BU Warren Towers

Boston, Massachusetts

Expanded Project Notification Form

February 1, 2024

submitted to
Boston Planning & Development Agency

submitted by **Trustees of Boston University**

prepared by **Fort Point Associates, Inc., A Tetra Tech Company**

in association with
MDS Architects
AECOM
Leftfield
RW Sullivan
The Green Engineer
Simpson Gumpertz & Heger
Nitsch Engineering, Inc.
Haley and Aldrich, Inc.
Souza, True & Partners
KMA Architecture + Accessibility
Copley Wolff Design Group
Acentech
Shawmut Design & Construction
RWDI, Inc.

Fort Point Associates, Inc.
Urban Planning Environmental Consulting Project Permitting
A TETRA TECH COMPANY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

Chapter 1

PROJECT SUMMARY

CHAPTER 1: PROJECT SUMMARY

1.1 PROJECT IDENTIFICATION

Project Name: Boston University Warren Towers

Project Proponent: Trustees of Boston University

Address/Location: 700 Commonwealth Avenue, Boston Massachusetts 02215

Assessor's Parcels: 2100347000 and 2100347001

1.2 INTRODUCTION

The Trustees of Boston University (the "Proponent") proposes to renovate 380,200 square feet ("sf") of Warren Towers gross floor area ("GFA"), the three-tower student residence (the "Project") which is home to approximately 1,800 undergraduate students at 700 Commonwealth Avenue (the "Project Site") on the Boston University (the "University" or "BU") Charles River Campus. The Project will include repairs to the building's envelope, reconfiguration of bathroom cores, accessibility improvements, modernization of elevators and escalators, and new mechanical, electrical, and plumbing ("MEP") systems.

This Expanded Project Notification Form ("EPNF") is being submitted to the Boston Planning & Development Agency ("BPDA") by the Proponent in accordance with Article 80B of the Boston Zoning Code. The Proponent submitted an Institutional Master Plan Notification Form for Renewal and 7th Amendment ("IMPNF") concurrently with this EPNF to include the Project as a Proposed Institutional Project ("PIP"), amending the 2013 – 2023 Institutional Master Plan ("IMP") under the provisions of Article 80D of the Boston Zoning Code.

1.3 EXISTING CONDITIONS

The Project Site is located on an approximately 62,800-square-foot ("sf") parcel, bounded by Commonwealth Avenue to the north, Cummington Mall to the south and to the west, and Hinsdale Mall to the east. The Project Site is in the Central Campus District, which is the area north of Interstate 90 (the "Turnpike" or "I-90") between the BU Bridge and Silber Way, comprising the academic and student life core of the University. This area includes the original Cram-Ferguson buildings, the Sert complex, the new Center for Computing & Data Science ("CCDS"), the Rajen Kilachand Center for Integrated Life Sciences & Engineering ("CILSE"), and major academic/research buildings and libraries. The 18-story building consists of three, 14-story resident towers above a four-story podium with student common space, street level commercial/retail space, and a parking garage. See Figure 1-1, Locus Map; Figure

1-2, Project Site Aerial View and Existing Conditions Photographs Key; Figures 1-3 through 1-6, Existing Conditions Photographs; and Figure 1-7, Existing Conditions Plan.

Warren Towers, constructed in 1965 and first occupied in 1966, is the largest dormitory in Boston and the second largest non-military dormitory in the United States, consisting of approximately 1,800 beds. The three towers (Floors 5 – 18) house half of BU's first-year undergraduate population; Fairfield Tower ("Tower A"), Marshall Tower ("Tower B"), and Shields Tower ("Tower C"). The fourth floor of the Project Site includes student common spaces and one of BU's largest full-service dining halls. The Project Site also includes a four-level parking garage from the basement to the third floor and street level commercial/retail space on the first floor.

Building Envelope

The roof systems are in poor condition, with numerous repairs and retrofit modifications and patches throughout. Membrane shrinkage has caused severe tenting at the perimeter of the roofs. In various locations, insulated cover board with aggregate walking surfaces is overlaid with loose material susceptible to uplift. There are numerous instances of water infiltration and areas of leaking. Due to the numerous deficiencies, a new roofing system is needed.

Except select windows on Tower B that have been replaced over time, the majority of the windows are original to the 1965 building construction and are not energy or thermal efficient. The windows are aluminum framed with operable vents and single-pane glazing.

The building's façade has not undergone any major renovations since the original construction. There is minor hairline cracking in the brick and mortar across the building and large step cracking and minor displacement are present in localized areas. The exposed concrete foundation at the base of the podium façade is typically cracked and spalled.

MEP Systems

The existing building's primary source of heat is through low pressure steam delivered from the University's central steam plant located across Commonwealth Avenue. Mechanical penthouses with air handling units ("AHUs") on each low roof serve the fourth floor and AHUs on the high roofs serve the bathroom cores. The roof mechanical penthouses contain two, 100% outdoor air, AHUs that are over 50 years old. The controls are a mixture of pneumatics that date to the building's original construction and direct digital control.

The existing building receives its power from a 15 kilovolt ("kV") switchgear located in the College of Arts and Sciences ("CAS"). The medium voltage feeders enter the building at the garage level where they are spliced in a junction box. The electrical distribution system is generally original to the building. There is currently no back up emergency generator, although emergency power is provided by redundant feeders, and there are few self-contained emergency battery units located within the facility.

Except the updated equipment and piping for portions of the systems that have been replaced due to failure or renovation, the overall plumbing systems are over 50 years old and are past their standard life. The bathrooms are obsolete functionally and aesthetically and improvements are needed to meet the current student population.

Accessibility

The first floor entrance does not meet accessibility requirements per 521 Code of Massachusetts Regulations ("CMR") 25.00. The fourth floor bathrooms, locker rooms, circulation doors, food service counterparts, ramps and stairs have accessibility deficiencies. At least 5% of dorm rooms need to be accessible and the non-accessible dorm rooms (95% of units) are required to provide doors into and within the units that provide a minimum clear width of 32 inches ("in") and the entry door. The kitchenettes and laundry rooms also require accessibility improvements.

The basement, second floor, and third floor of the parking garage do not provide accessible parking spaces. Although the first floor of the parking garage offers appropriately sized accessible spaces, the parking spaces are not within three spaces of an accessible entrance as required by 521 CMR 3.3.2. In addition, van accessible parking is not provided.

1.4 PROJECT PROGRAM SUMMARY

The Project primarily involves renovations to the residential fifth through 18th floors of the Project Site, plus rooftop mechanical systems and utility-related sitework. While the four-story podium will see some impacts related to construction staging and utility connections, renovation to the podium itself is not part of the Project. The existing dorm room configuration will also remain largely unchanged; however, dorm rooms will be modernized and there will be a nine bed increase to the overall student bed count. In addition, the parking garage will undergo reconfiguration, which will result in a reduction of 30 parking spaces, creation of a new accessible parking space, and an increase of 246 bicycle spaces. For a detailed description of the Project Program, see Chapter 2: Project Description.

1.5 CONSISTENCY WITH INSTITUTIONAL MASTER PLAN

The Project is included in the IMPNF as a PIP. The redevelopment of the Project Site is described as providing an opportunity to undertake major improvements to the existing student housing inventory in order to attract and retain on-campus housing demand. The Project is consistent with the PIP as described in the IMPNF. The Project will not change the building height or site area and will maintain the existing institutional uses, including student residences, administration, the dining hall, lounge, parking and commercial/retail space.

1.6 PUBLIC REVIEW PROCESS

Concurrent with the submission of this EPNF and the IMPNF to the BPDA, the Proponent will meet with BPDA and City staff and present the Project to the BU Charles River Campus Task Force (the "Task Force"). The Proponent looks forward to working with the BPDA, the community, and the City of Boston on this Project.

1.6.1 ARTICLE 80 REVIEW PROCESS

As described in Section 1.2, this document is submitted to the BPDA pursuant to Article 80B, Large Project Review, of the Boston Zoning Code. A scoping session and a community meeting are expected to occur during the public comment period and prior to the issuance of a Scoping Determination.

Following submission of this EPNF to the BPDA, the Proponent will meet with City agencies and present the Project at a combined community and Task Force meeting.

1.6.2 BOSTON CIVIC DESIGN COMMISSION

As required by Article 28 of the Boston Zoning Code, the Proponent and the Project Team will meet with the Boston Civic Design Commission ("BCDC") to review and discuss the design of the Project. The Proponent will seek a recommendation from the BCDC in advance of BPDA Board approval.

1.6.3 BOSTON UNIVERSITY CHARLES RIVER CAMPUS TASK FORCE

Task Force meetings to discuss the Project during the course of the Article 80B review process will be open to the public. The Task Force is comprised of 17 representatives from areas surrounding the BU Charles River Campus. Since 1986, the Task Force has reviewed each of the University's IMPs and development projects. Members of the Task Force currently include the following individuals:

- Pamela Beale, Chair
- Paul Creighton
- Dan Cuddy
- Anabela Gomes
- Paul Hughes
- Tahir Hussain
- Jim Hynes
- Katherine Ingraham
- Andrew Feldman
- Yvette Lancaster
- Terri North
- Richard Ong
- Thomas Pelkey
- Shlomo Pinkas
- Christopher Strang
- R. Mitchell Thomas
- Erika Johnson

1.7 ECONOMIC IMPACT AND COMMUNITY BENEFITS

Since its founding, the University has been committed to, and is an integral part of, the growth and development of the City of Boston. The University continues to make significant efforts to coordinate its goals and objectives with those of the City and is committed to maintaining and improving all property it acquires and to serving the residents of the City by making educational programs of the highest quality available and accessible. The University is proud to be a steward of many historically significant and important buildings on the BU Charles River Campus. Ongoing and extensive programs to preserve, maintain, and restore these buildings are at the core of the University's commitment to provide excellent facilities to students, faculty, and the public.

Through direct and indirect spending of the University, its employees, students, and their visitors, BU generates approximately $3.0 billion annually in economic activity in the Commonwealth of Massachusetts and $1.0 billion in the City of Boston.

BU is the fourth-largest private non-profit research university in the nation, the third-largest private employer in the City of Boston, and the 14th-largest employer in the Commonwealth. The University accounted for approximately 40,200 jobs in the Commonwealth, 21,000 of which were located in Boston. This total includes 20,000 individuals who were directly employed by the University and an additional 20,200 in Massachusetts that resulted from University spending.

The University makes significant annual contributions to local communities through a combination of direct payments and services, which include real estate taxes, payments in lieu of taxes, linkage payments, scholarships, fees and permits, police services, rubbish removal and street cleaning, and donated use of athletic and recreation facilities. Between Fiscal Year 2013 and Fiscal Year 2023, the University paid approximately $42.1 million in real estate property taxes, $7.4 million in linkage payments, and $61.6 million to the City of Boston for voluntary payments in lieu of taxes. Combined payments to the City have totaled approximately $111.1 million.

BU contributes directly to projects that benefit the City of Boston and the surrounding area, including providing matching dollars to city, state, and federal sources to improve the regional transportation network. The University committed more than $13 million to Commonwealth Avenue Phases 1 and 2, as well as funding for the Kenmore Square Project.

In addition to direct and indirect economic benefits to the City's economy, the University has long committed to providing opportunity and access to higher education through numerous scholarships that benefit residents of Boston.

The University's signature program, the Thomas M. Menino (the "Menino") Scholarship Program, is the longest-running and largest scholarship program of its kind. Each year, 25 or more exceptional Boston Public High School seniors are awarded four-year, full-tuition merit

scholarships to BU. Since the program's inception in 1973, over 2,000 students have received close to $205 million in full-tuition scholarship funding.

In 2009, to further expand scholarship opportunities for local students, the University committed to meeting the full financial need (without loans) of any Boston Public School ("BPS") graduate admitted to BU through the creation of the Community Service Scholarship. The BU Community Service Scholars constitute the only cohort of students anywhere for which the University makes this uncapped, no-loan commitment of financial aid. Since the program's inception in 2009, approximately 600 BPS students have received more than $100 million in scholarship funding.

In December 2017, BU announced the expansion of its Community Service Scholarship program, which had previously been limited to incoming first-year students who were BPS high school graduates, to include incoming transfer students who were BPS high school graduates beginning in the fall semester of 2017. All transfer students who graduated from a Boston Public High School are eligible, including those who have attended a two-year community college program and are looking to transfer to a four-year institution. This expansion builds on the University's commitment to expanding higher education opportunities for all BPS students.

The University also actively seeks ways to reduce demand on City services. Through its own Police Department, BU brings additional security to the entire campus area, 24 hours per day, seven days per week, responding to calls both inside and outside campus boundaries. The University's Campus Planning and Operations Department oversees the daily maintenance of the local Massachusetts Bay Transportation Authority ("MBTA") stations and City sidewalks and streets around campus, provides snow removal during winter months, plants and repairs street trees, and conducts pest control.

The Project will provide substantial benefits to the City and its residents, including:

- Refreshed room finishes and the addition of air-conditioning to the student rooms will provide an improved experience for students, including youth summer programs, many of which are attended by Boston residents;

- Interior renovation of an existing, on-campus dormitory with accommodations for over 1,800 students to make the residence hall more attractive to incoming and returning students to retain on-campus residency;

- Improved and accessible entries to street level commercial/retail spaces on Commonwealth Avenue;

- Creation of approximately 1,950 direct construction jobs, 470 indirect construction jobs, and 1,120 induced jobs as a result of the Project; and

- Upgrades to the mechanical system in an existing building to improve energy efficiency and reduction of carbon emissions by the elimination of fossil fuel with the use of all-electric equipment, as well as reduction of embodied carbon generation by the renovation and re-use of an existing building rather than a new building.

1.8 DIVERSITY, EQUITY, AND INCLUSION

1.8.1 BOSTON UNIVERSITY OVERVIEW AND VISION

BU is committed to addressing wealth inequality in its educational programs, hiring practices, and procurement processes. As a non-profit educational institution, the University believes the greatest contribution it can make is providing the opportunity for a high-quality education to those in need so that they may develop the skills and resources to pursue their goals and ambitions over a lifetime.

Since its founding, BU has opened its doors to all students without regard to religion, race, gender, or physical ability. Building and sustaining a vibrant community of scholars, students, and staff remains essential to BU's mission of contributing to, and preparing students to thrive in, an increasingly interconnected world.

1.8.2 PROJECT DEVELOPMENT

The University is committed to creating a positive impact on the City and the surrounding community in which BU operates. BU continually seeks to utilize Underrepresented Business Enterprises ("UBE") for design and construction services by utilizing the University's Sourcing and Procurement Office to identify potential firms through the Supplier Diversity Program.

BU will continue to solicit participation from UBEs for all professional services and materials not yet contracted or procured for the Project. This will be facilitated through the Supplier Diversity Program and by utilizing the Supplier Explorer by Supplier.io, a leading provider of supplier diversity solutions, to identify diverse suppliers by product category, location, and diversity attribute.

1.8.3 PROJECT DESIGN

Miller Dyer Spears ("MDS") was selected as the Architect for the Project based on their performance on the successful renovation of the BU Myles Standish Residence Hall. MDS is a Women Business Enterprise ("WBE") certified by the Massachusetts Supplier Diversity Office. The MDS DEI statement is as follows:

> *At MDS we foster an open creative environment where people from all backgrounds feel included and everyone can do their best work. Every voice is welcomed, heard, and respected because we believe each person's unique*

skills, creative insights, and experiences enrich our planning and design approach. An equal opportunity employer, we provide the same opportunities for hiring, advancement and benefits to all employees. We offer staff formal mentorship programs and a range of professional development resources that support and encourage their continued growth

We also seek out the participation of women, minorities, and local businesses as consultants. We believe diverse and inclusive project teams strengthen our planning and design services and provide us with a strong link to the communities that we serve. Although we are proud of our record of meeting and exceeding diversity team requirements, we are committed to going beyond quotas to make a difference in the industry.

1.8.4 PROJECT CONSTRUCTION

Shawmut Design and Construction ("SDC") has been selected as the Construction Manager for the Project, similarly to MDS, based on their successful renovation of the BU Myles Standish Residence Hall. BU and SDC understand the complexity of creating meaningful opportunities to facilitate the impactful involvement of UBEs, a diverse and local workforce, and community focused organizations. Below is a partial list of practices that will be implemented on the Project:

1. Local and Diverse Workforce within the Trades

    - SDC will promote the bidding opportunities and overall Project schedule with various stakeholders, including the subcontractor market and business agents, at industry events, such as regional Access and Opportunity Committee Meetings, to keep the community informed of bid timing.

    - In the invitation to bid, SDC will clearly highlight the Project's requirements to meet the workforce goals of the Boston Residents Jobs Policy ("BRJP") and the requirement will be included in all contracts.

    - Prior to the start of construction, each subcontractor will be required to meet with SDC and representatives of the construction trade unions to review compliance requirements. All subcontractors will provide a workforce projection schedule detailing when they expect to hire, the number of new hires, and how they will meet the workforce goals.

    - Monitor and verify all participation of local, minority, and female workers onsite, and provide regular reports and forms to the BRJP office.

    - Monitor that women and minorities have equal access to overtime hours for extended days and/or weekends.

- Each subcontractor will be required to provide documentation of outreach to the community, apprentices programs, Building Pathways, Youth Build Boston Pre-apprenticeship programs, women's organizations and others as needed.

2. Utilization of UBEs

- SDC will develop a prequalified bid list, including and indicating which contractors are Minority/WBE ("M/WBE") certified.

- Using the estimated cost of construction, SDC will run hypothetical scenarios based on expected bidders for bid outcomes to test various resulting M/WBE % participation outcomes.

- SDC will assist in facilitating subcontractor partnerships to help team M/WBE certified contractors with other prequalified subcontractors.

- Upon receipt of subcontractor bids, Shawmut will review whether businesses are M/WBE certified and obtain breakout values for second-tier subcontractors, vendors, or suppliers that are M/WBE certified.

1.8.5 OPERATIONS

With over 800 employees reflecting a wide range of specialties and expertise in facilities' operations, the University's Campus Planning & Operations ("CPO") team oversees real estate, planning, design and construction, and facilities management. CPO is dedicated to creating and maintaining a safe, welcoming, and sustainable environment that positively impacts and enables the teaching, learning, research, and student life activities at BU. CPO is responsible for the operation and maintenance of all buildings and grounds on BU's Charles River, Fenway, and Medical campuses.

CPO's goals and initiatives affirm a commitment to create and promote goals of diversity, equity, and inclusion ("DEI") in alignment with the University's Strategic Plan, engages in recruitment, retention, and training of staff to achieve DEI goals to foster an environment in which our employees can thrive as their authentic selves. This workforce is 25% female and 39% non-white.

For operational contracted services and purchased supplies, CPO also works with BU's Sourcing and Procurement Office to utilize the Supplier Diversity Program and the Supplier Explorer by Supplier.io, to identify and create a more diverse and inclusive supplier base, and provide increased access and opportunity to UBEs, both locally and nationally, to provide products and services to operate and maintain the campus facilities. Examples include:

- Casella, a certified WBE and regional leader in the waste management industry, and Cooperative Energy, Recycling, and Organics ("CERO") Cooperative Inc., a Boston-based woman- and minority-owned compost co-operative, are both incentivized to help the University achieve the goals outlined in the Zero Waste program. CERO prioritizes waste diversion from landfills and incinerators and identifies practices that reduce waste from the source. With CERO, BU's food waste is taken to a local farm and recycled into nutrient-rich compost products to support the local agricultural economy.

- Aetna Fire Alarm, a certified WBE in Dorchester specializing in installing and testing fire alarm systems, supports the BU Facilities Management and Operations team by conducting regular fire alarm system tests on the Charles River, Fenway, and Medical campuses, including the National Emerging Infectious Diseases Laboratories ("NEIDL").

1.9 SUMMARY OF REQUIRED PERMITS AND APPROVALS

Table 1-1 provides a list of approvals that may be required for the Project.

Table 1-1: Anticipated Project Approvals

Agency	Approval
Local	
Boston Planning and Development Agency (BPDA)	• Article 80B Large Project Review • Article 80D Institutional Master Plan Amendment • Schematic Design Approval • Design Development Approval • Construction Document Approval • Boston Residents Construction Employment Plan • Certification of Compliance with Article 80B • Certification of Consistency with Article 80D
Boston Civic Design Commission	• Recommendation to the BPDA Board
Boston Public Improvement Commission	• Specific Repairs Approval
Boston Zoning Commission	• Institutional Master Plan Amendment
Interagency Green Building Committee	• Article 37 Green Building
Boston Transportation Department	• Transportation Access Plan Agreement • Construction Management Plan
Boston Water and Sewer Commission	• Site Plan Approval • Groundwater Recharge Design Approval
Boston Disabilities Commission	• Letter recommending approval
Boston Inspectional Services Department	• Building Permit • Certificate of Occupancy • Flammable Storage and Garage Permit

1.10 PROJECT TEAM

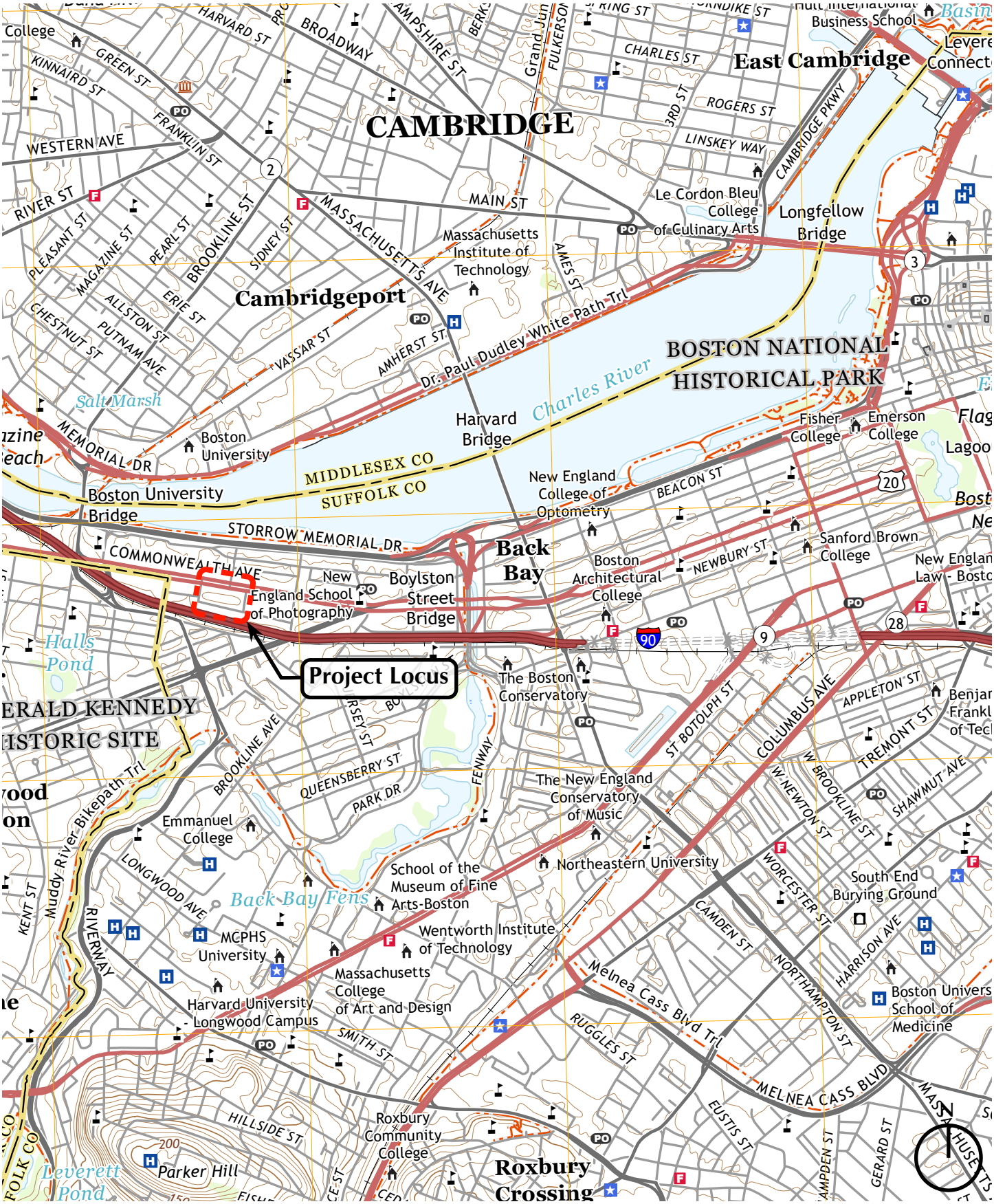
The primary contacts from the Project Team can be found below:

Project Team	Contact Information
Proponent	Trustees of Boston University One Silber Way, Suite 914 Boston, MA 02215 Contact: Sonia Richards Associate Vice President for Planning, Design, and Construction soniar@bu.edu 617-353-4313
Planning and Permitting	Fort Point Associates, Inc. 31 State Street, 3rd Floor Boston, MA 02109 Contact: Jamie Fay, AICP President jfay@fpa-inc.com 617-279-4384
Architect	MDS Architects 40 Broad Street, Suite 103 Boston, MA 02109 Contact: James Loftus, AIA, NCARB, MCPPO Principal jloftus@mds-bos.com 617-372-6878
OPM	Leftfield 101 Federal Street Boston, MA 02110 Contact: Matt McBurnie, PE Senior Project Manager mmcburnie@leftfieldpm.com 401-368-6605

Project Team	Contact Information
MEP/FP	RW Sullivan 529 Main Street, #203 Boston, MA 02129 Contact: Quy Vu, PE, LEED AP Principal/Project Manager quy@rwsullivan.com 617-337-9376
Legal	Trustees of Boston University One Silber Way, Suite 914 Boston, MA 02215 Contact: Jason A. Mahler Associate General Council jamahler@bu.edu 617-353-9857
Sustainability/LEED	The Green Engineer 23 Bradford Street, 1st Floor Concord, MA 01742 Contact: Chris Schafner, PE, LEED Fellow, WELL AP, WELL Faculty Founder & Chief Executive Officer, Owner chris@greenengineer.com 978-341-5454
Envelope	Simpson Gumpertz & Heger 800 Boylston Street, Suite 2320 Boston, MA 02199 Contact: Derek McCowan Associate Principal dbmccowan@sgh.com 781-907-9226
Accessibility	KMA Architecture + Accessibility One Bridge Street, Suite A102 Newton, MA 024558 Contact: John Safdie, AIA, NCARB, CASp Principal jsafdie@kmaccess.com 617-641-2802

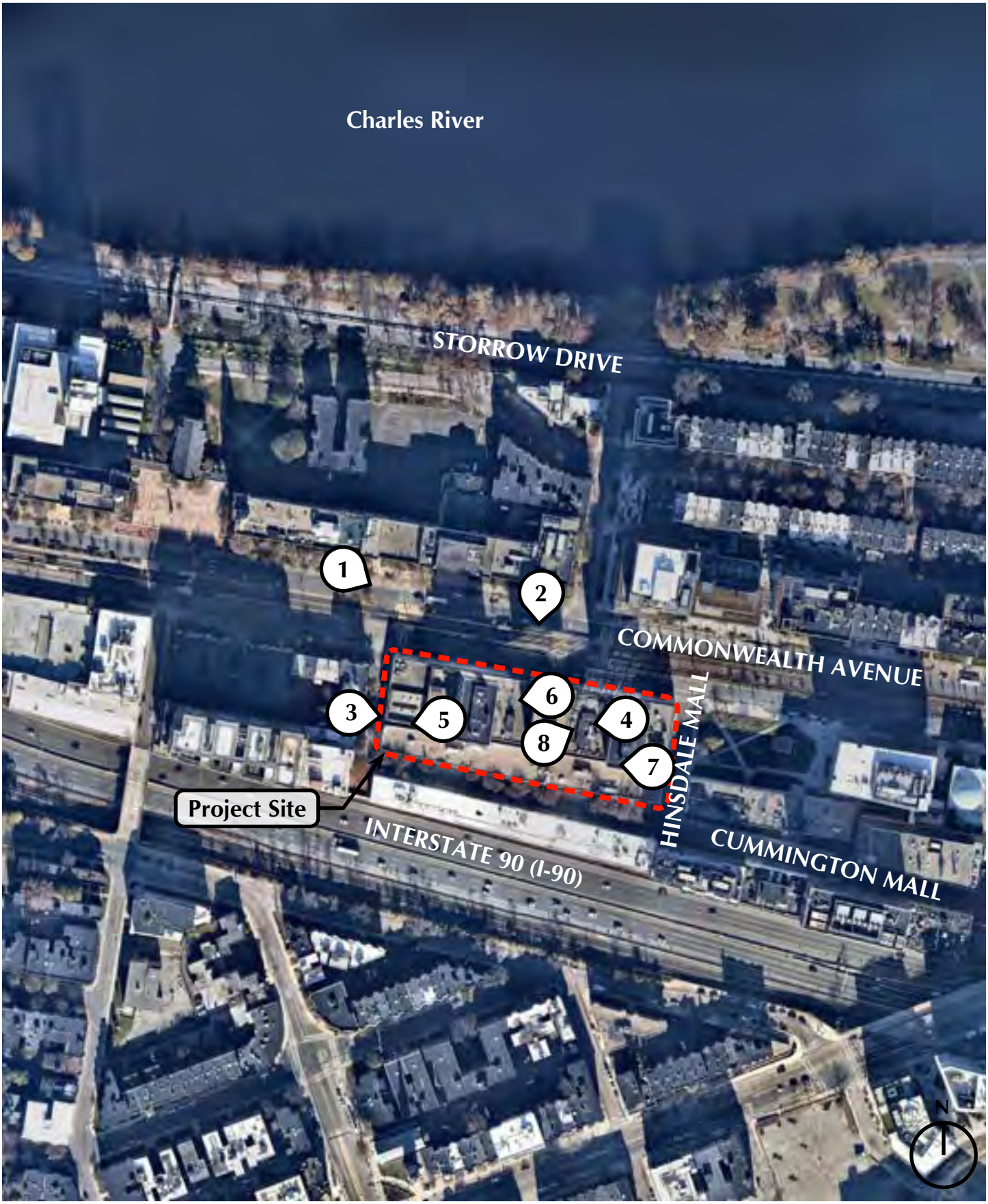
Project Team	Contact Information
Transportation	AECOM 1 Federal Street, 8th Floor Boston, MA 02110 Contact: James Doyle, AICP Vice President jay.doyle@aecom.com 978-905-2188
Civil Engineering	Nitsch Engineering, Inc. 2 Center Plaza, Suite 430 Boston, MA 01208 Contact: Chelsea R. Christenson, PE Project Manager cchristenson@nitscheng.com 508-365-1031
Geotechnical and Geothermal	Haley and Aldrich 465 Medford Street, Suite 2200 Boston, MA 02129 Contact: Bryan Sweeney, PE Senior Vice President bps@haleyaldrich.com 617-886-7364
Wind	RWDI, Inc. 600 Southgate Drive Guelph, ON Canada N1G 4P6 Contact: Sonia Beaulieu, M.Sc. PMP, PE Principal, Senior Project Manager sonia.beaulieu@rwdi.com 519-823-1311 x2429
Construction Manager	Shawmut Design & Construction 560 Harrison Avenue Boston, MA 02118 Contact: Doug Schultz Project Executive dschultz@shawmut.com 617-828-8417

Project Team	Contact Information
Structural Engineer	Souza, True & Partners 265 Winter Street, #3 Waltham, MA 02451 Contact: Jerry Yurkoski, PE Senior Principal jyurkoski@souzetrue.com 978-852-6243
Landscape Architect	Copley Wolff Design Group, Inc. 10 Post Office Square, Suite 1315 Boston, MA 02109 Contact: James A Heroux Principal JHeroux@copley-wolff.com 617-654-9000
Acoustic Consultant	Acentech 33 Moulton Street Cambridge, MA 02138 Contact: Ian Patrick, PE Senior Consultant ipatrick@acentech.com 617-499-8082



Boston, Massachusetts

Figure 1-1
Locus Map
Source: USGS, 2021



Boston, Massachusetts

Figure 1-2
Project Site Aerial View and Existing Conditions Photographs Key
Source: Nearmap, 2022

Photograph 1: View from 725 Commonwealth Avenue looking southeast at Project Site.

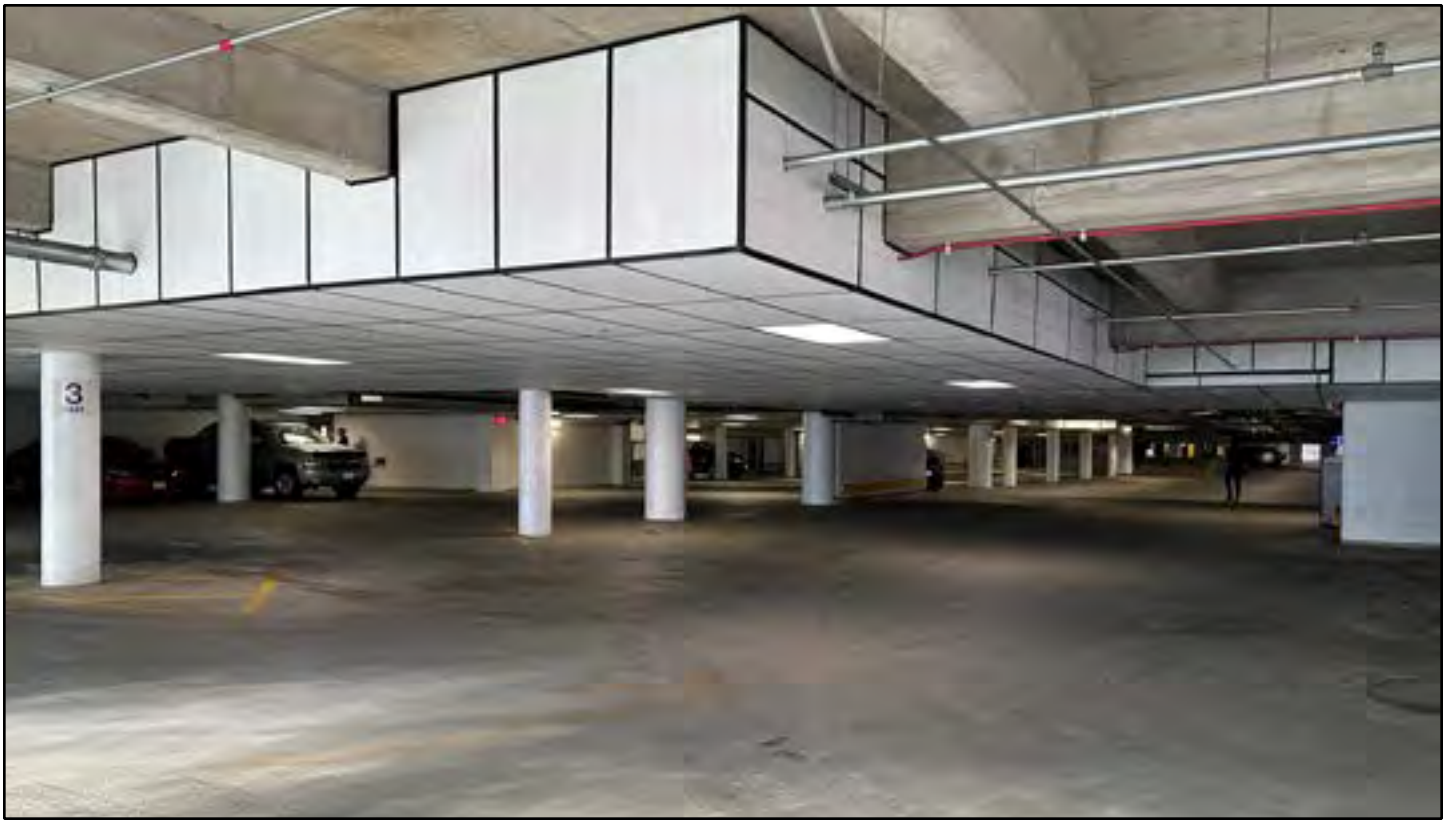
Photograph 2: View from Commonwealth Avenue looking south at Project Site front entrance.

Photograph 3: View from Cummington Mall looking east at Project Site garage entrance.

Photograph 4: View from Tower A looking west at Tower B facade.

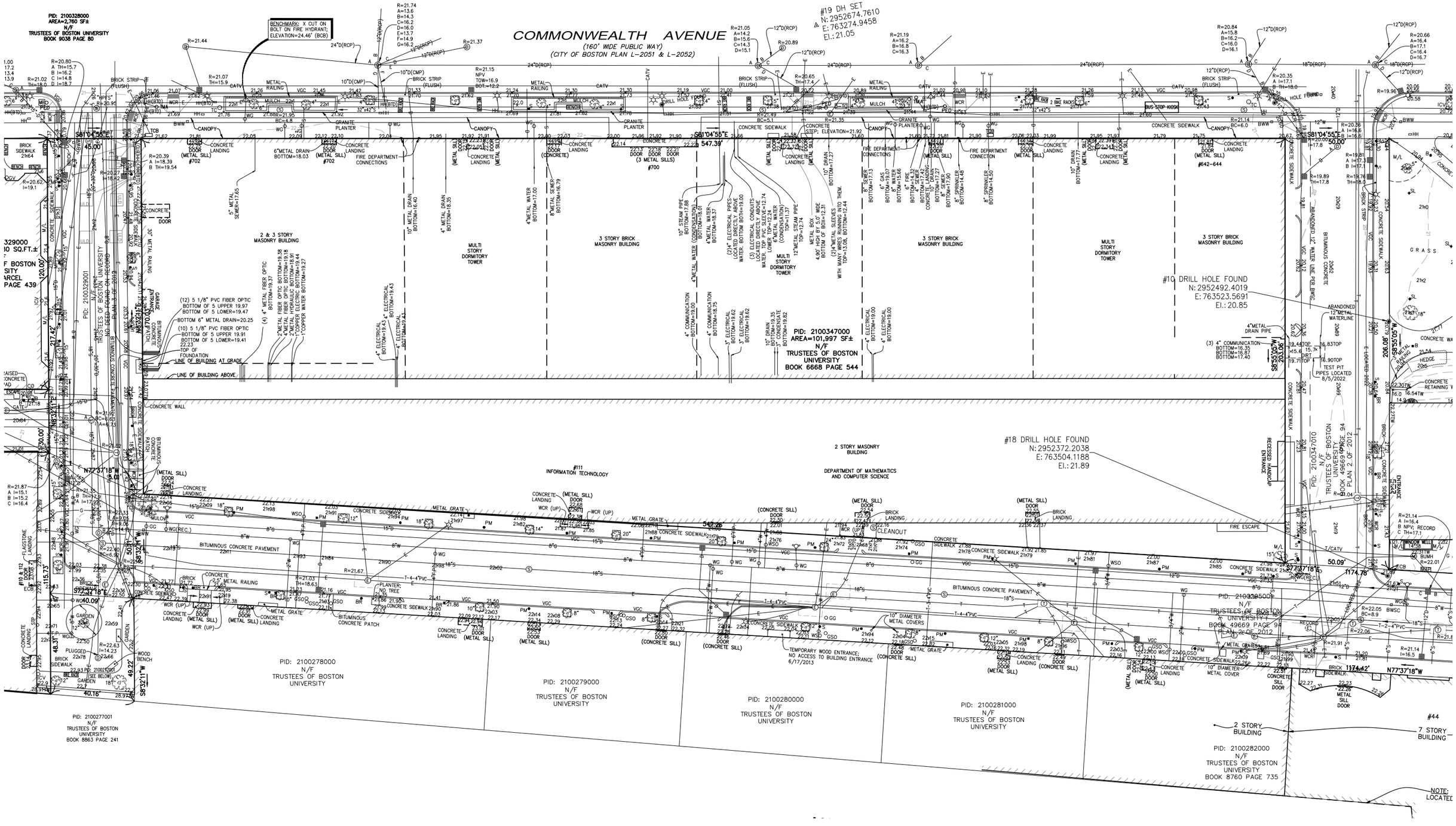
Photograph 5: View from Podium Roof A looking east at Commonwealth Avenue.

Photograph 6: Elevated view from Tower B looking west at Podium Roof C.



Photograph 7: View of the parking garage third floor looking west at parking spaces.

Photograph 8: View from Tower B roof looking east at Tower A facade and roof.



Boston, Massachusetts

Figure 1-7
Existing Conditions Plan
Source: MDS Architects, 2023

Chapter 2

PROJECT DESCRIPTION

CHAPTER 2: PROJECT DESCRIPTION

2.1 PROJECT SITE

The Project Site is located in the heart of BU's Charles River Campus academic core. The 18-story building consists of three, 14-story resident towers above a four-story podium with student common space, street level commercial/retail space, and a four-level parking garage. The podium supports three student residence towers on floors five through 18. The building was constructed along an entire block of Commonwealth Avenue in 1965, in the International Style typical of mid-twentieth century constructions of its scale. Much of the existing building components date back to Warren Towers' original construction, and the building envelope, mechanical systems, and other aspects of the building need renovation or replacement.

The Proponent owns and controls the majority of the buildings on Commonwealth Avenue from Kenmore Square to the BU Bridge. The Project Site is bounded by academic buildings to the west and south, campus green space to the east, and the newly constructed CCDS and the historic CAS to the north. In addition, uses within the vicinity of the Project Site include academic and student service facilities, commercial and retail activities, and student residences along Bay State Road. See Figure 2-1, Oblique View of Project Site.

The Project Site is served by existing public transportation, including the MBTA Green Line trolley via the B branch at the BU East stop, which provides access to a variety of destinations around and beyond Boston. The Project Site is also serviced directly by the MBTA Bus Route 57, and the University's free shuttle, BU Shuttle ("BUS"), which provides transportation between BU's Charles River, Fenway, and Medical Campuses.

2.2 PUBLIC REALM

The Project Site and the surrounding area are primarily defined by the academic facilities lining Commonwealth Avenue and adjacent streets. The widely varying architectural styles and building vintages, ranging from the historic Marsh Chapel and CAS building to the newly constructed CCDS building, contribute to a diverse and vibrant mix of building typologies that make BU's Charles River Campus stand out as a unique destination in the City of Boston.

The public realm surrounding the Project Site features a large pedestrian presence as a product of its location in the academic core of one of Boston's largest universities. The commercial/retail space on the first floor of the Project Site, combined with the large student population residing in the residential towers, contribute to the street level activity in the vicinity of the Project Site. The Commonwealth Avenue sidewalk within the Project Site is 20 feet ("ft") wide, 10 ft of which is sheltered by an overhead canopy connected to the podium of Warren Towers. Sidewalk amenities along this corridor include a bench, street trees and

planters, a bikeshare station, bicycle racks, and a bus stop. Commonwealth Avenue includes bicycle lanes and two general traffic travel lanes on each side of the roadway, with the Green Line B branch tracks and the BU East stop in the center median, all of which are heavily utilized by students and employees, and the broader population traveling to Downtown Boston and to points west.

Along the surrounding blocks are pocket parks and academic quads, benches, and numerous other academic, commercial, and dining destinations. The Charles River Esplanade is a short distance to the north of the Project Site, and features pedestrian and bicycle pathways, watercraft launching areas, and iconic views of the Charles River and the City of Cambridge skyline.

2.3 PROPOSED PROJECT

The Project includes 380,200 sf of repairs and renovations to Warren Towers. All proposed rehabilitation activities will take place within the existing footprint of the Project Site. The Project will take place in three phases over the course of approximately 44 months, anticipated from December 2024 to August 2028, to minimize disruption of on-campus student housing availability. Each phase of the construction will concentrate on the renovation of a single tower and portions of the podium, while the remaining towers and podium remain occupied and in use by the students and staff of BU. As each phase is complete, the students and staff will reoccupy the newly renovated area until all three towers and the portions of the podium have been renovated. The University will utilize existing student housing on the Fenway Campus to accommodate students displaced during the renovation of each tower.

Every aspect of the Project is informed by the University's sustainability goals, and the Proponent intends for the Project to earn Leadership in Environmental Design ("LEED") Gold certification.

2.3.1 PROGRAM DESIGN GOALS

Critical program design goals for the Project have been identified to:

- Upgrade an existing, on-campus dormitory with accommodations for over 1,800 students to make the residence hall more attractive to incoming and returning students;
- Replace the building's existing mechanical systems to improve energy efficiency and secure a minimum rating of LEED Gold, in line with the University's Climate Action Plan ("CAP") and the City of Boston's sustainability goals;
- Create all single-user, gender-neutral toilet and shower rooms to recognize diversity and promote inclusion within the residence hall;

- Repair and restore masonry with new flashing, lintels, and anchors for improved waterproofing and to renew the building for the next 50 years; and

- Improve the thermal envelope of the towers via window replacement, roof replacement, added wall insulation, and areas of rebuilt exterior wall assemblies with improved thermal performance.

2.3.2 PROJECT PROGRAM

The Project will include repairs to the building's envelope, reconfiguration of bathroom cores, accessibility improvements, modernization of elevators and escalators, and new MEP systems in the residential towers and fourth floor common areas, which includes adding air conditioning to dorm rooms and replacement of site utilities. The building will also contain six apartments for housing campus faculty and one apartment for a graduate student staff across the three Towers. The following section outlines the different components of the Project. See Table 2-1, Project Program and Figures 2-2 through 2-7 for Floor Plans.

Table 2-1: Project Program

Project Component	Dimensions/Count
Total Building Gross SF ("GSF")	625,800
Total Project (Renovated) GSF	482,900
Total Gross Floor Area ("GFA") (Per Zoning)	523,100
Total Renovated GFA (Per Zoning)	380,200
Building Footprint Area	62,800
Floor Area Ratio (Per Zoning)	8.3
Stories	18 + Mechanical Penthouse
Height (ft)	215
Student Beds	1,804
Staff Apartments	6
Parking Spaces	441
Covered Bicycle Parking Spaces	320

Building Envelope

The Project will involve extensive repairs to the building envelope, including the exterior walls, windows, and roof. The new design considerations include appearance, code requirements, and performance. On the east and west façades, existing windows, surrounding frames and panels will be removed and replaced with window-wall glazing systems and faceted composite metal panels on framed assemblies. On the north and south façades, these same features will also be removed and replaced with window-wall composite metal panel fin assemblies. The new

window systems will work in conjunction with the new mechanical systems to allow the building to operate efficiently and sustainably.

The building's roof system will undergo a major overhaul and replacement to address deterioration and water infiltration. The existing tower roof parapets will be replaced with brick and masonry parapets to address water infiltration issues and improve worker safety. The existing mechanical and stair penthouse structures will be demolished and reconstructed on the south side of the rooftops, at the same height as the existing elevator penthouses, which will remain in place.

MEP Systems

The Project will be all-electric and the MEP systems will be replaced. The Project will use newly installed systems with the latest technologies to maximize building efficiency and sustainability. The selection of all mechanical systems is informed by LEED Version ("v") 4.1, Energy and Atmosphere criteria.

The heating, ventilation, and air conditioning ("HVAC") systems have been employed to achieve the University's overall sustainability and efficiency goals. The Project will include air-to-water heat pumps ("AWHP") to provide all-electric cooling and electric heating down to 7°F outdoor temperature. Electric boilers will provide heating below this outdoor temperature. Additional HVAC-related features include valance units, dedicated outside air systems with energy recovery to heat, cool, and dehumidify the building fresh air before it is supplied to the toilet cores and student rooms, variable speed drives for all major equipment, and premium efficiency motors. The proposed HVAC systems will introduce air conditioning into the Project Site for the first time and the Project will also provide individual thermostat controls for each dorm room.

Domestic hot water ("DHW") systems served by AWHP will be employed as a modern and efficient water heating technology that contributes to the sustainability of the Project. In addition, the Project will install low flow and high efficiency plumbing fixtures to reduce potable water use throughout the building. Whole-building and selective end-use water metering will be installed to monitor potable water usage through the Project Site.

Electrical systems for the Project will be upgraded and building-level energy meters will be installed, the data from which will be shared with the U.S. Green Building Council ("USGBC") for a minimum of five years. The lighting systems will be replaced, with the new system designed by a lighting consultant. Energy consumption associated with lighting at the Project Site will be reduced by installing efficient LED fixture sensor-operated day light harvesting light panels in common areas, and multi-level lighting controls within the dorm rooms. Additionally, the Proponent will meet with National Grid and Eversource to discuss other energy conservation measures for the Project.

The Project Site contains nine geared traction elevators, one hydraulic elevator, one freight elevator, and four escalators. Students experience long waiting times with the current Two Button Conventional operation of the main elevators. Vertical transportation through the building is currently impacted by frequent shutdowns and repair issues due to the age of the existing equipment. The escalators will be replaced in the existing locations, the hydraulic elevator will be replaced with a machine room-less elevator, and the traction elevators will be modernized and upgraded with full replacement of the hoist machine, motor, controls, fixtures, door equipment, and wiring. These renovations will provide code compliant equipment that consumes less energy and produces less carbon, while resulting in a more reliable system that will function more efficiently and provide quicker vertical transport.

The Project will involve new utility connections for wastewater, domestic water, fire protection, and stormwater systems to accommodate the scope of work outlined above. There are no capacity issues anticipated with the surrounding utilities resulting from the Project's construction. The Project's construction manager will coordinate with the Boston Water and Sewer Commission ("BWSC") and relevant utility companies to secure the necessary approvals prior to implementation.

Accessibility

The Project's anticipated renovation work is expected to cost greater than 30% of the full and fair cash value of the building. Therefore, Section 3.3.2 of 521 CMR will apply, and the entire building must be brought into compliance with Massachusetts Architectural Access Board ("MAAB") regulations or variances must be requested.

Accessibility improvements to floors five through 18 include widening all student dorm room doors, providing a central lounge, providing compliant gender-neutral toilet and shower rooms, providing laundry machines with accessible controls, and providing the required quantity of mobility accessible student dorm rooms. The faculty apartments will be renovated to comply with the 2010 Americans with Disabilities Act ("ADA") and the apartment designated for the graduate student resident assistant will be renovated to comply with MAAB 521 CMR group 2B requirements.

Additional accessibility improvements include the following:

- Re-grading the sidewalk along Commonwealth Avenue and first floor commercial/retail entrances;
- Renovating the public bathrooms and security desk on the fourth floor;
- Adding automatic door openers;

- Updating emergency signage;
- Providing laundry machines with accessible controls on the podium level;
- Replacing the handrails and providing automatic door openers at stairways throughout the building;
- Relocating the elevator controls, installing an audible signal at each hoist way entrance, and regrading the door landings at passenger elevators; and
- Relocating the designated accessible car parking spaces within the garage closer to the main entrance lobby and comply with accessibility requirements.

2.4 SITE REQUIREMENTS

The exterior circulation around the Project Site will remain largely unchanged from existing conditions. See Figure 2-8, Circulation and Access Plan.

2.4.1 SITE CIRCULATION

Site circulation will remain unchanged from the existing condition. The Project Site's main entrance and most of the commercial/retail entrances are located along Commonwealth Avenue. The 20-ft wide sidewalk along this corridor and the 10-ft overhang support the busy pedestrian activity associated with the Project Site and the surrounding BU campus.

2.4.2 VEHICULAR CIRCULATION

Vehicular circulation along the Project Site will remain unchanged from the existing condition upon completion of the Project. The Project Site is surrounded on all four sides by roadways; City of Boston-owned Commonwealth Avenue, and BU-owned Hinsdale Mall and Cummington Mall. Commonwealth Avenue has two travel lanes in each direction, while Hinsdale Mall has one travel lane in each direction and Cummington Mall is a one-way street with one travel lane.

2.4.3 LOADING AND SERVICE

Loading and service activities will remain unchanged from the existing condition. A loading dock for the Project Site is available along Hinsdale Mall next to the parking garage exit. There are no loading zones available along Commonwealth Avenue in front of the Project Site. Hinsdale Mall and Cummington Mall have on-street restricted 30-minute delivery vehicle-only loading zones.

2.4.4 BICYCLE CIRCULATION

Existing bicycle accommodations around the Project Site are to remain following Project completion. There are bicycle lanes in both directions on Commonwealth Avenue, a secure bike storage room for Warren Towers residents, a BLUEbike bikeshare station, and 22 bicycle racks (44-bikes) available for use by the general BU and Boston communities. As part of the Project, a total of 320 bike parking spaces will be provided in the garage, which includes 120 two-tier bike racks and 40 inverted U-racks. The Project Site is well-connected to the Boston, Brookline, and Cambridge bicycle networks via dedicated bike facilities along intersecting streets and nearby shared-use paths.

2.4.5 ACCESSIBILITY

The Project requires compliance and updates to accessibility deficiencies to meet the standards defined by the ADA Accessibility Guidelines ("ADAAG"). Updates will include an accessible entrance, bathroom stall and circulation improvements, and dorm room, kitchenette, and laundry room improvements. See Attachment 1, Accessibility Checklist.

2.4.6 PARKING AND ACCESS

Parking associated with the Project Site will remain largely unchanged from the current condition. The Project Site features a four-level parking garage along the rear of the building available for use by permitted and assigned university-affiliated individuals and paying transient users. Access and egress to the garage is provided via Hinsdale Mall on the west and on Cummington Mall to the east. There is no general use on-street vehicular parking available at the Project Site. The addition of new mechanical equipment servicing the building results in a loss of 30 garage parking spaces.

2.5 OPEN SPACE AND LANDSCAPE

The Proponent proposes to maintain and expand the existing urban site conditions. Development of the Project will require disruption to sidewalks and streets for replacement of site utilities and a new stormwater management system. The sidewalk amenities on Commonwealth Avenue will be protected, maintained, or replaced in kind, including streetlights, signage, traffic signals, raised planters, the bus shelter, benches, the BLUEbike station, bicycle racks and trash/recycling receptacles. Trees will be protected, however three trees will be removed and replaced on Commonwealth Avenue, 11 trees will be replaced and one tree will be removed on Cummington Mall, and one tree will be removed and replaced on Hinsdale Mall. The existing canopy on Commonwealth Avenue will be salvaged, stored, and reinstalled. To resolve grading challenges along Commonwealth Avenue, an

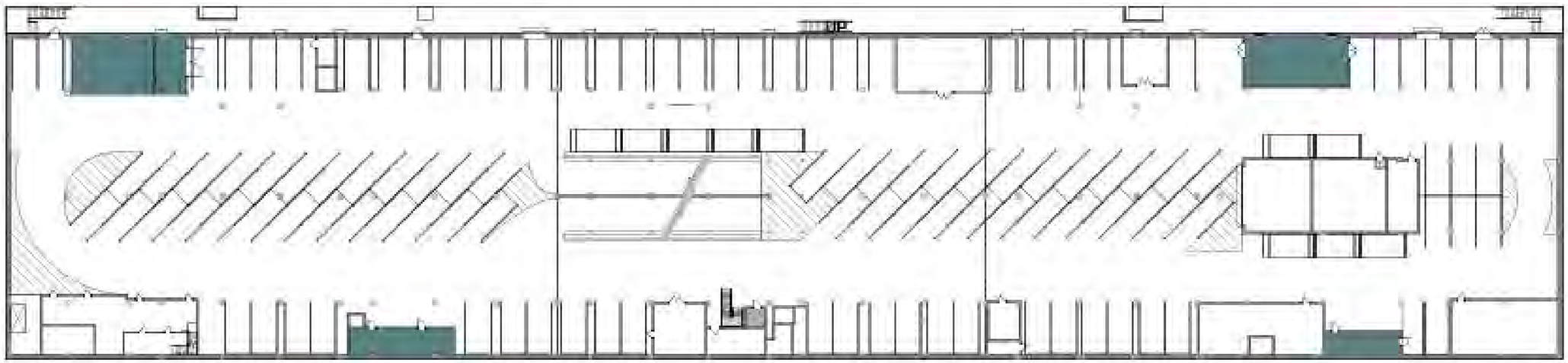
existing planter will be extended and a new raised planter with protective plant guard will be installed. Parking for 44 bikes will be maintained at newly installed racks.

