Increases One Category
32	Sitting	Standing	Increases One Category

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) Category Change is based on comparison with Configuration A

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Category Changes

🟧	Increases two categories
🟨	Increases one category
⬜	No Change
🟦	Decreases one category
🟦	Decreases two categories

Table 2: Mean Speed Category Change – Annual Winds

Location	BRA Comfort Category		Change in Comfort Category
	No Build	Build	
33	Walking	Standing	Decreases One Category
34	Standing	Walking	Increases One Category
35	Standing	Sitting	Decreases One Category
36	Sitting	Sitting	No Change
37	Sitting	Standing	Increases One Category
38	Sitting	Walking	Increases Two Categories
39	Standing	Standing	No Change
40	Standing	Walking	Increases One Category
41	Walking	Sitting	Decreases Two Categories
42	Walking	Sitting	Decreases Two Categories
43	Sitting	Standing	Increases One Category
44	Data not available		
45	Walking	Walking	No Change
46	Standing	Standing	No Change
47	Walking	Walking	No Change
48	Walking	Standing	Decreases One Category
49	Sitting	Standing	Increases One Category
50	Sitting	Standing	Increases One Category
51	Sitting	Sitting	No Change
52	Standing	Standing	No Change
53	Sitting	Sitting	No Change
54	Sitting	Sitting	No Change
55	Standing	Standing	No Change
56	Standing	Standing	No Change
57	Sitting	Sitting	No Change
58	Sitting	Sitting	No Change
59	Standing	Standing	No Change
60	Standing	Standing	No Change
61	Sitting	Sitting	No Change
62	Walking	Walking	No Change
63	Walking	Walking	No Change
64	Standing	Standing	No Change

Notes:
1) Wind speeds are for a 1% probability of exceedance; and,
2) Category Change is based on comparison with Configuration A

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Category Changes

🟧 Increases two categories
🟨 Increases one category
⬜ No Change
🟦 Decreases one category
🟦 Decreases two categories

Table 2: Mean Speed Category Change – Annual Winds

Location	BRA Comfort Category		Change in Comfort Category
	No Build	Build	
65	Walking	Walking	No Change
66	Standing	Walking	Increases One Category
67	Standing	Walking	Increases One Category
68	Standing	Standing	No Change
69	Walking	Walking	No Change
70	Sitting	Sitting	No Change
71	Sitting	Sitting	No Change
72	Sitting	Sitting	No Change
73	Walking	Standing	Decreases One Category
74	Standing	Standing	No Change
75	Walking	Walking	No Change
76	Standing	Walking	Increases One Category
77	Sitting	Sitting	No Change
78	Standing	Sitting	Decreases One Category
79	Uncomfortable	Uncomfortable	No Change
80	Walking	Walking	No Change
81	Walking	Walking	No Change

Notes: 1) Wind speeds are for a 1% probability of exceedance; and,
2) Category Change is based on comparison with Configuration A

Configurations

A – No Build
B – Build

Mean Wind Speed Criteria

Comfortable for Sitting:	≤ 12 mph
Comfortable for Standing:	> 12 and ≤ 15 mph
Comfortable for Walking:	> 15 and ≤ 19 mph
Uncomfortable for Walking:	> 19 and ≤ 27 mph
Dangerous Conditions:	> 27 mph

Category Changes

🟧 Increases two categories
🟨 Increases one category
⬜ No Change
🟦 Decreases one category
🟦 Decreases two categories

Appendix D

Air Quality

AIR QUALITY APPENDIX

Introduction

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

Motor Vehicle Emissions

The EPA MOVES computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2015 and 2020 for speed limits of idle, 10, 15, and 30 mph for use in the microscale analyses.

MOVES CO Emission Factor Summary

Carbon Monoxide Only

		2015	2020
Free Flow	30 mph	2.018	2.091
Right Turns	10 mph	3.484	3.369
Left Turns	15 mph	2.920	2.939
Queues	Idle	7.654	5.015

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

CAL3QHC

For the intersection studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOVES. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 321 cm was used for the intersection. Idle emission rates for queue links were based on 0 mph emission rates derived in MOVES. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