Due to construction mobilization, logistics, and the addition of the raised planters, three of the existing Bradford pear trees on Commonwealth Avenue will be removed and replaced with species chosen from the City of Boston approved tree list. One tree located on Cummington Mall at the west end of the Project Site on University property will be removed and not replaced due to the installation of a new electrical feed for the Project. All other trees on Commonwealth Avenue, whether in raised planters or the sidewalk, will be protected and trees not located in raised planters will include tree grates, matching those existing along the sidewalk east of the Project Site. Trees that are proposed in paved areas will be placed adjacent to 550 cubic feet ("CF") of sand-based structural soils below a paved walk composed of resin bound pavement. Permeable pavers along the back of the Commonwealth Avenue curb will be maintained and match the existing limits on-site. New pavement will be replaced in kind to meet current accessibility standards required by the City of Boston, and trees selected from the City of Boston approved street list will be installed using the city standard for tree pit size and spacing.

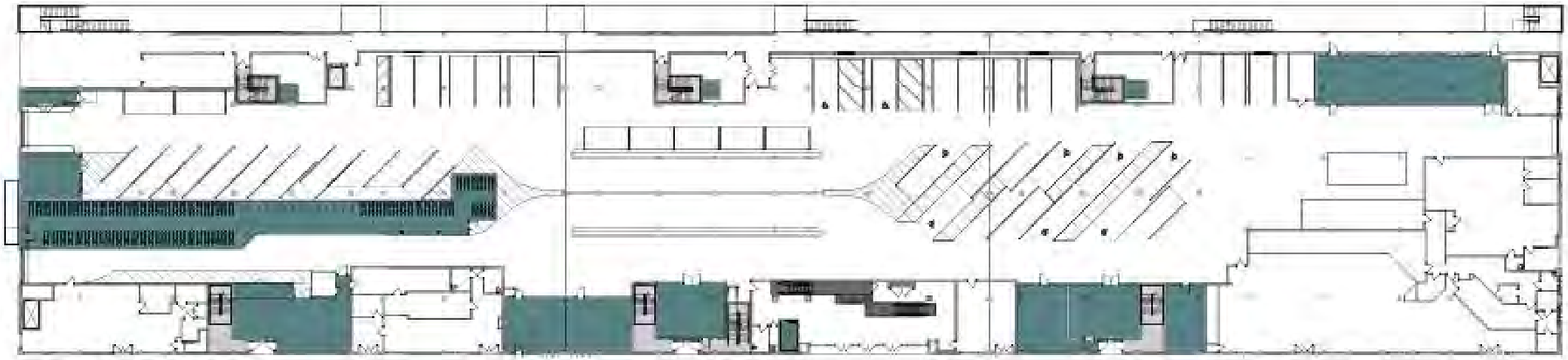
The sidewalk along Commonwealth Avenue will be replaced for water/drain line improvements and accessibility compliance and a portion of Commonwealth Avenue will be replaced to cut and cap the existing drain lines beneath the street and provide new sanitary connections. To the west, portions of the street and sidewalk along Cummington Mall will be disrupted for the installation of a new 18 ft x 10 ft Eversource manhole that brings power to the new switchgear in the garage. To the east, the street and sidewalk at Hinsdale Mall will be temporarily disrupted for the installation of a new stormwater management system.

See Figure 2-9, Project Site Plan.

Figure 2-1
Oblique View of Project Site
Source: MDS Architects, 2023



Basement Floor Plan

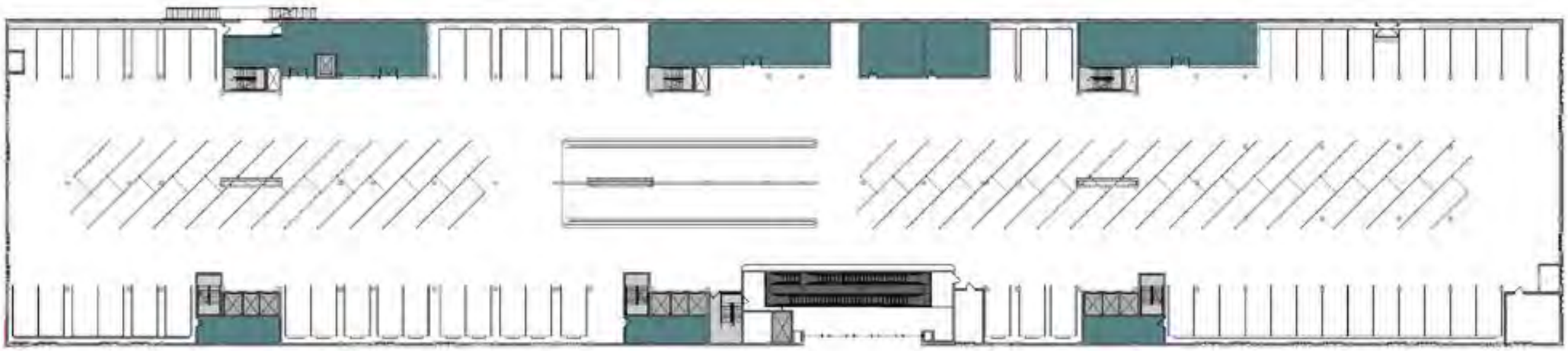


1st Floor /Ground Floor Plan

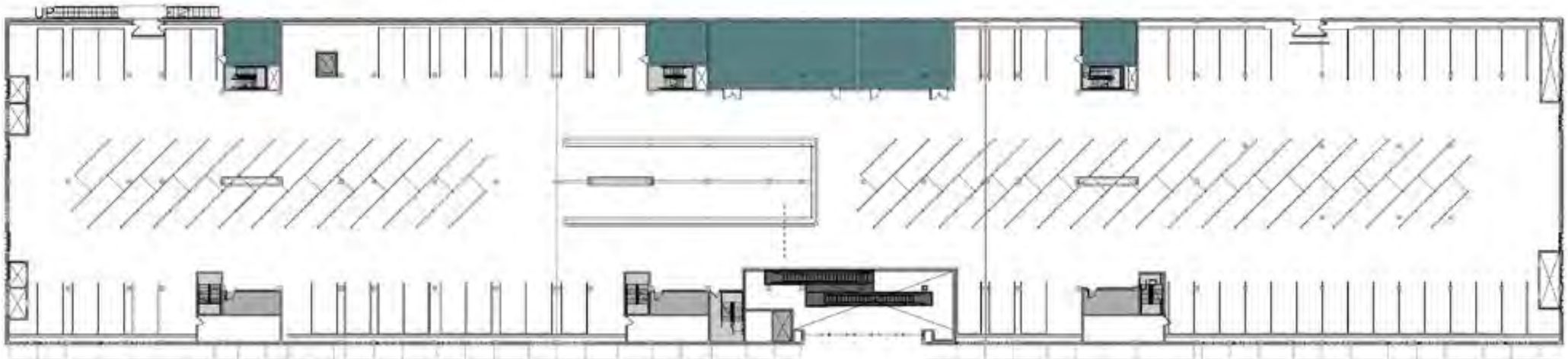
Building Support
Escalators
Elevators
Stairs

0' 10' 20' 40' 80' N

Figure 2-2
Basement and First Floor Plan
Source: MDS Architects, 2023



3rd Floor Plan

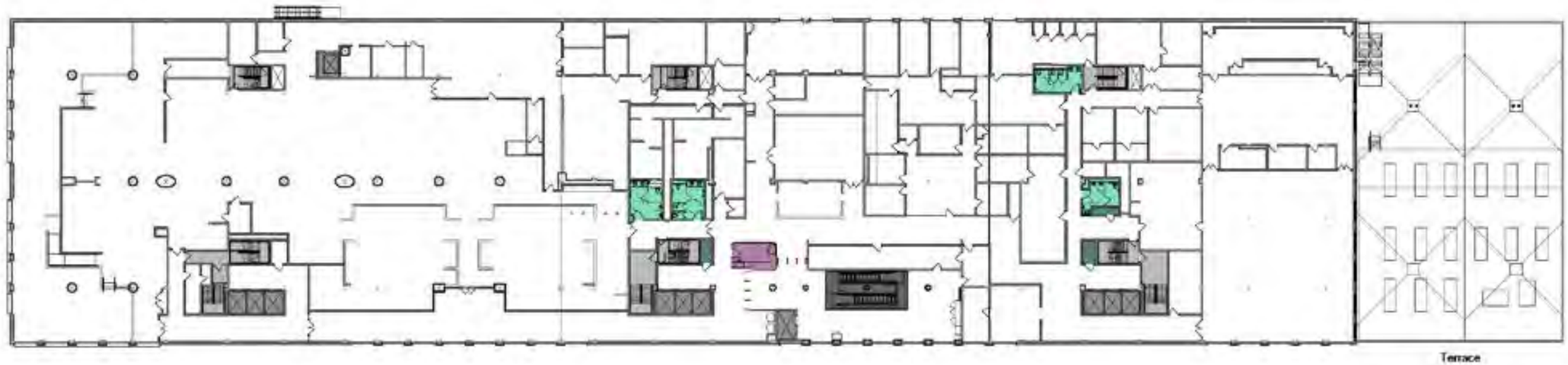


2nd Floor Plan

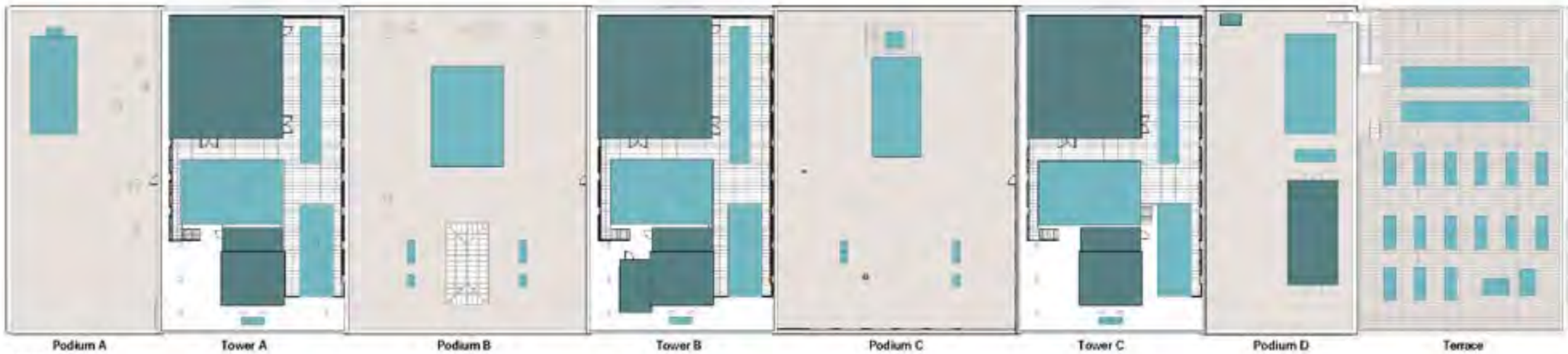
Building Support
Escalators
Elevators
Stairs

0' 10' 20' 40' 80'

Figure 2-3
Second and Third Floor Plan
Source: MDS Architects, 2023



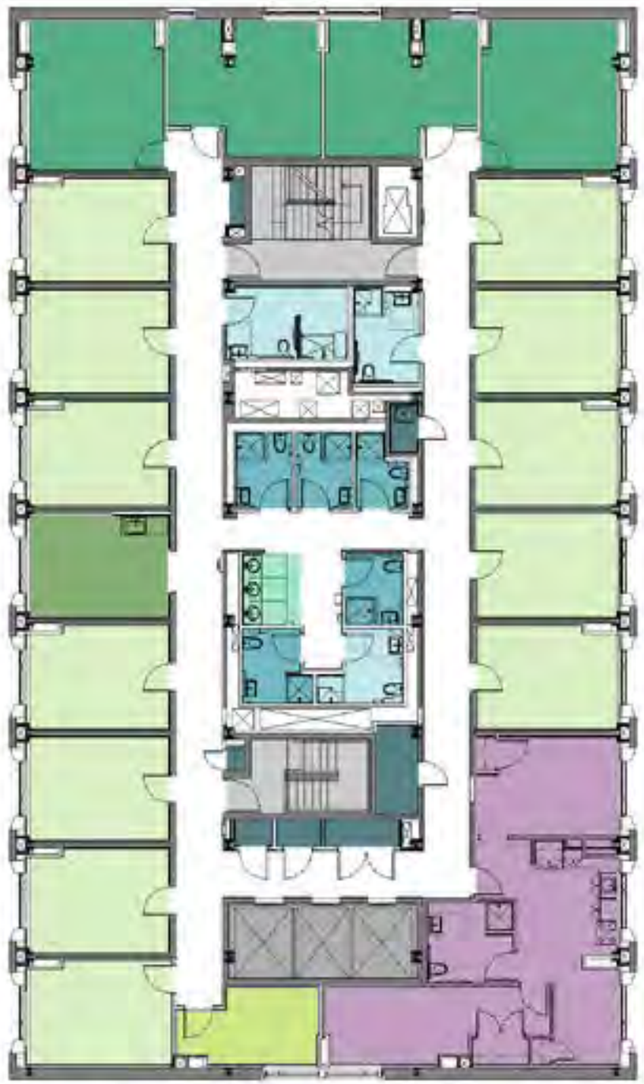
4th Floor Plan



Roof Plan

Figure 2-4
Fourth Floor and Roof Plan
Source: MDS Architects, 2023

Tower A - Floor 5



Tower A - Floor 6

- Single Room
- Double Room
- Triple Room
- Staff Apartment
- Common Bathroom
- Single Use Bathrooms
- Single Use Bathrooms (ADA)
- Lounge
- Building Support
- Elevators
- Stairs

Figure 2-5
Tower Plan - Tower A Floors 5 and 6
Source: MDS Architects, 2023

Tower B - Floor 5

Tower C - Floor 5

- Single Room
- Double Room
- Triple Room
- Staff Apartment
- Common Bathroom
- Single Use Bathrooms
- Single Use Bathrooms (ADA)
- Lounge
- Building Support
- Elevators
- Stairs

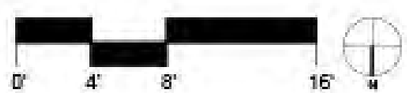
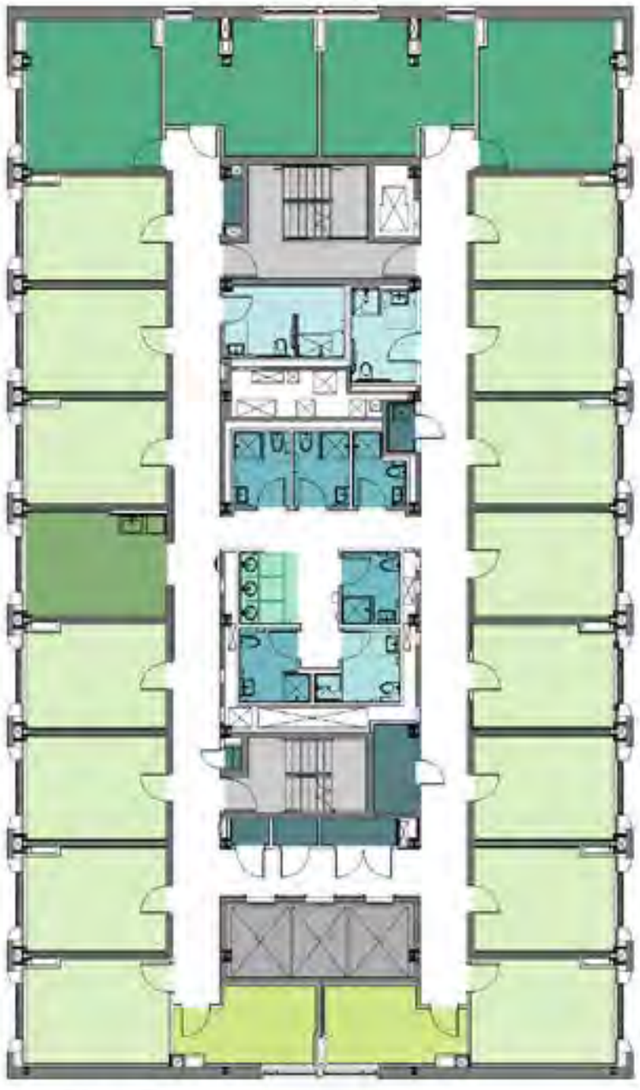


Figure 2-6
Tower Plan - Tower B and C Floors 5
Source: MDS Architects, 2023



Typical Tower Floor

- Single Room
- Double Room
- Triple Room
- Common Bathroom
- Single Use Bathrooms
- Single Use Bathrooms (ADA)
- Lounge
- Building Support
- Elevators
- Stairs

0' 4' 8' 16'

Figure 2-7
Typical Tower Plan
Source: MDS Architects, 2023

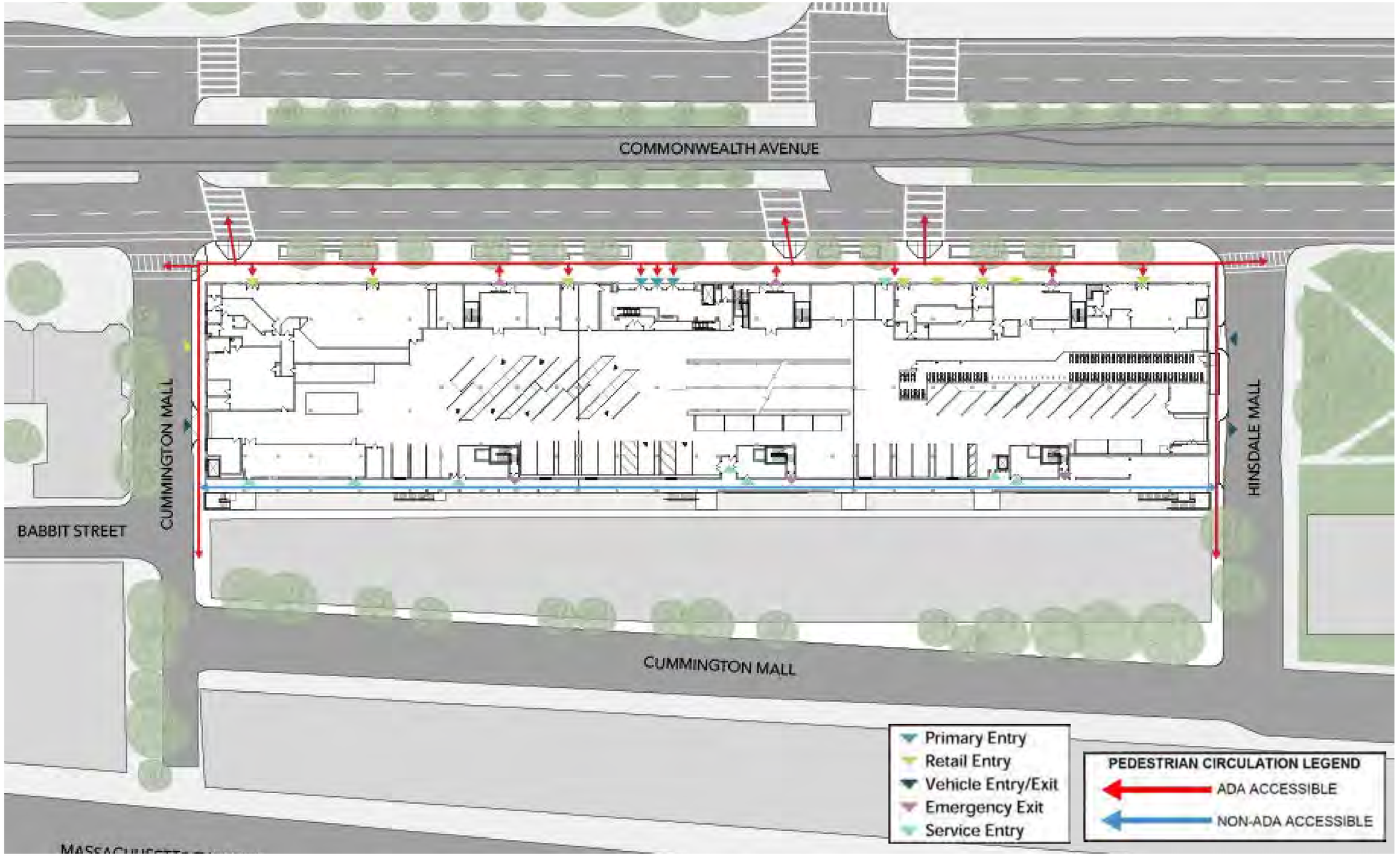


Figure 2-8
Circulation and Access Plan
Source: KMA Architecture + Accessibility, 2023

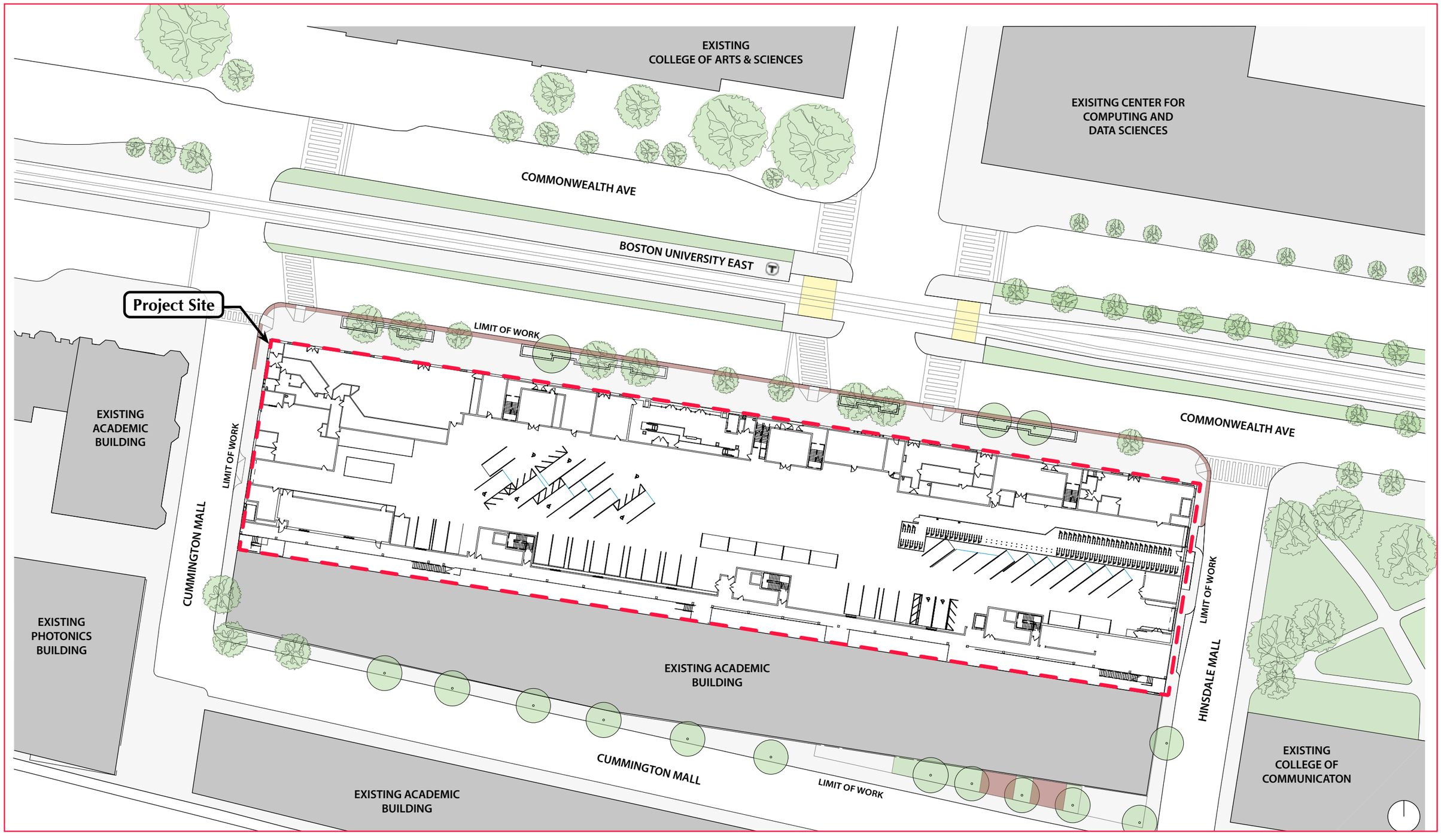


Figure 2-9
Project Site Plan
Source: MDS Architects, 2023

Chapter 3

URBAN DESIGN

CHAPTER 3: URBAN DESIGN

3.1 INTRODUCTION

The Project will undertake major repair and modernization of the three-tower student residence constructed in the mid 1960's which is home to nearly 1,800 undergraduates, most of whom are first-year students. The 18-story building consists of three, 14-story resident towers above a four-story podium with student common space, street level commercial/retail space, and a parking garage. The scope for work includes repair to the building's envelope, reconfiguration of bathroom cores, accessibility improvements, modernization of elevators and escalators, and all new MEP systems in the residential towers and fourth floor common areas, which includes adding air conditioning to dorm rooms and replacement of site utilities. The Project will maintain and expand the existing urban site conditions around the building. To reduce the impact on students and the overall inventory of student housing, the Project is being developed in three phases.

3.2 NEIGHBORHOOD CONTEXT

The BU Charles River Campus has evolved into a destination with distinct qualities based on architectural character and scale, historical significance, and academic and programmatic needs. Its physical identity is strongly influenced by Commonwealth Avenue, which not only serves as a major transportation corridor, but as the spine and heart of the campus. It is also situated in a geographically sensitive area bounded by the Charles River, important regional transportation infrastructure, well-established hubs of economic activity, and new large-scale real estate development initiatives. Warren Towers is strategically positioned on Commonwealth Avenue, providing undergraduate residential students convenient access to the campus academic core, convenient public transportation, and open space. See Figure 3-1, Neighborhood Context.

3.2.1 COMMONWEALTH AVENUE

BU's Charles River Campus consists of over 115 acres centered on Commonwealth Avenue between Massachusetts Avenue and Packard's Corner. In 1920, BU acquired a 15-acre site along the Charles River to build a new campus and consolidate the academic community, which at the time was in many locations throughout the City of Boston. The historic Marsh Chapel Plaza anchors the University's first constructed buildings on the BU Charles River Campus, as designed by architects Cram and Ferguson in the mid 1940's. The George Sherman Union ("GSU") Plaza is to the west of the Project Site. The GSU Plaza is an important public space that acts as an entry point to Josep Lluis Sert's congregation of mid-century modern structures. These buildings comprise BU's School of Law and serve University students who utilize the GSU and Mugar Memorial Library. The architectural character and urban form of this

section of Commonwealth Avenue is very distinct from the monumental Back Bay section with its uniform building scale and continuous "street wall" with median open space.

Throughout the length of BU's Charles River Campus, Commonwealth Avenue's median is occupied by the Green Line trolley, and the urban form is defined by the street wall punctuated by a series of well-scaled and well-used open spaces. The activity of student life along this boulevard makes this section of Commonwealth Avenue unique. In addition to the Green Line trolley, the pedestrian traffic of over 2,000 people/hour during peak hours makes Commonwealth Avenue one of the most vibrant and heavily travelled streets in the City of Boston. Recognizing the importance of Commonwealth Avenue, a highly successful public-private partnership was initiated by BU, the City of Boston's Department of Public Works and Transportation Department, and the State's Executive Office of Transportation. This partnership resulted in a significant investment by the University in major safety, aesthetic, and transportation improvements to the portion of Commonwealth Avenue from Kenmore Square to the BU Bridge. These improvements were accomplished through the installation of wider sidewalks, tree plantings on both sides of the corridor and median, period appropriate streetlights, and articulated crosswalks. The removal of an unnecessary third travel lane allowed for the installation of the first bike lanes in the City of Boston and effectively improved safety conditions for pedestrians and cyclists. BU contributed funds toward the design and construction of this phase of improvements and provides ongoing maintenance of the plantings along this segment of Commonwealth Avenue.

3.2.2 HINSDALE MALL

This service road connects Commonwealth Avenue to Cummington Mall to the south. BU owns Hinsdale Mall as well as the green space east of the Project Site. Hinsdale Mall provides access to the Project Site's parking garage and building services.

3.2.3 CUMMINGTON MALL

Cummington Mall is a one-way street extending around the back of the property from Hinsdale Mall to Commonwealth Avenue. There are two buildings on the west side of Cummington Mall across the street from the Project Site. One structure is a six-story masonry building with characteristics of a turn of the century apartment building, currently owned and used by BU as an academic building. The second structure is a five-story industrial looking masonry building owned and used by BU as an academic building. There is a small pocket park at the end of Cummington Mall adjacent to the Turnpike. At the first floor of the Project Site there is one commercial/retail space with an entry/exit to the parking garage.

3.3 MASSING

The Project is located in BU's Central Campus District, which features a wide variety of building types, sizes, and heights. The Project Site consists of three, 14-story high-rise dormitory towers, rising from a four-story podium structure occupying the length of the entire block. The podium has a series of roofs adjacent to and between Towers A, B, and C. For this Project, the podium roofs are designated, from east to west as podium roofs A, B, C, D, and Terrace roof. See Figure 2-4, Fourth Floor and Roof Plan.

The existing massing of the Project's three towers will remain relatively unchanged in the scope of the proposed renovation. Aside from envelope upgrades and fenestration replacement, the most notable changes to the massing of the towers will occur from alterations on the tower and podium roofs. The existing tower and podium roof parapets of brick and precast rails are failing, too low, and unsafe. The tower parapets will be replaced with taller brick and masonry parapets for a more continuous appearance and functional guardrail. The podium parapets will be replaced with metal-panel clad parapets.

On the tower roofs, the original mechanical penthouses and south stair penthouse structures must be demolished to provide sufficient space and efficient layouts for new penthouses for electrical rooms and boiler plants. Additionally, new rooftop equipment, including AWHP, dedicated outdoor air systems, and walk-in emergency generators, will be supported on elevated steel dunnage platforms. The existing penthouse structures will remain at the top of the north stairs and for the elevator machine rooms. Roof screens will run along the edge of the elevated dunnage platforms to reduce visibility of the roof equipment from below.

Each tower's new rooftop structures will be positioned away from Commonwealth Avenue and the perimeter parapets to minimize their visible presence from below. Although significant changes are proposed on each tower's roof, the new penthouses and equipment will not exceed 19 ft, the height of the existing elevator machine room.

The existing mechanical penthouses on the podium roofs A, B, C, and D will be removed. Podium roof A will receive a new AHU and new kitchen exhaust fans for the food service functions on the fourth floor. Podium roof B will also receive a new AHU, new kitchen exhaust fans, and new heat pump condensers serving new and renovated building support rooms in the garage levels. The skylight of podium roof B will be replaced. Podium roof C will receive a new AHU, an electrical load bank on an elevated platform, and new heat pump condensers for building support rooms in the garage. Podium roof D will receive new AHUs, exhaust fans, and a new boiler room penthouse for the fourth floor HVAC upgrades. The Terrace roof will house 15 domestic water heat pumps serving all three towers as well as two AWHPs for the fourth floor HVAC upgrades. The new AHUs on the podium roofs are for the new HVAC system serving the fourth-floor common spaces.

The podium roof parapets of brick and pre-cast concrete are similar to the tower parapets and will also need to be removed. These parapets will be replaced with metal panel cladding over concrete block to compliment the fenestration improvements on the towers above, described further in Section 3.4.

The parapet and masonry walls of the Terrace roof at the west end of the building will be removed and rebuilt as a taller wall with metal panel cladding. This new wall will act as both a visual and acoustic screen from the new heat pump equipment on elevated dunnage platforms proposed for the terrace roof.

3.4 CHARACTER AND MATERIALS

The original 1960's design of Warren Towers was typical of the International Style in the mid-twentieth century, emphasizing volumes, utility, and repetitive window elements. The towers' existing materials currently possess a stark neutral color palette of tan brick with corroded relieving angles, deteriorating concrete shelves and fins, broken glass block vertical reveals, and outdated mill-finished aluminum framed single-paned operable glazing with dark spandrel panels. The glass blocks in the reveals have failed and were recently covered with an adhered black waterproof membrane as a temporary fix due to breakage and leaks. The east and west windows of Tower B were replaced at some time with dark bronze aluminum storefront with operable windows.

On the towers' east and west façades, the leaking vertical glass block reveals, deteriorating concrete shelves, outdated fenestration, and the narrow brick piers between these elements will all be removed and replaced with window-wall glazing systems and faceted composite metal panels on framed and insulated assemblies.

On the towers' north and south façades, the outdated window fenestration will also be replaced while the protruding deteriorating concrete fins and ledges will be cut out. These elements will be replaced with window wall and composite metal panel assemblies. The scale and proportion of the new fenestration and panel treatments will be reminiscent of the original design and the depth of overhanging protrusions will be reduced.

The towers' proposed envelope improvements will include new window wall fenestration paired with faceted composite metal paneling assemblies. The window wall framing will have light color tones, akin to the original mill finish aluminum. The metal panels will add warm coppery metallic color tones to reinvigorate the façades. The patterns of accented color with increased areas of glazing will add more visual interest to the façades, providing a subtle building enhancement against the neutral tan brick masonry instead of the dark contrast made by the original dark spandrel panels.

The original brick relieving angles at each floor are rusting, deteriorating, and require replacement. Therefore, new galvanized relieving angles will be provided at each floor along with new metal drip edges, membrane flashing, and new brick. Significant cracking was

observed at the corners of the towers. Therefore, 2 ft of all vertical corners at each tower floor will be rebuilt and new vertical control joints are proposed to alleviate the stresses in the brick envelope. Where smaller selective areas of brick replacement are needed in the façade, salvaged brick from the corners and angle replacements will be used and toothed into the existing brick to match.

Around the tower roofs, the original low parapets of brick masonry and metal clad pre-cast rails are tilting, failing, and suffering from water infiltration. The proposed parapets will be rebuilt with brick veneer to match the existing masonry and brought up to a taller height for improved worker safety.

The towers' new penthouse structures will be clad with vertical metal panel siding with lighter grey colors. The elevated equipment platforms will be screened with similar metal panels to match the penthouse cladding and reduce visibility of roof equipment. The roof screen will have intermittent openings, aligned with the windows below, to facilitate window washing. These openings will have guardrails spanning across the openings for fall protection.

Due to the limitations of the existing narrow tower roofs with new equipment platforms and penthouses, window washing suspension support is provided via paired safety anchor posts aligned with each window opening and positioned at various locations: on the main roof, at the platform edges/roof screen openings, and on the new boiler penthouse roof.

On the four-story podium, the proposed envelope improvements are limited to brick masonry repairs. Relieving angles at floor levels and above large openings will be replaced with new angles, metal drip edges, membrane flashing, and new masonry. All existing fourth floor glazed openings will remain in place except at the Terrace roof. The existing precast framed openings for garage ventilation will remain in-place. All first floor commercial/retail storefront entrances will remain in place but made accessible with the regrading of the Commonwealth Avenue sidewalk. The three-story curtainwall and entrance doors to the Project Site lobby will remain in place.

The pre-cast, aluminum framed glazing, and the exterior wall along the Terrace roof will be removed and rebuilt to improve the acoustic separation from the new equipment. The rebuilt wall will have smaller glazed openings with laminated translucent inset panels to conceal the view looking into the new equipment while still permitting daylight to enter these interior spaces.

The podium roof parapets will be rebuilt with metal panel cladding in the same warm, coppery colors as the new metal panel cladding on the towers to carry the color and material around the top of the podium and visually tie the volumes and new character of the towers together with the podium.

The new terrace screen wall with metal cladding aligns with the podium parapets to allow the west end of the podium to appear as one consistent volume. The color of the metal panel

cladding below the coppery parapet will be similar to the existing brick and their surfaces will be in slight relief as the screen wall goes around the end of the building.

The Project will also be replacing the roof materials for both the towers and the podium with new Polyvinyl Chloride ("PVC") membrane roof assemblies. All new roof membranes on the tower roofs and penthouses will be white. For the podium and terrace roofs and the boiler room penthouse on podium roof D, all new roof membranes will be tan to help reduce the anticipated glare bouncing up into the dorm rooms.

See Figure 3-2, Elevated Perspective; Figures 3-3 through 3-7, Perspective Views; Figure 3-8, Building Section and Figures 3-9 through 3-11, Elevations.

3.5 VIEWS

3.5.1 TOWER LEVELS

Historically, Warren Towers has had a significant presence in the immediate neighborhood of BU's Charles River Campus and along the western skyline of Boston. The proposed envelope upgrades to window-wall fenestration with metal panels will be visible on all four sides of the towers. The new character and color of the envelope upgrades will be most prominent on the broad expanse of the east and west façades of each tower along Commonwealth Avenue facing the direction of its traffic. The narrow fenestration and metal panels on the north and south tower façades will be reminiscent of the original construction in scale and proportion.

The tower penthouse renovations and new roof equipment platforms will not be any taller than the original elevator machine room. Although space on the existing tower roofs is very limited, the new roof structures and elements will be positioned as far as possible from Commonwealth Avenue and closest toward the Turnpike on all three tower roofs. This positioning is to minimize the visible presence of these alternations from Commonwealth Avenue. The scale of these roof structure alterations will be unremarkable when seen from a distance.

3.5.2 PODIUM LEVELS

The masonry repair improvements to the podium will be less noticeable than the envelope improvements proposed for the towers. Existing precast, fourth floor glazing, and first floor commercial/retail storefront glazing will remain and the current canopy covering the sidewalk along Commonwealth Avenue will be salvaged and reinstalled at the end of construction.

Accessibility into the building and existing commercial/retail spaces will be improved by proposed sidewalk reconstruction and improvements, and also at all points of egress from the building.

See Figures 3-3 through 3-7, Perspective Views.

3.6 OPEN SPACE AND LANDSCAPE MATERIALS

3.6.1 STREETSCAPE

The four-story podium and residential towers create a strong urban edge along the south side of Commonwealth Avenue. The 20-ft sidewalks along Commonwealth Avenue provide enough space for heavy pedestrian traffic and sidewalk amenities. Commercial/retail spaces on the first floor contribute to the street activity. The street edge is lined with newer growth Bradford Pear deciduous trees planted in tree pits, some with grates, and raised granite planters with a plant guard. An existing vaulted canopy hangs from the façade 10 ft above the sidewalk, projecting out over half the depth of the sidewalk, providing shelter to the commercial/retail entrances as well as backdrop for signage. The canopy is interrupted in the middle of the block at the three-story curtainwall entrance to Warren Towers. Within the approximately 8-ft wide furnishing zone along the Commonwealth Avenue block is a bus shelter, a 16-inch ("in") wide permeable paver edge, bicycle racks, a BLUEbikes station, signs, trash/recycling receptacles, City of Boston standard light fixtures, and seating.

3.6.2 LANDSCAPE

The Proponent proposes to protect and maintain the existing sidewalk amenities at Commonwealth Avenue including overhead canopy, raised planters, the bus shelter, benches, the BLUEbikes station, bicycle racks, Boston light standards, and trash/recycling receptacles. Trees will be protected with the exception of the removal and replacement of trees due to construction logistics, the expansion and addition of raised tree planters, and the removal of one tree from University property for the installation of a new electrical feed for the Project. Sidewalk pavement will be modified to resolve accessibility inconsistencies by adding a new raised planter consistent with the City of Boston standards and lengthening an existing one. One existing raised planter on Commonwealth Avenue will remain and be protected. The masonry infiltration strip at the granite curb will be maintained at a 16-in width to the limits existing on-site.

Construction implementation requirements and logistics will require the existing trees to be pruned or replaced with trees selected from the approved City of Boston tree list. All soil within the existing raised planters will remain and expanded in the extended or additional planters. Existing tree pits will be enlarged to match the tree pits and grates established to the east and include 550 CF of sand-based structural soils below the adjacent concrete sidewalk. Utilities and lights standards will remain in place during construction while signs, trash/recycling receptacles, benches, and the BLUEbikes station will be managed during construction and returned in kind to

the existing location. There will be 22 new bicycle racks with a capacity for 44 bicycles installed between Cummington Mall and Hinsdale Mall and properly placed from the curb, utilities, and vegetation improvements per the City of Boston Complete Streets Guidelines.

See Figure 3-12, Landscape Plan.

3.6.3 SEATING

The Proponent proposes to remove the existing seating along Commonwealth Avenue during construction and reinstall the seating within the new landscape after construction.

3.6.4 PHASING

During each phase of the construction, portions of the urban conditions will be replaced. The initial enabling phase is expected to take five months and each phase is expected to take 15 months with approximately three months of overlap between each phase.

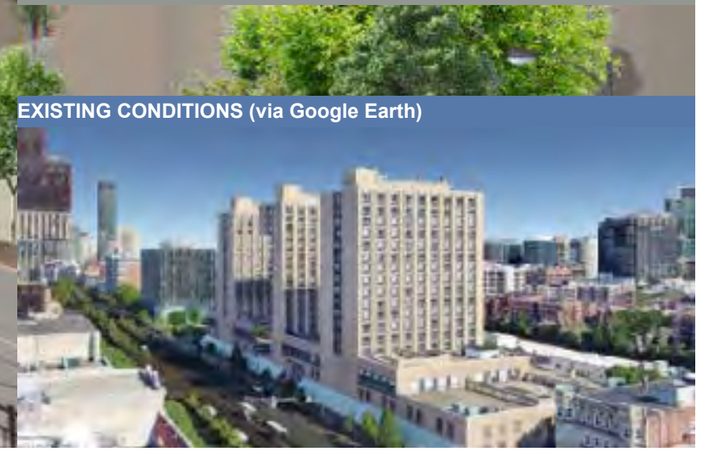
3.7 PEDESTRIAN ENVIRONMENT

The proposed work within the pedestrian environment is generally unchanged from existing conditions. Along the north face of the Project Site at Commonwealth Avenue is a 20-ft wide pedestrian realm composed of an 8-ft wide furnishing zone and a 12-ft wide pedestrian zone in accordance with the Complete Streets Guidelines. However, the public realm does not have a defined frontage zone because of the volume of activity at the building edge. The public realm is an active concrete paved sidewalk bordered by a furnishing zone that includes raised planters, bus shelter, trees in tree pits, multiple bicycle racks, a BLUEbikes station, trash/recycling receptacles, and benches. Heavy student pedestrian traffic flows in and out of the commercial/retail space and the Project Site's entry at the first floor, contributing to the activity and energy of the streetscape. The large canopy overhead protects pedestrians along this block from precipitation and also provides shade.

Figure 3-1
Neighborhood Context
Source: MDS Architects, 2023

EXISTING BRICK TO BE CLEANED AND RE-POINTED, BRICK REPAIRS TO MATCH EXISTING.

EXISTING CANOPY, SIGNAGE, AND 1ST FLOOR RETAIL GRAPHICS TO REMAIN



EXISTING CONDITIONS (via Google Earth)

Figure 3-2
Elevated Perspective
Source: MDS Architects, 2023

EXISTING CONDITIONS, MIDDAY

Boston, Massachusetts

Figure 3-3
Perspective Looking East
Source: MDS Architects, 2023

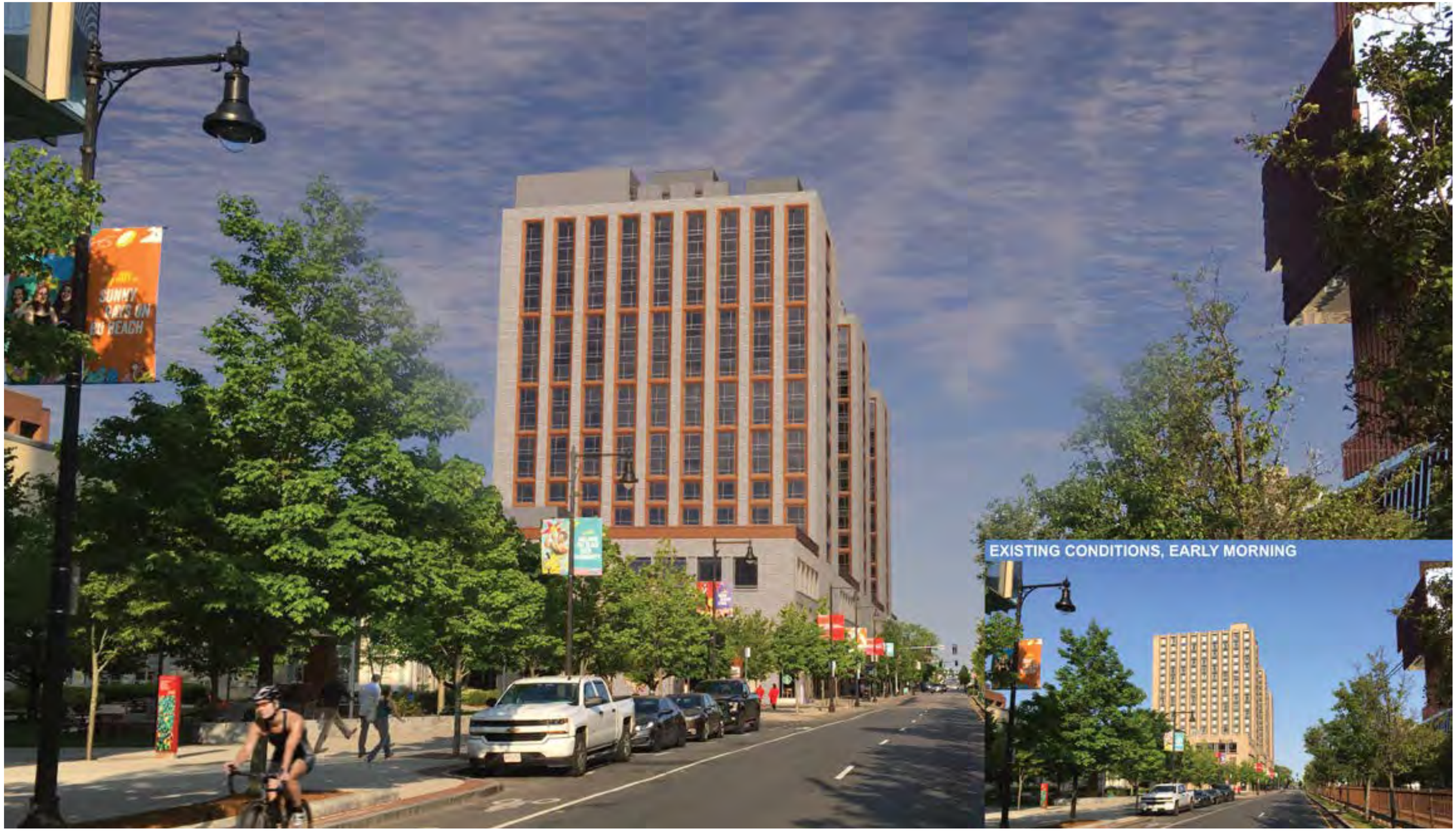


Figure 3-4
Perspective Looking West
Source: MDS Architects, 2023

Figure 3-5
Perspective Looking Southwest
Source: MDS Architects, 2023

Figure 3-6
Perspective Looking Northwest
Source: MDS Architects, 2023

Figure 3-7
Perspective Looking Southeast
Source: MDS Architects, 2023

Figure 3-8
Building Section
Source: MDS Architects, 2023

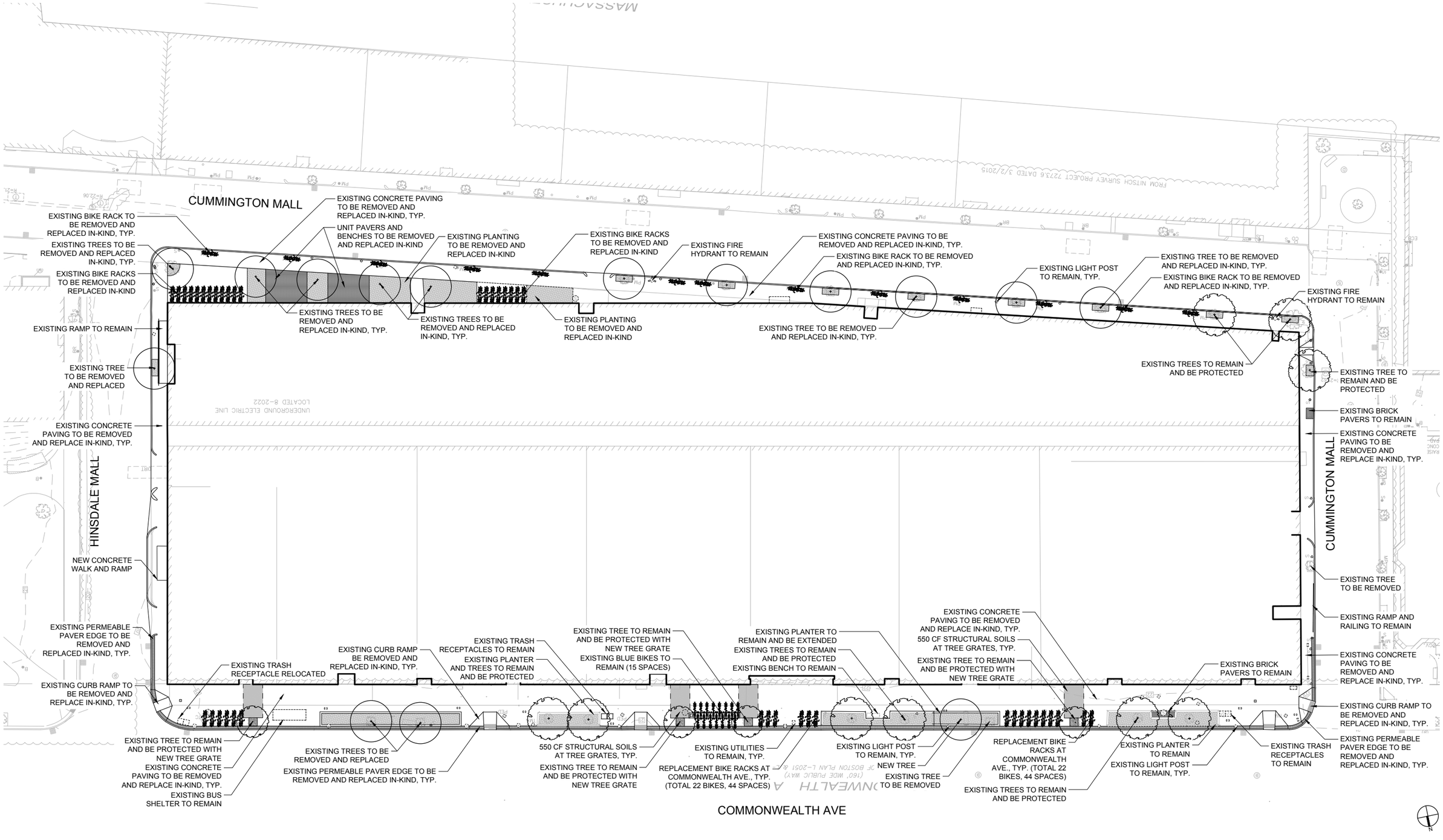
Figure 3-9
South Elevation
Source: MDS Architects, 2023

Figure 3-10
North Elevation
Source: MDS Architects, 2023

West Elevation

East Elevation

Figure 3-11
East and West Elevation
Source: MDS Architects, 2023



Boston, Massachusetts

Figure 3-12
Landscape Plan
Source: Copley Wolff Design Group, 2023

Chapter 4

SUSTAINABILITY

CHAPTER 4: SUSTAINABILITY

4.1 INTRODUCTION

The Project's sustainable design was guided by the BU CAP, which has five major commitments:

1. Prepare the University for the impacts from climate change that can no longer be avoided.
2. Reduce greenhouse gas emissions to operate the University to net zero by 2040 (including new growth).
3. Begin to track indirect emissions and develop a plan to reduce.
4. Integrate climate change into the University's education and research mission.
5. Integrate the CAP with the University's Strategic Plan.

As part of the CAP, the University established a Zero Waste goal that would divert 90% of operations and construction waste from landfills and incineration. The Zero Waste Plan, launched in 2021, is one of the most robust Zero Waste Plans for United States-based colleges and universities, and prioritizes the initiatives that are expected to have the greatest impact on reducing waste and increasing efficiency.

While the CAP is specific to BU, it has been developed in the context that climate change is a global problem which extends beyond the University's campuses. Implementing the CAP will elevate the University's position as a leader by addressing the challenges of climate change in its educational programs, research, operations, finance, and community engagement. Specific goals include:

- Achieve LEED Gold Certification for all new construction and major renovations,
- Reduce emissions by 31% by 2032 through energy efficiency,
- Match 100% of electricity use with renewables beginning in December 2020 through BU Wind, a Power Purchase Agreement ("PPA") for wind power in South Dakota, and
- Shift to fossil fuel-free heating and cooling.

The Project aims to reflect both BU's goals as stated above and the City of Boston's evolving sustainability performance aspirations and serve as an example of environmental stewardship. Initiatives of the Project include lowering energy consumption, reducing operational and embodied carbon, and minimizing water footprints.

4.2 ARTICLE 37/LEED COMPLIANCE

The Project will use the LEED rating system as a framework to measure the various sustainable features of the Project. This system is divided into the following categories: Integrative Process, Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere ("EA"), Materials and Resources, Indoor Environmental Quality, Innovation, and Regional Priority Credits ("RPC"). A variety of sustainable design strategies in each category will be pursued to target a minimum of Gold Certification, as provided in the University's CAP for construction projects of this size.

The Project will comply with the requirements of the City of Boston to address the current LEED v4. The USGBC recently released the beta version of the LEED v4.1 rating system which is intended to serve as an update to and improvement upon LEED v4. Recent guidance issued by the USGBC allows LEED v4 projects to substitute any prerequisite or targeted credit for the LEED v4.1 equivalent. Credits this Project intends to pursue using the LEED v4.1 criteria have been denoted with LEED v4.1 adjacent to the credit name within the ensuing credit narratives. The Proponent has used a LEED v4 Building Design + Construction: New Construction Checklist to illustrate that the Project is currently tracking 65 LEED points out of 110 available points. See Table 4-1, LEED Checklist and Attachment 2, LEED Project Scorecard. As the Project is in the early stages of the design process, there is potential to increase points as the design of the building evolves.

The Project will comply with Article 37 of the Boston Zoning Code, Boston's Green Building Regulations. The purpose of Article 37 is to ensure that major building projects are planned, designed, constructed, and managed to minimize adverse environmental impacts, conserve natural resources, prepare for climate change, promote a more sustainable city, and enhance the quality of life in Boston. The narrative below demonstrates that the Project is planned to be in compliance with Article 37. A completed Climate Resiliency Checklist can be found in Attachment 3. As the Project is in the early stages of the design process, some of these strategies are expected to evolve with the design of the building.

Table 4-1 LEED Checklist

	Y	M	N
Integrative Process	1	0	0
Location and Transportation	13	2	1
Sustainable Sites	6	2	2
Water Efficiency	5	2	4
Energy and Atmosphere	16	6	11
Materials and Resources	7	5	1
Indoor Environmental Quality	8	4	4
Innovation	6	0	0
Regional Priority	3	1	0
Total	**65**	**22**	**23**

4.2.1 INTEGRATIVE PROCESS

Credit 1: Integrative Process

The Project Team meets regularly to ensure team members from the various disciplines involved are all known to each other and collectively communicating. Sustainable design-focused workshops were held early in the design process to assist the team in establishing shared sustainable design and energy efficiency goals for the Project. This includes evaluations of both energy- and water-related systems, load reduction strategies, potential system downsizing opportunities, opportunities for non-potable water use, and any influenced adjustments to the Proponent's Project Requirements and/or the Basis of Design for the Project.