380 Stuart Street
Background Concentrations

POLLUTANT	AVERAGING TIME	Form	2012	2013	2014	Units	ppm/ppb to µg/m³ Conversion Factor	2012-2014 Background Concentration (µg/m³)	Location
SO_2 (1)(5)	1-Hour (4)	99th %	13.2	12	9.7	ppb	2.62	30.5	Kenmore Sq., Boston
	3-Hour (6)	H2H	*10.6*	*13.9*	*9.4*	ppb	2.62	36.4	Kenmore Sq., Boston
	24-Hour	H2H	5.4	*6*	*5*	ppb	2.62	15.7	Kenmore Sq., Boston
	Annual	H	1.87	1	0.94	ppb	2.62	4.9	Kenmore Sq., Boston
PM-10	24-Hour	H2H	28.0	50	53	µg/m³	1	53	Kenmore Sq., Boston
	Annual	H	15.7	19	14.9	µg/m³	1	19.0	Kenmore Sq., Boston
PM-2.5	24-Hour (4)	98th %	22.1	18	14.6	µg/m³	1	18.2	Kenmore Sq., Boston
	Annual (4)	H	9.0	8	6.02	µg/m³	1	7.7	Kenmore Sq., Boston
NO_2 (3)	1-Hour (4)	98th %	49	48	49	ppb	1.88	91.5	Kenmore Sq., Boston
	Annual	H	19.1	17.78	17.17	ppb	1.88	35.9	Kenmore Sq., Boston
CO (2)	1-Hour	H2H	1.3	1.3	1.3	ppm	1146	1489.8	Kenmore Sq., Boston
	8-Hour	H2H	0.9	0.9	0.9	ppm	1146	1031.4	Kenmore Sq., Boston
Ozone	8-Hour	H4H	0.078	0.059	0.054	ppm	1963	153.1	Harrison Ave., Boston
Lead	Rolling 3-Month	H	0.014	0.006	0.014	µg/m³	1	0.014	Harrison Ave., Boston

Notes:

From 2012-2014 MA DEP Annual Data Summaries. Missing data (in italics) from EPA's AirData Website

[1] SO_2 reported ppb. Converted to µg/m³ using factor of 1 ppm = 2.62 µg/m³.

[2] CO reported in ppm. Converted to µg/m³ using factor of 1 ppm = 1146 µg/m³.

[3] NO_2 reported in ppb. Converted to µg/m³ using factor of 1 ppm = 1.88 µg/m³.

[4] Background level is the average concentration of the three years.

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

Model Input/Output Files

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

Appendix E

Climate Change Preparedness Checklist

Climate Change Preparedness and Resiliency Checklist for New Construction

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

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

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

Climate Change Analysis and Information Sources:

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

Checklist

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

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

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

A.1 - Project Information

Project Name:	380 Stuart Street
Project Address Primary:	380 Stuart Street
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	Yanni Tsipis / SVP/ Colliers International / yanni.tsipis@colliers.com / 617-330-8151

A.2 - Team Description

Owner / Developer:	Manulife/ John Hancock Insurance Co
Architect:	SOM, Chicago and CBT Architects, Boston
Engineer (building systems):	Cosentini Associates
Sustainability / LEED:	CBT Architects
Permitting:	Epsilon Associates
Construction Management:	To be named
Climate Change Expert:	To be named

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:	Office and Retail
List the First Floor Uses:	*Office lobby, retail*

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

☐ Wood Frame	☐ Masonry	☑ Steel Frame	☐ Concrete

Describe the building?

Site Area:	*30,617 SF*	Building Area:	*625,000 SF*
Building Height:	*389 Ft.*	Number of Stories:	*27 Flrs.*
First Floor Elevation (reference Boston City Base):	*19.10 Elev.*	Are there below grade spaces/levels, if yes how many:	*4* *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
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:	*9,600 (kW)*	Heating:	*16,000 (MMBtu/hr)*
What is the planned building Energy Use Intensity:	*14 (kbtu/FS or kWh/SF)*	Cooling:	*2,100 (Tons/hr)*

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

Electric:	*750 (kW)*	Heating:	*0 (MMBtu/hr)*
		Cooling:	*0 (Tons/hr)*

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

Electrical Generation:	*800 (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 Days	*1 event / 5 yrs*

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*	*1 event/ 2 yrs*

What Extreme Wind Storm Event characteristics will be used for project planning – Peak Wind Speed, Duration of Storm Event, and Frequency of Events per year?

105 mph Peak Wind	*10 Hours*	*1 event / 4 yrs*

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:	***30%***
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:	Varied vision glass percentage of wall surface by solar exposure			

What are the insulation (R) values for building envelop elements?