4.2.2 LOCATION AND TRANSPORTATION

The Project is located in the Fenway/Kenmore neighborhood of Boston, where it has ample access to public transportation, including the MBTA Green Line trolley via the B branch at the BU East station, the MBTA Green Line trolley via the C and D branches at the Kenmore station, MBTA Bus Route 57, and the MBTA Commuter Rail via the Framingham Line at Lansdowne Station. The local neighborhood provides a variety of services with pedestrian and cyclist access.

The Project earns points for Sensitive Land Protection, High Priority Site, Surrounding Density and Diverse Uses, Access to Quality Transit, and Reduced Parking Footprint.

Credit 2: Sensitive Land Protection

The Project is a renovation of an existing building, and therefore is located entirely on previously developed land within BU's Charles River Campus.

Credit 3: High Priority Site

The Project is located within a U.S. Department of Housing and Urban Development Qualified Census Tract ("QCT"). A QCT is an area in which 50% of households have incomes below 60% of the Area Median Gross Income and/or there is a poverty rate of 25% or more. It is also located in a Difficult Development Area ("DDA"), which have high land, construction, and utility costs relative to the area median income.

Credit 4: Surrounding Density and Diverse Uses (v4.1)

The Project Site is located on a dense urban college campus, with a surrounding community that includes many local amenities within a 0.5-mile walking distance.

Credit 5: Access to Quality Transit (v4.1)

The MBTA Bus Route 57 is within 0.25 miles of the Project Site. The BU East station serving the B branch of the MBTA Green Line, Kenmore station serving the C and D branches of the Green Line, and Lansdowne Station serving the Framingham Line of the MBTA Commuter Rail are all within 0.5 miles of the Project Site.

Credit 7: Reduced Parking Footprint (v4.1)

The Project is located on top of a four-story, from basement, parking garage. There are approximately 441 spaces in the garage, which equates to a reduction in parking footprint of over 40% from base parking ratios recommended by the Institute of Transportation Engineers' ("ITE") Transportation Planning Handbook.

4.2.3 SUSTAINABLE SITES

The Project has a limited scope as a renovation of an existing building. As only the towers and fourth floor are being renovated, there is very limited sitework included as part of this Project scope. Therefore, the Project's ability to earn points in this category is limited. At this stage in the Project development, the Proponent is committed to reducing the heat island effect through light colored surfaces and maintaining the existing parking garage along the rear of the building. Additional measures to restore habitat and manage rainwater are still being considered.

Prerequisite 1: Construction Activity Pollution Prevention

The Project's construction manager will submit and implement an Erosion and Sedimentation Control ("ESC") Plan for construction activities related to the renovation of the building. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2012 Environmental Protection Agency ("EPA") Construction General Permit in order to comply with this LEED prerequisite.

Credit 1: Site Assessment

The Project Team will complete a survey that includes the Project Site's topography and soil conditions, human use, and hydrology.

Credit 4: Rainwater Management

The Project will include a 50,000+ gallon stormwater storage tank that is sized to accommodate a 90th percentile storm event, meeting BWSC standards, equal to 1.25" of rainfall across the site. A total of 12 recharge wells will infiltrate the stormwater beneath the Project Site. All areas of the Project Site will be addressed within the stormwater management plan and will therefore meet the LEED requirement.

Credit 5: Heat Island Reduction

The Project's hardscape and roofing materials will be selected with compliant solar reflectance index ("SRI") values in order to lower the Project's impact on the heat island effect.

Credit 6: Light Pollution Reduction

As there is no exterior lighting associated with the scope of this Project, the Project will comply with the intent of the credit and earn a point.

4.2.4 WATER EFFICIENCY

To improve on-site water efficiency and reduce the burden on municipal water supply and wastewater systems, the Project will reduce potable water use for domestic use and eliminate irrigation needs. Both whole-building and selective end-use water metering will be installed in the Project, and low flow and high efficiency plumbing fixtures will be used to reduce the amount of potable water used throughout the building.

The Project earns points for Outdoor Water Use Reduction, Indoor Water Use Reduction, and Water Metering.

Prerequisite 1 / Credit 1: Outdoor Water Use Reduction

The Project will comply as the ground level landscape scope will not require permanent irrigation. This allows the Project to meet the prerequisite and earns two points for no permanent irrigation.

Prerequisite 2 / Credit 2: Indoor Water Use Reduction

Through the specification of low flow and high efficiency plumbing fixtures, the Project shall implement water use reduction strategies that use, at a minimum, 20% less potable water than the water use baseline calculated for the building after meeting Energy Policy Act of 1992 fixture performance requirements. The Project is currently targeting an overall potable water use savings of 35% from the calculated baseline use. A higher goal will be considered depending on the final fixture selection for Water Use Reduction by the Project Team.

Prerequisite 3 / Credit 4: Building-Level / Advanced Water Metering

The Project will include building-level water meters, the data from which will be shared with the USGBC for a minimum of five years. Additionally, water meters will be installed for at least two subsystems in the Project. The following metering is being considered for the project:

1. The team is looking into tenant metering for the tenant spaces.
2. DHW will be metered.
3. Water serving the dorm central laundry rooms will be metered.
4. Water serving the kitchen will be metered.
5. Water to each tower will be independently metered.

4.2.5 ENERGY AND ATMOSPHERE

The building systems will be designed to optimize energy performance and reduce energy consumption through high efficiency building systems. The Project Team will engage a building commissioning agent to ensure the proper installation and operation of systems. No chlorofluorocarbon ("CFC") based refrigerants will be used in order to avoid ozone depletion in the atmosphere. The HVAC system description is provided below.

The Proponent will engage a Commissioning Agent ("CxA") during the design phase to review the proposed design and ultimately confirm the building systems are installed and function as intended and desired.

The Project will earn points for Enhanced Commissioning and Optimize Energy Performance.

Prerequisite 1 / Credit 1: Fundamental/Enhanced Commissioning and Verification

A CxA has been engaged by the Proponent for purposes of providing full commissioning services for the building energy related systems including building envelope, HVAC and Refrigeration ("HVAC&R"), lighting, and DHW systems. The CxA will verify that the building systems are installed, calibrated, and perform to the Project requirements and basis of design. Additionally, the CxA will perform Commissioning activities for MEP and renewable energy systems. Ongoing monitoring-based commissioning will also be performed to assess the performance of energy- and water-consuming systems.

Prerequisite 2 / Credit 2: Minimum/Optimize Energy Performance

The Project's energy performance shall meet the minimum requirements of EAp2. For EAc2, project teams may use a pilot alternative compliance path ("ACP") (EApc95) for documenting savings under the EA Optimize Energy Performance Credit. The intent of this ACP is to allow project teams to use performance metrics other than cost for documenting performance improvement. The ACP requires project teams to calculate and report a metric from each of the required categories: Site Energy Cost, Source

Energy, Greenhouse Gas Emissions, and Time Dependent Valuation ("TDV") Energy, if available.

The average percent savings of the two highest-performing metrics, using equal weighting, is then used to determine percentage energy savings for the Project. Source energy reduction and greenhouse gas emission reduction metrics will be used to document savings under LEED.

Based on early energy analysis, the average percent savings for energy use reduction is estimated at 20%, which equates to 8 LEED points. The Project Team shall develop a whole building energy model to demonstrate the expected performance rating of the designed building systems.

HVAC System Description

Specific HVAC technologies and systems employed to achieve overall building sustainability and efficiency are listed below.

1. Highly efficient AWHPs to provide all electric cooling and electric heating down to 7°F outdoor temperature. Below this temperature electric boilers will provide the heating. No fossil fuels will be used by the HVAC system. One AWHP shall be provided for each tower, while two AWHPs shall condition the fourth floor.

2. Valance Units for Student Rooms– this hydronic based system for heating and cooling requires no fan motors or filters at the terminal units, to reduce operating and maintenance costs.

3. Dedicated Outside Air Systems ("DOAS") with Energy Recovery – 100% outside air processing air handlers will be utilized to heat, cool, and dehumidify the building fresh air before it is supplied to the toilet cores and student rooms. The DOAS units also ensure accurate outside air volumes are delivered. Systems capture waste heat and cooling from building exhaust systems by incorporating energy recovery wheels. The DOAS units will have service corridors for ease of maintenance as well as multiple fans for redundancy.

4. Variable volume AHUs will provide conditioning and kitchen hood make up for the fourth floor. The units shall have air side economizers and enthalpy energy recovery wheels. Bathroom exhaust goes through the energy recovery wheel. The units shall have service corridors for ease of maintenance and multiple fans for redundancy.

5. Variable Speed Drives will be provided for all major equipment.

6. Premium efficiency motors premium efficiency motors will be specified for HVAC pumps and fans.

7. All major HVAC components shall interface with the campus Building Automation System through BACnet IP.

Plumbing Description:

The DHW system will be served by AWHPs that generate energy for a process loop to a heat exchanger that generates DHW stored in tanks for peak demand periods. The AWHPs recover the stored water during low demand periods. The AWHP system is sized for 100% of the DHW demand with electric resistance coils for hot water circulation temperature maintenance.

Prerequisite 3: Building-Level Energy Metering

The building has utility primary metered electrical services. A customer-owned electrical metering system will be installed to monitor the building usage at substations. The data from the whole-building metering will be shared with the USGBC for a minimum of five years.

Prerequisite 4: Fundamental Refrigerant Management

No CFC refrigerants are used in any of the Project's air conditioning systems. The AWHP will use R-454b which has a low global warming potential rating. Split systems for tel-data rooms, and other spaces will use a refrigerant that will not contribute to Ozone depletion.

Credit 7: Green Power and Carbon Offsets

The Project will be all-electric. With the existing BU Wind project, 100% of the Project's energy use will be covered by renewable energy.

4.2.6 MATERIALS AND RESOURCES

A demolition and construction waste management plan will be implemented during the construction of the Project to divert at least 50% of waste material from at least three separate waste streams from entering landfills. Building materials that disclose environmental and health information will be specified. Building-occupant waste recycling will be supported throughout the building and managed through the University's recycling program.

The Project earns points for Building Life Cycle Impact Reduction, Construction and Demolition Waste Management, and Building Product Disclosure and Optimization Environmental Product Declarations, and Material Ingredients.

Prerequisite 1: Storage and Collection of Recyclables

The storage of collected recyclables shall be accommodated within the Project design, including options for hazardous material disposal (i.e., batteries and electronic waste). Occupants shall have dedicated areas located on each floor to bring their recyclables for storage and collection. The University's contracted waste management company shall collect recyclables on a regular basis.

Prerequisite 2 / Credit 5: Construction Waste Management (Planning) (v4.1)

The specification shall require that prior to the start of construction, the Construction Management team shall prepare and submit a Construction Waste Management Plan that shall be implemented on the Project Site. The Project Construction Manager shall endeavor to divert as much demolition debris and construction waste from area landfills as possible with a goal to achieve at minimum 50% diversion of three waste streams.

Credit 1: Building Life-Cycle Impact Reduction (v4.1)

The Project is currently tracking 60% reuse of existing structural elements and 50% reuse of interior non-structural elements with preliminary calculations. Final calculations need to be performed to confirm these estimates.

Credit 2: Building Product & Disclosure: Environmental Product Declarations (v4.1)

The Architect will work with the specifications writer and the Construction Manager to specify 20 products from five manufacturers with compliant Environmental Product Declarations.

Credit 4: Building Product & Disclosure: Material Ingredients (v4.1)

The Architect will work with the specifications writer and the Construction Manager to specify 20 products from five manufacturers with compliant Health Product Declarations or similar.

Credit 5: Construction and Demolition Waste Management (v4.1)

The Project will track construction and demolition waste throughout the construction process to divert at least 50% of waste from landfill.

4.2.7 INDOOR ENVIRONMENTAL QUALITY

The comfort and well-being of the building occupants will be paramount in regard to indoor air quality, access to light, and thermal comfort. An Indoor Air Quality Management Plan will be implemented during construction to enhance the well-

being of construction workers and to promote a better indoor environment for building occupants. Low-emitting materials will be employed throughout the building to reduce the quantity of indoor air contaminants and promote the comfort and well-being of installers and building occupants.

The Project earns points for Enhanced Indoor Air Quality Strategies, Low Emitting Materials, Construction Indoor Air Quality Management Plan, Thermal Comfort, and Interior Lighting.

Prerequisite 1: Minimum Indoor Air Quality Performance

The toilet cores and student rooms will be ventilated by a dedicated, 100% DOAS with energy recovery in accordance with the flow rates prescribed by ASHRAE 62.1-2016. The DOAS unit would be constant volume with its airflow rate set during balancing. Current transducers on the fans will confirm airflow to the Building Management Systems ("BMS").

The air handlers serving the fourth floor will have their outdoor air volumes set to the greater of the requirements of ASHRAE 62.1-2016 or that required for kitchen exhaust make up. Air flow measuring stations on the fans, which is required for variable volume systems will confirm airflow to the BMS.

Prerequisite 2: Environmental Tobacco Smoke Control (v4.1)

The Project shall be non-smoking. Additionally, smoking shall be prohibited within 25 ft of all building openings and air intakes. Signage will be located within 10 ft of all entrances to inform building occupants.

Credit 1: Enhanced Indoor Air Quality Strategies

The Project will pursue both options for this credit. The following considerations will be made: Entryway Systems, Interior Cross-Contamination Prevention, and Filtration. Carbon dioxide ("CO_2") Monitors will be installed in each densely occupied space to comply with the second option for the credit.

The HVAC system meets the requirements for Option 1 of this credit. Janitor's closets are kept under negative pressure by being exhausted at a rate greater than 0.50 cfm/ft^2 of floor area while not being directly supplied. The DOAS units and fourth floor air handlers described above have MERV 14 final filters which is greater than the credit's requirement of MERV 13. CO_2 monitors with audible and visual alarms will be installed in each student lounge and each densely occupied area on the fourth floor.

Credit 2: Low-Emitting Materials (v4.1)

The specifications shall include requirements for at least three of the following categories to meet low emitting and volatile organic compounds ("VOC") criteria: adhesives and sealants, paints and coatings, flooring, composite wood, ceilings, wall panels, insulation, and furniture. The Project Construction Manager will be required to track all products used to ensure compliance.

Credit 3: Construction Indoor Air Quality Management Plan

The specifications shall require the Project Construction Manager to develop an Indoor Air Quality Management Plan for the construction and pre-occupancy phases of the Project to meet/exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association ("SMACNA") Indoor Air Quality ("IAQ") Guidelines for Occupied Buildings Under Construction 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

Credit 5: Thermal Comfort

All occupied spaces within the Project will be mechanically heated and air conditioned. The requirements of ASHRAE Standard 55-2017 will be met. Each student room shall have an individual thermostat and/or operable window. Multi-occupancy spaces on the fourth floor shall have group thermal comfort controls (i.e., thermostats).

Credit 6: Interior Lighting

The lighting system will be designed by the lighting consultant, but the lighting control system will be installed to reduce energy consumption by installing smart lighting panels along with occupancy sensors, vacancy sensors, photocells, time clock, and local manual dimmers and switches.

Credit 8: Quality Views

The Project will comply by providing a direct line of sight to the outdoors via vision glazing for over 75% of regularly occupied spaces. Occupants will have views of the sky and objects over 25 ft away.

4.2.8 INNOVATION

Credit 1.1: Exemplary Performance for Heat Island Reduction

The Project will achieve both Options 1 and 2 by installing a high reflectance roof and locating all parking under cover.

Credit 1.2: Purchasing- Lamps

The Project shall design the lighting to reduce the average mercury content of purchased lamps below 35 picograms per lumen hour or eliminate the use of mercury-containing lamps altogether. The credit requires that the Project demonstrate a reduction of mercury content in mercury-containing lamps to 35 picograms per lumen hour or less.

Credit 1.3: O + M Starter Kit

The Proponent shall implement a campus standard Green Cleaning Policy that covers green cleaning procedures, materials, and services that are within the building and site management's control and includes the organization responsible for cleaning the building and building site. Additionally, the Proponent will institute an Integrated Pest Management Program that includes measures for investigation, evaluation, and low-risk, alternative methods for pest management before moving to consider higher risk methods. In the event that high-risk methods of pest control are necessary, the Program will ensure notification of all building occupants prior to utilization.

Credit 1.4: Exemplary Performance for Environmental Product Declarations

The Architect will work with the specifications writer and the Construction Manager to specify at least 40 products from five manufacturers with compliant Environmental Product Declarations.

Credit 1.5: Pilot Credit Integrative Analysis of Building Materials

The Project shall specify and install at least three permanently installed products within the building that have a documented qualitative analysis of the potential health, safety, and environmental impacts of the product in five stages of the product's life cycle. Qualitative analysis will meet the requirements of this Pilot Credit.

Credit 2: LEED Accredited Professional

Multiple LEED AP's are on the Project Team and shall continue to provide administrative services to oversee the LEED credit documentation process.

4.2.9 REGIONAL PRIORITY

RPC are established LEED credits designated by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project for up to four total points. RPCs applicable to the Project's location include: LTc3 High Priority Site (2-point threshold), SSc4 Rainwater Management (2-point threshold), WEc2 Indoor Water Use Reduction (4-point threshold), EAc2 Optimize Energy Performance (8-point

threshold), EAc5 Renewable Energy Production (2-point threshold), and MRc1 Building Life-Cycle Impact Reduction (2-point threshold). This Project currently holds two RPCs as "Yes," as described in the sections above:

- MR Credit 1: Building Life-Cycle Impact Reduction
- EA Credit 2: Optimize Energy Performance

4.2.10 BOSTON GREEN BUILDING CREDITS

The Boston Green Building Credits were established in Appendix A to Article 37 as Boston-specific credits that can contribute a point toward a project's LEED "Certifiable" point total. One point may be awarded for each of the following four categories: Modern Grid, Historic Preservation, Groundwater Recharge, and Modern Mobility. The Project does not intend to pursue these optional credits to supplement the Project's LEED point total, given that the Project already comfortably shows enough points to demonstrate LEED Certifiability at a Gold level.

4.3 SUSTAINABLE DESIGN

Several sustainable design measures have been incorporated into the Project to address sustainability best practices and climate resiliency.

4.3.1 SUSTAINABLE PRACTICES

The Project design team has been working to ensure that the Project conserves as much water as possible using low-flush and low-flow fixtures and saves as much energy as possible through increasing the efficiency of the Project's mechanical systems. Additionally, by renovating an existing building, the life cycle impacts of the Project are greatly reduced.

To ensure a healthy living environment for residents, the Project is committed to using materials with disclosed ingredients and is striving to optimize the quality of the indoor environment.

4.3.2 CLIMATE RESILIENCY

Additional measures will be implemented on the Project to address various conditions brought on by climate change. These include optimizing heating and cooling load conditions and using passive and alternative energy building system strategies to reduce the overall energy consumption of the Project. Please see Attachment 3 for the Climate Resiliency Checklist.

4.4 CLEAN AND RENEWABLE ENERGY PRACTICES

The Proponent and Project Team have evaluated multiple potential clean and/or renewable strategies for the Project, however because of the renovation scope, there are limited feasible options for clean and renewable energy to be included.

The Project Team evaluated building-integrated ("BI") photovoltaics ("PV") early in the design process. The application of BIPV for the Project was deemed infeasible based on performance and cost implications.

The Project will incorporate "solar readiness" at all areas of new roof structures for future provision of roof-mounted PV. Portions of the existing-to-remain roof structure that cannot accommodate the additional load have been identified to ensure future provision of PV is sited properly.

BU purchases renewable energy certificates ("REC") for 100% of the campus' electricity use through a Renewable Energy Purchase Agreement from Triple H Wind Project, LLC. The purchase agreement covers 100% of all electricity used by the University for a period of 15 years. Additionally, the contract ensures that all RECs purchased as part of this agreement will be Green-e Energy certified.

4.5 ENERGY EFFICIENCY ASSISTANCE

The University has previously engaged with a Memoranda of Understanding ("MOU") with National Grid and Eversource to reduce natural gas and electricity consumption on campus. The Project Team will discuss incentive programs with the utility as design progresses and will meet to discuss potential energy conservation measures for the Project, as available to the Project Team.

Chapter 5

ENVIRONMENTAL

CHAPTER 5: ENVIRONMENTAL

5.1 INTRODUCTION

The Project has been thoughtfully designed to consider and improve the environmental conditions of the Project Site. The building will be renovated and operated in full compliance with local, state, and federal environmental regulations, and will not create undue solar glare, noise, or air quality impacts in the surrounding areas. An appropriate Construction Management Plan ("CMP") will be prepared and approved by the City prior to commencement of construction to avoid and mitigate any construction period impacts.

By adhering to environmental regulations, and implementing thoughtful construction and operational practices, the Project demonstrates its commitment to minimizing its ecological footprint and maintaining the environmental well-being of the surrounding community and ecosystem.

5.2 SOLAR GLARE

The BPDA Development Review Guidelines require projects undergoing Article 80B Large Project Review to analyze the potential impacts from solar glare on the following areas in order to identify the potential for visual impairment or discomfort due to reflective spot glare:

- Potentially affected key roadways;
- Public open spaces; and
- Pedestrian areas.

Furthermore, projects must consider the potential for solar heat buildup in any nearby buildings receiving reflective sunlight from the project, if applicable. A summary of the potential impacts from Project-related solar glare is presented below.

As the Project is a renovation of an existing building rather than a new structure, an experience-based design review was undertaken. See Attachment 4**,** Solar Reflection Review, to understand the potential for the modifications to the building envelope to significantly change the reflection characteristics of the building.

5.2.1 VISUAL REFLECTION POTENTIAL

While the windows will be updated, the current basis of design glazing is likely comparable in visible reflectivity to what exists currently. Further, the inset nature of

the windows will create a degree of self-shading. The remainder of the façade is not expected to be reflective to a significant degree.

The limited fenestration on the north and south elevations, along with the above discussed features make problematic reflections from these elevations onto nearby roads and MBTA Green Line tracks less likely. Eastbound drivers on the Turnpike may experience reflections from the east elevation of Tower A in the mornings and westbound drivers may experience reflections from the west elevation of Tower C in the evenings. However, the existing buildings between the Project and the Turnpike likely limit the potential to an extent. Car and MBTA Green Line drivers on Commonwealth Avenue will not have the same level of obstruction from buildings, though the street trees will potentially reduce the potential for glare when they have foliage.

Further, as the proposed renovations do not increase the reflective area of the towers and the visible reflectance of the glazing is likely similar, the reflections from the renovated towers are unlikely to be significantly different from the existing condition.

5.2.2 THERMAL REFLECTION POTENTIAL

The high-efficiency basis of design glazing is likely significantly more reflective to the sun's infrared energy than what is currently installed. However, other projects in Boston have used similar glazing, and for cases like the Project where the building geometry does not act to focus reflections, no significant thermal impacts have been seen. As such, significant thermal impacts from the Project are unlikely. Further, the aspects of the design that reduce the potential for visual impact are also expected to reduce the potential for thermal impacts.

5.3 AIR QUALITY

This section provides a qualitative review of potential air quality sources and impacts from the Project. Air quality impacts from construction operations are addressed in Section 5.9.5, Construction Air Quality. Wind tunnel exhaust dispersion modelling was completed to assess air quality conditions related to exhaust and intake design and can be found in Attachment 5, Exhaust Dispersion & Design.

5.3.1 EXISTING AIR QUALITY

Existing air quality at the Project Site is consistent with urban conditions. The presence of the Charles River and other open space provides some amelioration of impacts from stationary and mobile sources in the vicinity of the Project Site.

5.3.2 PARKING SOURCES

The existing building currently contains a parking garage on four levels (one sub-subterranean) with a capacity for 471 vehicles. The Project will eliminate 30 of these parking spaces resulting in a net reduction of air quality impacts from parking sources.

The Project also aims to encourage bicycle use and further reduce parking demand.

The Proponent's robust Transportation Demand Management ("TDM") program, combined with the Project's proximity to the MBTA Green line and bus lines, indicates that air pollution from vehicle sources will be minimized.

5.3.3 TRAFFIC SOURCES

During a typical day, there is not expected to be a significant change in the level of service of surrounding intersections after the Project is open given the Project's proximity to public transit and bicycle orientation. See Chapter 7, Transportation, for a full description of existing and proposed transportation conditions.

TDM strategies are a significant component of the Project and are anticipated to assist in minimizing adverse air quality impacts. As further described in Section 7.5, Transportation Mitigation Measures, the Project will utilize the following TDM initiatives to encourage employees, residents, and visitors to access the Project Site via alternative means of transportation that have less impacts on the overall air quality for the Project:

- Promote public transit and dissemination of transit information;
- Provide a ride-matching service for car and van pools;
- Provide secure, indoor bicycle storage for employees and students; and
- Provide publicly accessible outdoor bicycle storage for the Project's visitors.

5.3.4 BUILDING OPERATION SOURCES

This section provides a summary of the exhaust dispersion study conducted by RWDI USA LLC ("RWDI") to evaluate Project exhaust sources and the potential for air quality impacts at air sensitive receptor locations.

Methodology

The assessment was accomplished by performing detailed tracer gas wind tunnel dispersion modeling on a scale model of the Project and surroundings.

The focus of RWDI's assessment was the proposed 1,000 kW diesel generators, one located on the penthouse level of Towers A, B, and C, and the proposed replacement kitchen exhaust fans located on podium roof A and B. Exhaust impacts from these sources are expected to be most significant at receptors (air intakes and operable windows) on the Project itself, rather than at any of the existing surrounding buildings.

FINDINGS: Proposed Diesel Generator Exhausts

Both pollutant and odor emissions from the generator exhausts were considered. The recommended pollutant (health-based) threshold was met up to the maximum operating condition of three generators running at 100% load. The generators are therefore expected to meet applicable state and federal health-based air quality standards. The exhaust dispersion assessment determined there is some risk for re-entrainment of diesel odors at the Project Site during infrequent winds. Strategies to reduce the overall risk of odor impacts from the diesel generators are being evaluated.

FINDINGS: Proposed Kitchen Cooking Hood Exhausts

The exhaust dispersion assessment determined there is a risk of kitchen/cooking odor re-entrainment at various air sensitive receptor locations on the Project Site, particularly on and close to the podium roof level. The inclusion of filtration to remove odors has already been incorporated into the AHUs on the podium roof. The Project Team is evaluating potential mitigation options (i.e., filtration in other AHUs and/or on the exhaust) to reduce the overall risk of odor re-entrainment.

5.4 NOISE

The Project will be designed for compliance with applicable community noise emission regulations. These include the noise regulations outlined by the Massachusetts Department of Environmental Protection ("MassDEP"). These regulations apply to noise produced by the mechanical and electrical equipment serving the building.

The City of Boston noise regulations define fixed limits for noise emissions to adjacent residential zoned properties as 60 decibels A ("dBA") during daytime hours, 7:00 AM to 6:00 PM, Monday through Saturday and 50 dBA during all other times.

The MassDEP noise policy defines noise pollution by the condition resulting when the broadband sound level is increased by more than 10 dB above ambient levels or when noise emissions produce a pure tone condition where the sound pressure level in one octave band exceeds the levels in the two adjacent bands by 3 dB or more. The ambient sound level at the Project Site, which defines the MassDEP broadband limits, was determined by a community noise survey conducted by Acentech, Inc. in December 2022, which is summarized in a Community Noise Survey report dated January 6, 2023, included as Attachment 6.

The Community Noise Survey found that the quietest daytime hour at each representative measurement location at/near the Project Site ranged from 58 dBA to 64 dBA, and the quietest nighttime hour ranged from 55 to 56 dBA. The existing ambient sound levels alone exceed the City of Boston noise regulation limits for daytime and nighttime hours, which is common for urban locations, such as this.

The nearest adjacent lots are all owned by the Proponent. For similar institutional projects, stakeholders have elected to forego or relax local regulation requirements for noise emitted to/from facilities that are property of the same institution, particularly when none of the nearest adjacent lots are residences. None of the lots directly adjacent to the Project Site are residences. When implemented, a broadband sound level limit of 65 dBA is a standard approach for internal noise emission limits to non-residential academic building lots. A 65 dBA limit is consistent with the property line noise limits as defined by the MassDEP policy per the Community Noise Survey results.

The Project is subject to unique challenges in achieving compliance with the City of Boston fixed limits for residential zoned properties in a manner that is compatible with the operational and airflow requirements of the planned building utility equipment. Due to these challenges and the high existing site noise levels, a revised sound level limit of 65 dBA for community noise emissions to neighboring, non-residential, University-owned lots has been proposed and is currently under consideration. Pending approval, the applicable community noise emission limit will be set to 65 dBA at the nearest lots.

The majority of new mechanical equipment associated with the Project will be located on the roofs of each tower and the podium roofs. The primary anticipated noise-producing equipment includes DOAS units, AWHPs, and generators on the tower roofs, DHW pumps, exhaust fans, AHUs, and an electrical load bank on the podium roofs. This equipment and its associated ductwork and surrounding construction will feature sound attenuation measures, which will be necessary for meeting the 65 dBA property line sound level limit, per MassDEP requirements. These measured include:

- Outside-air and exhaust-air attenuators at the DOAS unit inlets and outlets;
- Compressor wraps and extended stack attenuators at the AWHPs;
- Walk-in enclosures for generators;
- Outside-air and exhaust-air attenuators at the podium roof AHU inlets and outlets; and
- A sound barrier wall surrounding the podium roof equipment with a sound absorbing finish on the interior (equipment facing) side.

5.5 FLOOD ZONES

According to the most recent Federal Emergency Management Agency ("FEMA") Flood Insurance Rate Map ("FIRM") Number 25025C0076G, dated September 25, 2009, the Project Site is not within a flood zone. See Figure 5-1, FEMA FIRM; 25025C0076G. The Project Site is outside of the area associated with Future Sea Level Rise in accordance with Article 25A of the Boston Zoning Code.

5.6 WATER QUALITY

Domestic water service will be provided to the building by BWSC. No aquifers or drinking water wells are located near the Project Site.

5.7 GROUNDWATER

Data obtained from monitoring wells in the area indicate that groundwater levels range from Elevation ("El.") 8 to El. 10 Boston City Base ("BCB")

The proposed building improvements do not include below-grade building construction. Some excavations in limited areas may be conducted below the groundwater level in connection with utility work or other work shown on the Civil Drawings. The dewatering performed in these limited excavations will be for construction only, no permanent dewatering features are planned to be installed. The Project will have no long-term groundwater pumping.

See Section 6.4 for additional details on stormwater recharge.

5.8 GEOTECHNICAL

5.8.1 SUBSURFACE SOIL CONDITIONS

Based on available information in the area, the general soil conditions are listed below from the ground surface down.

Table 5-1: Project Site Soil Profile

Generalized Description	Approximate Elevation of Top of Layer (ft, BCB)
Fill	12 – 15
Organics	5 – 8
Sand	15 – 20
Clay	150+

The top of bedrock is located approximately 200 ft below the ground surface.

5.8.2 BELOW GRADE DESIGN AND CONSTRUCTION

All of the below grade improvements (e.g., catch basins, pipes, tanks) planned outside the building footprint area will be soil supported. The existing building is supported on deep caissons. Any improvements inside the existing building will be supported on the existing deep caisson foundations.

Some excavations in limited areas (e.g., for a catch basin or manhole) may extend below the groundwater table (approximately 10 ft or more below grade). In these areas, excavation support systems such as timber sheeting or trench boxes will likely be used for excavation support.

If temporary dewatering is required during construction, the groundwater will be locally recharged into the ground or a National Pollutant Discharge Elimination System ("NPDES") permit for temporary construction dewatering will be obtained for discharge of dewatering effluent.

5.8.3 SOLID AND HAZARDOUS WASTE

In the future, it is planned to obtain site specific information regarding environmental conditions of excavated soils destined for off-site disposal to evaluate for the presence of oil and hazardous materials. Utility installations and other planned civil work will generate soil requiring off site transport. Chemical testing of the material will be required by receiving facilities if the soil is disposed off-site to identify chemical constituents and any contaminants present. Chemical testing of the material will be conducted prior to construction in accordance with facility requirements.

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

5.9 CONSTRUCTION IMPACTS

The following section describes impacts likely to result from the Project's construction and steps that will be taken to avoid or minimize environmental and transportation-related impacts. The Proponent has employed a Construction Manager who is responsible for developing a CMP and for coordinating construction activities with all appropriate regulatory agencies. See Attachment 7, Construction Logistics Plan. The approved CMP will address potential construction impacts in detail.

5.9.1 CONSTRUCTION MANAGEMENT PLAN

The Proponent will comply with applicable state and local regulations governing construction of the Project. The Proponent will require that the Construction Manager comply with the CMP developed in consultation with, and approved by, the Boston Transportation Department ("BTD") prior to the commencement of construction. The Construction Manager will be bound by the CMP, which will include detailed information about construction activities, specific construction mitigation measures, construction materials, and access and staging area plans to minimize the impact on the surrounding neighborhood and pedestrian environment. The Proponent understands the challenges of managing construction activities in this urban/academic context and has extensive experience with the necessary precautions.

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

5.9.2 CONSTRUCTION ACTIVITY SCHEDULE

The construction period for the Project will take place in three phases and is expected to last approximately 44 months, anticipated to begin in the December 2024 and end in August 2028. The Project will have an accelerated activity schedule with some shift work in the off-hours, in order to mitigate construction impacts. The City of Boston Noise and Work Ordinance allows construction from 7:00 AM to 6:00 PM, Monday through Friday, along with any approved exceptions. In order for the Project to comply with this ordinance and construct outside of the normal 7:00 AM to 6:00 PM weekday hours, the Proponent will seek a permit from the Commissioner of the Boston Inspectional Services Department ("ISD").

Project phasing will allow for construction activities in one tower of the Project Site to coincide with student habitation in the remaining two towers. This phasing will also allow for continuous use of the building's podium levels during the academic year. During each phase, the portion of the Project Site being worked on will be isolated and buffered in order to ensure that students residing in other portions of the building will experience minimal disruption. The Project phasing will allow for significantly less student displacement throughout the construction term than if the entire Project Site were under construction simultaneously. Those students who will be displaced will be housed in a University-managed facility at the Fenway campus. See Attachment 7, Construction Logistics Plan.

5.9.3 CONSTRUCTION TRAFFIC IMPACTS

Potential truck routes have been proposed to minimize traffic impacts. Specific truck deliveries and routes will be confirmed with BTD through the CMP. Construction contracts will include clauses restricting truck travel per BTD requirements.

From May 2025 to August 2025, construction traffic will take a right turn onto Blandford Mall from Commonwealth Avenue, and then take a right onto Cummington Mall while Hinsdale Mall is closed for utility work, however, the main access to the parking garage from Hinsdale Mall will remain open to traffic. From September 2025 to August 2028, construction traffic will take a right turn onto Hinsdale Mall from Commonwealth Avenue.

See Figure 5-2, Alternative Delivery Routing, May 2025 - August 2025 and Figure 5-3, Construction Delivery Routing, December 2024 – May 2025 and September 2025 - August 2028.

5.9.4 CONSTRUCTION WORKER PARKING AND STAGING

The number of workers required for the construction of the Project will vary depending upon the stage of construction. The Construction Manager will be responsible for educating all construction workers about public transit options and encouraging the use of High Occupancy Vehicles ("HOVs"). As part of the program to promote public transportation, the following mitigation measures will be implemented:

- No personal vehicles will be allowed to park at or in the vicinity of the Project Site;
- Jobsite personnel will be encouraged to utilize public transportation. Due to the proximity of the MBTA Green Line and Kenmore Station, a substantial level of public transportation use is anticipated by workers;
- Post transit schedules and maps at the jobsite;
- Lock-up facilities for work tools will be provided to make public transportation more convenient and desirable for workers; and
- Terms and conditions related to workforce parking and public transportation use will be written into each subcontract.

These measures will be incorporated into the CMP for the Project, which will be reviewed by the BTD prior to commencement of construction activities.

Should some of the workers choose to drive to the Project Site, there is available parking at off-street, commercial parking lots owned by the University. The lots are pay-on-entry facilities and are not currently fully utilized during the week. Because the construction workforce will arrive prior to AM peak traffic period and depart prior to the PM peak period, these trips are not expected to have an appreciable impact on the local transportation system.

5.9.5 CONSTRUCTION AIR QUALITY

Due to the nature of the Project, the proposed construction is not expected to generate significant fugitive dust. Some construction activities may generate fugitive dust, which will result in a localized increase of airborne particle levels. Fugitive dust emission from construction activities will depend on such factors as the properties of the emitting surface (e.g. moisture content), meteorological variables, and construction practices employed.

To reduce emission of fugitive dust and minimize impacts on the local environment the Construction Manager will adhere to a number of strictly enforceable mitigation measures. These measures may include:

- Using wetting agents to control and suppress dust from construction debris;
- Ensuring that all trucks traveling to and from the Project Site, including those with construction materials or debris, will be fully covered;
- Removing construction debris regularly;
- Monitoring construction practices closely to ensure any emissions of dust are negligible; and
- Cleaning streets and sidewalks to minimize dust and dirt accumulation.

5.9.6 CONSTRUCTION NOISE IMPACTS

Intermittent increases in noise levels will occur in the short-term during construction. Construction work will comply with the requirements of the City of Boston noise ordinance. This issue will be carefully addressed to ensure that any construction related noise will not adversely impact student residences or the surrounding academic and research buildings.

The proposed construction process for the Project will be designed around the constraints at the Project Site. Construction will occur during the daytime hours as defined by Boston Noise Regulations, 7:00 AM to 6:00 PM except Sundays. In some instances, second shifts may be required. When these events arise, all required

permits will be in place and the Department of Neighborhood Services will be notified.

Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures will include:

- Scheduling work during daytime hours;
- Initiating a proactive program for compliance with the City of Boston's noise limitations;
- Scheduling construction activities so as to avoid the simultaneous operation of the noisiest construction activities and reduce peak noise levels;
- Select the quietest practical items of equipment (electric instead of diesel powered equipment);
- Turning off all idling equipment; and
- Locating noisy equipment away from abutters; and shielding the noise generator by distance or enclosure.

5.9.7 SEDIMENT CONTROL MEASURES

During construction, erosion and sediment control measures will be implemented to minimize the transport of Project Site soils to off-site areas and the BWSC storm drain system. The existing catch basins will be protected with filter fabric or silt sacks to remove sediment from runoff. These controls will be inspected and maintained throughout the construction phase until all areas of disturbance have been stabilized through the placement of pavement, structure, or vegetative cover.

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

- Soil will not be stockpiled at the Project Site;
- Erosion controls will be maintained and replaced as necessary to ensure their effectiveness;
- Where necessary, temporary sedimentation basins will be constructed to prevent the transport of sediment off-site and silt sacks will be installed and maintain in existing catch basins drainage basins; and
- Measures to control dust will be implemented during excavation – all debris will be properly contained on the Project Site.

5.10 RODENT CONTROL

Construction and demolition activities can disturb rodent habitat, eliminating food, shelter, and movement routes. Since the Project involves renovations of existing conditions, the proposed construction activity is not expected to increase rodent activity in the vicinity. Rodent inspection, monitoring, and treatment in compliance with the City's requirements will be carried out before, during, and at the completion of all construction work for the Project.

5.11 WILDLIFE HABITAT

No federal, state, or local wildlife habitat has been identified on the Project Site.

5.12 HISTORIC AND ARCHAEOLOGICAL IMPACTS

BU is committed to maintaining and enhancing the value of historic resources on and around the BU Charles River Campus. The Proponent has invested significant resources in rehabilitating and preserving its historic buildings and has carefully introduced contemporary designs in new construction where appropriate.

In addition to identifying any historic resources located on the Project Site, an Area of Potential Effect ("APE") of one-quarter mile has been analyzed for the purpose of identifying historic resources in the vicinity of the Project Site. The potential project-related impacts on historic resources within the vicinity of the Project Site are discussed in the sections below.

5.12.1 HISTORIC INVENTORY IN THE VICINITY OF THE PROJECT SITE

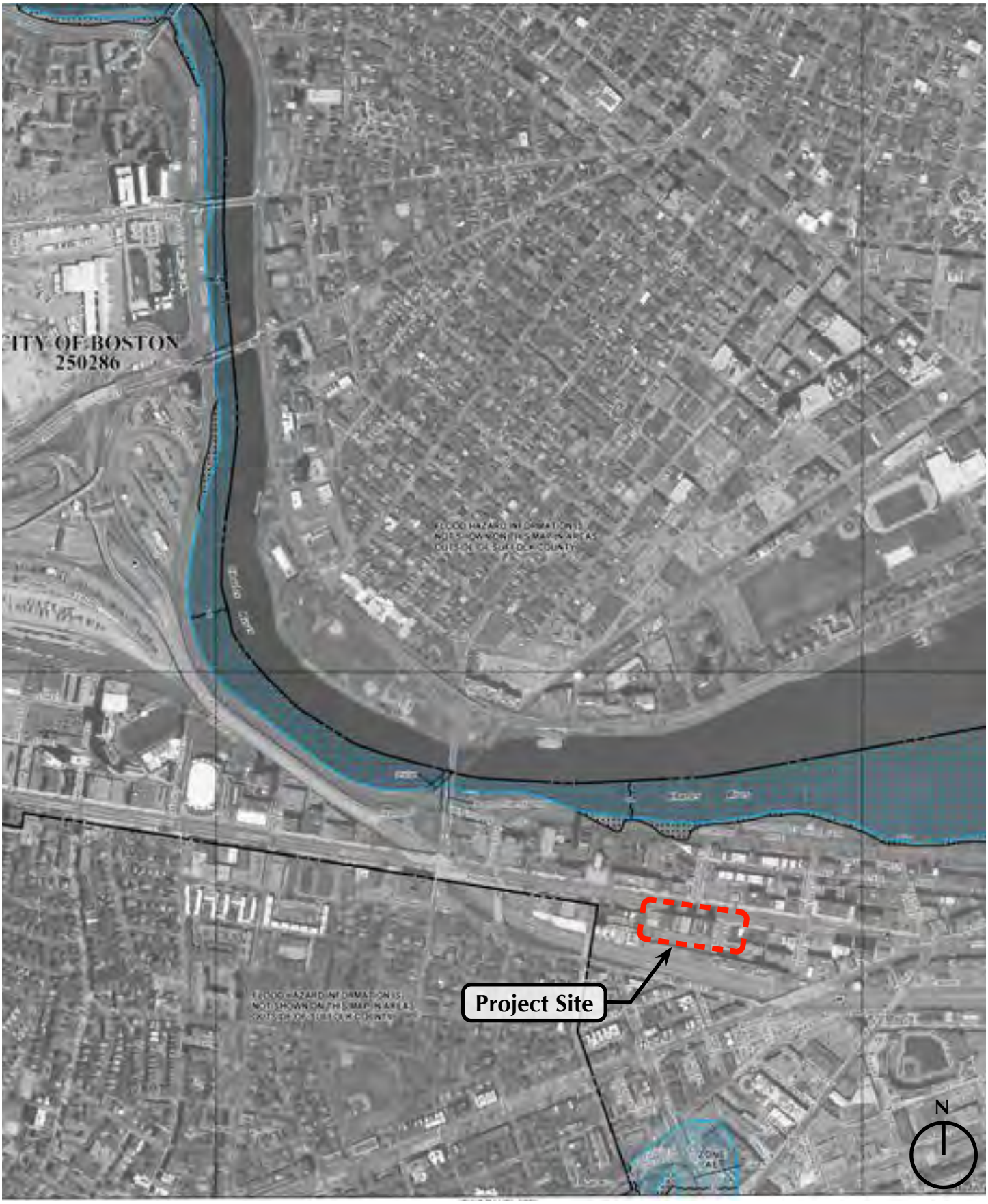
The Project Site does not contain any known structure, site, or building listed or potentially eligible for listing on the National Register of Historic Places or the State Register of Historic Places. The Project Site is not within a National Register Historic District, nor is it within a historic district that has been identified as potentially eligible for the National Register.

A review of the Massachusetts Historical Commission ("MHC") inventory within the APE revealed 10 historic districts and 236 historic properties within the APE. See Figure 5-4, Historic Resources and Attachment 8, Historic Resources in the APE.

5.12.2 HISTORIC RESOURCES ASSESSMENT

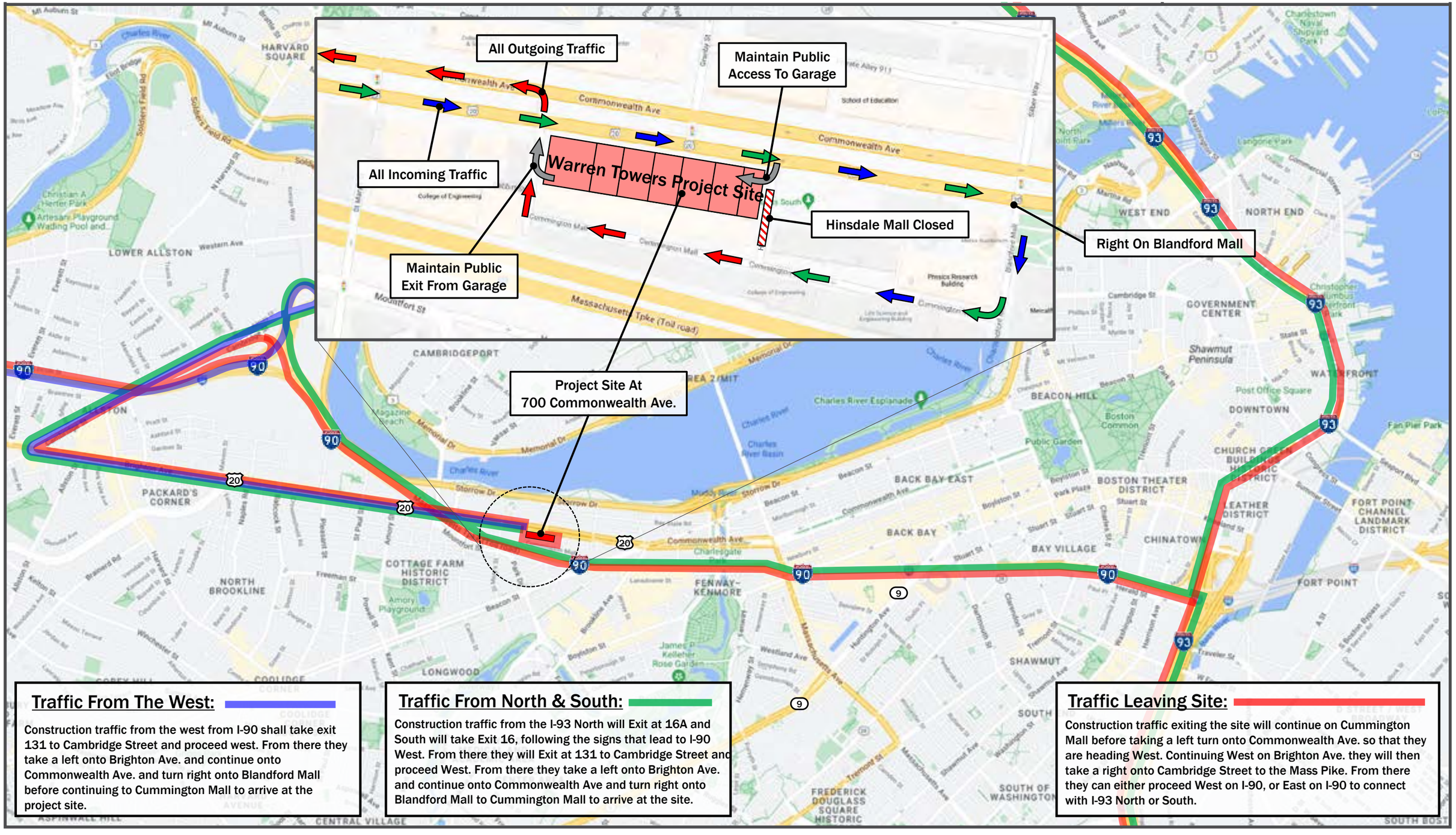
The Project Site is approximately 250 ft outside of the Bay State Road/Back Bay West Architectural Conservation District ("BSRACD"), which was designated as a Local Historic District in 1979. Many of the buildings within the BSRACD are owned and maintained by the University, most of which were constructed in the late 19th century in a variety of revival styles. These buildings have been well-maintained and

improved by both the University and private owners. The Project Site is not within the BSRACD, therefore the district and its buildings will not be affected by the Project.



Boston, Massachusetts

Figure 5-1
FEMA FIRM; 25025C0076G
Source: FEMA, 2009



Traffic From The West:

Construction traffic from the west from I-90 shall take exit 131 to Cambridge Street and proceed west. From there they take a left onto Brighton Ave. and continue onto Commonwealth Ave. and turn right onto Blandford Mall before continuing to Cummington Mall to arrive at the project site.

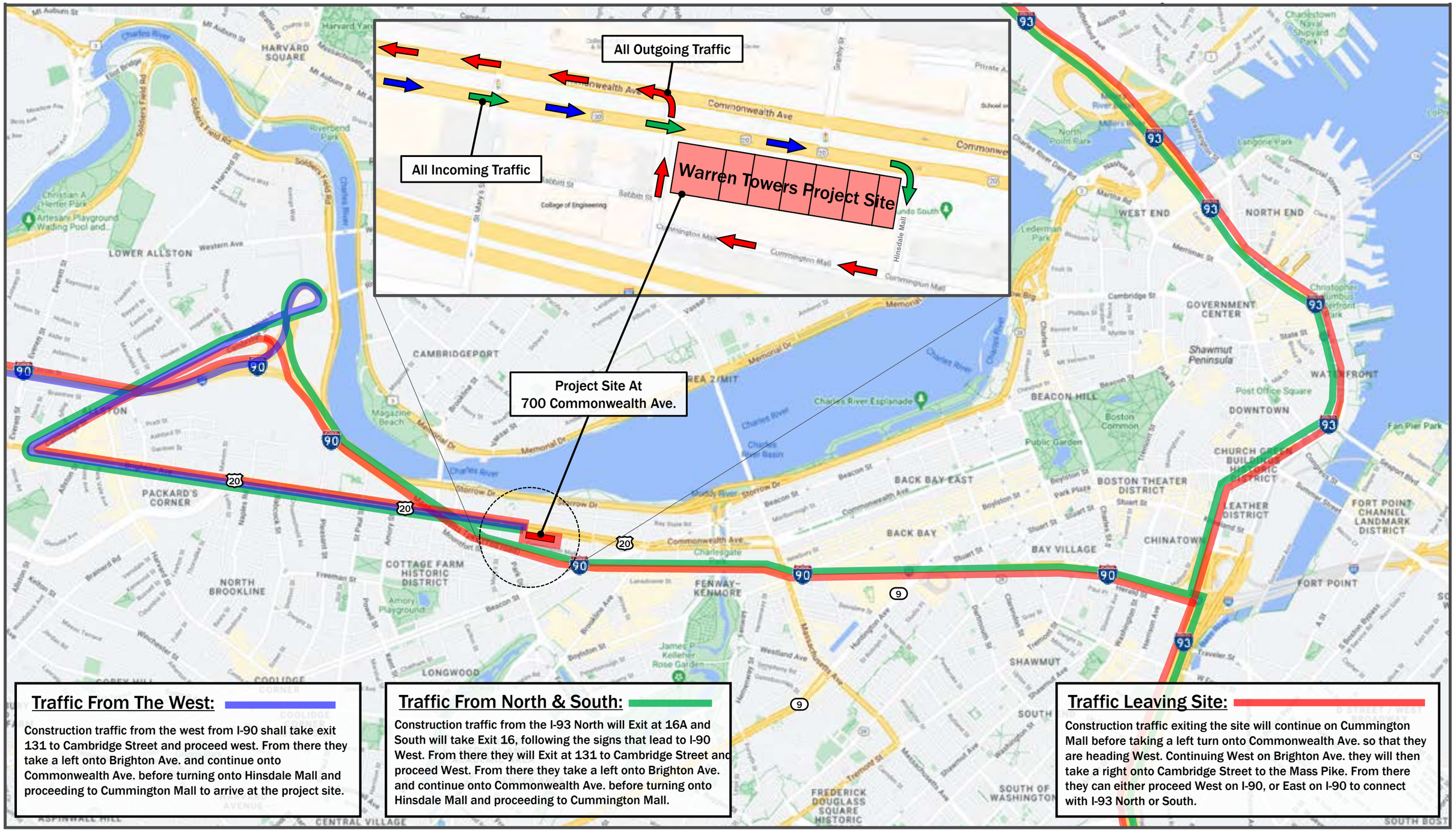
Traffic From North & South:

Construction traffic from the I-93 North will Exit at 16A and South will take Exit 16, following the signs that lead to I-90 West. From there they will Exit at 131 to Cambridge Street and proceed West. From there they take a left onto Brighton Ave. and continue onto Commonwealth Ave and turn right onto Blandford Mall to Cummington Mall to arrive at the site.

Traffic Leaving Site:

Construction traffic exiting the site will continue on Cummington Mall before taking a left turn onto Commonwealth Ave. so that they are heading West. Continuing West on Brighton Ave. they will then take a right onto Cambridge Street to the Mass Pike. From there they can either proceed West on I-90, or East on I-90 to connect with I-93 North or South.

Figure 5-2
Alternative Delivery Routing, May 2025 - August 2025
Source: Shawmut, 2023



Traffic From The West:

Construction traffic from the west from I-90 shall take exit 131 to Cambridge Street and proceed west. From there they take a left onto Brighton Ave. and continue onto Commonwealth Ave. before turning onto Hinsdale Mall and proceeding to Cummington Mall to arrive at the project site.

Traffic From North & South:

Construction traffic from the I-93 North will Exit at 16A and South will take Exit 16, following the signs that lead to I-90 West. From there they will Exit at 131 to Cambridge Street and proceed West. From there they take a left onto Brighton Ave. and continue onto Commonwealth Ave. before turning onto Hinsdale Mall and proceeding to Cummington Mall.

Traffic Leaving Site:

Construction traffic exiting the site will continue on Cummington Mall before taking a left turn onto Commonwealth Ave. so that they are heading West. Continuing West on Brighton Ave. they will then take a right onto Cambridge Street to the Mass Pike. From there they can either proceed West on I-90, or East on I-90 to connect with I-93 North or South.

Figure 5-3
Construction Delivery Routing, December 2024 - May 2025 and September 2025 - August 2028
Source: Shawmut, 2023

Figure 5-4
Historic Resources
Source: Massachusetts Historical Commission, 2023

Chapter 6

INFRASTRUCTURE

CHAPTER 6: INFRASTRUCTURE

6.1 INTRODUCTION

This chapter outlines the existing utilities surrounding the Project Site, the connections required to provide service to the Project, and any impacts on the existing utility systems that may result from construction of the Project.

6.2 WASTEWATER

6.2.1 EXISTING SEWER SYSTEM

The wastewater in the vicinity of the Project Site is owned, managed, and maintained by both BWSC and BU. There are existing sewer mains in Cummington Mall and Commonwealth Avenue: an 18-in private sewer main that flows westerly and connects to an 18-in private sewer main that flows northerly in Cummington Mall. There is a 32-in x 42-in BWSC sewer main that flows westerly in Commonwealth Avenue. There are no sewer services in Hinsdale Mall. The sewer mains eventually flow to an 84-in x 89-in Massachusetts Water Resources Authority ("MWRA") combined sewer that ultimately ends up at the MWRA Deer Island Wastewater Treatment Plant for treatment and disposal. See Figure 6-1, BWSC Sewer System Map.