Roof:	*R = 25*	Walls / Curtain Wall Assembly:	*R = 13*
Foundation:	*R = 15*	Basement / Slab:	*R =10*
Windows:	*R = 2.5 / U =0.4*	Doors:	*R = 1.4 / 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:	*2 Days*
If Yes, is building "Islandable?	No		
If Yes, describe strategies:			

Describe any non-mechanical strategies that will support building functionality and use during an extended interruption(s) of utility services and infrastructure:

Select all appropriate:	☐ Solar oriented – longer south walls	☐ Prevailing winds oriented	☐ External shading devices	☑ Tuned glazing,
	☐ Building cool zones	☐ Operable windows	☐ Natural ventilation	☐ Building shading
	☐ Potable water for drinking / food preparation	☐ Potable water for sinks / sanitary systems	☐ Waste water storage capacity	☑ High Performance Building Envelop
Describe any added measures:				

What measures will the project employ to reduce urban heat-island effect?

Select all appropriate:	☐ High reflective paving materials	☐ Shade trees & shrubs	☑ High reflective roof materials	☐ Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate rain events and more rain fall?

Select all appropriate:	☐ On-site retention systems & ponds	☑ Infiltration galleries & areas	☐ Vegetated water capture systems	☐ Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate extreme storm events and high winds?

Select all appropriate:	☑ Hardened building structure & elements	☑ Buried utilities & hardened infrastructure	☑ Hazard removal & protective landscapes	☐ Soft & permeable surfaces (water infiltration)
Describe other strategies:				

C - Sea-Level Rise and Storms

Rising Sea-Levels and more frequent Extreme Storms increase the probability of coastal and river flooding and enlarging the extent of the 100 Year Flood Plain. This section explores if a project is or might be subject to Sea-Level Rise and Storm impacts.

C.1 - Location Description and Classification:

Do you believe the building to susceptible to flooding now or during the full expected life of the building?

Yes / [✓ No]

Describe site conditions?

Site Elevation – Low/High Points: *Boston City Base 17.70/20.00*

Building Proximity to Water: *1,800 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?

1,600 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: *Boston City Base Elev.(Ft.)*

First Floor Elevation: *Boston City Base Elev. (Ft.)*

Will the project employ temporary measures to prevent building flooding (e.g. barricades, flood gates):

Yes / No

If Yes, to what elevation: *Boston City Base Elev. (Ft.)*

If Yes, describe:

What measures will be taken to ensure the integrity of critical building systems during a flood or severe storm event:

☐ Systems located above 1st Floor.	☑ Water tight utility conduits	☐ Waste water back flow prevention	☐ Storm water back flow prevention

Were the differing effects of fresh water and salt water flooding considered:

Yes / No

Will the project site / building(s) be accessible during periods of inundation or limited access to transportation:

Yes / No	If yes, to what height above 100 Year Floodplain:	*Boston City Base Elev. (Ft.)*

Will the project employ hard and / or soft landscape elements as velocity barriers to reduce wind or wave impacts?

Yes / No

If Yes, describe:

Will the building remain occupiable without utility power during an extended period of inundation:

Yes / No	If Yes, for how long:	*days*

Describe any additional strategies to addressing sea level rise and or sever storm impacts:

C.4 - Building Resilience and Adaptability

Describe any strategies that would support rapid recovery after a weather event and accommodate future building changes that respond to climate change:

Will the building be able to withstand severe storm impacts and endure temporary inundation?

Select appropriate:	*Yes / No*	☐ Hardened / Resilient Ground Floor Construction	☐ Temporary shutters and or barricades	☐ Resilient site design, materials and construction

Can the site and building be reasonably modified to increase Building Flood Proof Elevation?

Select appropriate:	*Yes / No*	☐ Surrounding site elevation can be raised	☐ Building ground floor can be raised	☐ Construction been engineered
Describe additional strategies:				

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	*Yes / No*	☐ Solar PV	☐ Solar Thermal	☐ Clean Energy / CHP System(s)
		☐ Potable water storage	☐ Wastewater storage	☐ Back up energy systems & fuel
Describe any specific or additional strategies:				

Thank you for completing the Boston Climate Change Resilience and Preparedness Checklist!

For questions or comments about this checklist or Climate Change Resiliency and Preparedness best practices, please contact: John.Dalzell.BRA@cityofboston.gov

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:	380 Stuart St.
Project Address Primary:	380 Stuart St.
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	Yanni Tsipis / SVP/ Colliers International / yanni.tsipis@colliers.com / 617-330-8151

Team Description

Owner / Developer:	Manulife / John Hancock Insurance Co.
Architect:	SOM, Chicago and CBT, Boston
Engineer (building systems):	Cosentini Associates
Sustainability / LEED:	CBT
Permitting:	Epsilon
Construction Management:	To be named

Project Permitting and Phase

At what phase is the project – at time of this questionnaire?

☑PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BRA Board Approved
BRA Design Approved	Under Construction	Construction just completed:

Building Classification and Description

What are the principal Building Uses - select all appropriate uses?

Residential – One to Three Unit	Residential - Multi-unit, Four +	Institutional	Education
Commercial	☑Office	☑Retail	Assembly
Laboratory / Medical	Manufacturing / Industrial	Mercantile	Storage, Utility and Other

First Floor Uses (List)	*Retail, Entrance Lobby, Accessory Loading Dock*

What is the Construction Type – select most appropriate type?

Wood Frame	Masonry	☑Steel Frame	Concrete

Describe the building?

Site Area:	*30,617 SF*	Building Area:	*625,000 SF*
Building Height:	*388 Ft.*	Number of Stories:	*27 Flrs.*
First Floor Elevation:	***19.10***	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.	Proposed building will be on the south side of Stuart St. between Clarendon and Berkeley Streets. The neighborhood is characterized by high-rise commercial office buildings, multifamily residential development, and hotels.
List the surrounding ADA compliant MBTA transit lines and the proximity to the development site: Commuter rail, subway, bus, etc.	Back Bay Station: Orange Line, Commuter Rail, and Amtrak Copley Square: Green Line Arlington: Green Line
List the surrounding institutions: hospitals, public housing and	Nearest hospital would be Boston Medical Center.

elderly and disabled housing developments, educational facilities, etc.	Recent nearby residential developments such as The Clarendon and 75 Clarendon were constructed with affordable and accessible dwelling units. Nearest public housing would be the "Tent City" project on Dartmouth St. Additional Public/Elderly housing is located on Stuart St. at Church St. Emerson College has nearby facilities Boston Ballet School is located in the South End.
Is the proposed development on a priority accessible route to a key public use facility? List the surrounding: government buildings, libraries, community centers and recreational facilities and other related facilities.	Boston Public Library Boston Fire Department at Columbus Ave and Isabella St. Copley Square Public Open Space The Public Garden & Boston Common Parks Site is not on a priority accessible route; MBTA 39 bus stops at Back Bay Station and Copley Square St.

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 sidewalks; apparently compliant ramps exist at all four corners at intersections of both Clarendon and Berkeley with Stuart There is also a pavement-painted mid-block crosswalk with apparently non-compliant ramps halfway between Clarendon and Berkeley The existing concrete public sidewalk in front of the project site has an apparently steeper than compliant cross slope
Are the sidewalks and pedestrian ramps existing-to-remain? If yes, have the sidewalks and pedestrian ramps been verified as compliant? If yes, please provide surveyors report.	No – sidewalk in front of property will be replaced; sidewalks to east and west of property were recently replaced by the adjacent development projects. New sidewalk will be compliant

Is the development site within a historic district? If yes, please identify.	No

Surrounding Site Conditions – Proposed

This section identifies the proposed condition of the walkways and pedestrian ramps in and around the development site. The width of the sidewalk contributes to the degree of comfort and enjoyment of walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Typically, a five foot wide Pedestrian Zone supports two people walking side by side or two wheelchairs passing each other. An eight foot wide Pedestrian Zone allows two pairs of people to comfortable pass each other, and a ten foot or wider Pedestrian Zone can support high volumes of pedestrians.

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? See: www.bostoncompletestreets.org	Yes
If yes above, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, Boulevard.	Downtown Commercial
What is the total width of the proposed sidewalk? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone.	Frontage = 1 ft Pedestrian = 10 ft Furnishing = 4 ft Total = 15 ft
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?	Furnishing and Pedestrian zones on Boston right of way: proposed material is concrete with stone decorative elements Frontage zone: proposed material is large smooth stone slabs; frontage zone inflects onto private property to allow setback of entrance and egress doors
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the City of Boston Public Improvement Commission?	Not on private property

Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way?	No
If yes above, what are the proposed dimensions of the sidewalk café or 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?	175
What is the total number of accessible spaces provided at the development site?	9
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?	No
Where is accessible visitor parking located?	In basement garage adjacent to elevators
Has a drop-off area been identified? If yes, will it be accessible?	Yes, at curb-side, opposite entrance
Include a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off	See attached diagram

areas to the development entry locations. Please include route distances.	