6.2.2 WASTEWATER GENERATION

The Project Site's existing and proposed sewage generation rates were estimated using both Sewage Flow Design Criteria described in MassDEP 310 CMR 15.203 (Title V) and actual water meter readings. Title V lists estimated sewage generation by building use plus a factor representing flow variations, producing a conservative value for estimated wastewater generation. The Project Site is currently a residential dormitory with existing commercial/retail space on the first floor. The student residential use will increase from 1,795 beds to 1,804 beds, resulting in an increase of 9 beds while the commercial/retail space remains the same. The Title V projection for "Boarding Schools, Colleges" is 65 gallons per day ("GPD") per person, resulting in a projected increase of 585 GPD.

Based on water meter readings from August 2022 to August 2023, the existing water flow ranges from approximately 17,900 GPD to 102,200 GPD, with an overall average of approximately 69,500 GPD. This results in an estimated water use of approximately 39 GPD per person for the 1,795 existing beds. The corresponding increase in projected wastewater flows based on the metered data is 349 GPD. See Table 6-1, Existing Metered Water Flows.

Table 6-1: Existing Metered Water Flows

Start Month	End Month	Total Flow (GPD)
August 2022	September 2022	65,153
September 2022	October 2022	98,053
October 2022	November 2022	96,567
November 2022	December 2022	89,325
December 2022	January 2023	30,582
January 2023	February 2023	102,199
February 2023	March 2023	92,821
March 2023	April 2023	97,899
April 2023	May 2023	82,136
May 2023	June 2023	17,872
June 2023	July 2023	29,176
July 2023	August 2023	32,291
	Average	**69,506**

6.2.3 SEWER CAPACITY AND IMPACTS

To evaluate the adequacy of the sewer lines in Commonwealth Avenue to accommodate proposed flows from the Project, an evaluation of their capacities was performed. The results in Table 6-2 indicate the hydraulic capacity of the 32-in x 42-in sewer main in Commonwealth Avenue. The minimum hydraulic capacity is 12.70 million gallon per day ("MGD") based on the Title V estimate for increase in average daily flow for the Project of 585 GPD or 0.0006 MGD, and with a factor of safety of 10 (total estimate = 0.0006 MGD x 10 = 0.006 MGD). On this basis, it is concluded that there is sufficient capacity in the sanitary sewer main on-site for increased wastewater generation from this Project. The Proponent will coordinate with BWSC throughout the design process to ensure capacity is not an issue.

Table 6-2: Existing Sewer Capacity Evaluation – Commonwealth Avenue

Segment: Manhole to Manhole	Street Name	Segment Size (in)	Length (ft)	Slope (%)	Capacity (MGD)
13-14	Commonwealth Avenue	32 x 42	248	0.13	12.70
14-15	Commonwealth Avenue	32 x 42	220	0.42	22.51
15-14*	Commonwealth Avenue	32 x 42	210	0.44	23.04
14*-17	Commonwealth Avenue	32 x 42	120	0.57	26.20

Note:
1. Manhole numbers taken from BWSC Sewer System GIS Map.
2. Flow calculations based on Manning Equation.
*Manhole shown with similar structure name has Manhole 14 on BWSC GIS Map. However, the manhole is downstream and with a lower invert.

6.2.4 PROPOSED SEWER SYSTEM

The Proponent will coordinate with BWSC on the design and capacity of the proposed connections to the sewer system. The Project is expected to generate an increase in wastewater flows of approximately 585 GPD. Approval for the increase in sanitary flow will come from the BWSC.

The Project will require new upgraded building sewer services. The new sewer services will connect to the existing 32-in x 42-in BWSC sewer main in running westerly in Commonwealth Avenue.

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

6.3 WATER SYSTEM

6.3.1 EXISTING WATER SYSTEM

Water for the Project Site is provided by BWSC. There are existing water mains in Cummington Mall and Commonwealth Avenue. There are no existing water mains in Hinsdale Mall. There are five water systems within the City which provide service to portions of the City based on ground surface elevation. The five systems are southern low ("SL"), commonly known as low service, southern high ("SH"), commonly known as high service, southern extra high, northern low, and northern high.

There is an existing 8-in BWSC SL Ductile iron, cement lined ("DICL") water main along the southwest side and adjacent to the Project Site in Cummington Mall that was installed in 1998. The Project does not propose any utility crossings for the water main in Cummington Mall. There is an existing 12-in BWSC SL DICL water main along the north side and adjacent to the Project Site in Commonwealth Avenue that was originally installed in 1891 and replaced in 2008. See Figure 6-2, BWSC Water System Map.

6.3.2 ANTICIPATED WATER CONSUMPTION

The Project will include replacement of existing water fixtures to reduce water consumption. The LEED water efficiency calculation has been completed to compare the existing estimated water consumption to the proposed estimated water consumption for total occupants and fixture uses per day with lower flow rates, as seen in See Table 6-3.

Table 6-3: Estimated Water Demand Comparison

Occupants	Fixture	Water per use (gallons)	Uses/Occupant/ Day	Water per day (gallons)
Existing				
1,795	Water Closet	1.6	5	14,360
1,795	Shower	20	1	35,900
1,795	Lavatory	1	5	8,975
448.75	Kitchen sink	2.2	4	3,949
			GPD	63,184
Proposed				
1,804	Water Closet	1.28	5	11,546
1,804	Shower	12	1	21,648
1,804	Lavatory	0.5	5	4,510
451	Kitchen sink	1.8	4	3,247
			GPD	40,951

The results of the water demand comparison show that although the number of students housed in the dorms will increase, the total volume of water required will decrease because of the use of low flow fixtures. It is projected that the total water use will decrease by 35%. Note that the consumption values are for comparison between the existing and proposed cases, not for system distribution or utility loading/sizing.

In accordance with industry standards, the Project's water demand was also estimated assuming 110% of the Project's sewer generation pursuant to Title V. Typical engineering practice assumes a 10% loss between the Project's water demand and sewer generation through typical building uses. The proposed increase in water demand for the Project is expected to be 644 GPD based on Title V.

The water for the Project will be supplied by the BWSC System in Commonwealth Avenue. The Proponent will coordinate with BWSC throughout the design process to ensure capacity is not an issue.

BWSC record flow data containing actual flow and pressure for hydrants adjacent to the Project Site was requested by the Proponent. Hydrant flow tests were performed within the vicinity of the Project Site on April 2, 2013, and on October 22, 2014. The results are shown in Table 6-4. As the Project design progresses, the Proponent will request additional hydrant flow tests be conducted by BWSC to ensure capacity is not an issue.

Table 6-4: Hydrant Flow Test Results

Flow Hydrant	Date of Test	Static Pressure (psi)	Residual Pressure (psi)	Total Flow (gpm)	Flow @ 20 psi (gmp)
H32	04/02/2013	70	64	2,004	6,297
H86	10/22/2014	70	64	1,876	5,895

Note: Data was provided by BWSC.

6.3.3 PROPOSED WATER SERVICE

Domestic water and fire protection service connections will be required for the Project. The Project's domestic and fire protection services are expected to tie into the 12-in BWSC-owned water main located in Commonwealth Avenue via new domestic and fire protection service laterals.

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

No water capacity problems are anticipated within this system as a result of the Project's construction.

6.3.4 WATER SUPPLY CONSERVATION AND MITIGATION MEASURES

Measures to reduce water consumption will be incorporated into the Project's design. Aeration fixtures and appliances will be chosen for water conservation qualities. In public areas, sensor-operated faucets and toilets will be installed.

New water services will be installed in accordance with the latest local, state, and federal codes and standards. The Project will reduce potable water use from the LEED baseline by approximately 35%. Backflow preventers will be installed at both domestic and fire protection service connections. New meters will be installed with Meter Transmitter Units ("MTUs") as part of the BWSC's Automatic Meter Reading ("AMR") 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 all non-residential restrooms will be incorporated into the design plans for the Project.

6.4 STORMWATER SYSTEM

6.4.1 EXISTING STORMWATER SYSTEM

BWSC record documents indicate that there are BWSC and private stormwater mains in Cummington Mall and Commonwealth Avenue. There are no existing stormwater mains in Hinsdale Mall.

An existing 15-in BWSC stormwater main in Commonwealth Avenue increases to 18-in and 24-in as it flows west. An existing 15-in private stormwater main in Cummington Mall flows north towards Commonwealth Avenue and connects to the existing 24-in stormwater main in Commonwealth Avenue. This stormwater main ultimately discharges to the Charles River.

A 20-in x 30-in private stormwater main also existing in Cummington Mall. This stormwater main eventually flows to an 84-in x 89-in MWRA combined sewer that flows to the MWRA Deer Island Wastewater Treatment Plant for treatment and disposal.

The Project Site consists of three existing towers, a four-story podium, and adjacent sidewalks. Stormwater from the building currently connects at several locations to the stormwater main in Commonwealth Avenue. Catch basins in the private ways of Cummington Mall and Hinsdale Mall connect to the existing stormwater main in Commonwealth Avenue.

See Figure 6-3, BWSC Stormwater System Map.

6.4.2 PROPOSED STORMWATER SYSTEM

Stormwater improvements will be reviewed as a part of the BWSC Site Plan Review process. Site Plan Review includes a comprehensive design review of the proposed service connections, assessment of Project demands and system capacity, and establishment of service accounts. The proposed stormwater management system will collect and retain runoff for 1.25 in of rainfall over the Project's impervious area, per the BWSC stormwater management requirements. The Project is also located within the Boston Groundwater Conservation Overlay District ("GCOD"). The Project's stormwater system will overflow to the stormwater system in Commonwealth Avenue.

Stormwater runoff will be collected by a series of roof drains which will then flow to a proposed concrete infiltration system in Cummington Mall. The infiltration system will be supplemented by 12 passive stormwater recharge wells. The recharge wells will consist of 2-ft diameter stone columns extending from the base of the infiltration tank to approximate El. -15 BCB, which is the sand layer below the organic and fill materials on the Project Site. Overflow from the infiltration system will be directed to BWSC stormwater main in Commonwealth Avenue. All work on the stormwater systems will be performed in accordance with BWSC standards and will be submitted to the necessary agencies for review and approval prior to implementation.

6.4.3 MITIGATION MEASURES

The stormwater management system will decrease or maintain the peak flow rate and volume of stormwater runoff from the Project Site. New stormwater runoff will not be directed towards abutters. No capacity issues in the existing stormwater mains are anticipated as a result of the Project.

Catch basins installed will be standard BWSC catch basins with deep sediment sumps and traps. BWSC "Don't Dump – Drains to Charles River" plaques will be installed at new catch basins and at existing catch basins if they are not already present.

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

If required, site dewatering permits will be conducted in accordance with applicable MWRA and BWSC discharge permits. Once construction is complete, the Project will be in compliance with local and state stormwater management policies described in the following section.

6.4.4 MASSDEP STORMWATER MANAGEMENT POLICY STANDARDS

In March 1997, MassDEP adopted a new Stormwater Management Policy to address non-point source pollution. In 1997, MassDEP published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy, which was revised in February 2008. The Policy prescribes specific stormwater management standards for development projects, including urban pollutant removal criteria for projects that may impact environmental resource areas. Compliance is achieved through the

implementation of Best Management Practices ("BMPs") in the stormwater management design. The Policy is administered locally pursuant to MGL Ch. 131, s. 40.

A 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: No new untreated stormwater will be directly discharged to, nor will erosion be caused to, wetlands or waters of the Commonwealth as a result of stormwater discharges related to the Project.

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

Compliance: The proposed design will comply with this Standard. The post-development peak discharge rates will not exceed the pre-development peak discharge rates through methods involving stormwater recharge on site, and will be coordinate with BWSC throughout the design process.

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

Compliance: The Project will comply with this Standard. Recharge to groundwater will be increased though reduction of impervious area and the implementation of a stormwater retention system.

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

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

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

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

Compliance: The proposed design will comply with this Standard. The Project will not have an impact on stormwater runoff quality. The Project stormwater system will not discharge to a combined sewer.

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

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

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

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

Compliance: The 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 Project is considered a redevelopment per the MassDEP Standards and will meet the credits to the maximum extent practicable.

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

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

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

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

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

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

6.4.5 STORMWATER QUALITY DURING CONSTRUCTION

Stormwater management BMPs relative to stormwater pollution prevention and erosion and sediment control will be implemented during construction. These will include:

- Protection of adjacent catch basins by installation of either hay bales or filter fabrics to prevent sedimentation from entering stormwater conveyance system.
- Utilization of sedimentation tanks or pits where appropriate to control and contain runoff during construction, including that derived from dewatering activities. Dewatering discharge will pass through a MassDEP approved sedimentation basin prior to discharge into the BWSC drainage system.
- Implementation of dust/emission controls. Examples of measures for dust control include use of wet suppression (alone or with approved binding agents) on a routine basis using a water truck and use of wet spray power vacuum street sweepers on paved roadways.

6.5 OTHER UTILITIES

6.5.1 DISTRICT HEATING AND COOLING OR GEOTHERMAL SYSTEMS

The new HVAC and DHW Systems shall be all-electric and will no longer use the campus district steam heating system. Heating will be primarily by electric AWHPs. Electric boilers will be used in very cold weather. Steam piping presently serving the HVAC system will be removed. DHW shall be generated by AWHPs and storage tanks. The existing steam fired water heaters and associated steam piping shall be removed.

6.5.2 NATURAL GAS SERVICE

The existing gas service shall remain in place to serve the existing gas fired kitchen equipment and central laundry clothes dryers. The new gas load for the building will be decreased compared to the existing load because of the existing equipment being removed and replaced with electrified equipment.

6.5.3 ELECTRICAL SERVICE

The existing building is powered from 15kV switchgear located in College of Business Administration Building. The medium voltage switchgear is fed from two 13.8kV Eversource (NSTAR) lines; 586-90 and 419-92. Feeders 3 and 4 provide 13.8kV primary and back-up power from the switchgear to the Warren Towers facility. The medium voltage feeders enter the building at the garage basement level where they

are spliced in a junction box and sectionalizing cabinet to feed the following substations Towers A, B, C, and 111 Cummington. Three substations are currently serving Towers A, B, and C, and a substation is serving 111 Cummington.

6.5.4 TELEPHONE AND TELECOMMUNICATIONS

The existing services are currently entering the building on basement level. The main building main equipment room ("MDF") is located on the third floor. Each tower has a small telecom closet ("IDF") on each floor which is used to provide telecommunications and Community Access Television ("CATV") as well as land line to the dorm rooms and other spaces.

Fiber and telecommunication equity expands availability of digital resources throughout the City of Boston with the implementation of telecom utilidors, fiber conduit, and fiber shadow conduit. Widespread access to digital platforms decreases the digital divide and increases equity.

Fiber and telecom equity technologies include utilidors that consolidate telecommunications conduit, energy-saving education and awareness programs, effective emergency management responses, grid interactive buildings, and demand responses. Implementing fiber and telecom equity provides expanded access to communication and information technologies, increased awareness of near-to-market and innovative technologies, direct citizen engagement and beneficial stakeholder relationships, efficient access to municipal services, efficient operations during future street renovations, and improved public health.

BU's Information Services & Technology ("IS&T") manages and maintains an extensive computing and communications network, supporting the University's strategic mission and business needs. The network interconnects BU's facilities as well as high-speed connectivity to the Massachusetts Green High Performance Computing Center ("MGHPCC") in Holyoke, providing access to the Internet and major national and international research networks. The MGHPCC utilizes hydroelectric power and is a LEED Platinum building.

BU's IS&T designs and oversees installation of all network infrastructure associated with renovations and new construction. The network infrastructure includes both University-owned and often shared conduit infrastructure with commercial carriers, and, in some instances, leased conduit and fiber. Inside BU's facilities this infrastructure includes conduit, communications closets, network outlets, cabling, network routers, switches, wireless access points, and increasingly consolidated data center networks to support members and guests of the University community.

The City of Boston requires projects larger than 1.5 million sf or those that reside alongside at least half a mile of roadway to implement telecom utilidors. The proposed Project is not greater than 1.5 million sf. See Attachment 9, Broadband Ready Buildings Questionnaire.

6.5.1 SMART UTILITIES PROGRAM

The following section summarizes the components of the Project that addresses the City's Smart Utilities Policy for the Project. See Figure 6-4, Smart Utility Plan and Attachment 10, Smart Utilities Checklist.

6.5.1.1 DISTRICT ENERGY MICROGRIDS

Since the Project is less than 1.5 million sf, it is not required to complete a District Energy Microgrid Feasibility Assessment.

6.5.1.2 TELECOMMUNICATIONS UTILIDOR

Since the Project is less than 1.5 million sf, it is not required to incorporate a telecommunications utilidor.

6.5.1.3 GREEN INFRASTRUCTURE

The Project is subject to the Green Infrastructure requirements of the Smart Utilities Policy. The Project will incorporate porous pavers and increased planting areas. The proposed stormwater management system will collect and retain runoff for 1.25 in of rainfall over the Project's impervious area, per the BWSC stormwater management requirements. See Section 6.4.3 for additional details on the proposed stormwater management system.

6.5.1.4 ADAPTIVE SIGNAL TECHNOLOGY

Since the Project is not a BTD project, it is not required to incorporate adaptive signal technology.

6.5.1.5 SMART STREET LIGHTS

The Project does not require a permit from the Boston Public Works Department, but will require approval from the Public Improvements Commission. The Public Improvements Commission will determine whether or not the Project is required to incorporate smart streetlights.

6.6 UTILITY PROTECTION DURING CONSTRUCTION

Existing public and private infrastructure located within nearby public rights-of-way will be protected during the construction of the Project. The installation of proposed utility connections within public ways will be undertaken in accordance with the 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 prior to the commencement of work.

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

The electrical distribution and substations depending on the phasing shall be maintained up to the final phase of the Project as detailed in the contractor construction scheduling and phasing drawings.

The telecommunications services shall remain and be maintained during construction.

6.7 FIRE PROTECTION

There are currently two fire protection services, both water services will be replaced to maintain a redundant water supply to the building. A new electric fire pump will be installed to serve the standpipes and automatic sprinkler systems.

Figure 6-1
BWSC Sewer System Map
Source: Nitsch Engineering and BWSC, 2023

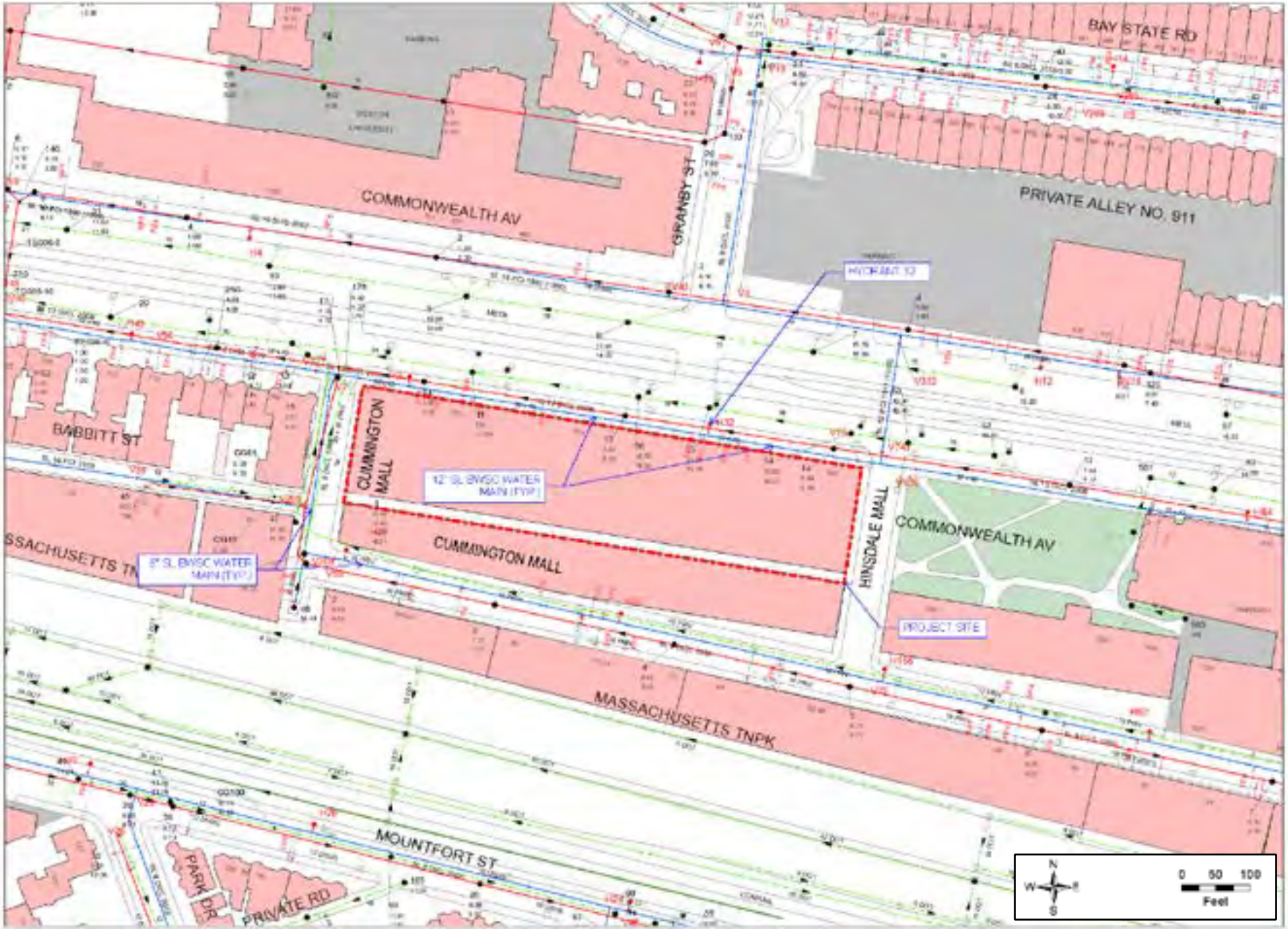


Figure 6-2
BWSC Water System Map
Source: Nitsch Engineering and BWSC, 2023

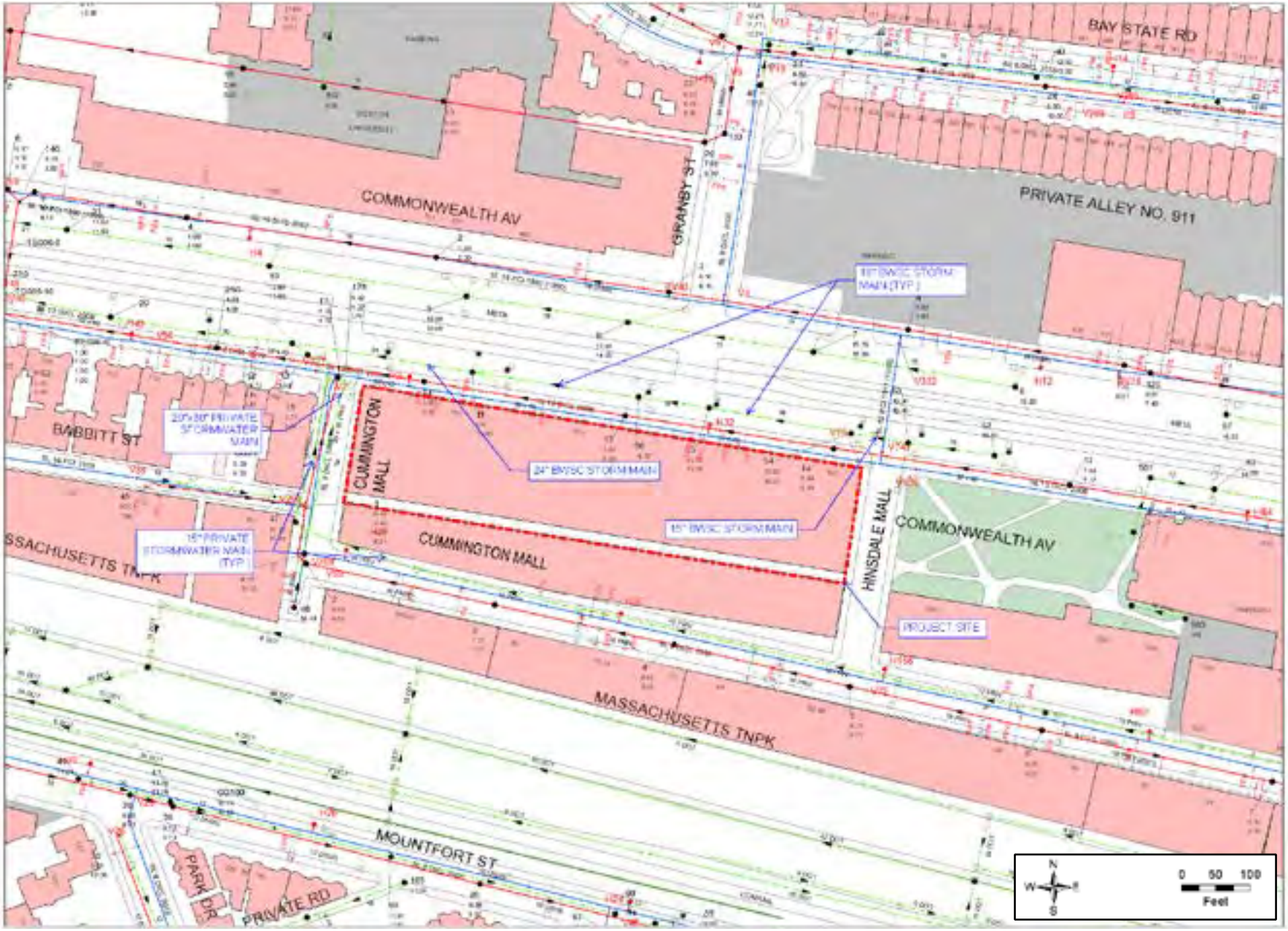
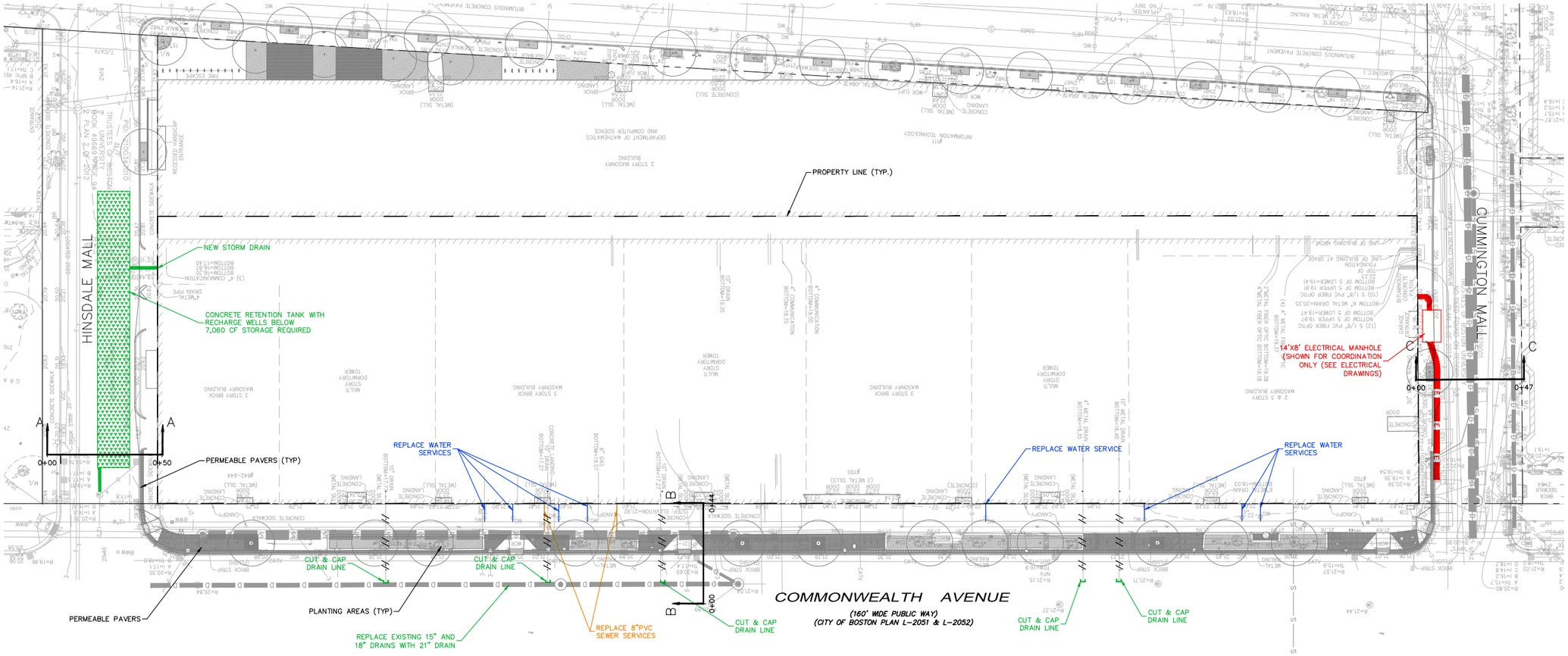
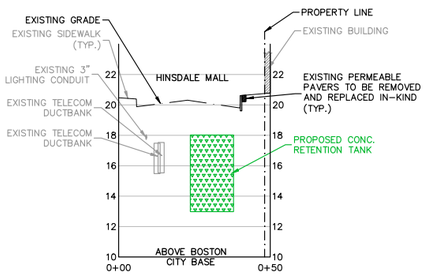
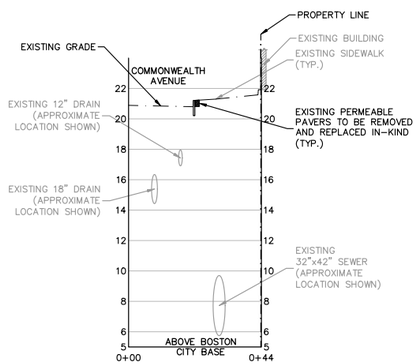


Figure 6-3
BWSC Stormwater System Map
Source: Nitsch Engineering and BWSC, 2023





HINSDALE MALL UTILITY SECTION
SECTION A–A
HORIZONTAL SCALE 1"=20'
VERTICAL SCALE 1"=4'



COMMONWEALTH AVENUE UTILITY SECTION
SECTION B–B
HORIZONTAL SCALE 1"=20'
VERTICAL SCALE 1"=4'

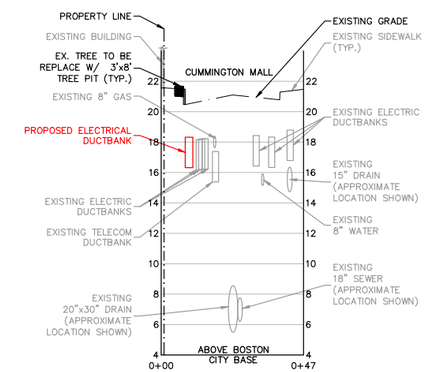
LEGEND

- DRAIN
- SEWER
- WATER
- ELECTRIC

VOLUME OF STORMWATER TO BE RETAINED ON SITE:

1.25" X TOTAL SITE IMPERVIOUS AREA = REQUIRED RECHARGE VOLUME
1.25" OF RUNOFF (0.104 FEET) OVER THE AREA =
0.104' X 67,772 SQUARE FEET = 7,060 CUBIC FEET
1.25" X 9,759,168 SQUARE INCHES = 12,198,960 CUBIC INCHES

SCALE:
1" = 20'
1" = 4'



CUMMINGTON MALL UTILITY SECTION
SECTION C–C
HORIZONTAL SCALE 1"=20'
VERTICAL SCALE 1"=4'

Figure 6-4
Smart Utility Plan
Source: Nitsch Engineering, 2023; MDS Architects, 2023

Chapter 7

TRANSPORTATION

CHAPTER 7: TRANSPORTATION

7.1 INTRODUCTION

The Proponent evaluated the existing transportation network at the BU Charles River Campus and potential Project-related transportation impacts. This chapter summarizes the existing and proposed transportation conditions, analyzes transportation operations, and identifies potential impacts, TDM strategies, and transportation mitigation measures. The study conforms to the BTD Transportation Access Plan Guidelines and BPDA Article 80B, Large Project Review.

7.1.1 SUMMARY OF FINDINGS

The Project is expected to generate no net new person trips and may slightly reduce vehicle trips through removal of 30 existing parking spaces from the garage at the Project Site, which is in the academic core of the Charles River Campus. Therefore, the Project is not expected to result in any significant impacts to the surrounding transportation network. The portion of Commonwealth Avenue along the Project Site is highly pedestrian- and bicycle-oriented with approximately 43% pedestrians and 7% bicycles during the weekday morning and afternoon peak hours. Pedestrian activity peaks in the mid-afternoon at 2:00 – 3:00 PM, before the afternoon peak hour, and represents 64% of all trips on Commonwealth Avenue at that time. With continued student residential use at the Project Site and the abundant and easily accessibly transportation options for its residents and visitors, the mode split for the Project is expected to be more weighted towards pedestrian and bicycle traffic than Commonwealth Avenue as a whole.

The Project is also well served by existing public transit via the MBTA Green Line B branch and bus routes, the Commuter Rail at Lansdowne Station, and the extensive BUS operations. Existing pedestrian and bicycle networks serving the Project Site are robust, having benefited from the University's partnership with the City on Commonwealth Avenue Improvements Phase 1 and the more recent investments associated with the University's nearby CCDS and Kilachand Center projects. Moreover, coordination with the City is underway on initiatives to further improve bicycle safety and bus reliability along this segment of Commonwealth Avenue. The Project is not expected to result in any significant changes to peak hour operating conditions at study area intersections, nor add significant new demand to the transit, pedestrian, or bicycle networks in the area.

7.1.2 STUDY AREA

The Study Area is bounded by Commonwealth Avenue to the north, Cummington Mall to the south and west, and Hinsdale Mall to the east. The Study Area includes the following four signalized and three unsignalized intersections. See Figure 7-1, Study Area Intersections.

- Commonwealth Avenue/St. Mary's Street (signalized);
- Commonwealth Avenue/Cummington Mall (signalized);
- Commonwealth Avenue @ Granby Street (signalized);
- Commonwealth Avenue @ Hinsdale Mall (unsignalized)
- Commonwealth Avenue @ Silber Way/Blandford Mall (signalized)
- Bay State Road @ Granby Street/Back Street (unsignalized);
- Silber Way @ Bay State Road (unsignalized)

7.1.3 STUDY METHODOLOGY

The BU Charles River Campus Transportation Master Plan ("TMP") 2013-2023, the 2013-2023 IMP, and Article 80 filings for other nearby projects such as CCDS were reviewed as background. The existing conditions traffic analysis for the Project was based on traffic counts performed at the study intersections on October 18-19, 2023. Future no-build conditions took into consideration the trips associated with other BU projects and projects proposed by others within the study area, including Kenmore Square to the east and along Beacon Street between Kenmore Square and Audubon Circle. The future build conditions are based on any net change in trips associated with completion of the Project.

Additionally, this document relies on data gathered to prepare several presentations given to BPDA with the following titles and dates:

- 2023-2033 Charles River Campus IMPNF: Meeting with BPDA Transportation & Infrastructure (November 15, 2022)
- BU Task Force and Public Meeting, Article 80: 2022-2023 IMPNF (January 24, 2023)

The No-Build and Build analysis year is 2028, consistent with the expected opening year for the Project.

7.2 EXISTING CONDITIONS

7.2.1 EXISTING ROADWAY NETWORK

Commonwealth Avenue is a two-way, four-lane roadway located to the south of the Project Site. Commonwealth Avenue is classified as an urban principal arterial roadway under BTD jurisdiction and runs primarily in an east-west direction from Route 95 in Weston to the west and Arlington Street in Boston to the east. In the Study Area, the MBTA Green Line B branch runs within the median of Commonwealth Avenue and separates the roadway directions of travel. The roadway network also provides for MBTA buses and the BUS. Wide sidewalks are provided on both sides of the roadway. Painted bicycle lanes are provided along both sides of Commonwealth Avenue. On the north side of the street, westbound bicyclists have a short stretch of parking-protected bicycle lanes immediately in front of CCDS. West of the BU Bridge, curb and parking protected bicycle lanes are provided. Immediately in front of the Project Site, the southern (eastbound) section of the roadway measures 30 ft wide, while the northern (westbound) section of the roadway measures 30 to 36 ft wide, depending on the presence of curb extensions. Commonwealth Avenue in front of the Project Site is a No-Stopping Tow Zone. On-street metered parking exists to the west, east, and north of the Project Site.

Hinsdale Mall is a private, University-owned two-way, two-lane road, with no on-street parking allowed. It connects Commonwealth Avenue to Cummington Mall. Hinsdale Mall is only permitted for use by University service vehicles and delivery trucks serving the Project Site and other BU buildings in the area. Hinsdale Mall is approximately 32 to 34 ft wide and has sidewalks along both sides.

Cummington Mall is a private, University-owned one-way roadway that runs westbound parallel with and to the south of Commonwealth Avenue, linking Blandford Mall to the Project Site, as well as other destinations before connecting with Commonwealth Avenue west of the Project Site. Cummington Mall also has a direct connection with the private, University-owned Babbitt Street on the west, which is a pedestrian-only street, with only delivery vehicles allowed. Cummington Mall is approximately 34 ft wide and has sidewalks along both sides.

Silber Way is a two-way, two-lane roadway located to the east of the Project Site, north of Blandford Mall. Silber Way is classified as a local roadway under BTD jurisdiction and runs in a north-south direction between Back Street and Commonwealth Avenue. Silber Way is approximately 40 ft wide and there are sidewalks and metered on-street parking along both sides.

Blandford Mall is a private, University-owned two-way, two-lane located to the east of the Project Site, adjacent to the Alfred L. Morse Auditorium and the Physics Research Building. It is the southern extension of Silber Way and it connects to Cummington Mall. Signage on Blandford Mall indicates that only emergency vehicles and delivery vehicles are allowed. Drivers in non-delivery vehicles are not allowed to park. On the south it dead-ends at a fence and retaining wall adjacent to I-90. Blandford Mall is approximately 34 ft wide and there are sidewalks along both sides.

Granby Street is located to the northeast of the Project Site, adjacent to the Departments of History and Political Science. It is classified as a local roadway under BTD jurisdiction and runs in a north-south direction between Back Street and Commonwealth Avenue (ending at Commonwealth Avenue). Granby Street is a two-way, two-lane roadway, with the segment south of Bay State Road having recently been converted from one-way southbound as part of the CCDS project. Granby Street is approximately 29 ft wide and there are sidewalks along both sides with a curb protected northbound cycle track on the east side of the street and a southbound bicycle lane protected by flex-posts on the west side of the street south of Bay State Road. There is metered parking on both sides of Granby Street north of Bay State Road.

Bay State Road is a one-way, single vehicular travel lane roadway, allowing westbound travel parallel to Commonwealth Avenue from Charlesgate to a point west of Granby Street, transitioning briefly to two-way operations west of Granby Street, before returning to one-way operations (with only eastbound delivery or service vehicles allowed). For most of its length, Bay State Road is approximately 35 ft wide with metered on-street parking on both sides, a westbound travel lane shared by vehicles and bicycles, and an eastbound contra-flow bicycle lane on the south side of the road. Bay State Road west of Granby Street is owned by the University.

Saint Mary's Street is a one-way (southbound) Town of Brookline Street with one travel lane and one lane of parking along the west curb line that links Commonwealth Avenue to Babbitt Street and Mountfort Street to the south. Saint Mary's Street is approximately 26 ft wide and has sidewalks along both sides.

7.2.2 EXISTING INTERSECTION CONDITIONS

Existing conditions of the Study Area intersections are summarized below:

Commonwealth Avenue/St. Mary's Street is a three-legged, signalized intersection with two approaches and a median that separates the eastbound and westbound directions of travel on Commonwealth Avenue. The MBTA Green Line B branch runs within the median of Commonwealth Avenue and crosses the intersection at grade.

The Commonwealth Avenue eastbound approach consists of one through lane and one shared through/right turn lane. Left turn and U-turns are prohibited on Commonwealth Avenue eastbound approach. The Commonwealth Avenue westbound approach consists of two through lanes and one dedicated left turn lane. U-turns are permitted on Commonwealth Avenue westbound approach. Crosswalks, curb cut ramps, and pedestrian signals for crossing are provided on each leg of the intersection. The City of Boston owns the east and west legs of the intersection, and the Town of Brookline owns the south leg.

Commonwealth Avenue/Cummington Mall is a three-legged, signalized intersection with three approaches and a median that separates the eastbound and westbound directions of travel on Commonwealth Avenue. The MBTA Green Line B branch runs within the median of Commonwealth Avenue and crosses the intersection at grade. The Commonwealth Avenue eastbound approach consists of two through lanes and one dedicated lane for making left-turn and U-turn. The Commonwealth Avenue westbound lane consists of two through lanes. Cummington Mall is one-way northbound on its approach, which consists of two single dedicated left and right turn only lanes. Crosswalks, curb cut ramps, and pedestrian crossing signals are provided along Commonwealth Avenue westbound approach leg, Commonwealth Avenue eastbound departure leg, and on Cummington Mall approach leg. Cummington Mall is a BU-owned roadway.

Commonwealth Avenue/Granby Street is a three-legged, signalized intersection with three approaches and a median that separates the eastbound and westbound directions of travel on Commonwealth Avenue. The MBTA Green Line B branch runs within the median of Commonwealth Avenue and crosses the intersection at grade. The Commonwealth Avenue eastbound and westbound approaches each consist of two through lanes. The inside lane of the Commonwealth Avenue westbound approach to Granby Street is a combined through/right turn lane. The Granby Street approach consists of one southbound combined through/right/left turn lane. Left turns for eastbound vehicles on Commonwealth Avenue are not allowed. Reaching Granby Street from Commonwealth Avenue eastbound requires vehicles to use the unsignalized U-Turn located just east of the Green Line B branch portal at the edge of Kenmore Square. Crossings, curb cut ramps, and pedestrian crossing signals are provided along all approach and departure legs at the intersection. All legs of this intersection are owned by the City of Boston.

Commonwealth Avenue/Hinsdale Mall is a two-legged, unsignalized T-intersection with two approaches that borders the Project Site on the east side. Hinsdale Mall measures approximately 32 ft curb-to-curb. The Commonwealth Avenue eastbound approach has one through lane and one shared through/right turn lane. Hinsdale Mall roadway approach has one right-turn-only lane for northbound vehicles, one

receiving lanes for drivers making a right turn from Commonwealth Avenue and is controlled by a STOP sign for northbound vehicles. A ladder-style crosswalk and curb cut ramps are provided on Hinsdale Mall roadway. There are no pedestrian crossing signals. Hinsdale Mall is a BU-owned roadway.

Commonwealth Avenue/Silber Way/Blandford Mall is a four-legged, signalized intersection with four approaches, with a median that separates the eastbound and westbound directions of travel on Commonwealth Avenue. The MBTA Green Line B branch runs within the median of Commonwealth Avenue and crosses the intersection at grade. The Commonwealth Avenue eastbound and westbound approaches both have one through lane and one shared through/right turn lane. Left turns are prohibited from both Commonwealth Avenue eastbound and westbound approaches. The Silber Way and Blandford Mall approaches both have one shared left turn/through/right turn lane. Crossings, curb cut ramps, and pedestrian crossing signals are provided on each leg of the intersection. Blandford Mall is a BU-owned roadway.

Bay State Road/Granby Street is a four-legged, stop-controlled intersection with four approaches. The short segment of the Granby Street southbound approach to Bay State Road sees only limited traffic as it only connects with the lightly used Back Street. Eastbound drivers are not allowed on Bay State Road east of this intersection. Crosswalks and curb cut ramps are provided on each leg of the intersection. The City of Boston owns the south, east, and north legs of the intersection, and the University owns it on the west.

Silber Way/Bay State Road is a four-legged, unsignalized intersection with three approaches controlled by an all-way STOP sign. Silber Way northbound approach has one shared left turn/through lane, Silber Way southbound approach has one shared through/right turn lane, and Bay State Road westbound approach has one shared left turn/through/right turn lane. Crossings and curb cut ramps are provided on each leg of the intersection. The City of Boston owns all four legs of the intersection.

7.2.3 TRAFFIC VOLUME & OPERATIONS ANALYSIS

Intersection turning movement counts ("TMCs") and vehicle classification counts were conducted at the study intersections on Wednesday, October 18, 2023, for inclusion in this EPNF. The TMCs were collected for 11 hours between 7:00 AM and 6:00 PM. Within that broader period, the peak AM hour was 8:00 AM to 9:00 AM, with the peak PM hour being 5:00 PM to 6:00 PM. The vehicle classification counts were collected for autos, heavy vehicles (trucks and buses), bicycles, and pedestrians. See Table 7-1. These peak hour volumes were then utilized in the traffic modeling software to determine average vehicle delay, volume/capacity, 50% queue length,

95% queue length, and Level of Service ("LOS"), using SYNCHRO 11 software to translate the peak hour traffic counts using Highway Capacity Manual ("HCM") methodology into delay-based LOS thresholds provided in the HCM. Table 7-2 summarizes the delay thresholds for vehicular LOS.

Key traffic operations metrics for existing conditions in the morning and afternoon peak hour at each study intersection and its approach are shown in Table 7-3 and Table 7-4 respectively.

The future Build traffic metrics show no change ("NC") relative to future No-Build conditions at these intersections because the Project is not anticipated to generate any new vehicle trips.

Table 7-1: Weekday Peak Hour Volumes (Existing Conditions)

Total Entering Traffic Volume, from All Intersection Approaches	Peak Hour Volume (AM)	Peak Hour Volume (PM)
Commonwealth Avenue at St Mary's Street	971	1,378
Commonwealth Avenue at Cummington Mall	924	1,347
Commonwealth Avenue at Granby Street	901	1,246
Commonwealth Avenue at Hinsdale Mall	884	1,199
Commonwealth Avenue at Silber Way/Blandford Mall	880	1,275
Bay State Road at Granby Street/Back Street	164	198
Silber Way at Bay State Road	243	245

Source: Traffic data collected October 18, 2023.

Table 7-2: Intersection LOS Calculations

	Average Delay per Vehicle (seconds)	
LOS	Signalized	Unsignalized
A	≤ 10.0	≤ 10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	≥80.1	≥50.1

Source: HCM, Special Report 209, Transportation Research Board, National Research Council, Washington, DC, 2000.

Note: The above LOS scores show the overall LOS of the intersection. For details regarding specific intersection approaches by time of day refer to Tables 7-3 and 7-4.

Table 7-3: AM Key Traffic Operations Metrics

	Existing AM Peak Hour					No-Build AM Peak Hour					Build AM Peak Hour				
	LOS	**Delay (s)**	**V/C**	**50% Queue Length (ft.)**	**95% Queue Length (ft.)**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**
Commonwealth Avenue @ Saint Mary's Street	**A**	**7.4**	**0.29**			**A**	**7.4**	**0.30**			NC	NC	NC	NC	NC
Commonwealth Ave EB Thru/Right	A	3.0	0.26	45	61	A	3.0	0.27	46	63	NC	NC	NC	NC	NC
Commonwealth Ave WB Left	D	49.1	0.38	36	75	D	49.1	0.38	36	75	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	9.1	0.23	62	95	A	9.1	0.24	64	98	NC	NC	NC	NC	NC
Commonwealth Avenue @ Cummington Mall	**C**	**27.3**	**0.58**			**C**	**28.3**	**0.59**			NC	NC	NC	NC	NC
Commonwealth Ave EB Left	D	44.0	0.21	34	61	D	44.0	0.21	34	61	NC	NC	NC	NC	NC
Commonwealth Ave EB Thru	C	33.1	0.83	394	416	C	34.8	0.85	410	432	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	B	15.2	0.25	85	116	B	15.3	0.26	87	120	NC	NC	NC	NC	NC
Cummington Mall* NB Left	D	42.9	0.08	13	21	D	42.9	0.08	13	21	NC	NC	NC	NC	NC
Cummington Mall* NB Right	D	42.4	0.01	0	0	D	42.4	0.01	0	0	NC	NC	NC	NC	NC
Commonwealth Avenue @ Granby Street	**A**	**8.2**	**0.23**			**A**	**8.2**	**0.23**			NC	NC	NC	NC	NC
Commonwealth Ave EB Thru	A	5.7	0.24	58	72	A	5.7	0.25	60	74	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	5.4	0.19	40	57	A	5.4	0.20	41	58	NC	NC	NC	NC	NC
Granby St SB Left	C	34.9	0.16	24	52	C	34.9	0.16	24	52	NC	NC	NC	NC	NC
Granby St SB Right	C	33.4	0.04	0	28	C	33.9	0.04	0	28	NC	NC	NC	NC	NC
Commonwealth Avenue @ Hinsdale Mall															
Hinsdale Mall* NB Right	C	17.8	0.04	N/A	3	C	17.9	0.04	N/A	3	NC	NC	NC	NC	NC
Commonwealth Avenue @ Silber Way/Blandford Mall	**A**	**9.2**	**0.27**			**A**	**9.1**	**0.27**			NC	NC	NC	NC	NC

	Existing AM Peak Hour					No-Build AM Peak Hour					Build AM Peak Hour				
	LOS	**Delay (s)**	**V/C**	**50% Queue Length (ft.)**	**95% Queue Length (ft.)**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**
Commonwealth Ave EB Thru	A	5.6	0.24	60	74	A	5.7	0.25	61	76	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	5.4	0.19	39	59	A	5.4	0.20	41	61	NC	NC	NC	NC	NC
Silber Way SB Left/Thru/Right	D	42.3	0.39	39	72	D	42.3	0.39	39	72	NC	NC	NC	NC	NC
Bay State Road @ Granby Street/Back Street															
Bay State Rd EB*	A	9.2	0.03	N/A	2	A	9.2	0.03	N/A	2	NC	NC	NC	NC	NC
Bay State Rd WB	B	10.4	0.21	N/A	20	B	10.4	0.21	N/A	20	NC	NC	NC	NC	NC
Bay State Road @ Silber Way	**A**	**8.3**				**A**	**8.3**				NC	NC	NC	NC	NC
Silber Way NB Left/Thru/Right	A	7.9	N/A	N/A	N/A	A	7.9	N/A	N/A	N/A	NC	NC	NC	NC	NC
Silber Way SB Left/Thru/Right	A	7.7	N/A	N/A	N/A	A	7.7	N/A	N/A	N/A	NC	NC	NC	NC	NC
Bay State Rd WB Left/Thru	A	8.4	N/A	N/A	N/A	A	8.4	N/A	N/A	N/A	NC	NC	NC	NC	NC

Table 7-4: PM Key Traffic Operations Metrics

	Existing PM Peak Hour					No-Build PM Peak Hour					Build PM Peak Hour				
	LOS	**Delay (s)**	**V/C**	**50% Queue Length (ft.)**	**95% Queue Length (ft.)**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**
Commonwealth Avenue @ Saint Mary's Street	**B**	**15.3**	**0.46**			**B**	**15.2**	**0.47**			NC	NC	NC	NC	NC
Commonwealth Ave EB Thru	A	5.5	0.26	58	101	A	5.5	0.25	61	104	NC	NC	NC	NC	NC
Commonwealth Ave WB Left	E	62.1	0.72	155	231	E	62.0	0.72	155	231	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	9.6	0.42	95	111	A	9.6	0.43	96	112	NC	NC	NC	NC	NC
Commonwealth Avenue @ Cummington Mall	**B**	**13.5**	**0.57**			**B**	**13.5**	**0.58**			NC	NC	NC	NC	NC
Commonwealth Ave EB Left	E	58	0.56	52	102	E	58.0	0.56	52	102	NC	NC	NC	NC	NC
Commonwealth Ave EB Thru	B	10.8	0.56	235	384	B	11.0	0.58	244	396	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	5.4	0.37	46	108	A	5.4	0.38	47	110	NC	NC	NC	NC	NC
Cummington Mall* NB Left	D	51.7	0.60	69	112	D	51.7	0.60	69	112	NC	NC	NC	NC	NC
Cummington Mall* NB Right	D	45.2	0.01	0	0	D	45.2	0.01	0	0	NC	NC	NC	NC	NC
Commonwealth Avenue @ Granby Street	**A**	**7.1**	**0.27**			**A**	**6.9**	**0.28**			NC	NC	NC	NC	NC
Commonwealth Ave EB Thru	A	1.3	0.22	9	11	A	1.3	0.23	10	12	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	2.2	0.28	29	31	A	2.2	0.29	29	31	NC	NC	NC	NC	NC
Granby St SB Left	D	40.6	0.24	37	67	D	40.6	0.24	37	67	NC	NC	NC	NC	NC
Granby St SB Right	D	39.3	.10	0	34	D	39.3	0.10	0	34	NC	NC	NC	NC	NC
Commonwealth Avenue @ Hinsdale Mall															
Hinsdale Mall* NB Right	F	>80	1.71	N/A	171	F	>80	1.73	N/A	172	NC	NC	NC	NC	NC
Commonwealth Avenue @ Silber Way/Blandford Mall	**B**	**11.2**	**0.38**			**B**	**11.2**	**0.38**			NC	NC	NC	NC	NC

	Existing PM Peak Hour					No-Build PM Peak Hour					Build PM Peak Hour				
	LOS	**Delay (s)**	**V/C**	**50% Queue Length (ft.)**	**95% Queue Length (ft.)**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**	**LOS**	**Delay (s)**	**V/C**	**50% Queue Length**	**95% Queue Length**
Commonwealth Ave EB Thru	A	7.5	0.26	55	150	A	7.7	0.26	57	155	NC	NC	NC	NC	NC
Commonwealth Ave WB Thru	A	7.5	0.33	80	142	A	7.6	0.33	81	146	NC	NC	NC	NC	NC
Silber Way SB Left/Thru/Right	D	44.1	0.57	59	104	D	44.1	0.57	59	104	NC	NC	NC	NC	NC
Bay State Road @ Granby Street/Back Street															
Bay State Rd EB*	A	0	0.03	N/A	0	A	0	0.03	N/A	0	NC	NC	NC	NC	NC
Bay State Rd WB	B	12.9	0.29	N/A	30	B	12.9	0.29	N/A	30	NC	NC	NC	NC	NC
Bay State Road @ Silber Way	**A**	**7.7**				**A**	**7.7**				NC	NC	NC	NC	NC
Silber Way NB Left/Thru/Right	A	7.5	N/A	N/A	N/A	A	7.5	N/A	N/A	N/A	NC	NC	NC	NC	NC
Silber Way SB Left/Thru/Right	A	7.5	N/A	N/A	N/A	A	7.5	N/A	N/A	N/A	NC	NC	NC	NC	NC
Bay State Rd WB Left/Thru	A	8.1	N/A	N/A	N/A	A	8.1	N/A	N/A	N/A	NC	NC	NC	NC	NC

Notes:
1. Synchro version 11 was used to calculate results.
2. Signalized intersection results HCM reports from Synchro.
3. Unsignalized intersection results are based on the HCM 2010 reports.
N/A – Results not reported or available.
NC – No Change from the No-Build Condition for reasons described previously in this report.
* – denotes BU-owned roadway. Bay State is BU-owned west of Granby Street.

Overall, all study intersections operate at acceptable overall LOS, with all locations except Commonwealth Avenue & Cummington Mall (LOS C in the AM) reporting *overall* LOS scores of B or better. *Individual* intersection approaches that report lower LOS scores in the AM or PM peak are as follows:

- Commonwealth Avenue at Saint Mary's Street (Commonwealth Avenue WB left), with an LOS of D (AM), and E (PM)
- Commonwealth Avenue at Cummington Mall (Commonwealth Avenue EB left), with an LOS of D (AM) and E (PM).
- Commonwealth Avenue at Cummington Mall (Commonwealth Avenue EB Thru), with an LOS of C (AM).
- Commonwealth Avenue at Cummington Mall (Commonwealth Avenue NB left and right), with an LOS of D (AM and PM).
- Granby Street SB at Commonwealth Avenue (left and right turns), with an LOS of C (AM) and D (PM).
- Commonwealth Avenue at Hinsdale Mall (Hinsdale Mall NB right), with an LOS of C (AM) and F (PM).
- Silber Way SB at Commonwealth Avenue (Thru from Silber Way), with an LOS of D (AM and PM).

7.2.4 CRASH ANALYSIS

A crash analysis at the Study Area intersections was conducted to identify potential vehicle accident trends by obtaining crash data from January 2018 to November 7, 2023 from the City of Boston's Vision Zero crash portal. The Massachusetts Department of Transportation ("MassDOT") City of Boston's crash database only contains "incidents requiring public safety response which may involve injuries or fatalities." Therefore, this document also references the MassDOT database, which is comprised of crash data (including all crash severities) from the Massachusetts Registry of Motor Vehicles ("RMV") Division. A review of the crash data showed the results, which are summarized in Table 7-5.

Table 7-5: Crashes in Study Area Intersections, City of Boston & MassDOT (January 2018 – November 7, 2023)

	City of Boston Data	MassDOT Data
Commonwealth Avenue @ Saint Mary's Street	2 (2)	1 (0)
Commonwealth Avenue @ Cummington Mall	1 (1)	0
Commonwealth Avenue @ Granby Street	3 (1)	0
Commonwealth Avenue @ Hinsdale Mall	0	1 (1)
Bay State Road @ Granby Street/Back Street	0	0
Commonwealth Avenue @ Silber Way/Blandford Mall	2 (2)	2 (0)
Silber Way @ Bay State Road	3 (3)	1 (1)

Source: City of Boston's Vision Zero website, MassDOT Crash Portal

Note: Crashes within 150 ft. of the centroid of the intersection were assigned to that intersection. Additionally, ( ) represents the number of bicyclist- and pedestrian-involved crashes out of the total.

Though City of Boston and MassDOT sources appear to differ, both report low overall number of crashes, with apparent declines in the number of crashes from earlier time periods. Additionally, a Highway Safety Improvement Plan ("HSIP") map of the top crash locations was reviewed, using MassDOT's online interactive map. The intersections or roadway segments within the Study Area are not or were not classified within an HSIP crash cluster during the analysis period covered by the data in current or recent years.

7.2.5 PARKING

BU owns and operates eight major off-street surface parking lots and nine parking garages. Additionally, the University regulates parking along several private roadways and various small off-street parking areas located throughout the campus. According to the University's Parking and Transportation Services Office, as of July 12, 2023, the University managed a total of 3,436 parking spaces, including accessible, reserved, and EV-only spaces.

Management of BU controlled off-street parking access, pricing, and capacity is a foundation of the University's TDM plan. BU has in place regulations and policies to restrict access to off-street parking, particularly by students, and has increased the price of parking in tandem with incentivizing use of other modes by students, faculty, and staff. The University has worked cooperatively with the City of Boston to steadily reduce parking capacity across the BU Charles River Campus, removing a total of 349 spaces (244 BU and 105 city metered spaces) over the course of the 2013-2023 IMP,

with most reductions occurring in Central Campus when the CCDS and Kilachand Center projects eliminated surface parking lots without adding any new parking.

Off-Street Parking

The Project Site includes an existing 471 space parking garage, also known as Lot K or the Warren Towers Garage. Lot K is a permit and assigned parking-only garage and is not open to the public. The parking garage is used by University employees during the day. There is a single point of gate-controlled ingress for the garage located off the west side of the University-controlled Hinsdale Mall. Garage egress is located along Hinsdale Mall just south of the garage point of ingress. An additional point of vehicle egress from the garage is located on the west side of the Project Site along Cummington Mall

All University-owned parking facilities within a quarter-mile radius from the Project Site are listed below. See Figure 7-2, Existing Off-Street Parking Facilities.

- Garage K Warren Towers at 700 Commonwealth Avenue (471 spaces);
- Garage L at 575 Commonwealth Avenue (112 spaces);
- Garage M at 595 Commonwealth Avenue (269 spaces);
- Garage Q at 730-750 Commonwealth Avenue (146 spaces);
- Lot R at 766 Commonwealth Avenue (83 spaces); and
- Lot J at CAS Lot at 240 Bay State Road (138 spaces).

In addition, the following lots are located marginally beyond the quarter-mile radius:

- Lot O (Kenmore Lot) at 549 Commonwealth Avenue (51 spaces);
- Lot G (Lower Bridge Lot) adjacent to BU Bridge (42 spaces); and
- Lot H (Upper Bridge Lot) adjacent to BU Bridge (67 spaces).

The area surrounding the Project Site also includes residential permit parking and University reserved parking on private roadways owned or shared by the University.

Several BU-owned parking facilities, including the Kenmore Lot (Lot O), Warren Towers Garage (Lot K), 575 Commonwealth Avenue Garage (Lot L), Rafik B. Hariri Building Garage (Lot M), and 766 Commonwealth Avenue Garage (Lot R) are available to the public during major events.

On-Street Parking

The on-street parking regulations within the Study Area are mostly comprised of no parking, two-hour parking, three-hour parking, and four-hour parking. The on-street parking on Commonwealth Avenue westbound in the vicinity of the Project Site and along Silber Way and Bay State Road are regulated with four-hour parking restrictions. Parking meters along Blandford Mall, Cummington Mall, and Hinsdale Mall were removed when these streets became private ways owned by the University and were consequently converted from vehicle to pedestrian use (except for authorized vehicles). Granby Street between Commonwealth Avenue and Bay State Road previously had 21 metered parking spaces, with nine spaces along the east side and 12 spaces along the west side prior to being removed as part of the CCDS project, which converted Granby into a two-way street with bicycle accommodation on both sides. There are 20 metered parking spaces along Commonwealth Avenue westbound between Silber Way and Granby Street and another 14 metered parking spaces along Commonwealth Avenue westbound between Granby Street and University Road, with all of those located between Granby Street and Marsh Chapel. See Figure 7-3, Existing On-Street Parking Facilities.

7.2.6 CAR SHARING SERVICES

Car sharing services provide an alternative means of short-term private vehicular transportation without the hassle of car ownership and maintenance costs. Vehicles are available for renting on an hourly or daily basis for a specific period. They can be parked on dedicated parking spots or returned to their designated drop-off parking locations specified in the reservation. Rental fee for car sharing service covers gas, insurance, parking, and maintenance costs.

Zipcar is a major car sharing service in the Boston area. Zipcar locations near the Project Site include:

- University surface lot at 766 Commonwealth Avenue (Lot R) – BU;
- 199 Mountfort Street, Brookline;
- 855 Commonwealth Avenue, Boston;
- 12 Arundel Street, Boston; and
- 854 Beacon Street – Brookline (2 vehicles).

Refer to Figure 7-4, Existing Public Transportation for the nearby Zipcar locations.

7.2.7 EXISTING PEDESTRIAN ACCOMMODATIONS AND VOLUMES

Sidewalks immediately in front of the Project Site on the south side of Commonwealth Avenue measure 20 ft wide, 10 ft of which are sheltered by an overhead canopy connected to the podium. Sidewalks on the northern side of Commonwealth Avenue, in front of the Tsai Performance Center and the CAS measure at least 14 ft, with another 9 to 11 ft of furnishing zone reserved for plantings, bicycle parking, benches, and other features. The new sidewalks on Commonwealth Avenue in front of CCDS that were installed with that project are also wide.

- Granby Street: west side of street has a 6 ft sidewalk, with the east side's sidewalk even wider and leading to a new plaza area as part of the CCDS project.
- Bay State Road (east of Granby Street): Sidewalks along both sides of Bay State Road appear to be 6 to 12 ft, varying by section; and
- Bay State Road, west of Granby Street until the existing roundabout: sidewalks vary from approximately 10 to 14 ft (both sides);
- Along Bay State Road west of the roundabout: sidewalks are approximately 9 ft (and are only on the southern side);
- Hinsdale Mall: Sidewalks along both sides, 6 to 7 ft, with approximately 5 ft of clear space
- Cummington Mall: Sidewalks along both sides, 6 to 7 ft, with approximately 5 ft of clear space
- Blandford Mall: Sidewalks along both sides, 6 to 7 ft, with potentially less than 5 ft of clear space (more space on the northern section that borders BU Grounds East)
- Silber Way: Sidewalks along both sides of varying width (more clear space on the east side).

The physical conditions of the sidewalks are generally good throughout the Study Area. Continental-stye crosswalks are provided at all study intersections. Not all ramps have detectable warnings; however, the City of Boston is planning to shortly upgrade all ramps along Commonwealth Avenue to be ADA-compliant. Detectable warnings are provided at the crossing points with the Green Line. Pedestrian crossing signals are provided at the signalized intersections. More generally, BU has added improved pedestrian infrastructure with recent projects, such as the new plaza and connecting path associated with CCDS. See Figure 7-5, Existing Pedestrian Network.

Pedestrian and bicycling counts were conducted along with vehicular counts on October 18 and 19, 2023. Refer to pedestrian, bicyclist, and driver volumes in Table 7-6. As the table shows, pedestrians comprise over 70% of all active transportation users. Additionally, Table 7-6 shows that pedestrians outnumber drivers at the following Commonwealth Avenue intersections (Saint Mary's Street, PM; Granby Street, PM; Silber Way/Blandford Mall, PM) and at the Bay State Road intersections (Granby Street/Back Street, AM and PM; and Silber Way, AM and PM).

The Commonwealth Avenue and Granby Street intersection shows the highest PM pedestrian volumes, while the Commonwealth Avenue and Saint Mary's Street intersection reports the highest AM pedestrian volumes.

Table 7-6: 2023 Pedestrian, Bicyclist, and Auto/Truck Volumes (AM and PM)

	Peak Hour Volume (8 – 9 AM)			Peak Hour Volume (5 – 6 PM)		
	Peds	**Bicycles**	**Cars/ Trucks**	**Peds**	**Bicycles**	**Cars/ Trucks**
Commonwealth Avenue at St Mary's Street	836	180	971	1,632	236	1,378
Commonwealth Avenue at Cummington Mall	548	168	924	1,159	171	1,347
Commonwealth Avenue at Granby Street	613	104	901	1,995	198	1,246
Commonwealth Avenue at Hinsdale Mall	371	129	884	984	148	1,199
Commonwealth Avenue at Silber Way/Blandford Mall	818	150	880	1,818	188	1,275
Bay State Road at Granby Street/Back Street	235	31	164	403	48	198
Silber Way at Bay State Road	293	60	243	534	68	245

Source: Data from Accurate Counts, Collected in October 2023

7.2.8 EXISTING BICYCLING INFRASTRUCTURE AND VOLUMES

Bicycle roadway infrastructure located in the vicinity of the Project Site include bicycle lanes along the northern edge of Commonwealth Avenue westbound and the southern edge of Commonwealth Avenue eastbound. A contra-flow bicycle lane is also provided for eastbound bicyclists on Bay State Road between Granby Street and Beacon Street to the east. Westbound bicyclists use shared lane markings (sharrows) on Bay State Road. On Granby Street there is a northbound cycle track at sidewalk

level and a southbound painted bicycle lane protected by flex-posts. See Figure 7-6 Existing Bicycle Network.

There is currently indoor bicycle storage at the Project Site, in a bicycle room, with space for 74 bicycles, which is provided through 37 Inverted U-racks. Additionally, within that bicycle room, there is one existing repair and one bicycle pump. There are on-street bicycle racks with space for 44 bicycles on Commonwealth Avenue between Hinsdale and Cummington Malls. Cummington Mall also has 108 combined outdoor spaces, and Babbitt Street has another 32, behind the Women's Gender and Sexuality Studies Building.

Additionally, there are numerous existing outdoor bicycle racks and bicycle storage rooms in the vicinity of the Project Site. Some of these are owned by BU, while others located along the curb line of Commonwealth Avenue are owned by the City. Within a quarter mile of the Project Site, there are 1,335 existing bicycle parking space, with 518 of those being sheltered. See Figure, 7-7 Existing Bicycle Storage. Additionally, bicycle-related facilities within that same area for the beginning or end of bicycle trips are listed below:

- CILSE: Bicycle pump (indoors);
- CCDS: Showers, changing room, repair station, bicycle pump (within an outdoor secure bicycle cage);
- 765 Commonwealth Avenue/BU Law School: Indoor bicycle pump, shower, and changing room; and
- 775 Commonwealth Avenue/GSU: Bicycle pump and repair station (outdoors).

Recent bicycling counts show high bicycling volumes along Commonwealth Avenue (104 to 180/hour between 8 AM and 9 AM, and between 171 to 236/hour between 5 PM and 6 PM). All-day counts at Commonwealth Avenue, east of Saint Mary's Steet, found 1,532 bicyclists moving eastbound and 1,525 moving westbound throughout the entire day (summing to a total of 3,057 bicyclists/day). About 8.4% of total 24-hour traffic occurred in the AM peak hour (between 8:30 AM and 9:30 AM, with another 8.9% occurring in the PM peak hour (between 4:45 PM and 5:45 PM).

Comparing bicycle volumes to overall vehicle volumes on Commonwealth Avenue at the same location (at Saint Mary's Street), bicyclists make up an estimated 16.3% of total traffic throughout the day. In the AM peak hour for vehicles (8:30 AM to 9:30 AM) at Saint Mary's Street, bicyclists comprise 23.8% of all trips, while in the PM peak hour for vehicles (5:15 PM to 6:15 PM) at Saint Mary's Street, bicyclists made up an estimated 20.4% of all traffic.

7.2.9 PUBLIC TRANSPORTATION

MBTA Services

The Project Site is within a quarter-mile of three MBTA transit modes and six individual service routes. The MBTA Green Line B branch Light Rail runs along the median on Commonwealth Avenue, providing frequent service through the campus to Brighton or Park Street in Boston. The MBTA Green Line C and D branches also run within the quarter-mile radius of the Project Site. However, the nearest C and D branch stations are just beyond a quarter-mile from the Project Site to the west and south of the Park Drive/Beacon Street intersection.

The MBTA bus route operating near the Project Site is Route 57 which runs along Commonwealth Avenue from Watertown Yard to Kenmore Station. Other MBTA bus routes within the quarter-mile distance of the Project Site include Routes CT2 and 47, which provide crosstown services linking Cambridge and points north of the Charles River with the Longwood Medical Area and other points to the south and east.

The Project Site is also near the Framingham/Worcester Line of the MBTA Commuter Rail service, with the nearest stop at the Lansdowne Station less than a quarter mile away. See Table 7-7, MBTA Service Operations; and Figure 7-4, Existing Public Transportation.

Table 7-7: MBTA Service Operations

Route	Origin–Destination	Weekday Peak Hour Frequency (min)	Hours of Service
Green Line B Branch	Boston College – Park Street	6-8	Weekdays: 5:01 AM - 12:14 AM Saturday: 4:45 AM – 12:16 AM Sunday: 5:20 AM - 12:17 AM
Bus Route 57	Watertown Yard – Kenmore Station	8-10	Weekdays: 5:20 AM - 1:11 AM Saturday: 5:17 AM - 1:12 AM Sunday: 6:30 AM - 1:13 AM
Bus Route CT2	Sullivan Square - Ruggles	21-27	Weekdays: 6:06 AM - 7:12 PM No weekend service
Bus Route 47	Central Square, Cambridge – Broadway Station	16-24	Weekdays: 5:41 AM – 12:38 AM Saturday: 5:21 AM - 1:05 AM Sunday: 7:58 AM - 1:03 AM
Framingham /Worcester Line	Worcester – South Station	12-60	Weekdays: 4:15 AM – 12:40 AM Weekend: 5:00 AM – 12:40 AM

Source: Subway and Bus: MBTA Summer 2023 Schedule, Commuter Rail: MBTA Schedule for Framingham/Worcester Line effective Spring/Summer 2023.

Boston University Shuttle Service

BU operates a free shuttle service, BUS, which provides essential access and mobility within and across the activity nodes within the BU Charles River Campus, as well as connections with the BU Medical Campus to facilitate travel and collaboration for students and faculty of both campuses. See Figure 7-4, Existing Public Transportation. The live view BUS tracking system on the BUS website and BUS mobile app provides real-time information of bus locations traveling along the route. The BUS operates four routes (via a contract operator):

- 1BU (CRC-MED) – links BU Charles River Campus and Medical Campus;
- Commonwealth Avenue – loop linking West Campus with East Campus and points in between;
- Fenway - links BU Charles River Campus with the Fenway Campus; and
- Night – provides service across the BU Charles River Campus and Fenway Campus in evening and late nights with greater frequency and span of service than is available from the MBTA.

The BUS provides weekday and Saturday service throughout the year and Sunday evening and late-night service during Fall and Spring semesters only. The University uses larger, articulated buses instead of standard city bus-type vehicles to accommodate increased demand during the weekday peak periods. The peak period bus routes only serve BU Charles River Campus and operate on a loop along Commonwealth Avenue between Harry Agganis Way and Kenmore Square. The Sunday evening and late-night service is also available in the BU Charles River Campus only. See Table 7-8 BUS Operations and Figure 7-4, Existing Public Transportation.

Table 7-8: BUS Operations

BUS Route	Origin–Destination	Weekday Peak Hour Frequency (min)	Hours of Service
BUS Fall/Spring Route	Weekday & Saturday: Student Village II (33 Harry Agganis) – 710 Albany Street – Student Village II (33 Harry Agganis) Sunday: Agganis & Commonwealth Avenue – Student Village (Buick Street)	10	Weekdays: 7:00 AM – 11:55 AM Saturday: 6:30 AM – 5:25 PM Sunday: 7:05 PM – 2:00 AM
BUS Summer Schedule	Student Village II (33 Harry Agganis) – 710 Albany Street – Student Village II (33 Harry Agganis)	30	Weekdays: 7:00 AM – 11:25 AM Saturday: 6:30 AM – 5:25 PM

Source: BU Parking & Transportation Services. The BUS Schedules.

7.2.10 BICYCLE SHARING SERVICES

The Project Site is near existing bicycle sharing locations. BLUEbikes, formerly known as Hubway, is Metro Boston's public bicycle share program. Hubway was launched in 2011, and the name was changed to BLUEbikes in the Spring of 2018. BLUEbikes now consists of more than 4,000 bicycles at over 400 stations across Greater Boston.

Three BLUEbikes stations are located at or near the Project Site, all on Commonwealth Avenue. The locations of the BLUEbikes stations are listed below and shown in Figure 7-6, Existing Bicycle Network.

- South side of Commonwealth Avenue, in front of the Project Site (16 docks).
- In front of GSU (north side of Commonwealth Avenue) (11 docks);
- Silber Way at Commonwealth Avenue (19 docks);

7.3 NO-BUILD CONDITION

The No-Build Condition analyzes the future transportation conditions within the Project Study Area without the Project. The No-Build traffic volumes include the additional traffic generated by the Kenmore Hotel; however, we know that these additional traffic volumes on Commonwealth Avenue are very small with less than 15 additional vehicles during each peak hour.

7.3.1 BACKGROUND TRAFFIC GROWTH

A 0% background traffic growth rate was applied to the Existing Condition peak hour traffic volumes. This is consistent with the directive from the BTD memo, *Traffic Counts During and Post-Pandemic,* which states that "BTD will no longer use background vehicle growth rates not associated with new development over time during or after the pandemic." Considering that this Project is only adding nine additional beds and removing 30 off-street parking spaces, no additional traffic is expected.

7.3.2 SPECIFIC DEVELOPMENT TRAFFIC GROWTH

Potential development projects by the University and others, expected to be completed by 2028 were identified and their impact on traffic growth was considered. These projects would have limited potential impact on the Project Site or the surrounding roadway network. The University's development projects were identified in the concurrent IMPNF as PIPs and are listed below.

- Pardee School of Global Studies (anticipated opening by 2028) – this project will replace an existing BU surface parking lot with a new academic building with users relocated from seven other existing locations in Central Campus. The Project results in no net increase in vehicle traffic because of a removal of surface parking and because most users of the Pardee Building are being relocated from existing BU campus buildings.

- Mugar Memorial Library Renovation – this project is a total rehabilitation of the existing facility with no change in use, gsf, or trips.

The development projects listed above are not anticipated to generate new vehicle trips or are anticipated to be constructed after the Project, and therefore are not assumed to add any vehicle traffic to the 2028 No-Build condition in this study. In addition to the University PIPs listed above, the Kenmore Hotel project was also considered in the No-Build traffic analysis, additional vehicle trips generated by that project were added to the roadway network, as shown in the Draft Project Impact

Report for One Kenmore Square, prepared by Epsilon Associates, Inc. and dated April 22, 2019.

7.3.3 TRAFFIC VOLUMES & OPERATIONS ANALYSIS

Key traffic operations metrics for the No-Build are shown in Table 7-3 and Table 7-4. The future No-Build traffic volumes include traffic to be generated along Commonwealth Avenue by the Kenmore Hotel project, but the generated results are almost identical to the existing conditions. All study intersections in the No-Build will operate at acceptable LOS (LOS C or better) for the overall intersection.

However, individual approaches to intersections will continue to operate at a lower LOS. In the weekday afternoon peak hour Hinsdale Mall approach to Commonwealth Avenue is expected to operate at LOS F in the Existing and the No Build conditions. This approach serves a very low volume of traffic with 46 vehicles in the peak hour and although the average delays per vehicle are high the queue lengths are anticipated to be very low. The high vehicle delays on Hinsdale are not anticipated to be a problem during construction of the Project because all exiting construction vehicles will be using Cummington Mall to access Commonwealth Avenue.

The City of Boston is exploring the feasibility of converting an existing travel lane in each direction along Commonwealth Avenue between Packard's Corner and Kenmore Square to bus priority, similar to what is currently in operation on Brighton Avenue west of Packard's Corner used by the MBTA Route 57. The University will coordinate with the City, the MBTA, and others as this concept is explored to better understand its potential benefits to MBTA bus and BUS operations, and potential impacts on other modes operating in the corridor.

7.3.4 NO-BUILD PEDESTRIAN IMPROVEMENTS

BTD is advancing a project to update pedestrian curb ramps east of the BU Bridge to ensure safety and comfort to those with vision or ambulatory issues. Such improvements are being coordinated with the above-mentioned bicycle lane and other corridor improvements along this segment of Commonwealth Avenue.

7.3.5 NO-BUILD BICYCLE IMPROVEMENTS

Currently, the University is coordinating with the City of Boston as they advance a design for parking- and bollard-protected bicycle lanes on both sides of Commonwealth Avenue between the BU Bridge on the west and Kenmore Square on the east. This City led effort will provide a more comfortable and safer bicycle route along an important segment of Commonwealth Avenue serving the Central and East campuses. BU is working collaboratively with BTD to ensure that these facilities best

serve the needs of the community, and that the protected bicycle lanes are coordinated with other corridor improvements, such as bus stops and Uber/Lyft pick-up and drop-off.

7.3.6 NO-BUILD PUBLIC TRANSPORTATION IMPROVEMENTS

The BTD, in coordination with the MBTA, is planning improvements to the Route 57 bus corridor to reduce transit delay and enhance safety. The MBTA 57 route operates between Kenmore Square and Watertown, with the eastern portion of the route on Commonwealth Avenue through the BU Charles River Campus. Improvements being considered include bus signal priority and converting one of the two existing general travel lanes in each direction into a bus priority lane. These potential changes potentially include the section of Commonwealth Avenue in front of the Project Site.

7.4 BUILD CONDITION

The 380,200 sf renovation will include repairs to the building's envelope, reconfiguration of bathroom cores, modernization of elevators and escalators, and new MEP systems in the residential towers and fourth floor common areas, which includes adding air conditioning to dorm rooms and replacement of site utilities. Parking capacity in the existing garage will be slightly reduced. As renovation of an existing building with no significant change to the building uses or capacities, the Project will not add new trips to the campus network.

7.4.1 PROJECT SITE ACCESS AND CIRCULATION

The Project Site will create no new curb cuts for vehicular access along any City of Boston roadways. Access to the Project Site is via a private way and access for loading, deliveries, and trash pick-up will utilize the existing facilities that service the abutting properties of the University. Given the modest scale and uses in the building, the demand on existing site access and circulation will not be significant. University service vehicles and delivery trucks will access the Project Site via the same route as used for serving existing buildings, which is from Commonwealth Avenue westbound, to Granby Street northbound, and to Bay State Road westbound, where they will enter the service driveway. Service and delivery vehicles will exit the Project Site in the reverse of how they entered, i.e., via Bay State Road to Granby Street to Commonwealth Avenue.

7.4.2 PARKING

The Project will remove 30 spaces from the Project Site's parking garage. Visitors now and with the Project can utilize existing metered parking located along the north and south sides of Commonwealth Avenue and Bay State Road or they may park at the

University-owned pay-on-entry Kenmore Parking Lot (Lot O) located at the corner of Commonwealth Avenue and Deerfield Street. BU visitors can also park in the Agganis Arena Lot/Garage and Langsam Garage located west of the BU Bridge, and can walk, bicycle, or take MBTA bus, Green Line trains, or BUS to the Project Site.

See Figure 7-2, Existing Off-Street Parking Facilities.

The University has implemented several measures to reduce the number of vehicles on campus and increase the use of sustainable modes of transportation for commuters. The University has a success TDM program in place that offers MBTA subsidies, discourages single occupancy vehicle travel and encourages transit use, walking, biking, and carpooling. The University charges faculty, staff, and students' fees for parking permits to discourage vehicle trips to the University; limits student parking permits; and actively restricts the number of parking permits issued to undergraduate students. The University will consider several additional measures to further strengthen the TDM program to achieve its goal of increasing the use of sustainable modes of transportation by employees and students, particularly among those currently commuting to the BU Charles River Campus in single occupancy vehicles.

Nearly half of the University's off-street parking spaces are in the West Campus, with the other half spread across Central, South, and East Campuses. Based on a survey conducted in October 2022 the peak in-semester weekday parking utilization rates are highest in East, Central, and South Campus and lowest in West Campus.

The University will continue its efforts to reduce on-campus parking especially in the academic core and will adjust the TDM measures to achieve those goals. The loss of parking will also require further increases in operational efficiency and enforcement at the University's remaining parking facilities, while encouraging people to park in lower demand areas or take fewer auto trips.

The vehicles that are using the 30 spaces being removed will need to shift to another on-campus parking facility. There is available capacity within the University's parking system, although users will likely find themselves parked at a less convenient location. In the longer term, the reduction in parking supply underscores the importance of reducing commuter vehicle trips to campus. While restricting access to parking and increasing its price has helped reduce parking demand there is the opportunity to reduce it further. Employees currently without a transit pass (82%) have the largest impact on parking demand. Therefore, targeting those employees with a "universal transit pass" program, permitting free or discounted transit trips daily, is the only new significant transit incentive available to shift additional commuter trips from driving to transit.

7.4.3 CAR SHARING SERVICES

The Project will have no impact on available car sharing services. Existing Zipcar locations within and adjacent to campus are shown as part of Figure 7-4, Existing Public Transportation. The nearest Zipcar location to the Project Site is at the University-owned permit-only surface parking lot at 766 Commonwealth Avenue. There is another existing Zipcar location near Park Drive in South Campus.

7.4.4 LOADING AND SERVICE

The Project makes no significant changes to the existing uses and capacity of the building and therefore does not require changes to the existing loading and service areas. The main service entrance will remain at the southeast corner of the building on Hinsdale Mall. Access for loading, deliveries, and trash pick-up will utilize the existing facilities, which consist of the primary loading zone on Hinsdale Mall, with a supplemental loading zone on Cummington Mall at the west end of the building used to service first floor tenants along Commonwealth Avenue at the west end of the building. The University will continue to discourage tenant suppliers from stopping on Commonwealth Avenue in front of the Project Site, which is a City of Boston roadway currently signed as a tow zone with no stopping any time. This is to prevent the stopped vehicles impact on the existing curbside bicycle lane, bus stop, and general traffic operations.

7.4.5 RIDE-SHARE CURB

Potential ride-share curb locations were evaluated for transportation network company ("TNC") vehicles serving the Project Site. The area directly in front of the Project Site is a No-Stopping Tow Zone with a narrow right-of-way supporting two eastbound vehicle lanes, a curbside bicycle lane, and limited depth of sidewalk making it unsuited for ride-share use. The preferred location is on Commonwealth Avenue east of Hinsdale Mall, which is the current location of the food truck curb. For this location the food truck would be relocated to the nearby University-owned Blandford Mall and the existing curb would be converted to ride-share use. The Proponent also evaluated an alternative location along Commonwealth Avenue west of Cummington Mall, where there is the potential to convert existing metered parking spaces closest to Cummington Mall into a ride-share curb. For either location the University would coordinate with the City on design and implementation of the ride-share curb in tandem with geofencing the area directly in front of the Project Site.

7.4.6 PEDESTRIAN ACCOMMODATIONS

Pedestrians will be able to enter the Project Site from existing access points bordering Commonwealth Avenue. There will be no changes to the location, capacity, or function of the existing building ingress/egress points at street level. Pedestrians within the Project Site will benefit from updates to accessibility deficiencies defined by the ADAAG. Specific updates will include an accessible entrance, bathroom stall and circulation improvements, dorm room, kitchenette, and laundry room improvements.

7.4.7 BICYCLE ACCOMMODATIONS

In line with BU's current TDM program, the Project will encourage bicycle use and reduce parking demand. As part of the Project, a total of 320 bicycle parking spaces will be provided in the garage, which includes 120 two-tier bicycle racks and 40 inverted U-racks. This is more than a fourfold increase from the existing 74 indoor bicycle racks and an important benefit considering that the number of proposed beds with the new redesign will remain essentially the same. Outdoor bicycle parking along Commonwealth Avenue will remain unchanged. The rack type may change with proposed work, but the quantity will be unchanged. Similarly, the BLUEbikes bikeshare station on Commonwealth Avenue immediately in front of the Project Site will remain.

During construction, the University will continue to coordinate with the City and BLUEbikes to ensure that construction does not impact the ability of users to access the BLUEbikes bikeshare station.

7.4.8 PUBLIC TRANSPORTATION

The Project makes no changes to public transportation infrastructure or services at or in the vicinity of the Project Site.

7.4.9 PROJECT TRIP GENERATION

The Proponent anticipates generating no additional trips relative to the No-Build condition. The Project is renovating an existing residential facility, and although there will be a 0.5% increase in the number of residential beds, these nine additional beds are anticipated to have negligible new trip generation.

7.4.10 BUILD CONDITION TRAFFIC OPERATIONS ANALYSIS

Traffic operations for all intersections are expected to be the same as for No-Build, with modest improvements likely from the removal of 30 parking spaces from the Project Site's parking garage.

7.5 TRANSPORTATION MITIGATION MEASURES

As described in Section 7.4, there are no adverse traffic-related impacts associated with the Project. The Project will result in the net removal of 30 existing parking spaces located in the Project Site's parking garage. The removal of these parking spaces will slightly reduce traffic volumes on Hinsdale and Cummington Mall, as well as the associated intersections with Commonwealth Avenue by eliminating vehicle trips currently using those roadways for parking garage ingress and egress. It is expected that some of those vehicle trips will shift to using other BU permit parking facilities located a greater distance from the CAS, while others will turn to other modes incentivized by the BU TDM program.

To accommodate the reduction in parking supply, BU has a proven and robust TDM program that has effectively reduced parking demand on campus. As the University continues to expand its TDM program, parking demand on campus is expected to continue to fall. The following section describes the current and planned TDM program elements.

7.5.1 TRANSPORTATION DEMAND MANAGEMENT

BU's Parking and Transportation Services office has established a set of initiatives with the goal of reducing the number of vehicles on campus and increasing the use of sustainable modes of travel. Reducing drive-alone vehicle demand is an essential component of the University's TDM program, and faculty, students, and staff are encouraged to pursue alternatives to driving alone. The University's TDM program includes the following components:

- Employee carpool incentives including reserved spaces and discounted parking;
- Terrier Transit, a BU-specific trip-planning app for iOS and Android that uses real-time BUS, MBTA, BLUEbikes, and Zipcar data to help users make informed mobility decisions;
- Pre-tax payroll deduction purchase options and a 50% subsidy for employee MBTA passes;
- 50% subsidized employee parking at transit stations;
- A student MBTA semester pass program that provides an 11% discount;

- The free BUS service, which connects the three campuses at high frequency during weekday peak hours and provides late-night service seven days per week;
- Safe and secure bicycle storage at all major BU facilities;
- Public bicycle repair stations with tools and pumps;
- Shower facilities accessible to those who run or bicycle to work;
- Bicycle lights, bells, and helmets provided to BU employees and students at no charge;
- Bicycle safety and encouragement programs including commuting clinics, bicycle safety checks, and a 1-credit urban bicycling class;
- Discounted bicycle and car-sharing memberships, with easy on-campus access to services;
- A Personalized Commuting Assistance service that provides students and employees with personalized analyses of their commuting options from their home to their campus destination with an emphasis on alternatives to driving alone;
- A generous bicycle commuter reimbursement benefit that reimburses employees for bicycle commuting-related purchases;
- Membership in Allston-Brighton Transportation Management Associations ("TMA"), A Better City TMA, and Medical Academic and Scientific Community Organization ("MASCO"). The TMAs have robust TDM programming for their members mostly provided via the statewide "GoMassCommute" platform, including:
    - carpool matching and incentives
    - a Guaranteed Ride Home program via Uber
    - a bicycle commuter reimbursement benefit
    - trip tracking incentives including monthly prizes
    - member events including talks and bicycle repair clinics

In addition, several strategies are employed by the University to manage parking supply and demand, including:

- Parking permit program fees for employees and students who bring vehicles to campus;
- Restriction of the availability of parking permits issued to undergraduate students; and
- Reduction in available parking spaces as PIPs are developed on surface parking lots.

The University is continuing to monitor the changes related to the impact of COVID-19 and remote work policies on TDM goals and objectives and intends to pursue the following steps to further improve the bicycle component of its TDM program:

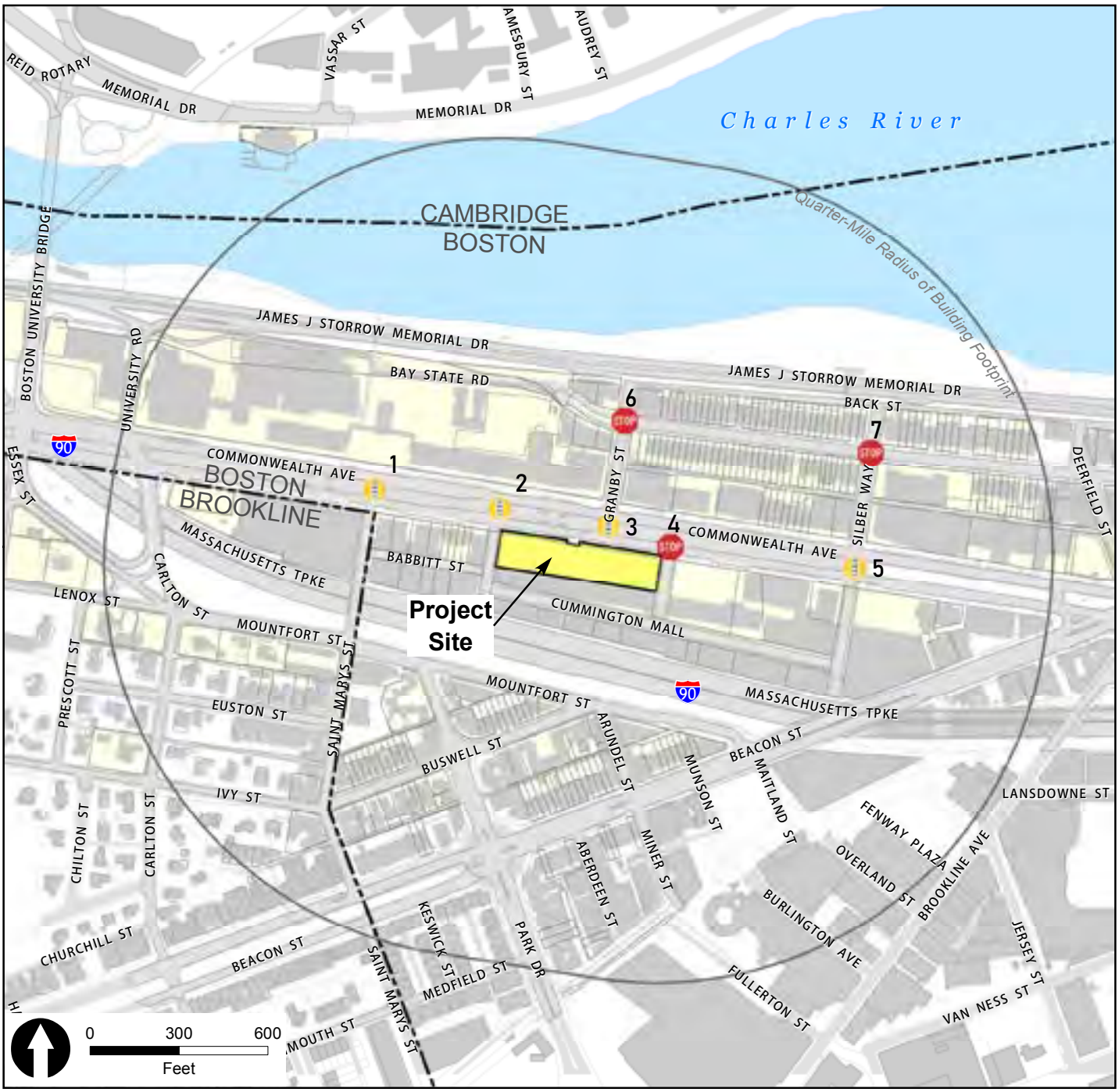
- Assess current bicycle parking inventory, bicycle parking placement, bicycle rack styles, end-of-trip facilities, and wayfinding (both on and off-campus routes);
- Determine likely areas of growth in demand for bicycle parking and potential mode shift expectations;
- Recommend short-, medium-, and long-term bicycle parking facilities improvements, including areas to install sheltered bicycle parking and opportunities to expand capacity; and
- Assess the potential for a BLUEbikes bicycle share system to serve as part of the solution to the increasing demand on available bicycle parking.

The BTD has a TDM Point System Tool that is used to score projects depending upon the area of the City in which the development is proposed. Developers use an interactive spreadsheet that assigns points for different TDM strategies and development components.

Attributes associated with the Project and the University's overall TDM program were input to the BTD Point System Tool, which shows the Project scores 136 points against a target score of 100. See Attachment 11, BTD TDM Point System Tool for details of the Project score.

7.6 TRANSPORTATION ACCESS PLAN AGREEMENT

The Proponent is responsible for preparation of the Transportation Access Plan Agreement ("TAPA"), which is a formal legal agreement between the Proponent and the BTD. The TAPA formalizes the findings of the transportation study, mitigation commitments, elements of access and physical design, TDM measures, traffic impact model, and any other responsibilities that are agreed to by both the Proponent and the BTD. The TAPA will be executed after the completion of the technical analyses.



Signalized Intersection

Unsignalized Intersection

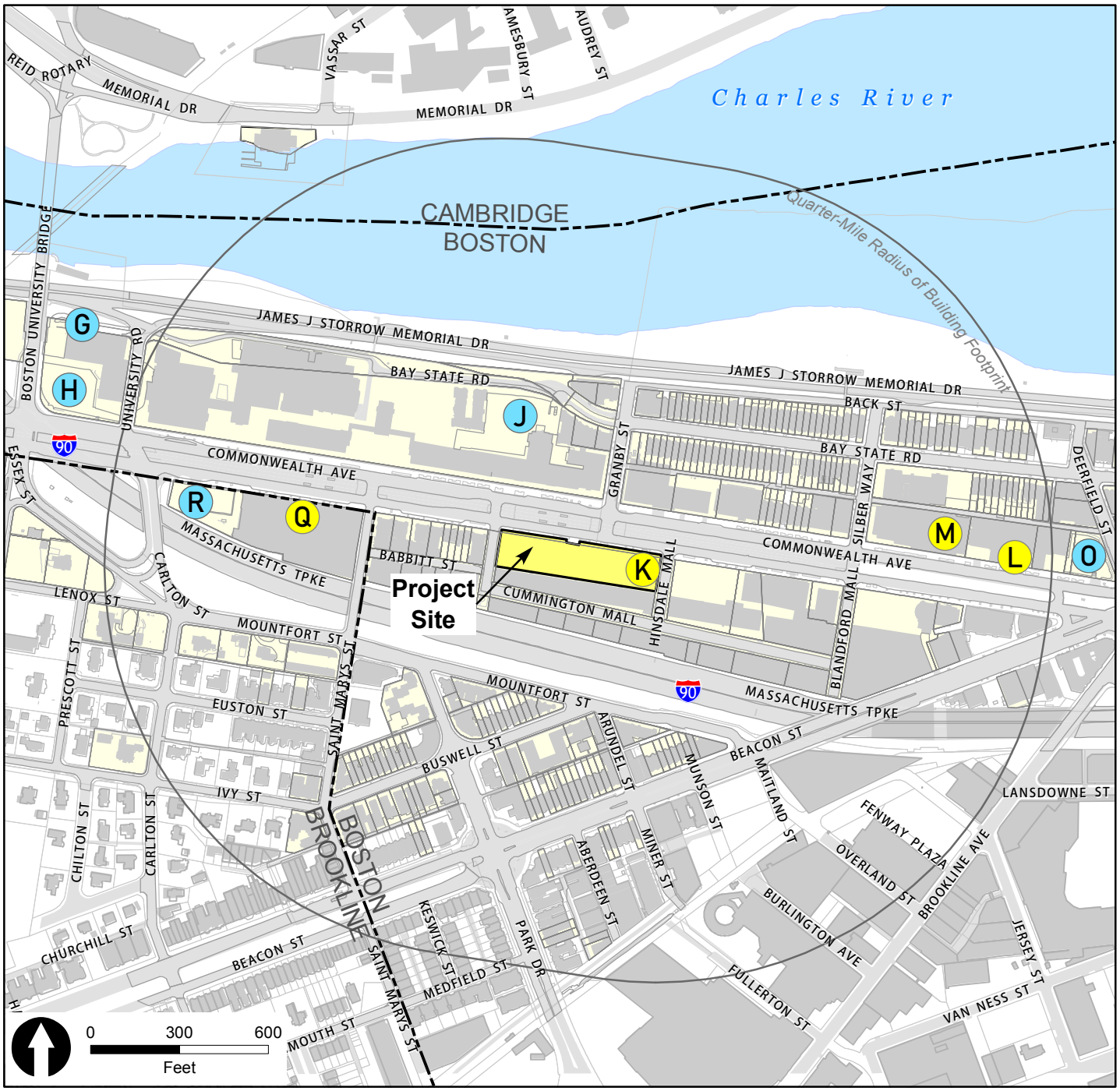
Boston University Parcel

Municipal Boundary

Source: City of Boston, Boston University

1 Commonwealth Ave/St Marys St
2 Commonwealth Ave/Cummington Mall
3 Commonwealth Ave/Granby St
4 Commonwealth Ave/Hinsdale Mall
5 Commonwealth Ave/Silber Way/Blandford Mall
6 Granby St/Bay State Rd
7 Silber Way/Bay State Rd

Figure 7-1
Study Area Intersections
Source: AECOM, 2023



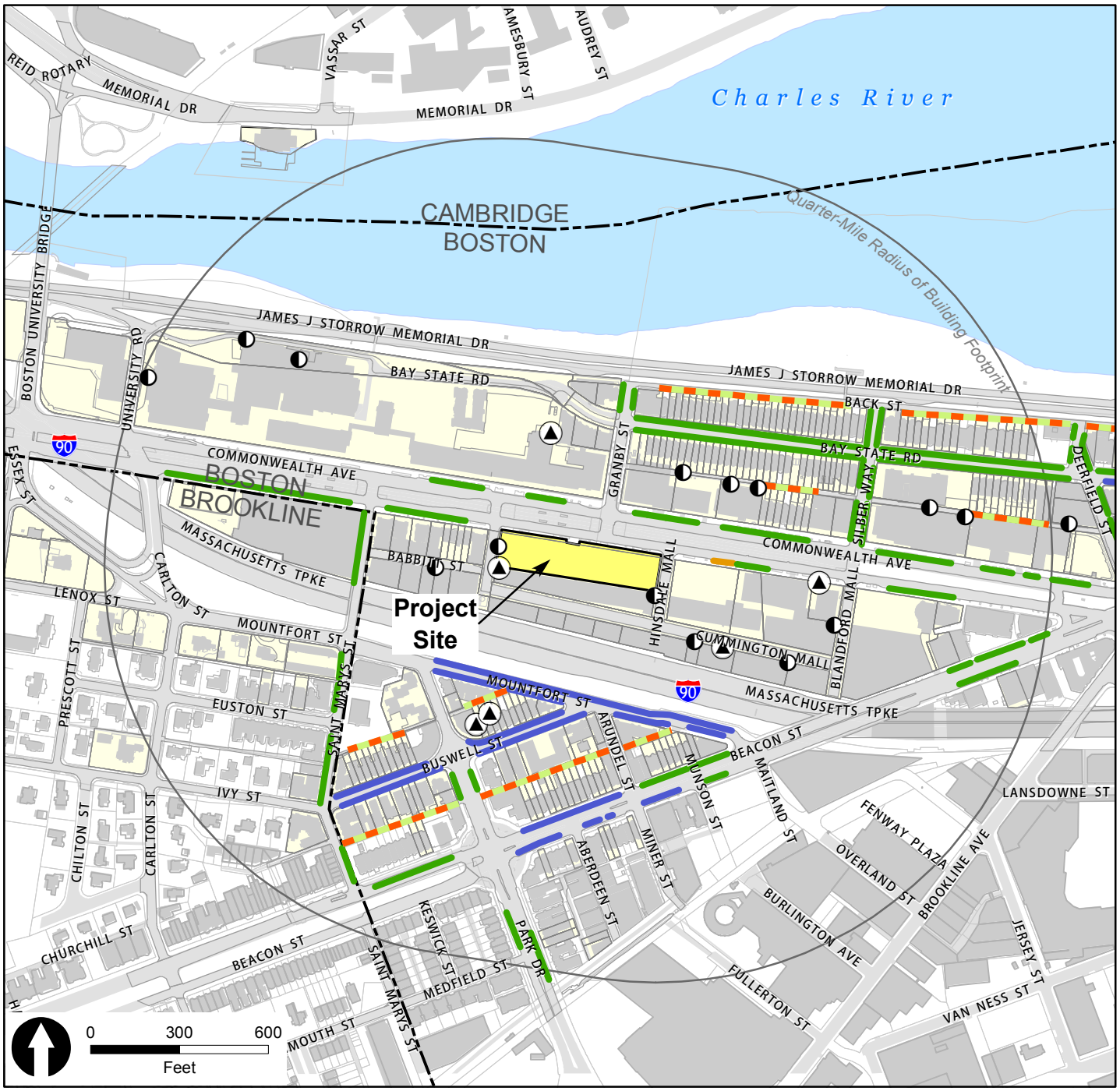
Id	Name	Type	Spaces
G	Lower Bridge Lot	Surface	42
H	Upper Bridge Lot	Surface	67
J	CAS Lot	Surface	138
K	Warren Towers Garage	Garage	471
L	575 Commonwealth Ave	Garage	112
M	Rafik B. Hariri Building Grarage	Garage	269
O	Kenmore Lot	Surface	51
Q	730/750 Commonwealth Ave	Garage	146
R	766 Commonwealth Ave	Surface	83
		Total	**1379**

Off-Street Parking
- Garage
- Surface

Boston University Parcel

Municipal Boundary

Figure 7-2
Existing Off-Street Parking Facilities
Source: AECOM, 2023



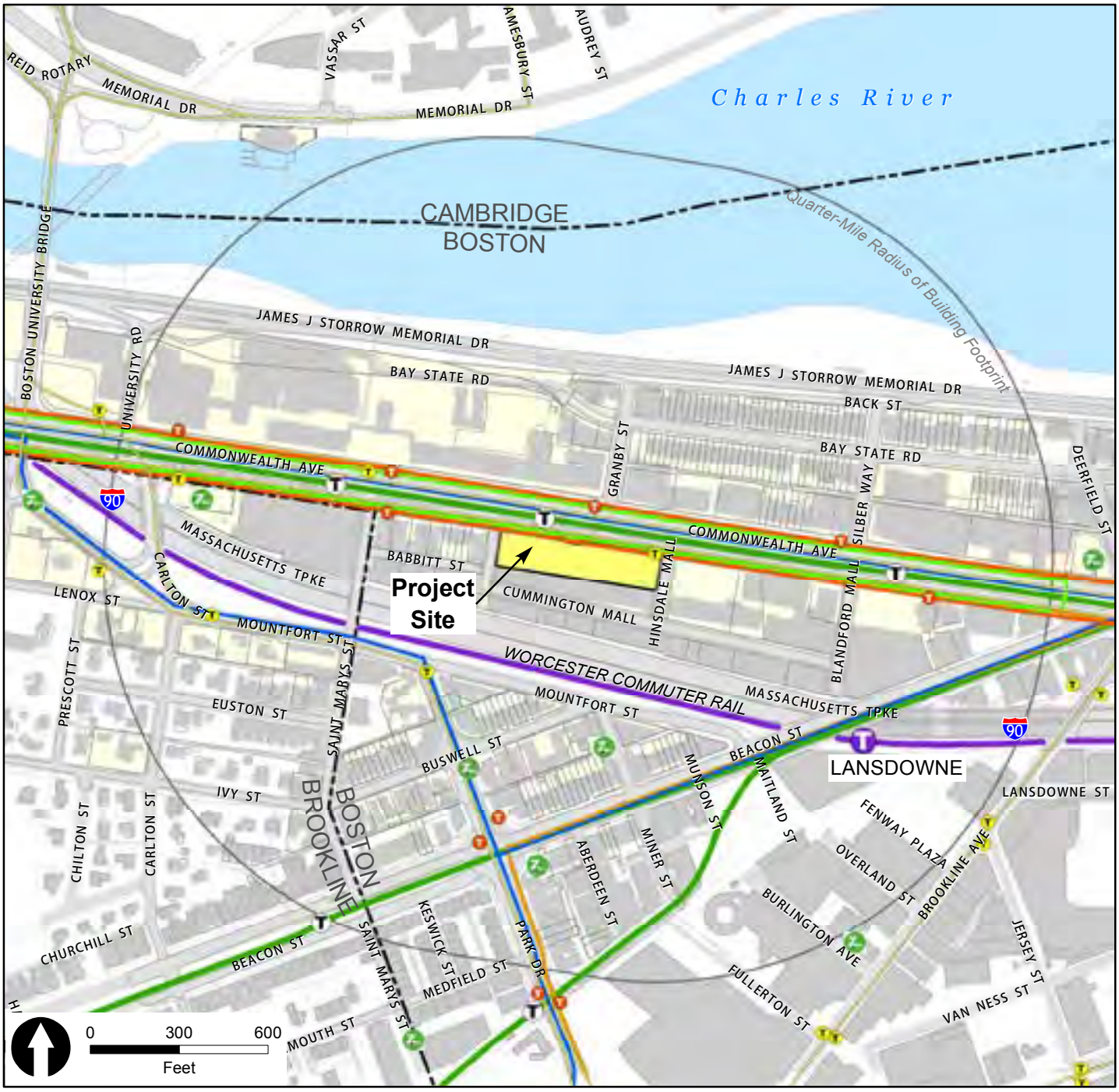
Boston University Parcel
Municipal Boundary

On-Street Parking
Metered Parking
BU Permit Parking
Other Restricted
Boston Resident Parking
Food Truck Parking

Loading Dock/Service Bay
Loading Zone

Source: City of Boston, BU, Google Streetview

Figure 7-3
Existing On-Street Parking Facilities
Source: AECOM, 2023



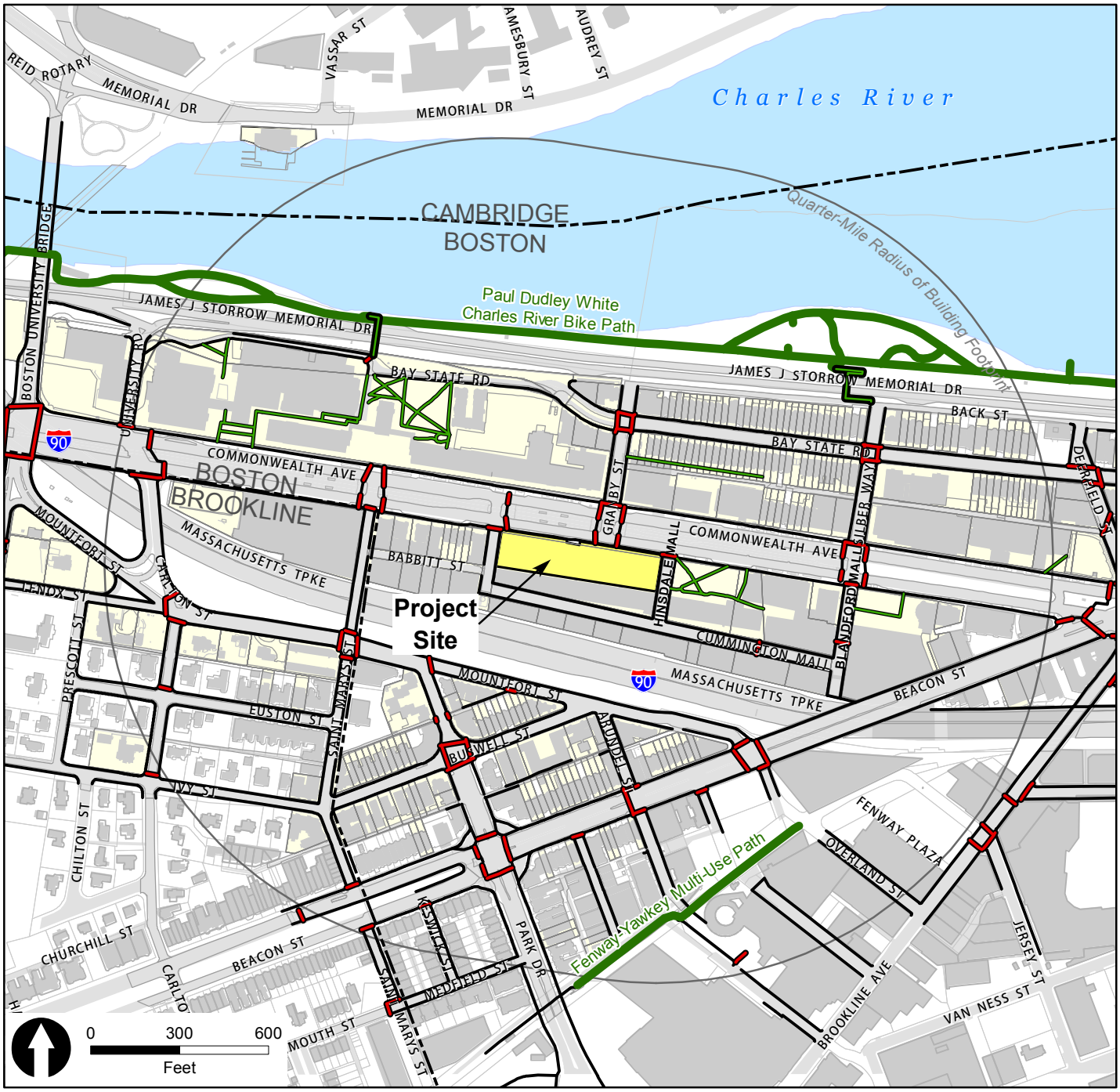
Zipcar
Commuter Rail Station
MBTA Stop
MBTA Bus & BU Shuttle Stop (Shared Stop)
MBTA Bus Stop