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.	See attached diagram
Describe accessibility at each entryway: Flush Condition, Stairs, Ramp Elevator.	All entries are flush condition
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.	No
Has an accessible routes way-finding and signage package been developed? If yes, please describe.	Not yet

Accessible Units: (not 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?	
How many units are for sale; how many are for rent? What is the market value vs. affordable breakdown?	

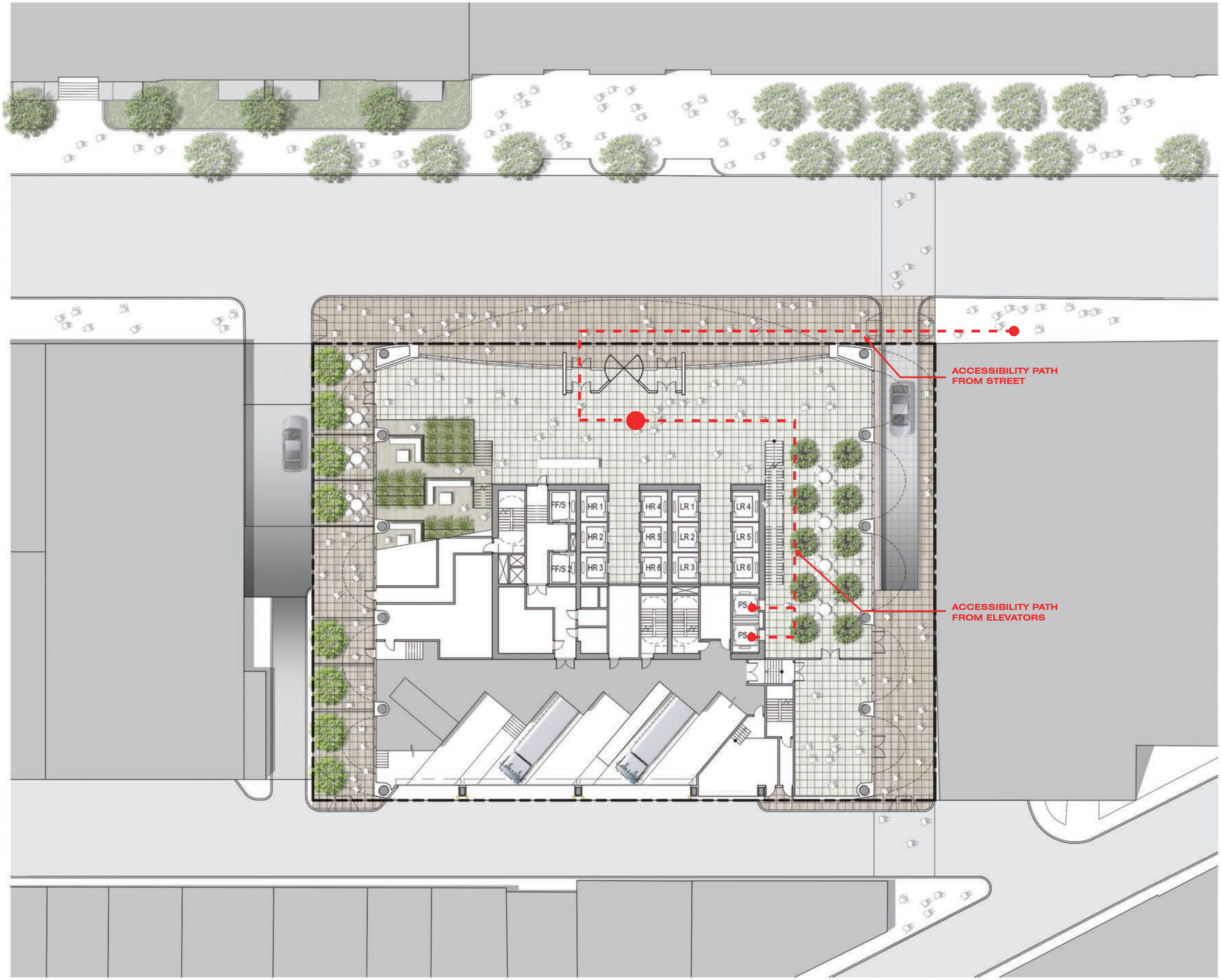
Article 80 | ACCESSIBILTY CHECKLIST

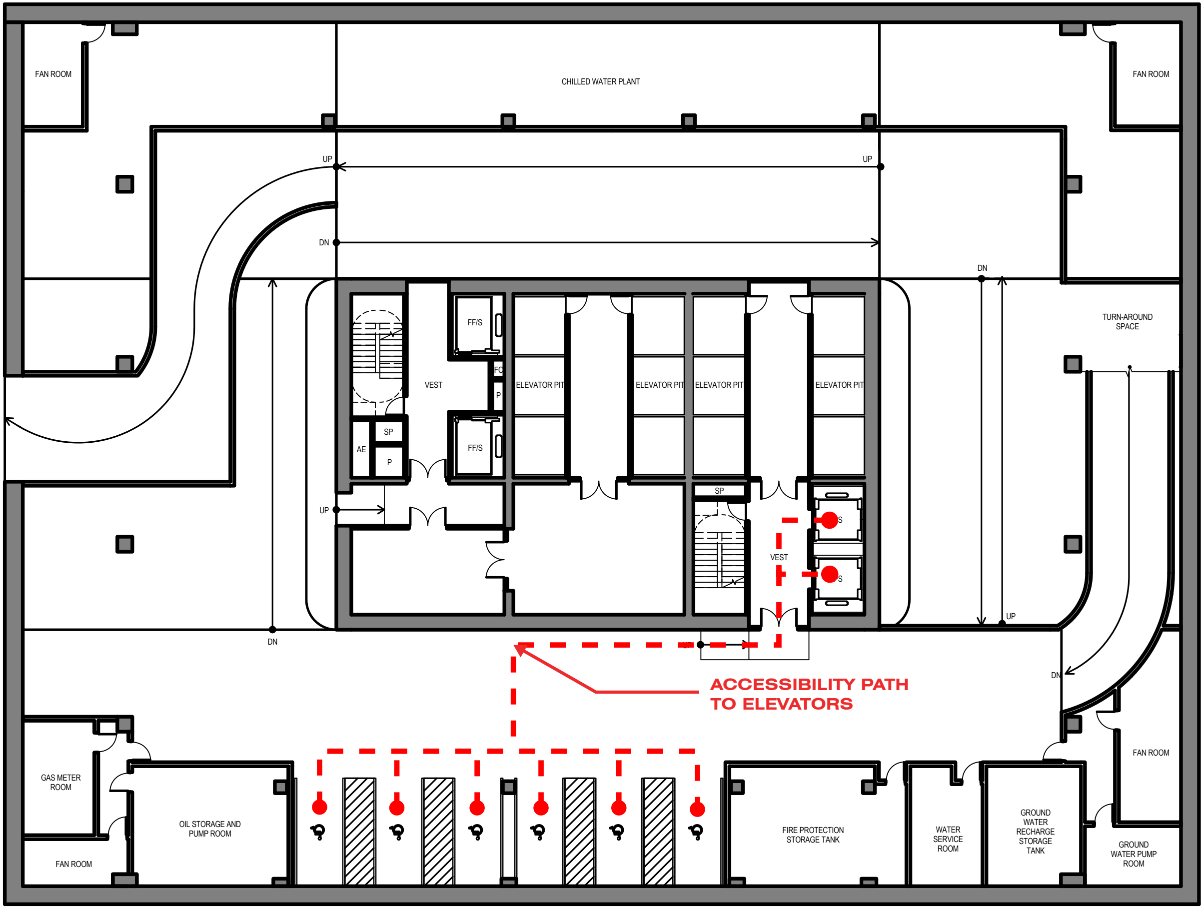
How many accessible units are being proposed?	
Please provide plan and diagram of the accessible units.	
How many accessible units will also be affordable? If none, please describe reason.	
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs at entry or step to balcony. If yes, please provide reason.	
Has the proponent reviewed or presented the proposed plan to the City of Boston Mayor's Commission for Persons with Disabilities Advisory Board?	
Did the Advisory Board vote to support this project? If no, what recommendations did the Advisory Board give to make this project more accessible?	

Thank you for completing the Accessibility Checklist!

For questions or comments about this checklist or accessibility practices, please contact:

kathryn.quigley@boston.gov | Mayors Commission for Persons with Disabilities


ACCESSIBILITY PATH FROM STREET
ACCESSIBILITY PATH FROM ELEVATORS
FF/S 1
HR 1
HR 4
LR 1
LR 4
HR 2
HR 5
LR 2
LR 5
FF/S 2
HR 3
HR 6
LR 3
LR 6
PS
PS



ACCESSIBILITY PATH TO ELEVATORS