BU Shuttle Line
1BU
Comm Ave Loop
Night Line
Fenway Line

MBTA Bus Route
Commuter Rail Line
Rapid Transit Line
MBTA Green Line
Boston University Parcel
Municipal Boundary

Source: City of Boston, BU, CTPS

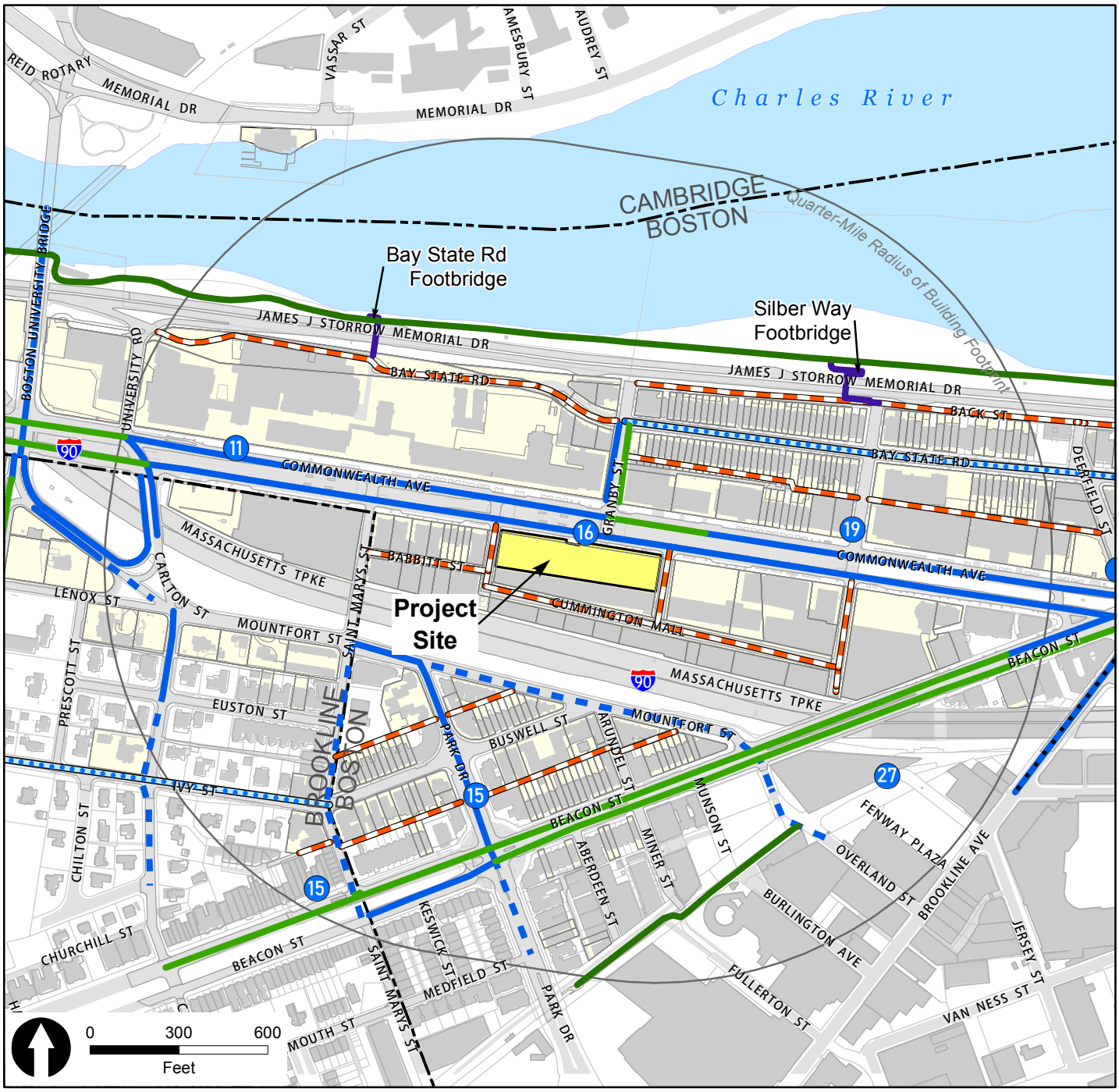
Figure 7-4
Existing Public Transportation
Source: AECOM, 2023



Boston University Parcel
Municipal Boundary
Shared Use Path
Ped Bridge
Sidewalk
Painted Crosswalk
Walkway

Source: City of Boston (BTD), BU, DCR

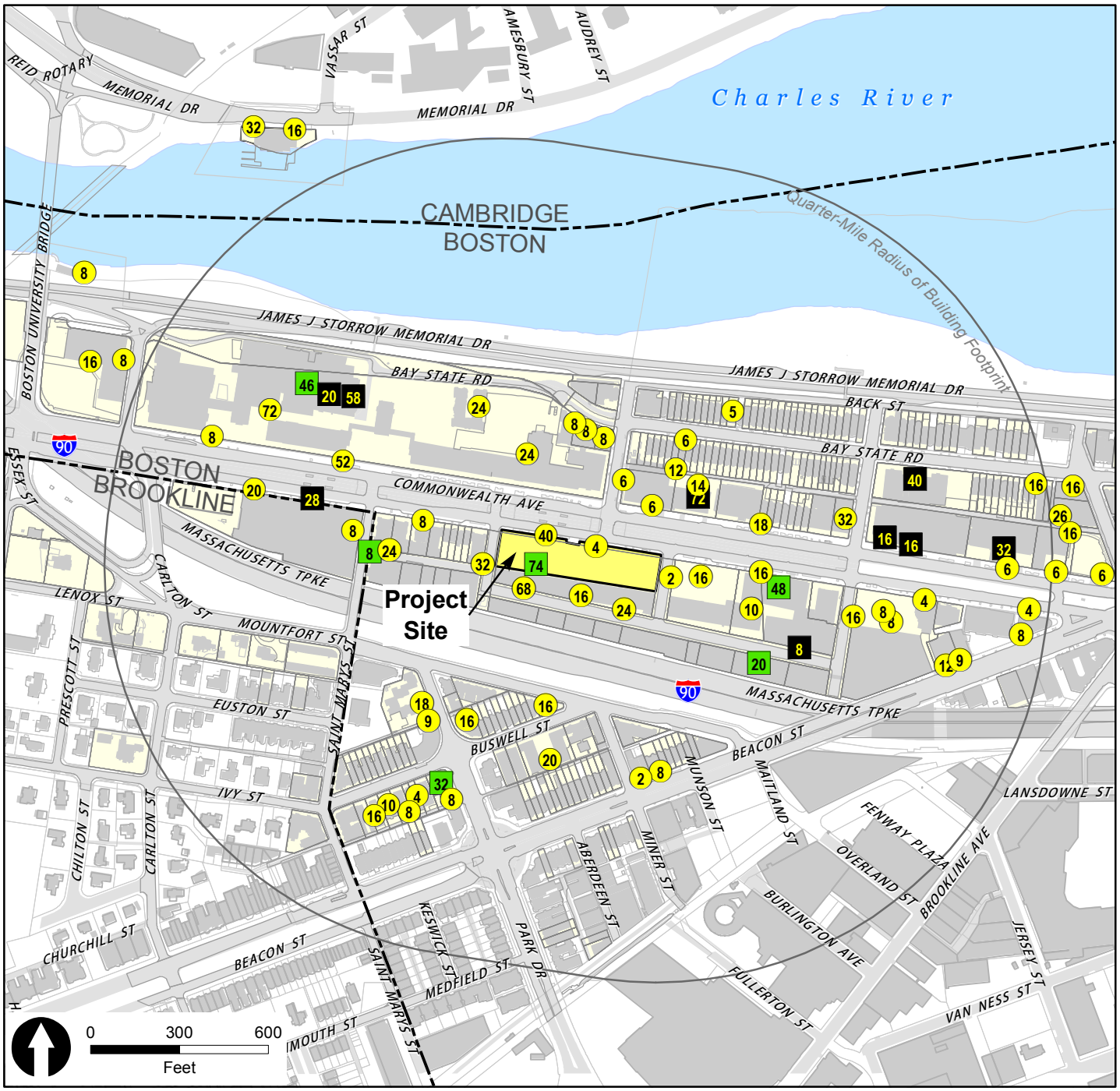
Figure 7-5
Existing Pedestrian Network
Source: AECOM, 2023



Boston University Parcel
Municipal Boundary
BLUEbikes Station (Number of Docks)
Bike Lane/Shared Lane Hybrid
Bike Lane or Buffered Bike Lane
Contraflow Bike Lane
Separated Bike Lane
Shared Lane Markings or Shared Bus Lane
Walkway
Shared Use Path
Private Way

Source: City of Boston (BTD), City of Boston Open Data Portal
Town of Brookline, Bicycle Network Plan.

Figure 7-6
Existing Bicycle Network
Source: AECOM, 2023



Boston University Parcel
Municipal Boundary

Source: Boston University

6 Bike Room and Capacity
6 Covered Bike Rack and Capacity
6 Uncovered Bike Rack and Capacity

Figure 7-7
Existing Bicycle Storage
Source: AECOM, 2023

Attachment 1

ACCESSIBILITY CHECKLIST

ARTICLE 80 – ACCESSIBILITY CHECKLIST

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

The Mayor's Commission for Persons with Disabilities works to reduce architectural barriers that impact accessibility in Boston's built environment. This Checklist is intended to ensure that accessibility is planned at the beginning of projects, rather than after a design is completed. It aims to ensure that projects not only meet minimum MAAB/ADA requirements, but that they create a built environment which provides equitable experiences for all people, regardless of age or ability.

All BPDA Small or Large Project Review, including Institutional Master Plan modifications, must complete this Checklist to provide specific detail and data on accessibility. An updated Checklist is required if any project plans change significantly.

For more information on compliance requirements, best practices, and creating ideal designs for accessibility throughout Boston's built environment, proponents are strongly encouraged to meet with Disability Commission staff prior to filing.

Accessibility Analysis Information Sources:

1. Age-Friendly Design Guidelines - Design features that allow residents to Age in Place
   https://www.enterprisecommunity.org/download?fid=6623&nid=3496
2. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
   http://www.ada.gov/2010ADAstandards_index.htm
3. Massachusetts Architectural Access Board 521 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
4. Massachusetts State Building Code 780 CMR
   http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/building-codebbrs.html
5. Massachusetts Office of Disability – Disabled Parking Regulations
   http://www.mass.gov/anf/docs/mod/hp-parking-regulations-summary-mod.pdf
6. MBTA Fixed Route Accessible Transit Stations
   http://www.mbta.com/riding_the_t/accessible_services/
7. City of Boston – Complete Street Guidelines
   http://bostoncompletestreets.org/
8. City of Boston – Mayor's Commission for Persons with Disabilities
   http://www.boston.gov/disability
9. City of Boston – Public Works Sidewalk Reconstruction Policy
   http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
10. City of Boston – Public Improvement Commission Sidewalk Café Policy
    http://www.cityofboston.gov/images_documents/Sidewalk_cafes_tcm3-1845.pdf
11. International Symbol of Accessibility (ISA)
    https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/guide-to-the-ada-standards/guidance-on-the-isa
12. LEED – Pilot Credits for Social Equity and Inclusion
    https://www.usgbc.org/articles/social-equity-pilot-credits-added-leed-nd-and-leed-om

Glossary of Terms:

1. ***Accessible Route*** – A continuous and unobstructed path of travel that meets or exceeds the dimensional requirements set forth by MAAB 521 CMR: Section 20
2. ***Accessible Guestrooms*** – Guestrooms with additional floor space, that meet or exceed the dimensional requirements set forth by MAAB 521 CMR: Section 8.4
3. ***Age-Friendly –*** Implementing structures, settings and polices that allow people to age with dignity and respect in their homes and communities
4. ***Housing – Group 1 Units –*** Residential Units that contain features which can be modified without structural change to meet the specific functional needs of an occupant with a disability, per MAAB 521 CMR: Section 9.3
5. ***Housing – Group 2 Units –*** Residential units with additional floor space that meet or exceed the dimensional and inclusionary requirements set forth by MAAB 521 CMR: Section 9.4
6. ***Ideal Design for Accessibility –*** Design which meets, as well as exceeds, compliance with AAB/ADA building code requirements
7. ***Inclusionary Development Policy (IDP)*** – Program run by the BPDA that preserves access to affordable housing opportunities in the City. For more information visit: http://www.bostonplans.org/housing/overview
8. ***Public Improvement Commission (PIC)*** – The regulatory body in charge of managing the public right of way in Boston. For more information visit: https://www.boston.gov/pic
9. ***Social Equity LEED Credit –*** Pilot LEED credit for projects that engage neighborhood residents and provide community benefits, particularly for persons with disabilities

10. ***Visitability*** – A structure that is designed intentionally with no architectural barriers in its common spaces (entrances, doors openings, hallways, bathrooms), thereby allowing persons with disabilities who have functional limitations to visit

Today's Date:	**Your Name and Title:**

1. Project Information:

If this is a multi-phased or multi-building project, fill out a separate Checklist for each phase/building.

Project Name:	**Boston University Warren Towers**		
Project Address(es):	**700 Commonwealth Avenue, Boston MA 02215**		
Total Number of Phases/Buildings:	**3**		
Primary Contact: (Name / Title / Company / Email / Phone):	**Sonia Richards** **Associate Vice President** **Planning, Design, and Construction** **Boston University** **soniar@bu.edu** **617-353-4313**		
Owner / Developer:	**Trustees of Boston University**		
Architect:	**MDS Architects**		
Civil Engineer:	**Nitsch Engineering**		
Landscape Architect:	**Copley Wolff Design Group**		
Code Consultant:	**Hastings Consulting Inc.**		
Accessibility Consultant (*If you have one*):	**KMA Architecture + Accessibility**		
What stage is the project on the date this checklist is being filled out?	SPRA PNF/ **Expanded PNF Submitted**	Draft / Final Project Impact Report Submitted	BPDA Board Approved or other: _____

2. Building Classification and Description:

This section identifies preliminary construction information about the project including size and uses.

What are the dimensions of the project? See below:

Site Area:	62,800 SF	Building Area:	*Existing*: 625,800 GSF *Renovated:* 482,900 GSF
First Floor Elevation:	22.25 ft	Any below-grade space	**Yes** / No

What is the construction classification?	New Construction	**Renovation**	Addition	Change of Use

Do you anticipate filing any variances with the MAAB (Massachusetts Architectural Access Board) due to non-compliance with 521 CMR?		**YES** NO		
If yes, is the reason for your MAAB variance: (1) technical infeasibility, **OR** (2) excessive and unreasonable cost without substantial benefit for persons with disabilities? Have you met with an accessibility consultant or Disability Commission to try to achieve compliance rather than applying for a variance? Explain:		(1) **OR** **(2)** Much of the building will be brought into full compliance. Variances have been discussed with an experienced accessibility consultant and relate primarily to the inflexibility of the existing building construction type.		
What are principal building uses? (using IBC definitions, select all appropriate that apply):	Residential – One - Three Unit	Residential - Multi-unit, Four+	**Institutional**	Educational
	Business	Mercantile	Factory	Hospitality
	Laboratory / Medical	Storage, Utility and Other	Other:	
List street-level uses of the building:	**Retail/Commercial**			

3. Accessibility of Existing Infrastructure:

This section explores the proximity to accessible transit lines and institutions. Identify how the area surrounding the development is accessible for people with mobility impairments, and analyze the existing condition of the accessible routes to these sites through sidewalk and pedestrian ramp reports.

Provide a description of the neighborhood where this development is located and its identifying topographical characteristics:	The Project is located approximately 0.3 miles west of Kenmore Square within the Boston University Charles River Campus and the Fenway/Kenmore neighborhood of Boston. The neighborhood consists of several Boston University-owned academic and research buildings along Commonwealth Avenue from Kenmore Square to the Boston University Bridge. The Project Site is bounded by academic buildings to the west and south, campus green space to the east, and the newly constructed CCDS and the historic CAS to the north. In addition, uses within the vicinity of the Project Site include academic and student service facilities, commercial and retail activities, and student residences along Bay State Road. Two public open spaces and University-owned parking garages and lots are located within the immediate vicinity of the Site. A variety of shops and restaurants are located in the neighborhood and are accessible by foot, bicycle, and public transportation. The Project is located on flat terrain.

List the surrounding accessible MBTA transit lines and their proximity to development site, including commuter rail, subway stations, and bus stops:	The Project is served by four accessible MBTA transit lines located within a quarter-mile distance of the Project Site. The accessible MBTA transit lines and the proximity of the accessible stops/stations to the Project Site are listed below: MBTA Green Line B Branch (Boston College to Park Street Station): Boston University East Station (accessible station) is located approximately within 300 feet of walking distance from the Project Site. MBTA Bus Route 57 (runs along the Commonwealth Avenue from Watertown Yard to Kenmore Station and from Oak Square to Kenmore Station, respectively): The closest outbound accessible stop (to Watertown Yard) is located at Commonwealth Avenue at Granby Street and is within approximately 200 feet of walking distance from the accessible entrance on the western side of the Project Site. The closest inbound accessible stop (to Kenmore Square) is located at Commonwealth Avenue at Blandford Street and is approximately within 0.2 miles of walking distance from the accessible entrance on the eastern side of the Project Site. MBTA Framingham/Worcester Commuter Rail Line: Lansdown Station is the nearest accessible station from the Project Site, and it is within 0.3 miles walking distance from the accessible entrance on the eastern side of the Project Site.
List surrounding institutions and their proximity: hospitals, public housing, elderly and disabled housing, educational facilities, others:	The Project Site is located within the Boston University Charles River Campus and is surrounded by several Boston University academic buildings located along Commonwealth Avenue as mentioned above. Other institutions are located within 1 mile of driving distance and are listed below: **Public housing:** BHA Trustman Apartments (150 Amory Street, Brookline), **Elderly and disabled housing:** West Fenway Elderly Housing (110 Peterborough Street, Boston), and **Hospitals:** Beth Israel Deaconess Medical Center and HRI Hospital.
List surrounding government buildings and their proximity: libraries, community centers, recreational facilities, and related facilities:	There are no surrounding government buildings other than a limited number of non-profit Community Centers within approximately one mile of the Site. These include the Fenway Community Center and the Brookline Arts Center.

4. Surrounding Site Conditions – Existing:

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

Is the development site within a formally recognized historic district? ***If yes,*** which one?	**YES** **NO**
Are there existing sidewalks and pedestrian ramps at the development site? ***If yes***, list the existing sidewalk and pedestrian ramp slopes, dimensions, materials, and physical condition:	**YES** **NO** There are existing concrete sidewalks along Commonwealth Avenue, Cummington Mall, and Hinsdale Mall. The sidewalks are in good condition. The three curb ramp landings have slopes >2%, at up to 4.6%.
Are the sidewalks and pedestrian ramps existing-to-remain? ***If yes,*** have they been verified as ADA/MAAB compliant (with yellow composite detectable warnings, cast in concrete)? ***If yes,*** provide description and photos. If ***no,*** explain plans for compliance:	**YES** **NO** The three curb ramps will be reconstructed to meet ADA/MAAB requirements.
5. Surrounding Site Conditions – Proposed *This section identifies the proposed condition of the sidewalks and pedestrian ramps around the development site. Ideal sidewalk width contributes to lively pedestrian activity, allowing people to walk side by side and pass each other comfortably walking alone, in pairs, or using a wheelchair or walker.*	
Are the proposed sidewalks consistent with Boston Complete Streets? ***If yes***, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, or Boulevard. Explain:	**YES** **NO**
What are the total dimensions and slopes of the proposed sidewalks? List the widths of each proposed zone: Frontage, Pedestrian and Furnishing Zone:	**Frontage**: There is no defined Frontage Zone along Commonwealth Avenue. **Pedestrian**: The Pedestrian Zone is ±13'-2" and will be sloped at the Boston preferred slope of 1.5-1.6% slope. **Furnishing**: The Furnishing Zone on Commonwealth Avenue is ±8'-8" including the 6" street curb and will be sloped at the Boston preferred slope of 1.5-1.6% slope, except within planting areas where slopes will vary.
List the proposed materials for each Zone. Will the proposed materials	**Frontage**: There is no defined Frontage Zone along Commonwealth Avenue.

be on private property or will the proposed materials be on the City of Boston pedestrian right-of-way?	**Pedestrian**: The Pedestrian Zone on Commonwealth Avenue will be paved with standard City of Boston concrete pavement with light-broomed finished and saw cut joints. **Furnishing**: The Furnishing Zone on Commonwealth Ave will be paved with standard City of Boston concrete pavement with light-broomed finished and saw cut joints. The Furnishing Zone will maintain the width of the existing 16" wide permeable brick edge located at the back of the roadway curbing to the existing extents currently on site and extending ±22'-6" to the south along the back of the curb on both Hinsdale and Cummington Malls. Other materials in the Furnishing Zone include raised planting beds on granite curbs, individual trees in tree grates, 22 bicycle racks (44-bicycle capacity), a BLUEbike station, a municipal bus shelter, 3-pairs of trash/recycle units, and an existing seat bench.
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way? ***If yes,*** what are the proposed dimensions of the sidewalk café or furnishings and what will the remaining right-of-way clearance be?	**YES** **NO**
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the Public Improvement Commission (PIC)?	**YES** **NO**
Will any portion of this project be going through the Public Improvement Commission (PIC)? ***If yes,*** identify PIC actions and provide details:	**YES** **NO** Specific repairs for resetting existing curbing, new porous pavers, new trees and planters, new bike racks, and installation of structural soil.
6. Building Entrances, Vertical Connections, Accessible Routes, and Common Areas: *The primary objective in ideal accessible design is to build smooth, level, continuous routes and vertical connections that are integrated with standard routes, not relocated to alternate areas. This creates universal access to all entrances and spaces, and creates equity for persons of all ages and abilities by allowing for "aging in place" and "visitability" (visiting neighbors).*	
Are all of the building entrances accessible? Describe the accessibility of each building entrance: flush condition, stairs, ramp, lift, elevator, or other. If all of the building entrances are ***not accessible***, explain:	**YES** **NO** The main entrance and one tenant entrance lack a level landing and are not flush. All five tenant entrances have a step up from the sidewalk and are not flush.

Are all building entrances well-marked with signage, lighting, and protection from weather?	**YES** **NO** Signage: There is visual signage that is typically visible from the right-of-way, has sufficient contrast, and provides clear text identification. Lighting: There is lighting under the awning at the retail spaces, but nothing specifically at the exterior of the dorm entrance. Weather protection: Awnings at the retail entrances and roof along the back facade provide weather protection. There is a small setback at the dorm entrance about 2' deep.
Are all vertical connections located within the site (interior and exterior) integrated and accessible? Describe each vertical connection (interior and exterior): stairs, ramp, lift, elevator, or other. If all the vertical connections are ***not integrated and accessible***, explain:	**YES** **NO** All three elevators lack audible signals at each entrance. Two elevators doors lack level landings. The egress stairwells lack accessible handrails and stair nosings. The egress stairwell doors lack the required door maneuvering clearances.
Are all common spaces in the development located on an accessible route? Describe:	**YES** **NO** The sundeck is not located on an accessible route, but will be removed as part of the Project.
Are all of the common spaces accessible for persons with mobility impairments? (Examples: community rooms, laundry areas, outdoor spaces, garages, decks/roof decks):	**YES** **NO** Non accessible common spaces include: lounges, laundry room, dining hall, study spaces, and recreation room.
What built-in features are provided in common public spaces? (Examples: built-in furnishings such as tables, seating; countertop heights, outdoor grills and benches). Are these accessible? Do benches and seats have armrests? Describe:	There are built-in tables and chairs in the Lounge (Room 405).
If this project is subject to Large Project Review/Institutional Master Plan, describe the accessible routes way-finding / signage package:	At this time, an accessible routes way-finding and signage package has not been developed.
7. Accessible Housing Units (If applicable) – Residential Group 1, Group 2, and Hospitality Guestrooms	

In order to create accessible housing and hospitality rooms, this section addresses the number of accessible units that are proposed for barrier-free housing and hotel rooms in this development.	
What is the total number of proposed housing units or hotel rooms for this development?	The proposed renovation work will result in 863 student dorm rooms, providing 1,804 beds.
If a residential development, how many units are for sale? How many are for rent? What is the breakdown of market value units vs. IDP (Inclusionary Development Policy) units?	N/A
If a residential development, will all units be constructed as MAAB Group 1* units, which have blocking and other built-in infrastructure that makes them adaptable for access modifications in the future? (**this is required in all new construction*):	**YES NO** N/A – however the proposed Project will result in (6) Group 1 units.
If a residential development, how many fully built-out ADA (MAAB Group 2) units will there be? (*requirement is 5%*):	N/A – however the proposed Project will result in (1) Group 2 unit.
If a residential development, how many units will be built-out as ADA/MAAB sensory units? (*requirement is 2%*):	N/A
If a residential development, how many of the fully built-out ADA (MAAB Group 2) units will also be IDP units? ***If none***, explain:	N/A
If a hospitality development, how many of the accessible units will feature a wheel-in shower? Will accessibility features and equipment be built in or provided (built-in bench, tub seat, etc.)? ***If yes,*** provide details and location of equipment:	N/A

Do the proposed housing and hotel units that are standard, non-ADA units (MAAB Group 1) have any architectural barriers that would prevent entry or use of the space by persons with mobility impairments? (Example: stairs or thresholds within units, step up to balcony, etc.). ***If yes,*** explain:	**YES** **NO** N/A
8. Accessible Parking: *See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirements and the Massachusetts Office of Disability Disabled Parking Regulations.*	
What is the total number of parking spaces provided at the development site? Will these be in a parking lot or garage? Will they be mechanically stacked? Explain:	The total number of existing parking spaces within the Warren Towers garage is 471. The Project will result in a loss of 30 existing parking spaces, leaving 441. The spots will not be mechanically stacked.
How many of these parking spaces will be designated as Accessible Parking Spaces? How many will be "Van Accessible" spaces with an 8 foot access aisle? Describe:	9 of these parking spaces will be designated as accessible. 2 of the 9 spaces will be "Van Accessible" with 8-ft access aisles.
Will visitor parking be provided? If ***yes,*** where will the accessible visitor parking be located?	**YES** **NO**
Has a drop-off area been identified? ***If yes,*** where is it located, and is it wheelchair accessible?	**YES** **NO**
9. Community Impact: *Accessibility and inclusion extend past required compliance with building codes to providing an overall development that allows full and equal participation of persons with disabilities and older adults.*	
Has the proponent looked into either of the two new LEED Credit Pilots for (1) Inclusion, or (2) Social Equity – with a proposal that could increase inclusion of persons with disabilities? ***If yes,*** describe:	**YES** **NO** As the Project is in very early stages of design, the Proponent and Project team have not discussed these credits; it will be a point of discussion as the Project progresses.

These new LEED Pilot Credits may be awarded for filling out this checklist and evaluating ways to add features to your design that will increase equity for persons with disabilities. Have you looked at this list to assess the feasibility of adding any of these features?	**YES** **NO**
Is this project providing funding or improvements to the surrounding neighborhood or to adjacent MBTA Station infrastructure? (Examples: adding street trees, building or refurbishing parks, adding an additional MBTA elevator or funding other accessibility improvements or other community initiatives)? ***If yes,*** describe:	**YES** **NO**
Will any public transportation infrastructure be affected by this development, during and/or post-construction (Examples: are any bus stops being removed or relocated)? ***If yes***, has the proponent coordinated with the MBTA for mitigation? Explain:	**YES** **NO**
During construction, will any on-street accessible parking spaces be impacted (during and/or post-construction)? **If yes,** what is the plan for relocating the spaces?	**YES** **NO**
Has the proponent reviewed these plans with the City of Boston Disability Commission Architectural Access staff? ***If no,*** will you be setting up a meeting before filing?	**YES** **NO**

10. Attachments

Include a list of all documents you are submitting with this Checklist – drawings, diagrams, photos, or any other materials that describe the accessible and inclusive elements of this project.

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

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

For questions about this checklist, or for more information on best practices for improving accessibility and inclusion, visit www.boston.gov/disability, or contact our Architectural Access staff at:

ADA@boston.gov | patricia.mendez@boston.gov | sarah.leung@boston.gov |
617-635-3682 (phone) | 617-635-2726 (fax) | 617-635-2541 (tty)

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

***Updated*: October, 2019**

COMMONWEALTH AVENUE

CUMMINGTON MALL

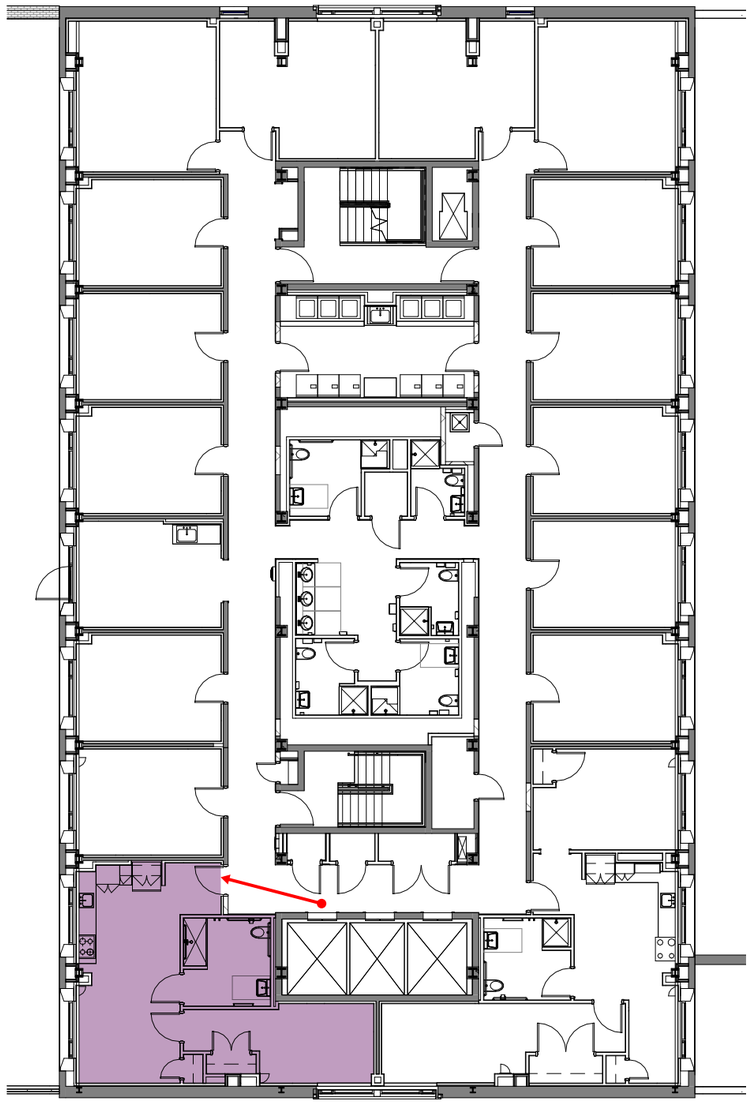
BABBIT STREET

HINSDALE MALL

CUMMINGTON MALL

MASSACHUSETTS TURNPIKE

Accessible Route
Minimum Travel Distance - 123'-0"
Maximum Travel Distance - 250'-7"



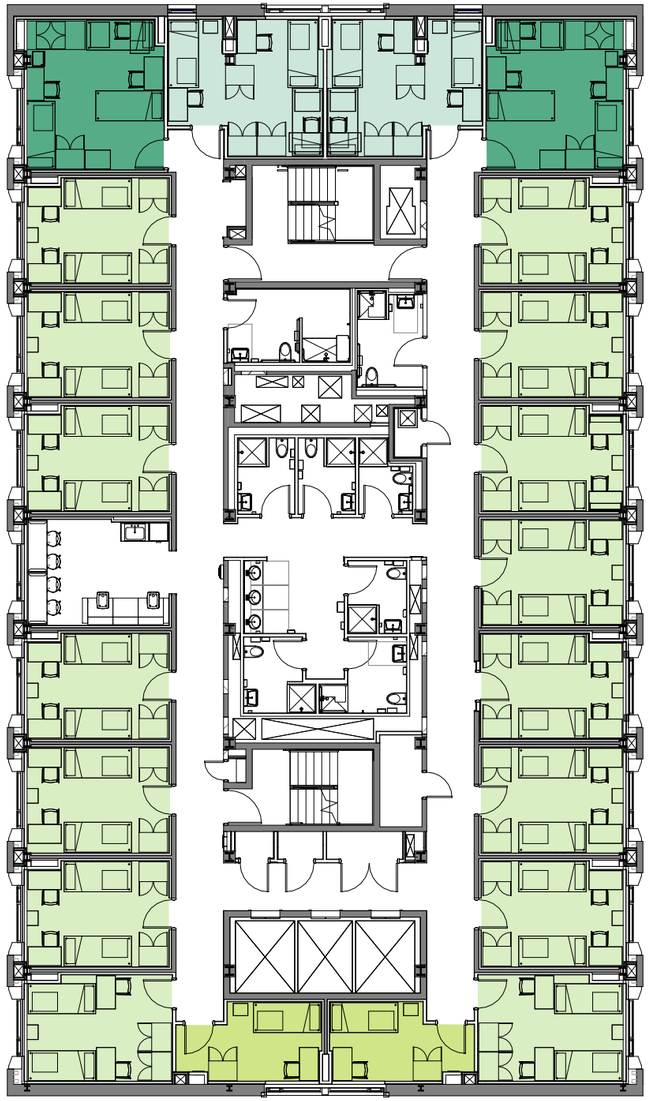
Group 2B Staff Apartment Unit
Graduate Student Resident Assistant

Accessible Route
Travel Distance from entry point on floor - 5'-7"

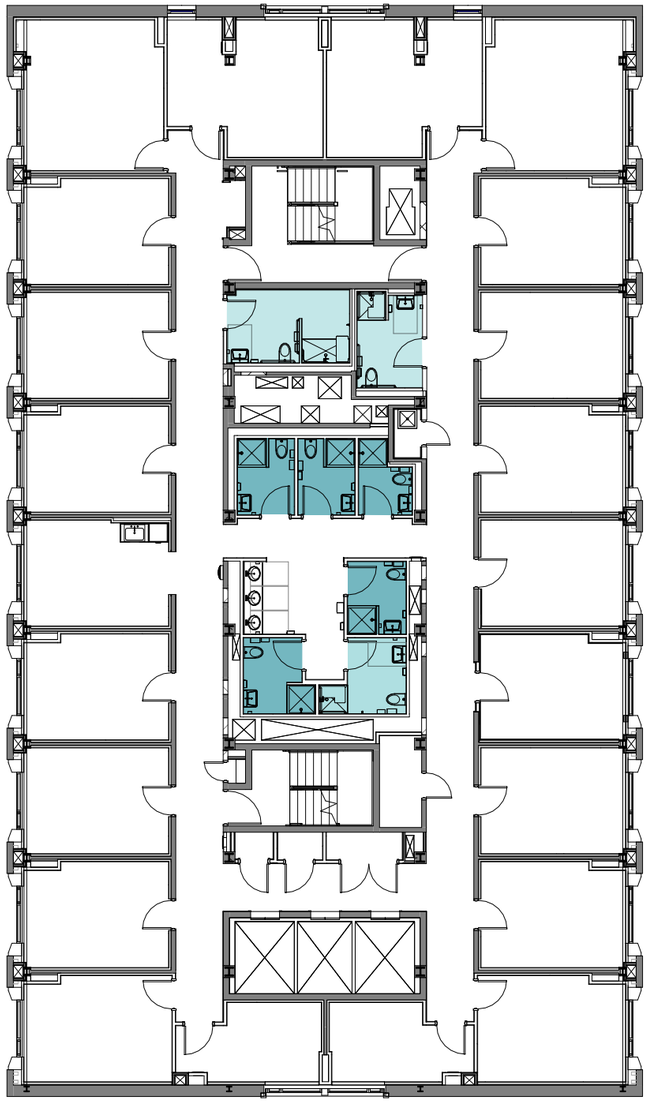
Tower A - Floor 5

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

0' 4' 8' 16' N



Typical Tower Floor - Accessible Dorm Rooms



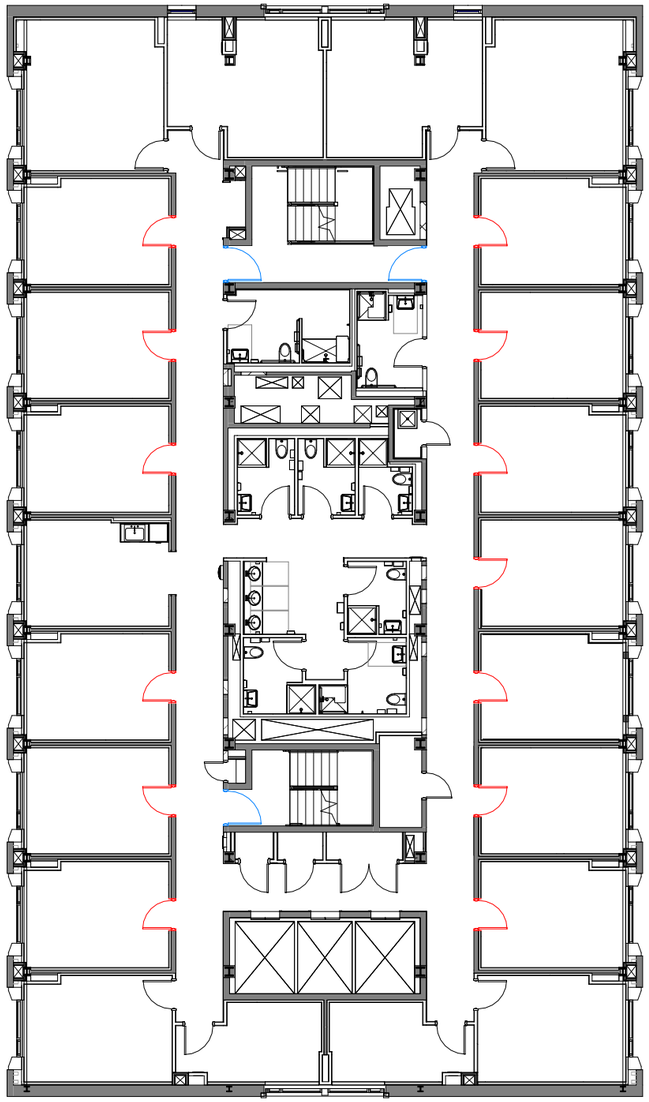
Typical Tower Floor - All Single User, Gender-Neutral Shower Rooms

- Single Room
- Double Room
- Triple Room
- Triple Room (Not Accessible)
  Can be converted into Accessible Double

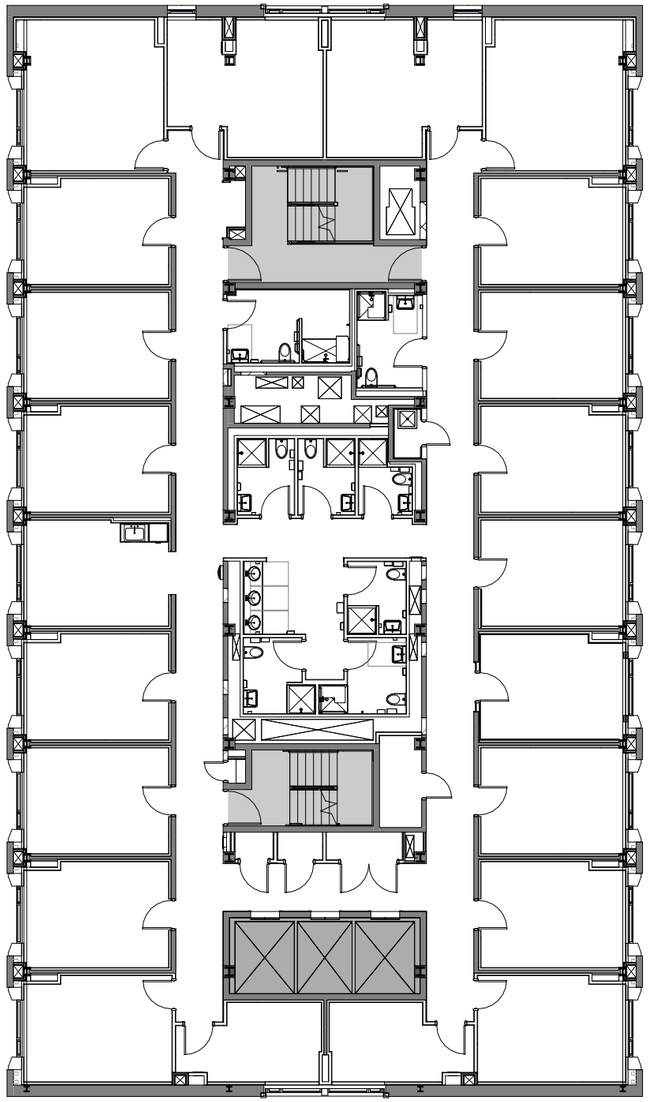
- Single Use Bathrooms
- Single Use Bathrooms (ADA)

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

0' 4' 8' 16' N



Typical Tower Floor - Making Existing Doorways Accessible



Typical Tower Floor - Making Elevators & Existing Stairs Accessible

Widened Existing Doorway

Added Door Operator

Elevators

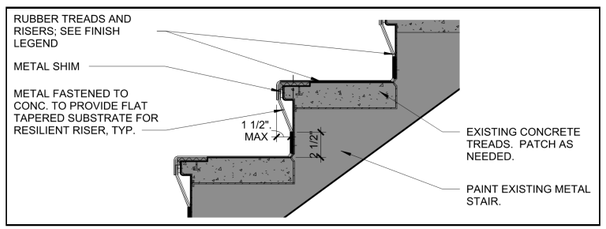
New controls

Audible signals

Stairs

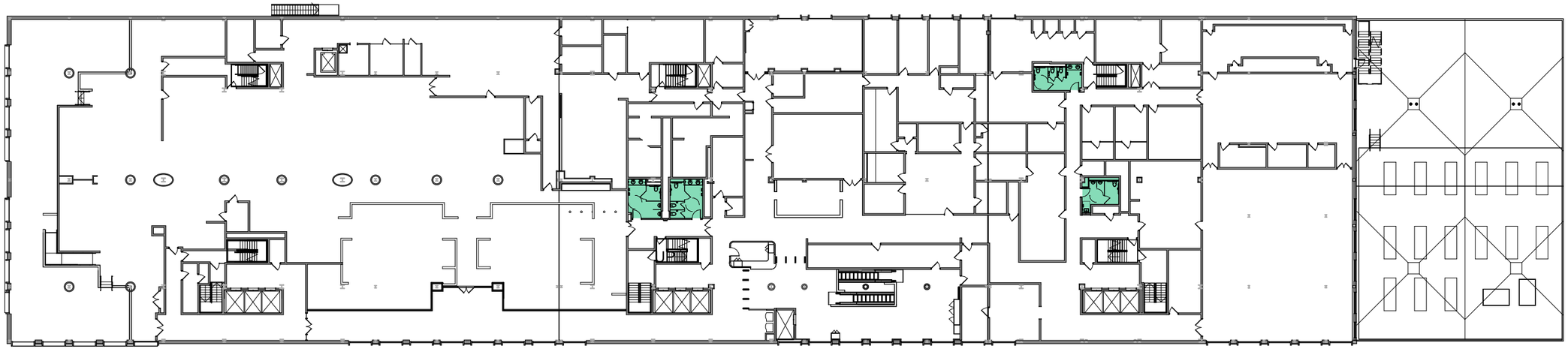
New handrails

Compliant nosing

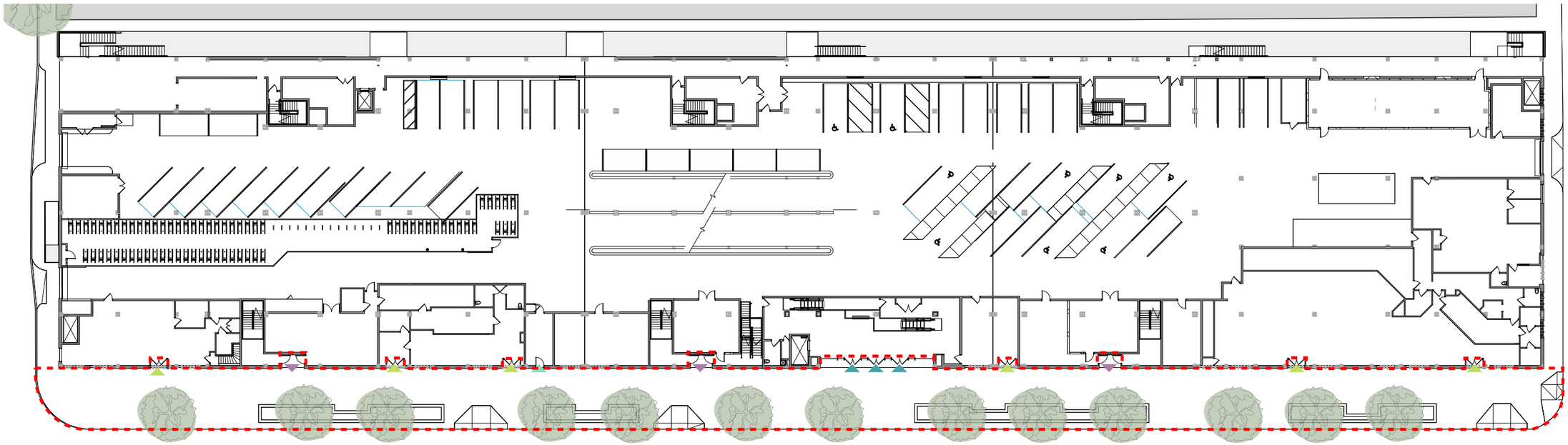


Scale: 1/8" = 1'-0"

0' 4' 8' 16' N



4th Floor Plan - Public Bathrooms



1st Floor /Ground Floor Plan - Accessible Entries on Commonwealth Avenue

Accessible Sidewalk

Primary Entry

Retail Entry

Emergency Exit

Service Entry

Public Bathroom (ADA)

Scale: 1" = 40'

0' 10' 20' 40' 80'

N

Attachment 2

LEED PROJECT SCORECARD

LEEDv4 BD+C: New Construction (LEEDv4 NC)
Project Scorecard

The Green Engineer
Sustainable Design Consulting

Project: **BU Warren Towers**
Address: **700 Commonwealth Avenue, Boston, MA 02215**
Date: **December 22, 2023**

	Yes	Maybe	No			
	1	0	0	**INTEGRATIVE PROCESS**		**1**
D	1			IPc1	Integrative Process	1
	Yes	**Maybe**	**No**			
	13	2	1	**LOCATION & TRANSPORTATION**		**16**
D			N	LTc1	LEED for Neighborhood Development Location	16
D	1			LTc2	Sensitive Land Protection	1
D	1		1	LTc3	High Priority Site	1-2
D	5			LTc4	Surrounding Density and Diverse Uses	1-5
D	5			LTc5	Access to Quality Transit	1-5
D		1		LTc6	Bicycle Facilities	1
D	1			LTc7	Reduced Parking Footprint	1
D		1		LTc8	Green Vehicles	1
	Yes	**Maybe**	**No**			
	6	2	2	**SUSTAINABLE SITES**		**10**
C	Y			SSpr1	Construction Activity Pollution Prevention	Req'd
D	1			SSc1	Site Assessment	1
D		1	1	SSc2	Site Development - Protect or Restore Habitat	1-2
D			1	SSc3	Open Space	1
D	2	1		SSc4	Rainwater Management	2-3
D	2			SSc5	Heat Island Reduction	1-2
D	1			SSc6	Light Pollution Reduction	1
	Yes	**Maybe**	**No**			
	5	2	4	**WATER EFFICIENCY**		**11**
D	Y			WEpr1	Outdoor Water Use Reduction	Req'd
D	Y			WEpr2	Indoor Water Use Reduction	Req'd
D	Y			WEpr3	Building-level Water Metering	Req'd
D	2			WEc1	Outdoor Water Use Reduction	1-2
D	2	2	2	WEc2	Indoor Water Use Reduction	1-6
D			2	WEc3	Cooling Tower Water Use	1-2
D	1			WEc4	Water Metering	1
	Yes	**Maybe**	**No**			
	16	6	11	**ENERGY & ATMOSPHERE**		**33**
C	Y			EApr1	Fundamental Commissioning and Verification	Req'd
D	Y			EApr2	Minimum Energy Performance	Req'd
D	Y			EApr3	Building-level Energy Metering	Req'd
D	Y			EApr4	Fundamental Refrigerant Management	Req'd
C	6			EAc1	Enhanced Commissioning	2-6
D	8	2	8	EAc2	Optimize Energy Performance	1-18
D		1		EAc3	Advanced Energy Metering	1
C		2		EAc4	Demand Response	1-2
D			3	EAc5	Renewable Energy Production	1-3
D		1		EAc6	Enhanced Refrigerant Management	1
C	2			EAc7	Green Power and Carbon Offsets	1-2

	Yes	Maybe	No			
	7	5	1	**MATERIALS & RESOURCES**		13
D	Y			MRpr1	Storage & Collection of Recyclables	Req'd
C	Y			MRpr2	Construction and Demolition Waste Management Plan	Req'd
C	4	1		MRc1	Building Life-Cycle Impact Reduction	2-5
C	1	1		MRc2	Building Product Disclosure & Optimization-EPD's	1-2
C		1	1	MRc3	Building Product Disclosure & Optimization-Raw Materials	1-2
C	1	1		MRc4	Building Product Disclosure & Optimization-Material Ingredients	1-2
C	1	1		MRc5	Construction and Demolition Waste Management	1-2

	Yes	Maybe	No			
	8	4	4	**INDOOR ENVIRONMENTAL QUALITY**		16
D	Y			EQpr1	Minimum IAQ Performance	Req'd
D	Y			EQpr2	Environmental Tobacco Smoke (ETS) Control	Req'd
D	2			EQc1	Enhanced IAQ Strategies	1-2
C	2	1		EQc2	Low-Emitting Materials	1-3
C	1			EQc3	Construction IAQ Management Plan	1
C			2	EQc4	IAQ Assessment	1-2
D	1			EQc5	Thermal Comfort	1
D	1	1		EQc6	Interior Lighting	1-2
D		2	1	EQc7	Daylight	1-3
D	1			EQc8	Quality Views	1
D			1	EQc9	Acoustic Performance	1

	Yes	Maybe	No			
	6	0	0	**INNOVATION**		6
D	1			INc1.1	Innovation: EP for Heat Island Reduction	1
D	1			INc1.2	Innovation: Purchasing - Lamps	1
D	1			INc1.3	Innovation: O+M Starter Kit	1
C	1			INc1.4	Innovation: EP for EPDs or HPDs	1
C	1			INc1.5	Pilot Credit: Integrative Analysis of Building Materials	1
C	1			INc2	LEED Accredited Professional	1

	Yes	Maybe	No			
	3	1	0	**REGIONAL PRIORITY 02215 (underlined)**		4
D	1			RPc1	Building Life-Cycle Impact Reduction (RP@2)	1
D	1			RPc2	Optimize Energy Performance (RP@8)	1
D		1		RPc3	Indoor Water Use Reduction (RP@4)	1
D	1			RPc4	Rainwater Management (RP@2)	1
				RPcX	High Priority Site (RP@2)	1
				RPcX	Renewable Energy Production (RP@2)	1

Yes	Maybe	No		
65	22	23	**PROJECT TOTALS (Certification Estimates)**	110

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

Attachment 3

CLIMATE RESILIENCY CHECKLIST

Climate Resiliency Checklist
Initial Filing (PNF)

1. Team Information

Information	
Building Name	Warren Towers
Related Project	N/A
Building Street Number	700
Building Street Name	Commonwealth
Building Street Suffix	Avenue
Select the type of filing	Initial (PNF, EPNF, NPC or other substantial filing)
Filing Contact Name	Sonia Richards
Filing Contact Email	soniar@bu.edu

Team	
Owner/Developer	Trustees of Boston University
Architect	MDS Architects
Landscape Architect	Copley Wolff Design Group, Inc.
Mechanical Engineer	RW Sullivan
Sustainability/LEED	The Green Engineer
Performance Modeler	The Green Engineer
Civil Engineer	Nitsch Engineering, Inc.
Permitting	Fort Point Associates, Inc.
Construction Management	Shawmut Design & Construction
Transportation Consultant	AECOM
Consultant for Advanced Energy Feasibilty Assessment	N/A

Building Description and Design Conditions	
Date COBUCS Report was submitted	12/20/2023
Site Area *(SF)*	121,640
Length of sidewalk to be reconstructed *(LF)*	1,534
What are the building's First Floor Building Uses?	Business / Retail, Garage, Storage, Utility / Mechanical
Please specify the building's below grade uses	Garage, Storage, Utility / Mechanical
Building Gross Square Feet *(GSF)*	625,800
Project Gross Square Feet *(GSF)*	482,900
Building Gross Floor Area *(GFA)*	523,100
Project Gross Floor Area *(GFA)*	380,200
Building Height *(Ft)*	215'
Building Height *(Stories)*	18 + MP

2. Design Conditions

Description and Design Conditions - Building Envelope When reporting U values, report total assembly U value including supports and structural elements. **Note:** for any data (number) requests that are not applicable to this project, please enter a value of 0.	
Roof Area *(SF)*	62,800
Roof U Value *(U)*	0.032
Foundation Wall Area *(SF)*	0
Foundation Wall U Value *(U)*	0
Exposed Floor Area *(SF)*	0
Exposed Floor U Value *(U)*	0
Slab on Grade Area *(SF)*	0
Slab on Grade U Value *(U)*	0

Description and Design Conditions - Vertical Above-Grade Assemblies When reporting U values, report total assembly U value including supports and structural elements. **Note:** for any data (number) requests that are not applicable to this project, please enter a value of 0.	
Building Infiltration Rate	0.4 (cfm/sf@50pa)
Opaque Curtain Wall/Spandrel Area *(SF)*	4,340
Opaque Curtain Wall/Spandrel U Value *(U)*	0.049
Opaque Mass Masonry Wall Area (SF)	21,820
Opaque Mass Masonry Wall U-value (U)	0.067
Opaque Framed Wall Area *(SF)*	11,940
Opaque Framed Wall U Value *(U)*	0.041
Vision Glazing/Window Type 1 Area *(SF)*	12,130
Vision Glazing/Window Type 1 U Value *(U)*	0.19
Vision Glazing/Window Type 1 SHGC	0.19
Doors - Area *(SF)*	390
Doors - U Value *(U)*	0.6
Total Wall Area *(SF)*	50,620
Vertical U Average *(U)*	0.09
Whole Building U Average *(U)*	0.06

Article 37 Green Building	
LEED Certified?	No
Proposed LEED Rating	Gold

3. Building 2035

Building 2035 Predictive Carbon Emissions Intensity (pCEI) Targets and Performance

Using predictive modeling and 2035 Emissions Factors, report the modeled performance for Primary, Secondary, and Tertiary Building Uses and the Whole Building including Energy Source Amount(s) and pCEI(s). If multiple uses share common syustems or are not individually modeled, use a common pCEI. Otherwise provide use specific performance data.

Note: for any data (number) requests that are not applicable to this project, please enter a value of 0.

2035 Emissions Factor Electric *(kg CO2e/MBtu)*	52.00
2035 Emissions Factor Gas *(kg CO2e/MBtu)*	53.11

Building 2035 pCEI Targets and Performance - Primary Use

In the next sections, we ask for information about up to three building uses. Using predictive modeling and 2035 Emission Factors, report the modeled performace for Primary Building Uses including Energy Source Amount(s) and pCEI(s). If multiple uses share common systemsor are not individually modeled, use a common pCEI. Otherwise provide use specific performance data.

Note: for any data (number) requests that are not applicable to this project, please enter a value of 0.

Please indicate the building's primary use type	Residential - Dormitory
Square footage of the building's primary use floor area including related uses	353,653
Primary Use Annual Electric *(Mbtu/yr)*	18,951
Primary Use Annual Electric pCEI *(kg CO2e/sf/yr)*	2.79
Primary Use Annual Gas/Other *(Mbtu/yr)*	0
Primary Use Annual Gas/Other pCEI *(kg CO2e/sf/yr)*	0
Primary use Energy Amount Totals *(Mbtu/yr)*	18,951
Primary Use pCEI totals *(kg CO2e/sf/yr)*	2.79

Building 2035 pCEI Targets and Performance - Secondary

Using predictive modeling and 2035 Emission Factors, report the modeled performance for Secondary Building Uses including Energy Source Amount(s) and pCEI(s). If multiple uses share common systems or are not individually modeled, use a common pCEI. Otherwise provide use specific performace data.

Note: for any data (number) requests that are not applicable to this project, please enter a value of 0.

Please indicate the building's secondary use type	N/A
Square footage of the building's secondary use floor area including related uses	0
Secondary Use Annual Electric *(Mbtu/yr)*	0
Secondary Use Annual Electric pCEI *(kg CO2e/sf/yr)*	0
Secondary Use Annual Gas/Other *(Mbtu/yr)*	0
Secondary Use Annual Gas/Other pCEI *(kg CO2e/sf/yr)*	0
Secondary use Energy Amount Totals *(Mbtu/yr)*	0
Secondary Use pCEI totals *(kg CO2e/sf/yr)*	0

Building 2035 pCEI Targets and Performance - Tertiary Use

Using predictive modeling and 2035 Emission Factors, report the modeled performance for Tertiary Building Uses including Energy Source Amount(s) and pCEI(s). If multiple uses share common systems or are not individually modeled, use a common pCEI. Otherwise provide use specific performace data.

Note: for any data (number) requests that are not applicable to this project, please enter a value of 0.

Please indicate the building's tertiary use type	N/A
Square footage of the building's tertiary use floor area including related uses	0
Tertiary Use Annual Electric *(Mbtu/yr)*	0
Tertiary Annual Electric pCEI *(kg CO2e/sf/yr)*	0
Tertiary Annual Gas/Other *(Mbtu/yr)*	0
Tertiary Annual Gas/Other pCEI *(kg CO2e/sf/yr)*	0
Tertiary Use - Energy Amount Totals *(Mbtu/yr)*	0
Tertiary Use pCEI totals *(kg CO2e/sf/yr)*	0

Building 2035 pCEI Targets and Performance - Whole Building

Using predictive modeling and 2035 Emissions Factors, report the modeled performance for Whole Building Uses including Energy Source Amount(s) and pCEI(s). If multiple uses share common syustems or are not individually modeled, use a common pCEI. Otherwise provide use specific performance data.

Note: for any data (number) requests that are not applicable to this project, please enter a value of 0.

Whole Building pCEI *(kg CO2/sf/yr)*	2.79
Total Annual Energy *(Mbtu/yr)*	18,951
Energy Use Intensity *(kBtu/sf-yr)*	53.6
Annual Heating *(kBtu/sf-yr)*	7.26
Peak Heating Load *(Btu/hr-sf)*	17.3
Annual Cooling *(kBtu/sf-yr)*	7.34
Peak Cooling Load *(Btu/hr-sf)*	27
Energy Code Compliance Path	IECC-MA 2021
How much funding assistance?	TBD based on Mass Save assessment

4. Building Carbon Emissions

Building Performance Assistance (Utility, State and Federal)	
Has the project team met with utility representative for project assistance?	Yes
Have the local utilities reviewd the predictive performance model?	No
Will the project receive assistance?	Yes
How much funding assistance?	TBD based on Mass Save assessment

Carbon Emission Mitigation - On-site Renewable Energy Generation	
System 1 - Select the type	N/A
System 1 - Ownership	N/A
System 1 - Indicate it's size in kW *(kW)*	0
System 1 - Annual Output *(kWh)*	0
System 2 - Select the type	N/A
System 2 - Ownership	N/A
System 2 - Indicate it's size in kW *(kW)*	0
System 2 - Annual Output *(kWh)*	0
Total Systems *(kW)*	0
Total Annual Output *(kWh)*	0

Carbon Emission Mitigation - On-site Renewable Energy Storage	
Select the Energy Storage System Type	N/A
Describe the ownership	N/A
Storage System Size *(kW)*	0
Storage System Capacity *(Mbtu)*	0

Building Carbon Emission Mitigation - Off-site measures - Procurement	
Describe the type of Renewable Electrcity procurement	N/A
Describe the source of renewable electricity	N/A
Annual Quantity of renewable electricity *(kW)*	0
Renewable electricity procurement % of total Annual Electricity Usage	0

Building Carbon Emission Mitigation - Off-site measures - Procurement RECs, Power Purchase Agreements, and other Mechanism	
Describe the type of RECs, Power Purchase Agreements, and other Mechanism	Large-Scale Power Purchase Agreement
Source of RECs, Power Purchase Agreements, and other Mechanism	Triple H Wind Project
Annual Quantity of RECs, Power Purchase Agreements, and other Mechanism *(T CO2e)*	985.44
Percent of total Annual Carbon Emissions - RECs, Power Purchase Agreements, and other Mechanism	100%

5. Extreme Heat Mitigation

Extreme Heat Mitigation - Site (Existing and Proposed)	
Annual average temperature in Boston increased by about 2°F in the past hundred years and will continue to rise due to climate change. By the end of the century, the average annual temperature could be 56° (compared to 46° now) and the number of days above 90° (currently about 10 a year) could rise to 90.	
Note: please enter a value of 0 for any data/number requests that do not apply to your project.	
Existing Hardscape - Percent of Site *(%)*	85%
Proposed Hardscape - Percent of Site *(%)*	78%
Existing Softscape - Percent of Site *(%)*	18%
Proposed Softscape - Percent of Site *(%)*	22%

Extreme Heat Mitigation - Urban Heat Island Reduction - Proposed Site and Building	
Non-roof Landscape Area *(SF)*	23,390
Non-roof Landscape - Percent of Site *(%)*	20%
Non-roof Landscape - Area Meeting LEED Criteria *(SF)*	2%
Non-roof Landscape - SRI Value *(SRI)*	0%
Non-roof Hardscape - Area *(SF)*	20,690
Non-roof Hardscape - Percent of Site (%)	17%
Non-roof Hardscape - Area Meeting LEED Criteria *(SF)*	835
Non-roof Hardscape - SRI Value *(SRI)*	0%
Roof Surface - Area *(SF)*	92,050
Roof Surface - Percent of Site *(%)*	76%
Roof Surface - Area Meeting LEED Criteria *(SF)*	100% Proposed
Roof Surface - SRI Value *(SRI)*	Tower roofs = 107 Initial (90 Aged) Podium roofs = 89 Initial (78 Aged)
Vegetated Roof - Area *(SF)*	There are no vegetated roofs on this project.
Vegetated Roof - Percent of Site *(%)*	There are no vegetated roofs on this project.
Vegetated Roof - Area Meeting LEED Criteria *(SF)*	There are no vegetated roofs on this project.
Vegetated Roof - SRI Value *(SRI)*	There are no vegetated roofs on this project.
Total Area *(SF)*	121,640
TOTAL Area Meeting LEED Criteria *(SF)*	94,750
Total SRI Value (weighted average) *(SRI)*	TBD
Vertical Cool Wall - Area *(SF)*	There are no Vertical Cool Walls in this project.
Vertical Cool Wall - Area Meeting LEED Criteria *(SF)*	There are no Vertical Cool Walls in this project.
Vertical Cool Wall - Percent Meeting LEED Criteria *(%)*	There are no Vertical Cool Walls in this project.

Extreme Heat Mitigation - Storm Water Management - Site and Building

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

Are any parcels across the entire project located in a Groundwater Conservation Overlay District (GCOD)?	Yes
Permeable Site Surfaces - Area *(SF)*	2,680
Permeable Site Surfaces - Percent of Site *(%)*	2%
Impermeable Site Surfaces - Area *(SF)*	23,730
Impermeable Site Surfaces - Percent of Site *(%)*	20%
Impermeable Surfaces Water fr 1" of Rain *(CF)*	1,978
Impermeable Surfaces Water fr 1.25" Rain *(CF)*	1,978
Roofs - Area *(SF)*	92,780
Roofs - Percent of Site *(%)*	76%
Roofs - Water from 1" of Rain *(CF)*	7,732
Roofs - Water from 1.25" of Rain *(CF)*	9,665
Total Area Precipitation Mitigation *(SF)*	62,800
TOTAL - Water from 1" of Rain *(CF)*	5,233
TOTAL - Water from 1.25" of Rain *(CF)*	6,542
Rain Water Reuse - Type	none
Rain Water Reuse - Amount *(CF)*	n/a
Storm Water Reuse - Type	none
Storm Water Reuse - Amount *(CF)*	n/a
Green Infrastructure - Type	Infiltration tank/wells
Green Infrastructure - Amount *(CF)*	6,542
Storm Water Retention - Type	Infiltration tank/wells
Storm Water Retention - Amount *(CF)*	6,542
TOTAL Retention - Amount *(CF)*	6,542

6. Sea Level

Sea Level Rise and Storms Under any plausible greenhouse gas emissions scenario, sea levels in Boston will continue to rise throughout the century. This will increase the number of buildings in Boston susceptible to coastal flooding and the likely frequency of flooding for those already in the floodplain.	
Is any portion of the site in a FEMA SFHA zone? https://msc.fema.gov/portal/home	No
Is any portion of the site in the BPDA Coastal Flood Resilience Overlay District? Use the online BPDA Zoning Viewer to assess the susceptibility of the project site. https://maps.bostonplans.org/zoningviewer/	No

Attachment 4

SOLAR REFLECTION REVIEW

600 Southgate Drive
Guelph ON Canada
N1G 4P6

Tel: +1.519.823.1311
Fax: +1.519.823.1316
E-mail: solutions@rwdi.com

MEMORANDUM

DATE:	2023-01-26	**RWDI Reference No.:** 2302578
TO:	James Loftus – MDS Architects	**EMAIL:** jloftus@mds-bos.com
FROM:	Ryan Danks - RWDI Stephen Owens - RWDI	**EMAIL:** ryan.danks@rwdi.com **EMAIL:** stephen.owens@rwdi.com
RE:	**Solar Reflection Review** **Boston University – Boston, MA** **Warren Tower**	

Dear James,

RWDI was retained by Miller Dyer Spears (MDS) Architects to review the planned renovation of Warren Towers at Boston University for its potential to cause issues related to visible or thermal reflections.

Note that detailed simulations have not be undertaken at this time but will be at a later date once the design is more developed. Instead, this experience-based review will provide qualitative feedback on based on a 3D Revit model (provided by MDS on January 9, 2023), a basis of design (BOD) glazing type (provided by MDS on January 9, 2023), and RWDI's extensive experience in studying urban reflections in Boston and around the world.

Visual Reflection Potential

Given that this is a renovation rather than new construction, the overall potential for the Project to change the existing visible reflection characteristics is low. While the windows will be updated, the BOD glazing (Vitro Solarban 70) has a low visible reflectance (4%-13% depending on glass color) which is likely comparable to what exists currently. Further, the windows are planned to be inset within the facade, creating a degree of self-shading which will further help reduce the potential for reflections. It is RWDI's understanding that the remainder of the facade will not be significantly reflective, much like the current design.

The project is north of the Massachusetts Turnpike and south of Commonwealth Avenue. The limited fenestration on the north and south elevations, along with the above discussed features make problematic reflections from these elevations onto nearby roads and trainlines unlikely. Eastbound drivers may experience reflections from the east elevation of the east tower in the mornings and westbound drivers may experience reflections from the west elevation of the west tower in the evenings. However, the existing buildings between the Project and the Turnpike are likely to limit the

potential for reflections for drivers on the Turnpike. Car and train drivers on Commonwealth Avenue will not have the same level of obstruction from buildings, though the street trees will potentially reduce the potential for glare when they have foliage.

RWDI would also note that since the proposed renovations do not increase the reflective area of the towers and the visible reflectance of the glazing is likely similar, the reflections from the renovated towers are unlikely to be significant different from the existing condition. Thus, if glare was a problem, it likely would have been identified long ago.

Thermal Reflection Potential

The high-efficiency BOD glass is likely significantly more reflective to the sun's infrared energy than what is currently installed. However, RWDI has investigated other projects in Boston where the glazing had similar properties, and for cases like the proposed Project where the building geometry does not act to focus reflections, no significant thermal impacts were predicted. As such RWDI does not expect significant thermal impacts from this project. Further, the aspects of the design that reduce the potential for visual impact are also expected to reduce the potential for thermal impacts.

Summary

Overall, based on RWDI's review of the provided information, we would not expect the reflections from the renovated Warren Tower to be atypical for any contemporary design with a similar window to wall ratio (including the existing towers). We would also note that given the relatively early stages of the design process, opportunities exist to further reduce the potential for glare which RWDI will assist with and confirm through a detailed analysis later in the design process.

Yours truly,

RWDI

Ryan Danks, P.Eng.
Technical Director | Associate

Stephen Owens
Project Manager

Attachment 5

EXHAUST DISPERSION & DESIGN

FINAL REPORT

BOSTON UNIVERSITY WARREN TOWERS

BOSTON, MA

EXHAUST DISPERSION & DESIGN
RWDI # 2302578
January 5, 2024

SUBMITTED TO

James Loftus, AIA, NCARB, MCPPO
Principal
jloftus@mds-bos.com

MDS/Miller Dyer Spears Architects
40 Broad Street, Suite 103
Boston, MA, USA 02109
T: 617-338-5350

SUBMITTED BY

Amir Ahmadi, M.Sc.
Technical Coordinator
Amir.Ahmadi@rwdi.com

Hanna Ivankovic, B.Eng.
Senior Technical Coordinator
Hanna.Ivankovic@rwdi.com

Ruth McMath, M.Sc.
Senior Scientist/Associate
Ruth.McMath@rwdi.com

Sonia Beaulieu, M.Sc., PMP, P.Eng.
Senior Project Manager, Principal
Sonia Beaulieu@rwdi.com

Rowan Williams Davies & Irwin Inc.
600 Southgate Drive
Guelph Ontario Canada N1G 4P6
T: 519.823.1311
F: 519.823.1316

EXECUTIVE SUMMARY

Wind tunnel exhaust dispersion modeling was completed to assess air quality conditions and provide recommendations related to the exhaust and intake design of Boston University Warren Towers in Boston, MA. Exhaust sources evaluated in the wind tunnel include the proposed emergency diesel generators and proposed kitchen exhausts. The potential impacts from these sources were assessed at air intakes and operable windows. The primary conclusions and recommendations from the assessment are summarized below:

Proposed Emergency Generators

The proposed 1,000 kW emergency diesel generators located on the penthouse level of each tower (Tower A, B and C) were evaluated for two scenarios: 1) with all units running simultaneously at 100% of rated capacity to represent an emergency power outage scenario and 2) with each generator running individually at 30% to represent a routine testing scenario.

- The recommended health-based dilution criterion is predicted to be met at the receptors of concern for both the emergency and routine testing scenarios.
- During the routine testing scenario, there is some risk of not meeting the diesel odor criteria at the assessed receptor locations. Increasing the stack height by 5 ft (to discharge 15 ft above the enclosures) is expected to result in the odor recognition criterion being met at all air intake locations.

Proposed Kitchen Cooking Hood Exhaust Fans

The wind tunnel dispersion modeling results for two groups of kitchen exhausts located on the roof of podium A and podium B were compared against RWDI's recommended dilution criterion of 600:1 for detection of kitchen odors.

- Dilution levels below the odor criterion are predicted at all receptors assessed for a high frequency of wind conditions.
- The planned addition of carbon filtration in the podium AHU's will mitigate the risk of odor re-entrainment.
- Equipping kitchen exhausts with odor removal equipment is expected to reduce but not remove the risk of odors at other air sensitive locations not equipped with specialized filtration (i.e. DOAS unit intakes and operable windows). The odor reduction is expected to be significant if the removal equipment has a 75% of efficiency or higher.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Miller Dyers Spears Architects (MDS) to conduct an exhaust dispersion assessment for the proposed renovation of the Boston University Warren Towers in Boston, MA. This renovation is comprised of three existing 14-story residential towers positioned atop a large podium base along Commonwealth Ave. During this renovation one (1) new 1,000 kw emergency diesel generator will be added on the roof of each of the three towers and all existing kitchen exhausts on the podium roof will be replaced by eleven (11) new kitchen exhausts. Four (4) air handling units (AHUs) will be added on the podium to replace existing units. Furthermore, one (1) Dedicated Outside Air Supply (DOAS) unit will be added on the roof of each of the three towers.

The objective of the assessment was to quantify the potential for the proposed generator exhausts and kitchen exhausts to result in undesirable levels of pollutants or odors to occur at proposed and air intakes and existing operable windows. Where possible, mitigation options were developed to reduce the magnitude and/or frequency of such air quality impacts.

This final report presents the background, objectives, results, and recommendations from the assessment, which was conducted in two stages. The first stage involved a qualitative design review, which provided early guidance and identified the exhaust sources to be included in the detailed modelling. The design review was submitted to Miller Dyers Spears Architects (MDS) on September 5, 2023, and is included as Appendix A for reference. The second stage of the assessment involved detailed exhaust dispersion modeling using physical testing in a wind tunnel.

2 BACKGROUND AND APPROACH

2.1 Dispersion Modeling

The assessment was accomplished by performing detailed tracer gas wind tunnel dispersion modeling on a 1:400 scale model of the proposed development and surroundings. Wind tunnel modeling is considered to be the most accurate method of replicating airflow patterns around buildings and quantifying the effects these patterns have on exhaust dispersion. Photographs of the scale model in one of RWDI's boundary layer wind tunnels are presented below.

Testing was conducted by releasing a tracer gas of known concentration from each exhaust source and taking measurements at selected receptors under the influence of approaching wind. Mean concentrations of tracer gas at selected receptor locations were measured by drawing samples through flush-mounted tubes leading to a bank of infrared analyzers stationed outside the tunnel. Tests were completed for a range of wind directions and speeds to characterize dispersion of the exhaust in the context of the local aerodynamic conditions, including upwind terrain and building effects. Building effects were captured by constructing scale models of all buildings and structures with a 1,600-ft. radius of the Boston University Warren Towers, while upwind terrain conditions were simulated by means of roughness elements and spires.

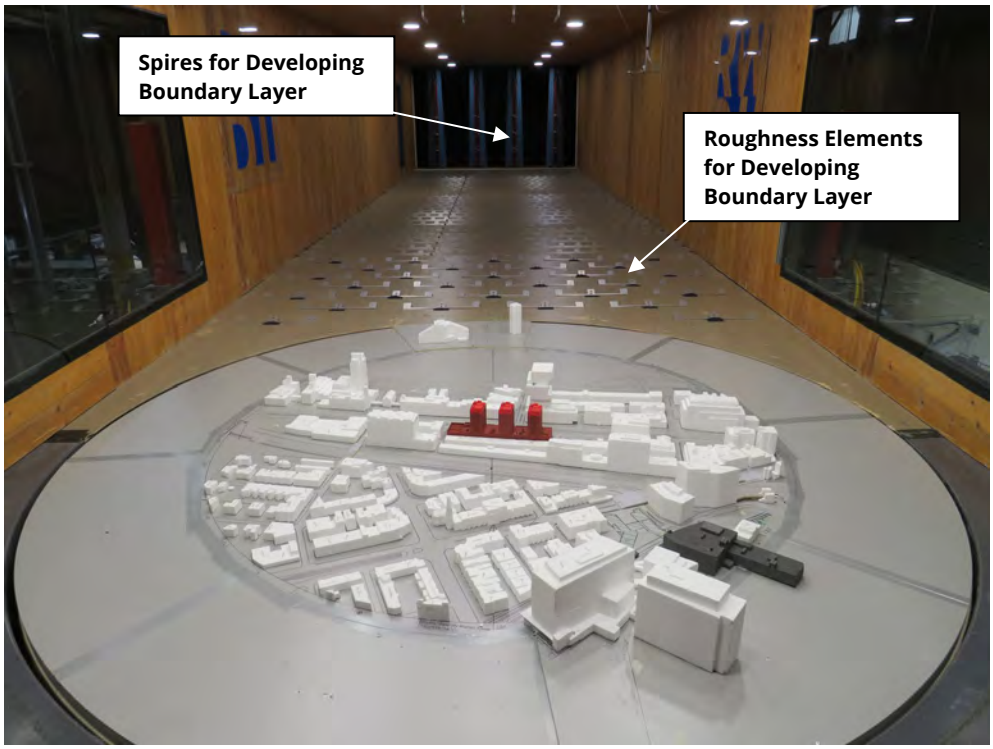


Image 1: Photograph of Scale Model in RWDI Boundary Layer Wind Tunnel

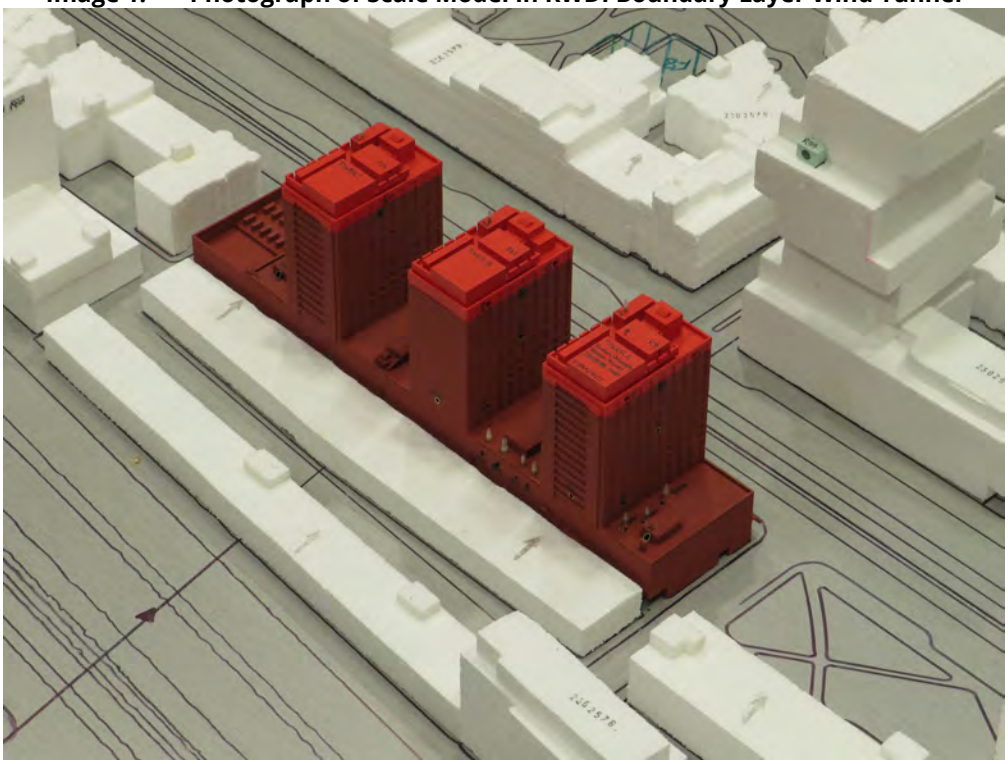


Image 2: Close-Up Photograph of the of Scale Model

2.2 Criteria

For design purposes, RWDI applies dilution criteria to assess dispersion from various types of exhaust sources. Exhaust dilution (*D*) is defined as the ratio of source concentration (C_o) to the concentration predicted at a receptor (*C*). In other words:

$$D = \frac{C_o}{C}$$

Dilution criteria for good design practice are developed for each exhaust source and are based on specific pollutant and/or odor emissions, air quality exposure limits, and/or odor thresholds. The design objective is for exhaust to be well diluted, at a level equal to or greater than the criteria, at all important receptors to achieve acceptable air quality. The dilution criteria applied for each of the exhaust sources are summarized along with the modeling results in Section 3, and are discussed in detail in Appendix B.

2.3 Exhaust Sources and Receptors

Exhaust dispersion modeling was conducted for the sources listed in Table 1. Comments regarding other sources that were assessed on a screening level, but for which detailed modeling was not performed, are provided in Section 3.3.

Table 1: Summary of Exhaust Sources Modeled

Source Label	Description		Stack Height	Exhaust Flow Rate (cfm)	Stack Internal Diameter (in)	Stack Exit Velocity (fpm)
G1-G3	Three (3) Proposed 1,000 kW Emergency Diesel Generators	100% Rated Capacity	28 ft Above Penthouse Level	8,115 (per stack)	12	10,330 [1]
		30% Rated Capacity		3,273 (per stack)		4,170 [1]
KE1	Podium A – Proposed Kitchen Cooking Hood Exhaust Fans		12 ft (above Podium A roof)	2,475	11	3,750
KE7				1,200	8	3,430
KE8				3,844	14	3590
KE10				3,500	12	4,430
KE11				700	8	2,000
KE2	Podium B – Proposed Kitchen Cooking Hood Exhaust Fans		12 ft (above Podium B roof)	6,200	16	4,430
KE3				3,713	14	3,470
KE4				1,875	10	3,410
KE5			13 ft	16,350	28	3,850

Source Label	Description	Stack Height	Exhaust Flow Rate (cfm)	Stack Internal Diameter (in)	Stack Exit Velocity (fpm)
		(above Podium B roof)			
KE6		12 ft (above Podium B roof)	5,513	16	3,940
KE9 [1]			600	5	4,290

Notes: [1] Kitchen Exhaust KE9 was not considered for wind tunnel testing. See "Other Sources Identified" section.

Dispersion of the exhaust from these sources was assessed at receptors representing outside air intakes serving occupied spaces, and passive air intakes such as operable windows. These receptor locations are summarized in Table 2. Their locations are illustrated along with the exhaust sources on Figure 1.

Table 2: Summary of Receptor Locations Recommended for Evaluation

Receptor Labels	Building	Approximate Elevation Above Grade [1]	Façade	Description
R1	Podium A	55	South	Podium AHU 1 Air Intake
R2-R3	Tower A	65	East	Representative Operable Windows at Level 6
R4		115		Representative Operable Windows at Level 12
R5-R6		170		Representative Operable Windows at Level 18
R7		190		Tower Rooftop DOAS Air Intake
R8		65	North	Representative Operable Windows at Level 6
R9		170		Representative Operable Windows at Level 18
R10		65	South	Representative Operable Windows at Level 6
R11-R12		65	West	Representative Operable Windows at Level 6
R13		115		Representative Operable Windows at Level 12
R14-R15		170		Representative Operable Windows at Level 18
R16	Podium B	55	North	Podium AHU 2-3 Air Intake
R17-R18	Tower B	65	East	Representative Operable Windows at Level 6
R19		115		Representative Operable Windows at Level 12
R20-R21		170		Representative Operable Windows at Level 18
R22		190		Tower Rooftop DOAS Air Intake
R23		65	North	Representative Operable Windows at Level 6

Receptor Labels	Building	Approximate Elevation Above Grade [1]	Façade	Description
R24		170		Representative Operable Windows at Level 18
R25		65	South	Representative Operable Windows at Level 6
R26		170	West	Representative Operable Windows at Level 18
R27	Podium C	55	North	Podium AHU 4 Air Intake
R28	Tower C	170	East	Representative Operable Windows at Level18
R29		190		Tower Rooftop DOAS Air Intake
R30		170	North	Representative Operable Windows at Level18
R31		170	West	Representative Operable Windows at Level18
R32	Podium D	55	South	Podium AHU 5 Air Intake
R33	Engineering College	150	East	Representative Penthouse Air Intake
R34	Center for Computing and Data Sciences	220	South	Representative Penthouse Air Intake

Notes: [1] Grade is referenced to 22 ft as per Mechanical Drawings issued on June 30, 2023.

2.4 Meteorological Data

RWDI reviewed wind data from the Boston Logan International Airport to estimate wind conditions at the site. This is the closest meteorological station with a substantial and recent data set. A summary of the directional distribution of winds over a period from 1973 to 2022 is shown below. The wind directions in the figure refer to the direction from which the wind blows, while the annual frequency of a given wind direction is shown as a distance radially from the center.

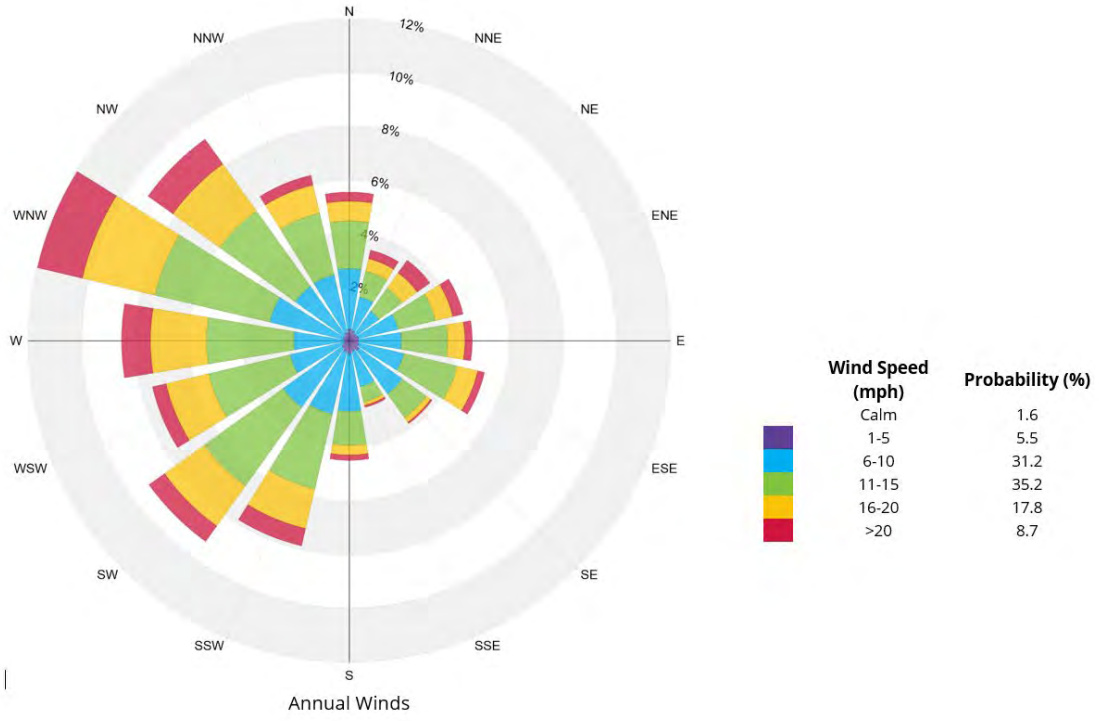


Image 3: Directional Distribution (%) of Winds from Station at Boston Logan International Airport, Boston, MA (1973-2020)

The wind data was used to estimate the percent of time that wind conditions resulting in dilution levels less than the indicated dilution criteria are expected to occur, using a statistical analysis of the wind tunnel results combined with historical meteorological data from the Boston Logan International Airport Frequency is defined as the annual percentage of wind conditions that may result in dilution levels less than the given criterion at a receptor. For example, a 50% frequency means that there is a 1 in 2 chance of winds that will result in the indicated dilution criterion not being met. In this example, 50% of winds represents approximately 4,380 hours per year (i.e., 8,760 x 50%).

3 RESULTS AND DISCUSSION

Dispersion modeling results are presented and discussed on a source-by-source basis in Sections 3.1 and 3.2. Results are presented in the form of minimum predicted dilution levels and compared to criteria. Results from wind frequency analyses are presented where appropriate.

Recommendations for modification to design or operating parameters are provided in situations where recommended exhaust dilution criteria are not met.

3.1 Proposed 1,000 kW Emergency Generators (G1-G3)

One 1,000 kW emergency diesel generator will be located on the penthouse level of each tower (Tower A, B and C; Sources G1, G2, and G3 respectively). Generator stacks were modeled to discharge vertically 28 ft above the penthouse level with 10 ft stack height above the generator enclosure. Two operational scenarios were evaluated: one to consider emergency operation (all generators at 100% of rated capacity) and one to consider routine testing (one generator at 50% of rated capacity). It is important to note that the wind tunnel modeling was conducted based on meeting RWDI's recommended criteria for good design practice. This modeling is not intended to be used in support of the Massachusetts Department of Environmental Protection (MassDEP) Compliance Certification Program application(s).

3.1.1 Emergency Scenario

Simultaneous operation of three generators at 100% of rated capacity was tested to represent an emergency use of the generators. Since the emergency use scenario is expected to occur less frequently, results for this scenario were considered on the basis of pollutant emissions only and were compared to a health-based dilution criterion of 290:1. Wind tunnel modeling results showed that the health-based dilution criterion of 290:1 is met at all receptors assessed (i.e. proposed AHU air intakes, tower rooftop DOAS unit air intakes and operable windows).

3.1.2 Routine Testing Scenario

Individual operation of a generator at 30% of rated capacity was modeled to represent a routine testing scenario. Results were compared to a recommended health-based criterion of 210:1 and an odor recognition criterion of 1,500:1.

Health Discussion

During routine testing of any of the generators (Sources G1 – G3), the health-based dilution criterion of 210:1 was met at all receptors assessed (i.e., the proposed AHU air intakes, tower rooftop DOAS units air intakes and operable windows).

Odor Discussion

When considering the risk of diesel odor impacts, two criteria were considered; one for odor detection (3,000:1) and one for odor recognition (1,500:1). The 3,000:1 target corresponds to a 50% detection level and to a 20% recognition level (i.e., approximately 20% of the population will be able to recognize the diesel odor at this dilution level). The 1,500:1 target corresponds to a 50% recognition level. This is the level at which 50% of an exposed population will recognize the odor as diesel. It is often the level which corresponds to an objectionable response (i.e., complaints). Table 3 presents the frequencies of wind conditions predicted to result in dilution levels below the respective odor thresholds for the Tower B generator. It should be noted that the recommendations below the Table can be applied to any of the three generators.

Table 3: Summary of Results for 1,000 kW Emergency Diesel Generator (Source G2) – Routine Testing Scenario [1]

Receptor Label	Receptor Description	Frequency [2] of Wind Conditions Expected to Result in Dilution Levels Below Criterion	
		Odor Detection Criterion (3,000:1)	Odor Recognition Criterion (1,500:1)
R7	Proposed DOAS 1 Air Intake on Tower A	*Target Met*	*Target Met*
R8-R15	Tower A Representative Operable Windows	*11%*	*3%*
R16	Podium B AHU 2-3	*Target Met*	*Target Met*
R22	Proposed DOAS 2 Air Intake on Tower B	*15%*	*Target Met*
R17-R21 & R24 & R26	Tower B Representative Operable Windows	*5%*	*Target Met*
R27	Podium C AHU 4	*Target Met*	*Target Met*
R29	Proposed DOAS 3 Air Intake on Tower C	*10%*	*4%*
R33	Representative Penthouse Air Intake on College of Engineering	*Target Met*	*Target Met*
R34	Representative Penthouse Air Intake on Center for Computing and Data Sciences	*2%*	*<1%*

Notes: [1] Receptors not included in this table (such as Tower C receptors) are expected to meet odor-based dilution criteria.
[2] Frequency is defined as the annual percentage of wind conditions that may result in dilution levels less than the given criterion at a receptor.
[3] Please note that our assessment assumes that vertical stacks do not feature fixed rain caps. The use of flip caps would be acceptable provided that they fully open under any testing load scenario.

The criteria for diesel odors were met at all air intake locations assessed with exception of the Tower C DOAS 3 air intake (receptor R29). There is also a risk of odors reaching the operable windows. Windows located at upper elevations (above Level 12) are likely to experience a higher magnitude and frequency of odors compared to operable windows at lower elevations. There is a low frequency of wind conditions expected to result in dilution levels below the odor criteria at the Center for Computing and Data Sciences building to the north (receptor R34). When considering the odor recognition criterion, the overall risk is considered to be low at the receptor locations where the target was not met.

Odor Mitigation Strategies

Increasing the stack height by 5 ft (to discharge 15 ft above the enclosures) would help to reduce the risk of odors. The increased stack height is expected to result in the odor recognition criteria being met at all air intake locations. Similar improvements would also be expected for the generator on Tower A (source G1) and on Tower C (source G3).

Alternatively, if there is a desire to reduce the risk of not meeting the odor detection threshold at all receptor locations, odor control technology such as combined diesel particulate and diesel oxidation catalyst (DPF/DOC) on the exhausts could be considered. This approach is likely unnecessary if the design team is considering the implementation of increased stack height or if the overall risk of not meeting the odor recognition threshold is deemed acceptable.

3.2 Proposed Kitchen Cooking Hood Exhaust Fans (K1-K11)

Two groups of kitchen exhausts are located on the roof of podium A (sources KE1, KE7, KE8, KE10, and KE11) and podium B (sources KE2, KE3, KE4, KE5, KE6, and KE9). Kitchen exhaust labelled as KE5 was modeled with a 13 ft stack height, while the rest of the kitchen exhausts were modeled with a 12 ft stack height. Exhaust dispersion results are compared against RWDI's recommended dilution criterion of 600:1 for detection of kitchen odors as presented in Table 4. The resultant frequency of wind conditions expected to result in dilution levels below the criterion with the inclusion of odor controls with different removal efficiencies are presented in Table 5.

Table 4: Summary of Results for Proposed Kitchen Hood Exhaust Fans (Source K1-K11)

Receptor Group	Receptor Description	Minimum Predicted Dilution Level	Frequency [1] of Wind Conditions Expected to Result in Dilution Levels Below Odor Criterion (600:1)
R1	Podium A AHU 1 Air Intake	120:1	*77%*
R2-R6 & R8-R15	Tower A Representative Operable Windows	10:1	*99%*
R7	Proposed DOAS 1 Air Intake on Tower A	40:1	*64%*
R16	Podium B AHU 2-3	80:1	*77%*
R17-R20 & R23 & R25 & R26	Tower B Representative Operable Windows	30:1	*92%*
R22	Proposed DOAS 2 Air Intake on Tower B	*40:1*	*49%*

Notes: [1] Frequency is defined as the annual percentage of wind conditions that may result in dilution levels less than the given criterion at a receptor.

Table 5: Comparison of Odor Removal Equipment Efficiencies for Proposed Kitchen Hood Exhaust Fans

Receptor Group	Receptor Description	Frequency of Wind Conditions Expected to Result in Dilution Levels Below Odor Criterion			
		Without Odor Removal Equipment (600:1)	With Odor Removal Equipment		
			50% Efficiency (300:1)	75% Efficiency (150:1)	95% Efficiency (30:1)
R1	Podium A AHU 1 Air Intake	*77%*	*48%*	*12%*	*Target Met*
R2-R6 & R8-R15	Tower A Representative Operable Windows	*99%*	*99%*	*99%*	*31%*
R7	Proposed DOAS 1 Air Intake on Tower A	*64%*	*37%*	*20%*	*Target Met*
R16	Podium B AHU 2-3	*77%*	*63%*	*31%*	
R17-R20 & R23 & R25 & R26	Tower B Representative Operable Windows	*92%*	*82%*	*42%*	*<1%*
R22	Proposed DOAS 2 Air Intake on Tower B	*49%*	*18%*	*4%*	*Target Met*

Discussion

Dilution levels below the odor criterion are expected at all receptors assessed for a high frequency of wind conditions. Most notably, when the kitchen exhausts operate, odors are predicted at the Tower A operable windows 99% of the time.

Mitigation Strategies

RWDI was notified during a conference call on December 8, 2023, that all podium AHU's (receptors R1 & R16) will be equipped with activated carbon filtration. In RWDI's experience, the implementation of activated carbon filtration is an effective mitigation strategy for odors provided that the additional filters are appropriately sized and maintained. The inclusion of activated carbon filters in the tower rooftop DOAS units (receptors R7 & R22) is also recommended, if feasible, to mitigate the risk of odors at the tower air intakes.

To reduce the risk of odor infiltration via the operable windows, odor control technology on the kitchen exhausts is recommended. In RWDI's experience, the most effective reduction of odor emissions from kitchen exhausts is achieved when high efficiency grease and particulate removal is combined with specialized filtration (such as activated carbon). It is understood the traditional pollution control units (PCU's) are not feasible for this project. AirMaid technology was discussed with RWDI as an odor mitigation option to reduce odor impacts at the operable windows and tower rooftop DOAS unit air intakes. RWDI cannot quantify the removal efficiency of AirMaid systems, however, implementation of this technology is preferable to having no odor reduction technology at all. It is recommended that a manufacturer guarantee be obtained regarding the performance of the selected equipment. As shown in the Table 5, a removal efficiency of 75% or greater is expected to significantly reduce the risk of odors at all locations with the exception of the operable windows on Tower A.

It is also noted the design team is considering the implementation of traditional upblast fans instead of the proposed high plume fans. The implementation of upblast fans is expected reduce the risk of odors at the tower rooftop DOAS air intakes marginally and should not have an impact on the odor risk at operable windows.

3.3 Other Design Comments

Exhaust dispersion and air quality concerns were considered for an additional exhaust source, but detailed dispersion modeling was not deemed necessary.

3.3.1 Proposed Kitchen Exhaust (Fan Tag: KEF 9)

A proposed 600 cfm kitchen exhaust (KEF 9) will be located on the east end of podium B roof. Due to the limitations in accurately physically modeling such a small exhaust, it was excluded from wind tunnel testing. Screening level numerical modeling was performed to assess its potential for exhaust re-entrainment at the proposed Air Handling Unit (AHU) intake on the same level and operable windows located on the west faced of Tower A. Based on this modeling, the same mitigation strategies discussed with respect to the assessed kitchen exhausts in previous are recommended for KEF 9.

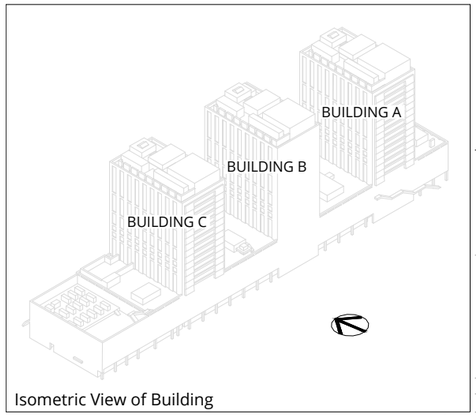
4 STATEMENT OF LIMITATION

This report entitled Boston University Warren Towers Exhaust Dispersion & Design Final Report dated January 5, 2024 was prepared by Rowan Williams Davies & Irwin Inc. ("RWDI") for MDS/Miller Dyer Spears Architects ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

FIGURES



Isometric View of Building

LEGEND:

- Exhaust Stack
  G1-G3: 1000 kW Emergency Generators
  KE1-KE11: Kitchen Exhaust Fans
- Air Intake
- Operable Window

Location of Exhaust Sources and Receptors

Boston University Warren Tower - Boston, MA

True North

Project #2302578

Drawn by: ALJM	Figure: 1
Approx. Scale:	1"=80'
Date Revised:	Nov. 23, 2023

APPENDIX A

1608 Walnut Street, Suite 1200
Philadelphia, PA
USA 19103

Tel: +1.267.773.8375
Fax: +1.888.686.1869

September 5, 2023

James Loftus, AIA, NCARB, MCPPO
Principal
MDS/Miller Dyer Spears Architects
40 Broad Street, Suite 103
Boston, MA, USA 02109
617.338.5350

Re: Exhaust Dispersion Design Review
Boston University Warren Towers
RWDI Reference No. 2302578

Dear James,

RWDI USA LLC (RWDI) was retained by MDS/Miller Dyer Spears Architects to conduct an air quality assessment for the proposed renovations to the Boston University Warren Towers in Boston, MA.

This report summarizes our preliminary design recommendations with respect to proposed exhaust sources and air intakes. Our feedback is qualitative and is based on:

- Architectural and mechanical drawings received up to August 15, 2023, and communications with the design team;
- A review of the long-term meteorological data from the Boston Logan International Airport;
- Screening-level numerical exhaust dispersion calculations; and
- Our wind tunnel experience with exhaust dispersion, wind flow around buildings, and other similar projects.

For exhaust sources where recommendations in this report can be implemented, further evaluation may not be necessary. For more problematic exhaust sources, detailed (i.e., wind tunnel) dispersion modeling is recommended to quantify the level of frequency air quality impacts and investigate mitigation strategies.

Project Description

The Warren Towers site includes three 14-story residential towers on a large four-story podium on the Boston University campus along Commonwealth Ave. The surrounding area consists primarily of a mix of low-rise residential, commercial, and academic buildings, and the taller Center for Computing & Data Sciences to the northeast (Image 1).

The proposed renovations to Warren Towers include:

1. Base scope: addition of three (3) new 1,000 kw emergency diesel generator and DOAS units, one on the roof of each of the three towers. New domestic hot water (DHW) heat pumps will also be added on the terrace roof. The generators and DOAS units are highlighted in Appendix A (attached).
2. "HVAC Alternate" scope – replacement of HVAC equipment on the podium rooftops, including four (4) air handling units (AHUs), one (1) air-to-water heat pump (AWHP), replacement of all kitchen and laundry exhaust fans, an electrical load bank, and an all-electric boiler plant. The locations of the AHUs and the replacement kitchen exhaust fans are highlighted in Appendix A (attached).

Image 1 – Existing Warren Towers (Image Courtesy of Google Earth™)

James Loftus, AIA, NCARB, MCPPO
MDS/Miller Dyer Spears Architects
RWDI#2302578
09/05/2023

Wind Climate

RWDI reviewed wind data from the Boston Logan International Airport to estimate wind conditions at the site. This is the closest meteorological station with a substantial and recent data set. A summary of the directional distribution of winds over a period from 1992-2022 is shown below. The wind directions in the figure refer to the direction from which the wind blows, while the annual frequency of a given wind direction is shown as a distance radially from the center.

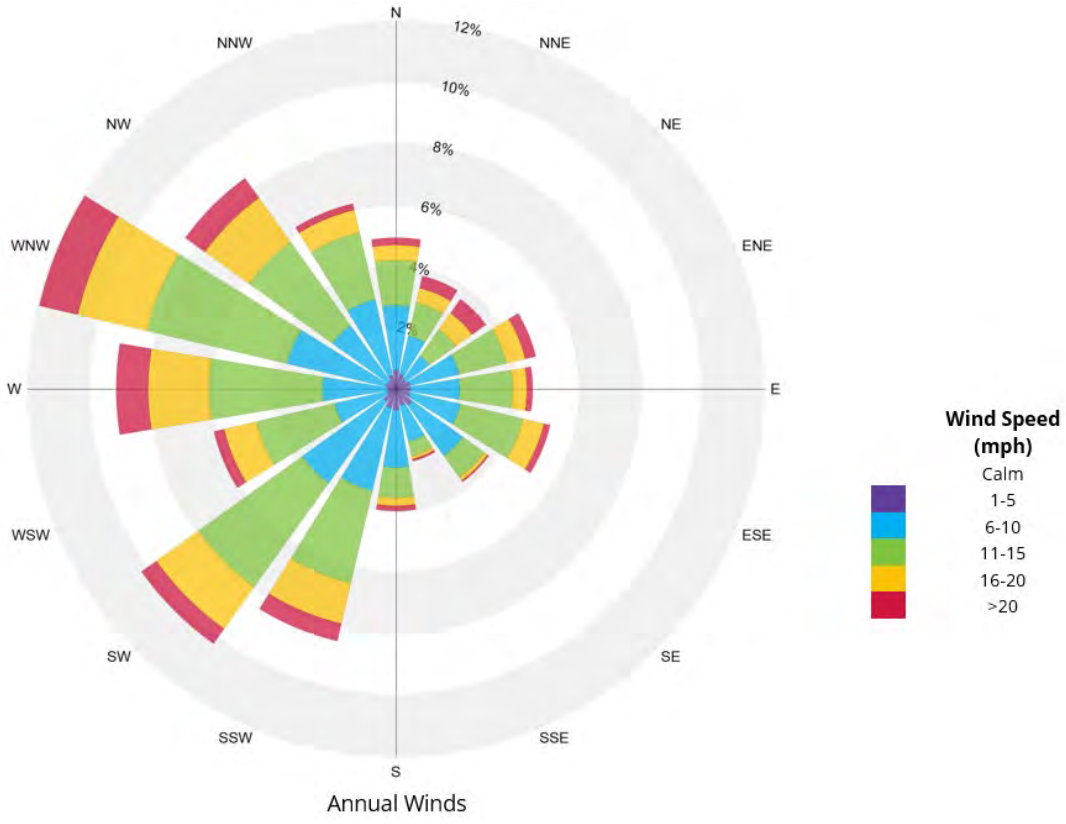


Image 2 – Directional distribution (%) of winds (blowing from)
Station: Boston Logan International Airport (1992-2022)

Design Feedback

The primary exhaust sources of concern (i.e., sources of pollutant and/or odorous emissions) associated with the Warren Towers renovations are the diesel generators and the kitchen exhausts. These are discussed in the following sections.

Diesel Generators

There are two potential sources of concern associated with re-entrainment of exhaust from diesel generator combustion flues: elevated pollutant levels (primarily nitrogen dioxide, NO_2), and strong nuisance odors. The proposed generators will each be housed in a 13 ft enclosure, with a vertical stack extending at least 10 ft above the roof of the enclosure.

The generators are positioned in the best possible locations, on the roof of each tower. This positioning will limit exhaust impacts to the new DOAS units and windows on the upper levels of the towers.

However, based on the capacity of the generators and the relatively close proximity of these receptor locations, there is a potential for undesirable pollutant and odor levels to occur during generator operation. This is of greatest concern for the Tower B and Tower C generators, which will align with the rest of the site during prevailing westerly winds. Additionally, as westerly winds interact with the exposed Tower C façade, a recirculation zone is expected to form over the Tower C roof that will hinder dispersion of the generator exhaust (refer to Image 3). Smaller recirculation zones are also expected to form over the Tower B and Tower A rooftops.

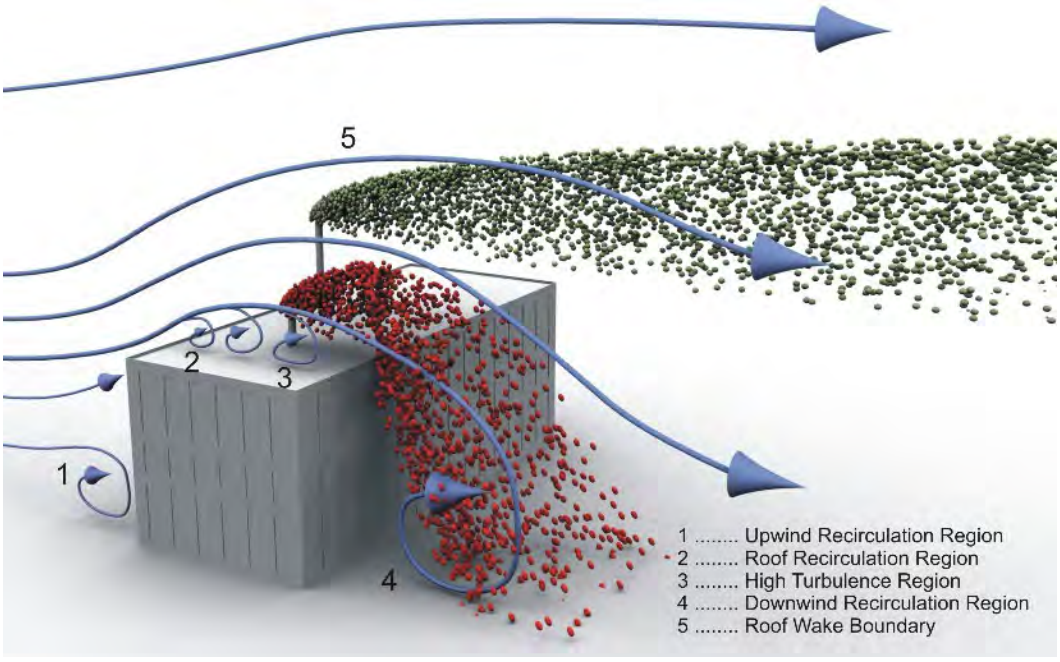


Image 3: Conceptual example of wind interaction with rooftop building exhausts

The level of concern for re-entrainment will depend on the anticipated operating scenario for the diesel generators, both for routine testing and emergency power outages. Wind tunnel testing is recommended to quantify dispersion levels for these operating scenarios, along with the frequency of wind conditions of concern for both elevated pollutant levels and odors at the proposed discharge height. **Please provide details on how the generators will operate during regularly scheduled tests, and during emergencies (e.g., generators will be tested individually, operating at 50% of rated capacity).**

Several mitigation strategies can be considered to reduce both pollutant and odor concerns. Increased stack height is often the most effective strategy to reduce the likelihood of the exhaust being trapped within a rooftop recirculation zone. However, in the case of the proposed generators, tall stacks may be required. Wind tunnel testing should therefore be utilized to determine the minimum stack height at which recommended health-based dilution thresholds are met for each generator.

Other mitigation strategies that can be utilized in conjunction with or as alternatives to stack height include:

- Emission control technology to reduce pollutant emissions: selective catalytic reduction ("SCR") technology is an effective means of reducing NOx emissions from generators. However, SCR equipment would add significant cost to the project. SCRs also require additional space on and around the generators, which may not be feasible on the project.
- Emission control technology to reduce odor emissions: in RWDI's experience, the most effective reduction in diesel odor strength is achieved with a combined diesel particulate filter (DPF) and diesel oxidation catalyst (DOC). DPF alone can partially reduce odor emissions.
- Specialized filtration at air intakes, such as activated carbon, can be an effective means to remove odors, provided that the filters are appropriately sized and maintained. However, this approach would only be applicable at intakes such as the DOAS units and would not address odors at operable windows.

It is also noteworthy that a separate analysis using EPA dispersion modeling for the MassDEP Compliance Certification (as outlined in question 9 of the MassDEP form) will be required for the proposed generators. RWDI's recommended health-based dilution criterion is based on meeting a "good practice" short term exposure threshold for pollutant emissions, and typically results in more conservative recommendations compared to modeling outcomes for the MassDEP Compliance Certification. However, modeled results and any recommendations from a MassDEP analysis may supersede findings from the wind tunnel study with respect to pollutant emissions.

Kitchen Exhausts (HVAC Alternative)

The existing kitchen exhausts appear to be upblast-style fans, primarily located on the south end of the Podium B roof. The replacement and new kitchen exhausts, listed in Table 1 per fan information

provided by the design team on July 17, 2023, will be located in two clusters on the Podium A and Podium B rooftops (Image 3). The proposed Vektor fans will all have a discharge height of at least 11.5 ft above the podium roof.

Table 1: Proposed Kitchen Exhausts

Fan Label	Podium Location	Fan Model	Exhaust Flow Rate
KEF-1	A	Vektor-H-16	2,475 cfm
KEF-2	B	Vektor-H-22	6,200 cfm
KEF-3	B	Vektor-H-16	3,713 cfm
KEF-4	B	Vektor-H-12	1,875 cfm
KEF-5	B	Vektor-H-36	16,350 cfm
KEF-6	B	Vektor-H-22	5,513 cfm
KEF-7	A	Vektor-H-9	1,200 cfm
KEF-8	A	Vektor-H-22	3,844 cfm
KEF-9	B	Vektor-H-9	600 cfm
KEF-10	A	*Unknown – please provide cut sheets if available*	3,500 cfm
KEF-11	A		700 cfm

Air flow in the areas between and next to the towers is expected to be limited, particularly on and around Podium B, between Tower A and Tower B. As a result, very low dilution levels, well below RWDI's recommended threshold for kitchen cooking odors, are expected to occur at the proposed air intakes on the podium rooftops. Strong odors are also anticipated at operable windows on the towers adjacent to the kitchen exhausts. It is understood that odors from some or all the existing exhausts have been observed by members of the design team while on the podium roof; this anecdotally supports the expectation of low dilution levels in these areas.

Conversion of the exhausts from upblast fans to Vektor fans may help to slightly improve dilution levels at the podium roof decks; however, the exhaust plumes are still expected to be effectively trapped as the wind flows around the much larger tower structures (see Images 4 and 5). During certain wind conditions, including prevailing westerly and northwesterly wind directions, the exhaust is expected to traverse up to the DOAS units on the Tower A and Tower B rooftops.

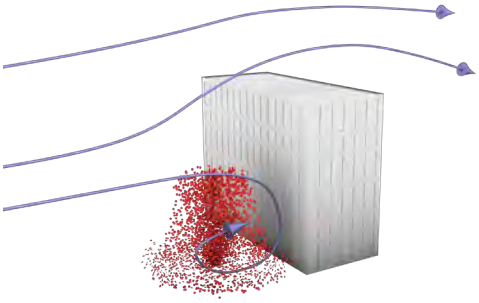


Image 4: Conceptual example of direct wind interaction with building exhausts at a low elevation (e.g., easterly winds approaching Tower A)

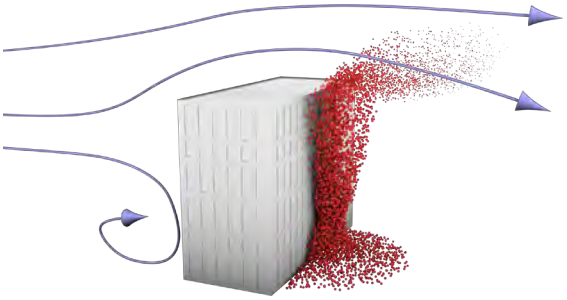


Image 5: Conceptual exhaust of indirect wind interation with building exhausts at a low elevation (eg., westerly winds approaching Towers C, B, or A)

Reasonable stack design changes (e.g., further increases in discharge height or exit velocity) are not expected to significantly improve exhaust dilution levels, owing to the aerodynamic influence of the adjacent towers. On this basis, if there is a desire to reduce the potential for odor re-entrainment as part of the HVAC Alternative scope of work, we recommend that the exhausts be equipped with control technology. In RWDI's experience, the most substantial reduction in odors from kitchen exhausts is achieved through a combination of high-efficiency grease removal combined with specialized filtration such as activated carbon to remove gaseous odors.

As discussed with respect to the diesel generators, consideration could be given to equipping the AHU and DOAS units with activated carbon filtration to remove odors. However, this approach would not address the potential for odor re-entrainment via the nearby windows.

If desired, wind tunnel testing could be conducted to quantify exhaust dilution levels from the kitchen exhausts along with the frequency of wind conditions of concern for re-entrainment.

Closing

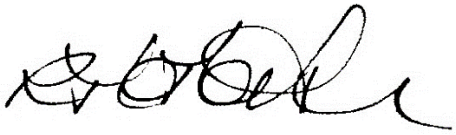
We would like to discuss the above feedback with the design team. Our next step will be to review any revisions to the mechanical design and prepare a "test plan" document outlining the exhaust parameters and receptor locations to be in included in the detailed wind tunnel dispersion modeling. Based on our review of the proposed mechanical design, detailed modeling is recommended for the proposed diesel generator exhausts to quantify dilution levels and provide stack height recommendations for each unit.

If the design team proceeds with the HVAC Alternative, wind tunnel modeling could also be conducted for the replacement kitchen exhausts, if there is a desire for more accurate quantification of dilution levels and/or feedback on the need for pollution control units.

We hope the enclosed meets your present requirements. Please contact us if you have any questions regarding this assessment.

Sincerely,
RWDI USA LLC

Stephen Owens,
Project Manager



Ruth McMath, M.Sc. | Associate
Senior Scientist

Statement of Limitations

The information provided here as a set of preliminary results for MDS/Miller Dyer Spears Architects ("the Client") was prepared by RWDI USA LLC ("RWDI") as part of the Exhaust Dispersion Design Review ("the Study") for Boston University Warren Towers ("the Project"). These preliminary results are being provided early and prior to the completion of RWDI's final report on the Study solely for the convenience of the Client. These preliminary results are based on the information available to RWDI when the Study was being conducted. No conclusions or recommendations should be inferred from this information other than those specific comments offered by RWDI. It is imperative that the Client and/or any person reviewing these preliminary results understand that full documentation of underlying assumptions and limitations of these preliminary results will be provided in the final report. Hence, it is possible that a number of factors which may impact the conclusions and recommendations have not been provided as part of this early communication. Accordingly, the Client and any other party reviewing these preliminary results should not make any decisions relying solely on these preliminary results.

Legend:

DOAS units: OA intake louvers ▶

1,000 kW diesel generators (10 ft. minimum combustion flue above approx. 12'6" enclosure)

2 ROOF PLAN - DUNNAGE PLATFORM AND PENTHOUSE ROOFS

SCALE: 1/16" = 1'-0"

1 FLOOR PLAN - TOWER ROOFS AND PENTHOUSE PLANS

SCALE: 1/16" = 1'-0"

BOSTON UNIVERSITY
WARREN TOWERS RENOVATION

700 COMMONWEALTH AVE
BOSTON, MA 02215

KEY PLAN

MDS ARCHITECTS

Project Status:	DD PRICING SET
MDS Project Number:	2220-000
Drawn By:	WH
Checked By:	ST
Date:	JUNE 30, 2023

Revisions

No.	Date	Description

FLOOR PLAN - TOWER - PENTHOUSE & TOWER ROOFS

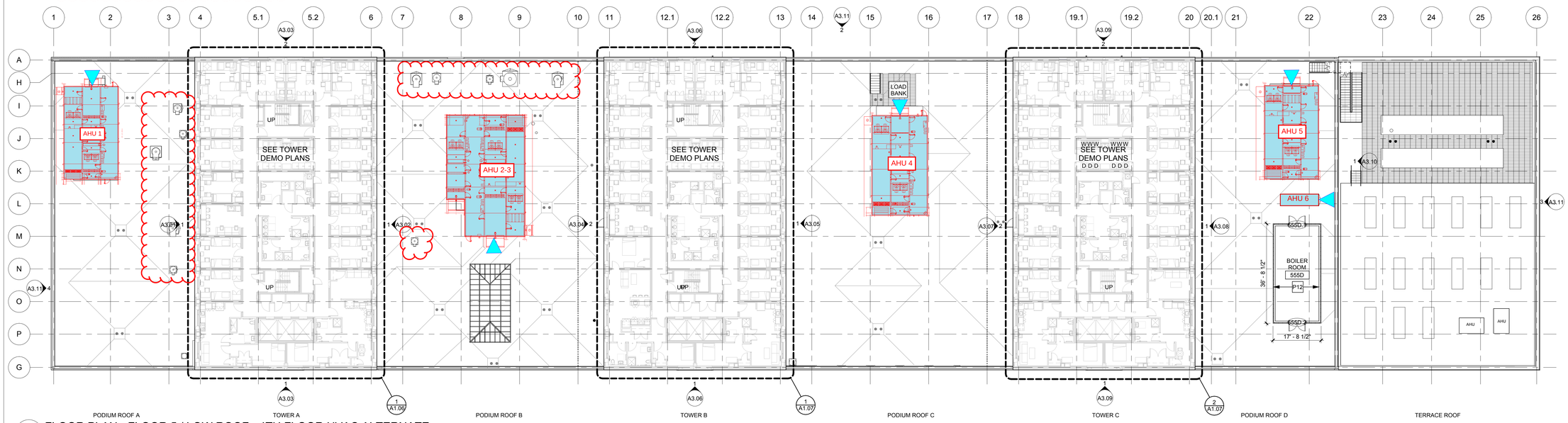
A1.04

SCALE: As indicated

Legend:

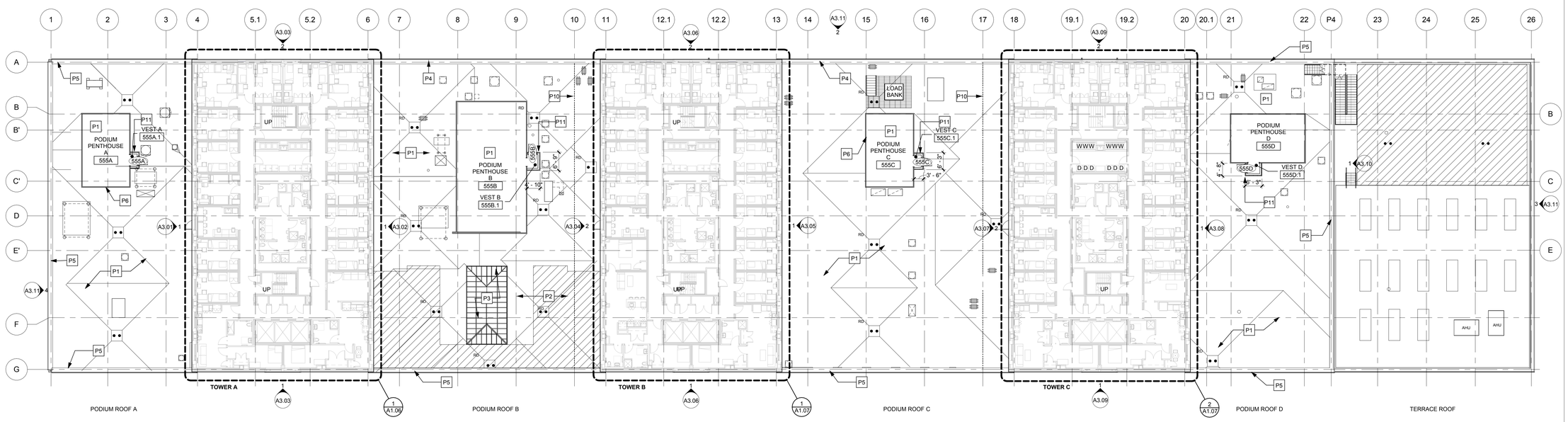
AHUs: OA intake louvers

Kitchen exhaust fans



2 FLOOR PLAN - FLOOR 5 / LOW ROOF - 4TH FLOOR HVAC ALTERNATE

SCALE: 1/16" = 1'-0"



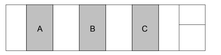
1 PODIUM ROOF PLAN - PODIUM MASONRY AND ROOF ALTERNATE

SCALE: 1/16" = 1'-0"

BOSTON UNIVERSITY
WARREN TOWERS RENOVATION

700 COMMONWEALTH AVE
BOSTON, MA 02215

KEY PLAN



N

MDS ARCHITECTS

Project Status:	DD PRICING SET
MDS Project Number:	2220-000
Drawn By:	ST
Checked By:	ST
Date:	JUNE 30, 2023

Revisions

No.	Date	Description

ROOF PLANS - PODIUM - ALTERNATES

A1.03A

SCALE: As indicated

APPENDIX B

APPENDIX B: DISCUSSION OF DILUTION CRITERIA

Combustion Exhausts

The primary pollutants associated with combustion exhausts are nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (PM) and sulfur dioxide (SO_2). Odor is also a concern for exhaust sources that use diesel or jet fuel, such as generators, trucks, buses, and helicopters. Gasoline and natural gas combustion sources have negligible odor emissions.

Health Criteria

Occupational and ambient air quality standards should be considered when developing health-based dilution criteria for combustion exhaust. It is the opinion of RWDI, however, that the application of occupational standards may not be sufficiently stringent for the higher risk demographic that can be found in the general population including children, the elderly, or other individuals that are more susceptible to respiratory ailments or other health effects of poor air quality (e.g., those with chronic obstructive pulmonary disorder (COPD) or asthma). Therefore, ambient air quality standards are utilized to develop health-based dilution criteria. In most cases NO_2 is the limiting pollutant, meaning that it has the highest ratio of source concentration to allowable concentration and requires the most dilution. By designing to meet the recommended target for NO_2, recommended thresholds for other criteria pollutants are typically also met.

For intermittent sources, the EPA has expressed the view that the 1-hour standard of 188 µ/m³ for NO_2 may be too strict and not necessarily applied to such sources as generators that are only used for emergency purposes[1]. Several studies, as summarized by the California Environmental Protection Agency[2,3], have been published citing the acute health effects of NO_2 in humans exposed to varying concentrations in non-occupational settings. These studies demonstrated that short-term exposure of individuals with compromised respiratory systems to concentrations of NO_2 as low as 338 µg/m³ affected airway responsiveness. Based on this evidence, RWDI recommends applying a not-to-exceed target of 338 µg/m³ for NO_2 emissions from intermittent combustion exhaust sources unless a stricter national or state standard exists.

---

1 Fox, T. United States Environmental Protection Agency. "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard." Office of Air Quality Planning and Standards. March 1, 2011.

2 California Environmental Protection Agency (CalEPA), Air Resources Board (ARB) and Office of Environmental Health Hazard Assessment (OEHHA). "Review of the California Ambient Air Quality Standard for Nitrogen Dioxide Technical Support Document." January 2007.

3 California Environmental Protection Agency (CalEPA), Air Resources Board (ARB) and Office of Environmental Health Hazard Assessment (OEHHA). "Review of the California Ambient Air Quality Standard for Nitrogen Dioxide Staff Report." January 2007.

EMERGENCY GENERATOR

For the 1000 kW Tier 2 emergency diesel generator the exhaust must be diluted by a factor of 290:1 to meet the suggested short-term limit of 338 µg/m³. This health-based dilution criterion was developed using a nitrogen oxides (NO_x) emission rate of 6 g/bhp-hr at 100% load. For 30% load operation, the exhaust must be diluted by a factor of 210:1, based on an estimated NOx emission rate of 5.1 g/bhp-hr.

Odor Criteria

Odor is very subjective, and there is a varying degree of sensitivity within the human population. It is often very difficult to eliminate odors entirely. Instead, design targets can be used for minimizing detection and recognition of the odorous exhaust. To do so, RWDI recommends designing to reduce the strength of odors from combustion exhausts such as diesel engines to a 50% detection level, which is recognized as an industry standard target for reducing odors to a generally acceptable level. By designing to meet this level, approximately 50% of the population will be able to detect an odor, while fewer people would be able to recognize the odor or find it objectionable. Combustion sources are very odorous and require significantly more dilution to meet odor thresholds compared to meeting health-based air quality standards.

DIESEL GENERATOR ODOR

To address odor from diesel generator exhaust, RWDI recommends designing to achieve an exhaust dilution of 3,000:1 at nearby receptors of concern (i.e., the exhaust is diluted 3,000 times before reaching the receptor location). This design target is based on odor panel testing conducted previously by RWDI using field samples from modern (post-2005) diesel generator exhausts operating on ultra-low sulfur diesel (ULSD) fuel.

The 3,000:1 target corresponds to a 50% detection level and to a 20% recognition level (i.e., approximately 20% of the population will be able to recognize the diesel odor at this dilution level). Table A1 provides the approximate levels of response that could be expected at various levels of dilution for diesel odor based on the odor panel testing.

Table B1: Approximate Levels of Population Response to Diesel Odor

Level of Exhaust Dilution	Diesel Odor Detection Response (% of population)	Diesel Odor Recognition Response (% of population)
1,000:1	95%	60%
1,500:1	80%	50%
2,000:1	70%	30%
3,000:1	50%	20%
5,000:1	15%	<10%

Diesel Generator Odor Control Technology

The best available technology to reduce the strength of odor emissions from diesel generators is to implement a combined diesel particulate filter (DPF) and diesel oxidation catalyst (DOC). RWDI has conducted limited odor panel sampling for a generator installation with passive regeneration DPF/DOC technology. The results from this odor panel testing indicates that a dilution level of 500:1 corresponds with a 50% odor detection response. It is noted that a specific minimum operating temperature is required for DOC equipment to function as designed; this minimum temperature and the minimum load to provide the required temperature should be confirmed with the manufacturer. It is also recommended that the equipment manufacturer be consulted to confirm that the unit does not increase the in-stack ratio of nitrogen dioxide (NO_2) above 10%. The same odor panel sampling testing indicated that, for a generator equipped with a DPF only, a dilution level of 1,000:1 may be sufficient to achieve a 50% odor detection response. However, RWDI cannot guarantee that these levels are applicable in all cases for all equipment.

Kitchen and Cooking Exhaust

The primary concern with kitchen exhaust is the potential re-entrainment of cooking odors at nearby intakes. Odor by nature is subjective as is a varying degree of sensitivity within the human population. Consequently, it is often very difficult to eliminate odors entirely. The goal is therefore to design exhausts to meet a 50% detection threshold, which is recognized as an industry standard target for reducing odors to a generally acceptable level.

A 50% detection threshold means that approximately 50% of an exposed population will be able to detect some odor at this level, but may not necessarily object to it, or be able to identify it. A smaller percentage of the population may find the odor objectionable. On average, 50% of the population will not detect any odor at this level.

Table A5 provides a summary of the 50% odor detection dilution threshold for a range of cooking and restaurant types. The target is applicable to both grease-laden and non-grease-laden cooking fumes. This target is based on odor panel testing conducted previously by RWDI using field samples from various types of kitchen exhausts and corresponds to a 50% detection level.

RWDI typically recommends applying a dilution threshold of 600:1 for any kitchen exhausts serving areas where grilling, frying, or other active cooking activities will occur.

Table B2: 50% Odour Detection Threshold for a Difference Types of Cooking and Restaurants.

Odour Characterization	50% Odour Detection Dilution Threshold	Types of Cooking and Restaurants
Strong Odours	>600:1	Heavy grilling and/or frying such as hamburger restaurants, restaurants that cook a lot of fish/shellfish, and onion/garlic.
Moderate Odours	100:1 to 300:1	Restaurants that do have grilling and frying operations but is not the primary way of cooking, such as cafeterias or cafes. Coffee shops that may roast their beans on site can generate moderate food odours, but the odours are very hedonic (pleasurable) so the risk of complaints tends to be low.

Weak Odours	<50:1	Delicatessens or sandwich shops with soup vats or where frozen foods may be microwaved; ice cream shops; tea houses; etc.

Attachment 6

COMMUNITY NOISE SURVEY

ACENTECH

33 Moulton Street
Cambridge MA 02138
617 499 8000
acentech.com

January 6, 2023

Diana Bruschi, RA, LEED AP BD+C
MDS | Miller Dyer Spears Architects
40 Broad Street
Boston, MA 02109
dbruschi@mds-bos.com

Subject: **Community Noise Survey**
Warren Residential Towers at Boston University
Boston, MA
Acentech Project No. 635897

Dear Diana:

This letter presents the results of our ambient noise survey at the site of the Boston University Warren Residential Towers. This survey will inform the basis of design criteria relating to outdoor noise emissions from the building mechanical equipment associated with the renovation.

APPLICABLE NOISE REGULATION

The new HVAC system equipment should be selected and located such that sound emissions to the community comply with Massachusetts Department of Environmental Protection (MADEP) and City of Boston noise ordinance requirements.

City of Boston Requirements

Community noise to surrounding residential properties should not exceed 60 dBA during daytime hours (7:00 AM to 6:00 PM, Monday through Saturday) and 50 dBA at all other times.

MADEP Requirements

The MADEP noise policy defines noise pollution by the condition resulting when:

> (a) Increases the broadband sound level by more than 10 dB above ambient.
>
> (b) Produces a pure tone condition, where the sound pressure level in one octave band exceeds the levels in the two adjacent octave bands by 3 dB or more.

The regulation defines the “ambient sound level” as the background A-weighted sound level that is exceeded 90% of the time during a measurement. This metric is commonly known as the L_{90}, expressed in dBA. Acentech conducted a community noise survey at the project site to determine existing ambient sound levels.

MEASUREMENT PROCEDURE

We placed four calibrated sound level monitors to collect sound levels continuously from December 14 to December 20, 2022. The monitor locations are described below and shown in Figure 1 on the next page:

- Location 1: Roof of 704 Commonwealth Ave, west of the project site
- Location 2: BU Grounds South park, east of the project site
- Location 3: Low roof of 700 Commonwealth Ave, west of Tower C

- Location 4: Low roof of 700 Commonwealth Ave, between Towers A and B

MEASUREMENT RESULTS

All data collected are reported in terms of A-weighted decibels (dBA), a weighted average of the sound spectrum based on the sensitivity of human hearing. The monitors collected data in 1-hour intervals, and recorded statistical metrics of sound levels measured during each interval. We report here the 90-percent exceedance level (L_{90}): the sound level (in dBA) that was exceeded 90% of the time over each 1-hour interval. The L_{90} constitutes the "ambient" sound level as defined by the Massachusetts DEP.

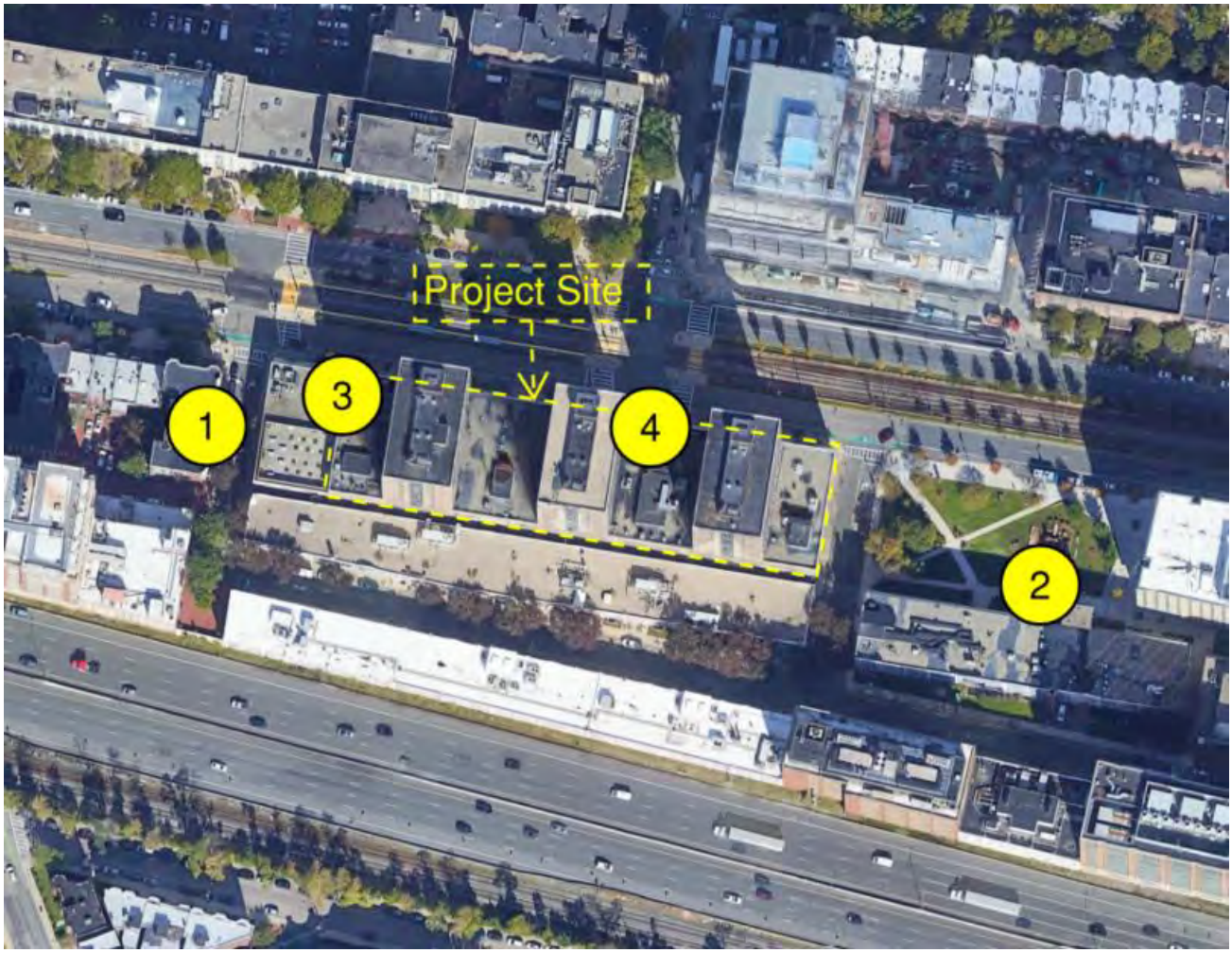


Figure 1. Sound level meter locations

Graphs of the measured hourly A-weighted L_{eq}, L_{90}, and L_{01} at each location are attached to this report. Table 1 lists the quietest hour-long periods recorded during daytime and nighttime hours at each location. Daytime hours are defined as 7:00 AM to 6:00 PM. Nighttime hours are defined as 6:00 PM to 7:00 AM.

Table 1: Lowest Measured Hourly L_{90} Sound Levels

Location	Description	Lowest Daytime L_{90} (dBA)	Lowest Nighttime L_{90} (dBA)
1	704 roof	64	56
2	Park	58	55
3	West low roof	62	55
4	Towers A&B low roof	60	56

CONCLUSIONS

Per the MADEP noise regulations, noise emissions from the project should not exceed the ambient sound levels at nearest neighboring properties by 10 dB. Based on the measurements results, the applicable MADEP noise limits derived from the ambient levels summarized in Table plus 10 dB all exceed the applicable City of Boston noise level limits of **60 dBA during daytime hours** and **50 dBA during nighttime hours and Sundays**. This is expected, given the site's urban location and resultant high ambient noise levels.

The City of Boston noise limits (the more stringent of the two) will be used as the baseline design goal for noise emissions to neighbors for this project.

Satisfying these requirements may require strategic location of outdoor mechanical equipment and sound attenuation measures, such as enclosures, quiet fan selections, compressor wraps, duct/stack attenuators, and/or barriers. The equipment that we will review provide recommendations for noise mitigation strategies, if necessary for compliance with noise emission requirements, includes:

DOAS-1-3**:** Three 25,300 CFM DOAS units (one on each tower)

CH-1-3: Three 225 ton air-cooled scroll chillers (one on each tower)

AWHP-1-3 - ADD ALT: Three 225 ton air to water heat pumps (one on each tower) in lieu of CH-1-3

Emergency Generator: One 800 kW emergency generator located on Tower A

Standby Generator: One 750 kW standby generator located on Tower B

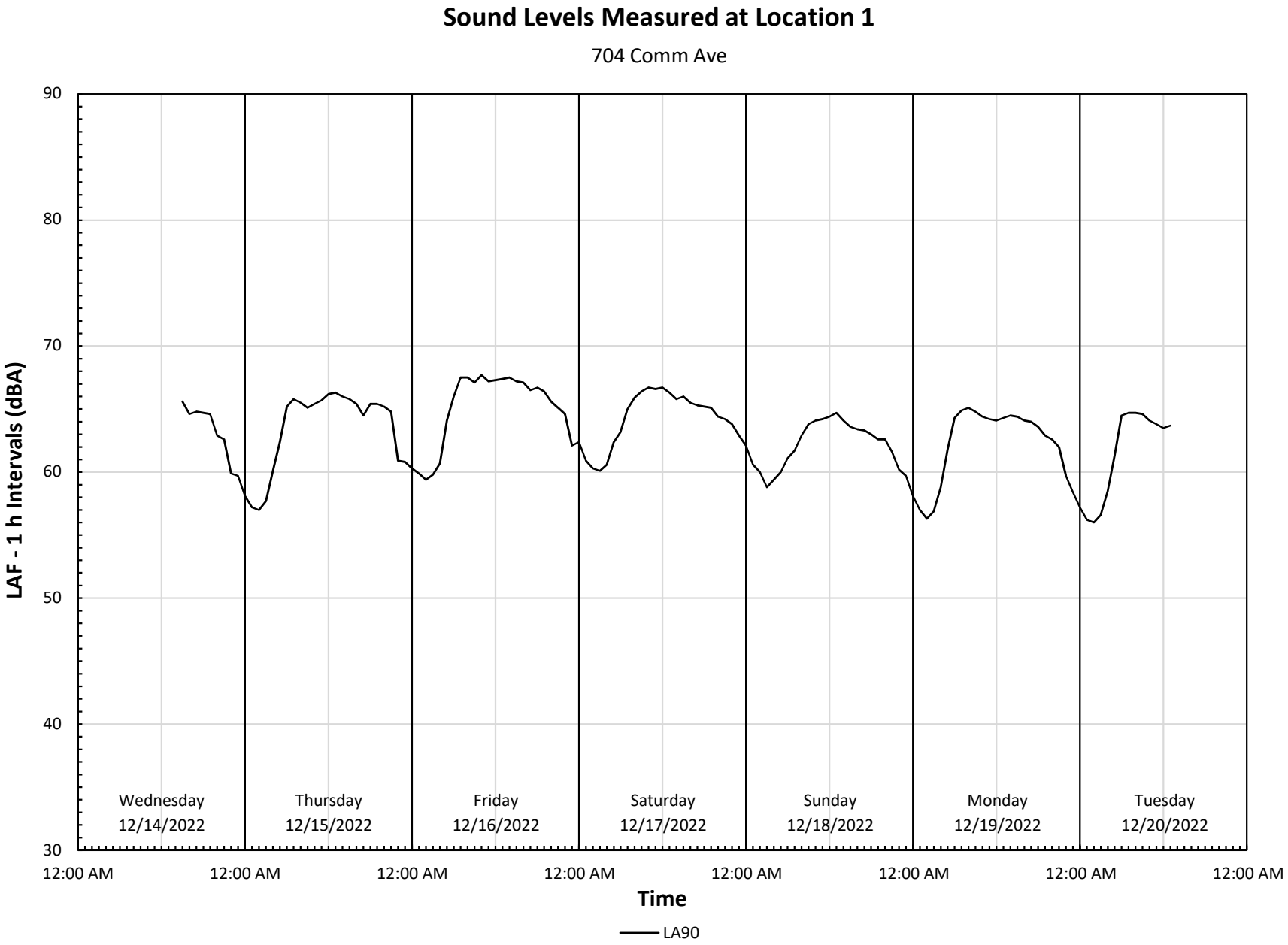
* * * * *

I trust this letter provides the information you need at this time. Please contact me with questions at 617-499-8082 or ipatrick@acentech.com.

Sincerely,

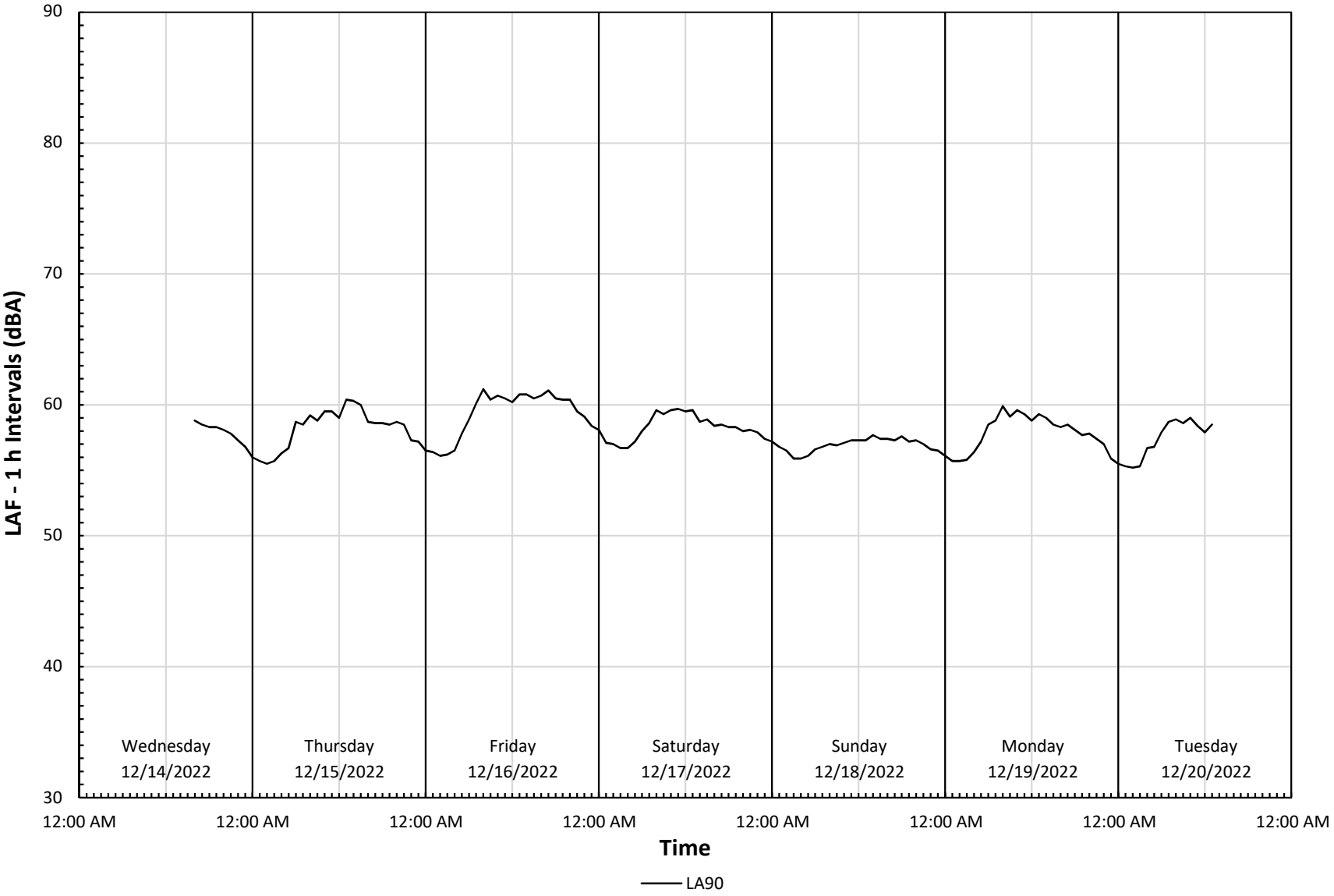
Ian Patrick, PE
Senior Consultant

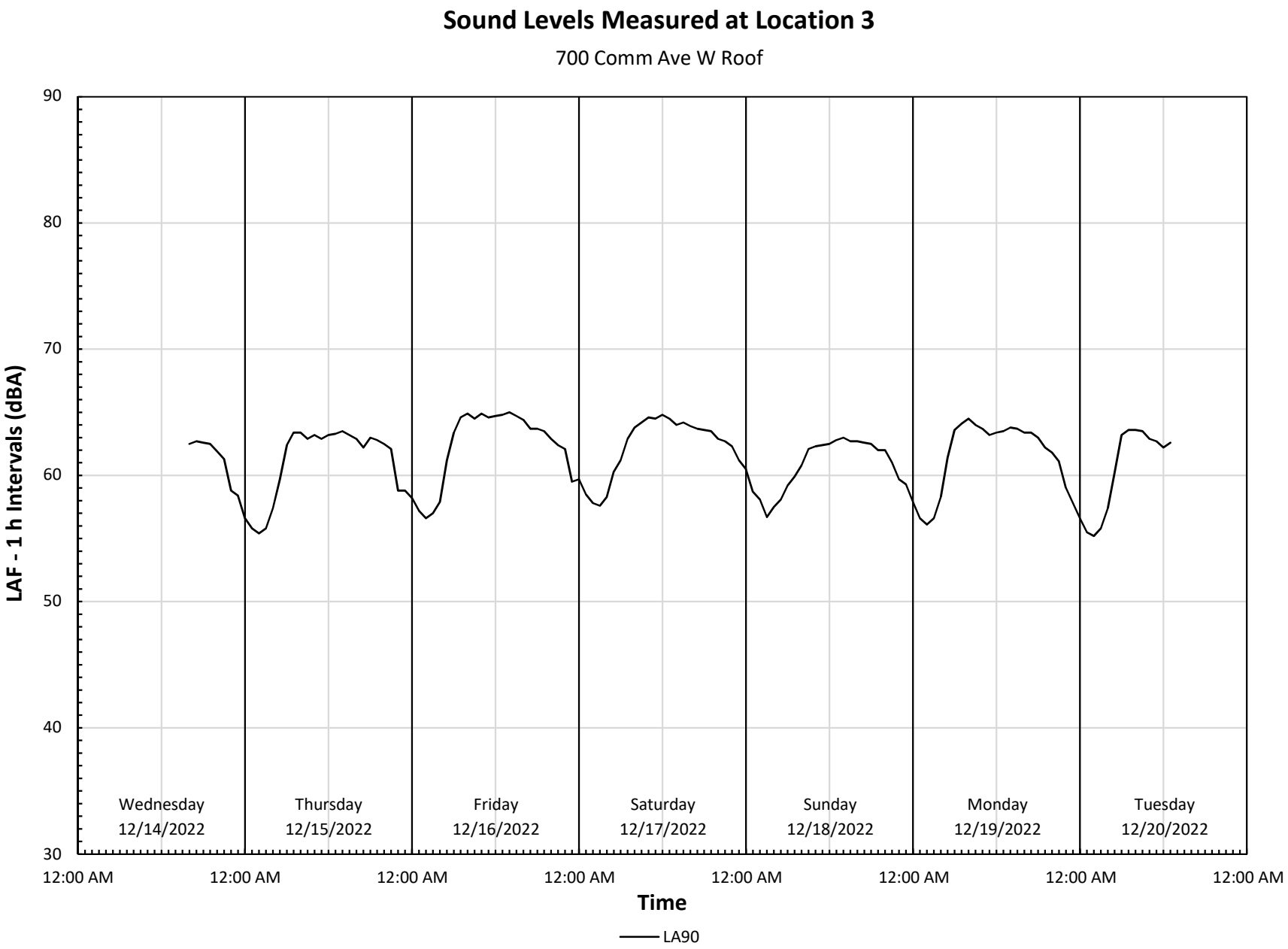
Enc: Graphs of Measured Site Noise Levels
CC: Ioana Pieleanu (Acentech)


Sound Levels Measured at Location 1
704 Comm Ave
LAF - 1 h Intervals (dBA)
90
80
70
60
50
40
30
Wednesday
12/14/2022
Thursday
12/15/2022
Friday
12/16/2022
Saturday
12/17/2022
Sunday
12/18/2022
Monday
12/19/2022
Tuesday
12/20/2022
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
Time
LA90

Sound Levels Measured at Location 2

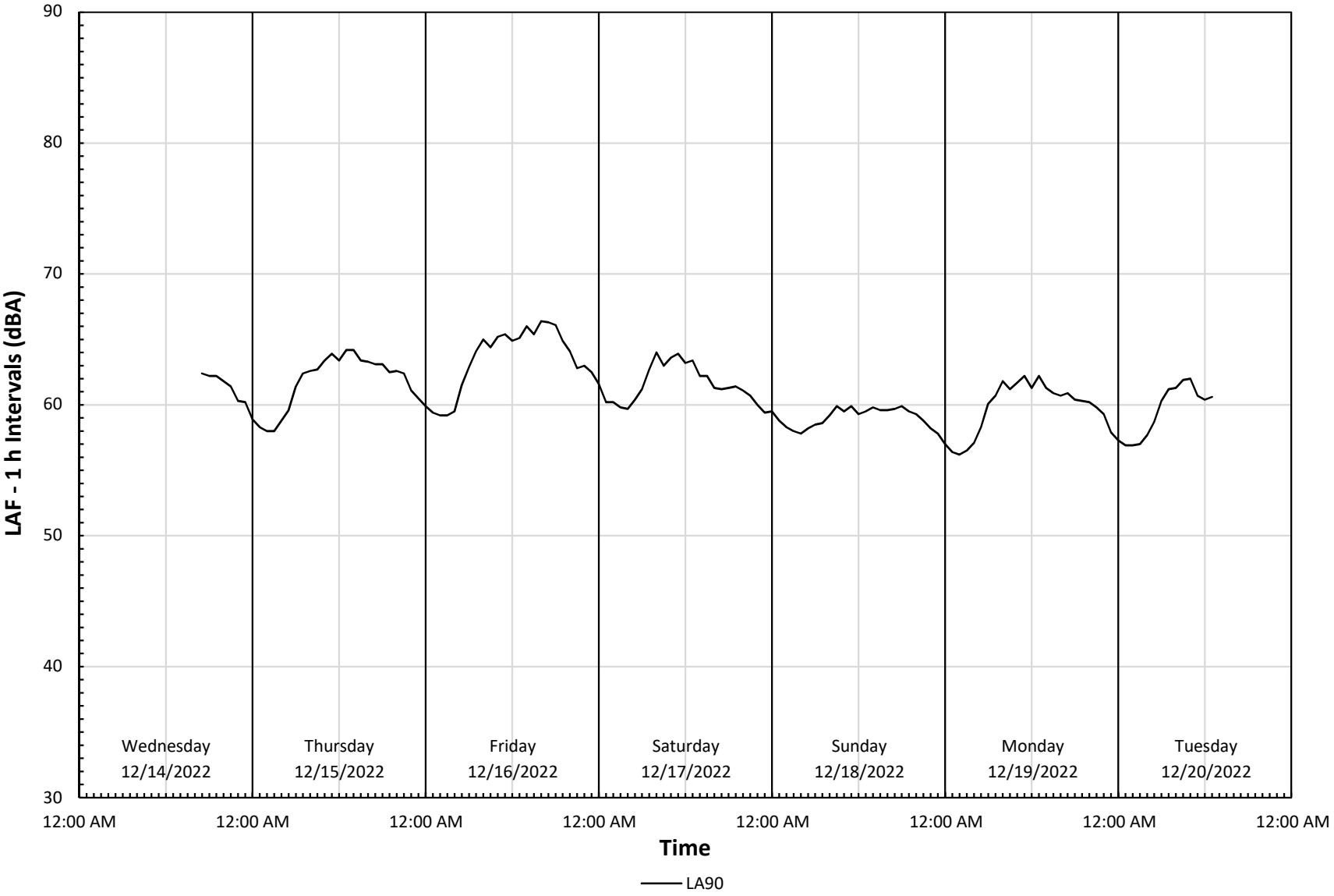
BU Grounds South




Sound Levels Measured at Location 3
700 Comm Ave W Roof
LAF - 1 h Intervals (dBA)
90
80
70
60
50
40
30
Wednesday
12/14/2022
Thursday
12/15/2022
Friday
12/16/2022
Saturday
12/17/2022
Sunday
12/18/2022
Monday
12/19/2022
Tuesday
12/20/2022
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
12:00 AM
Time
LA90

Sound Levels Measured at Location 4

700 Comm Ave AB Roof

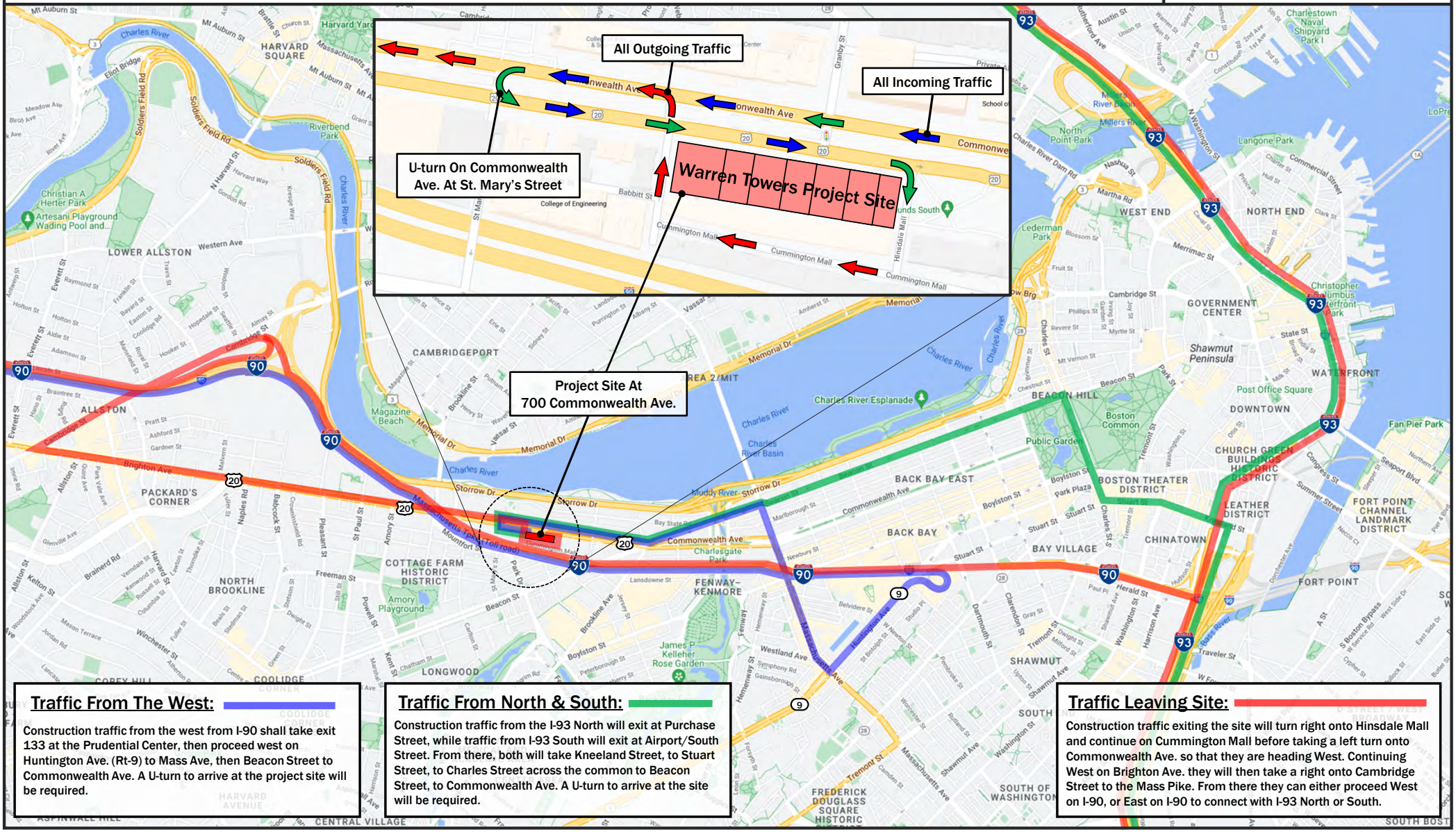


Attachment 7

CONSTRUCTION LOGISTICS PLAN

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: DELIVERY ROUTING



Traffic From The West:

Construction traffic from the west from I-90 shall take exit 133 at the Prudential Center, then proceed west on Huntington Ave. (Rt-9) to Mass Ave, then Beacon Street to Commonwealth Ave. A U-turn to arrive at the project site will be required.

Traffic From North & South:

Construction traffic from the I-93 North will exit at Purchase Street, while traffic from I-93 South will exit at Airport/South Street. From there, both will take Kneeland Street, to Stuart Street, to Charles Street across the common to Beacon Street, to Commonwealth Ave. A U-turn to arrive at the site will be required.

Traffic Leaving Site:

Construction traffic exiting the site will turn right onto Hinsdale Mall and continue on Cummington Mall before taking a left turn onto Commonwealth Ave. so that they are heading West. Continuing West on Brighton Ave. they will then take a right onto Cambridge Street to the Mass Pike. From there they can either proceed West on I-90, or East on I-90 to connect with I-93 North or South.

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: Site Prep Winter Break DEC '24 – JAN '25

BOSTON UNIVERSITY | SHAWMUT

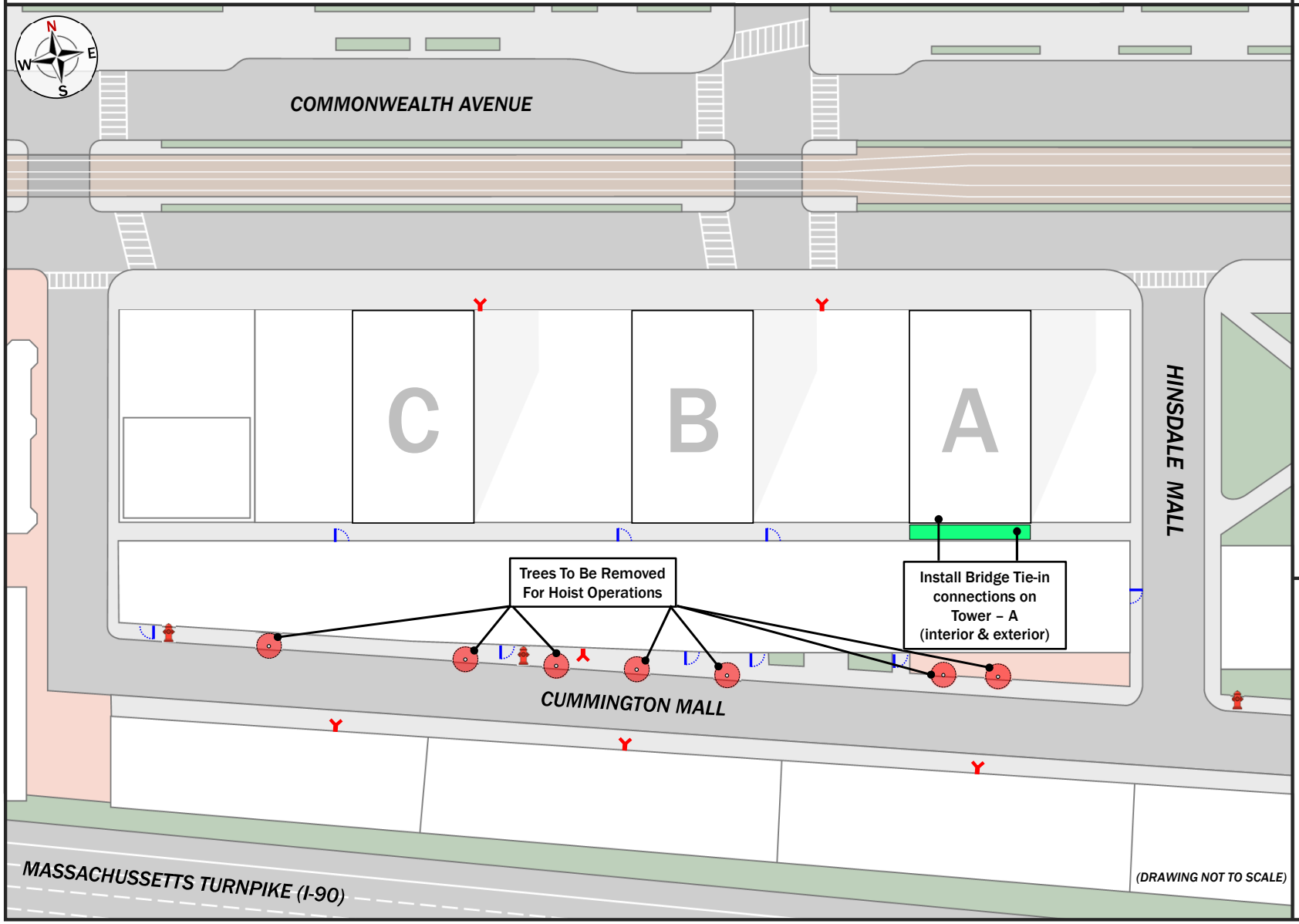


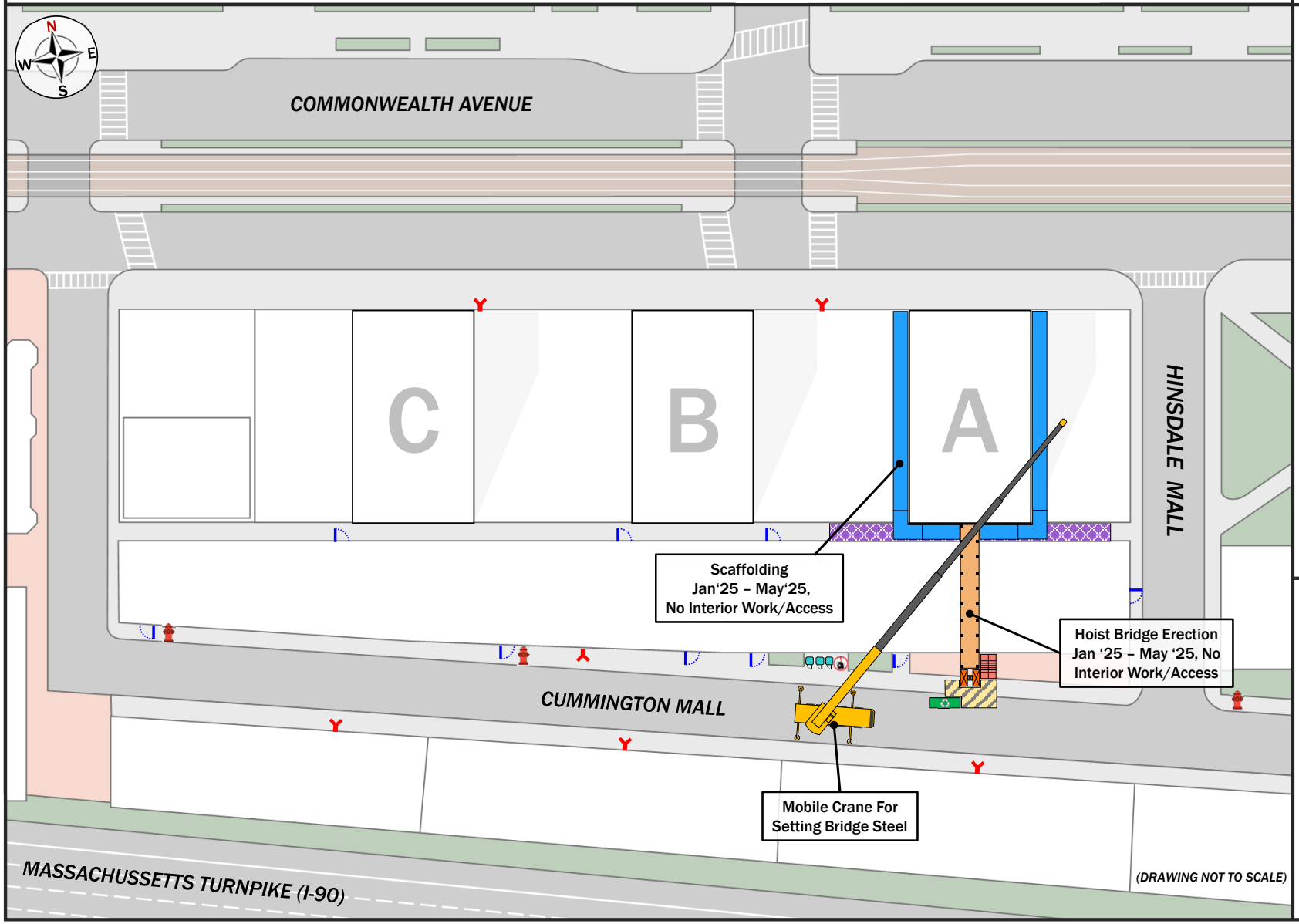
Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE — Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 1 – Hoist/Bridge/Staging Set-Up Spring 25'



BOSTON UNIVERSITY | SHAWMUT

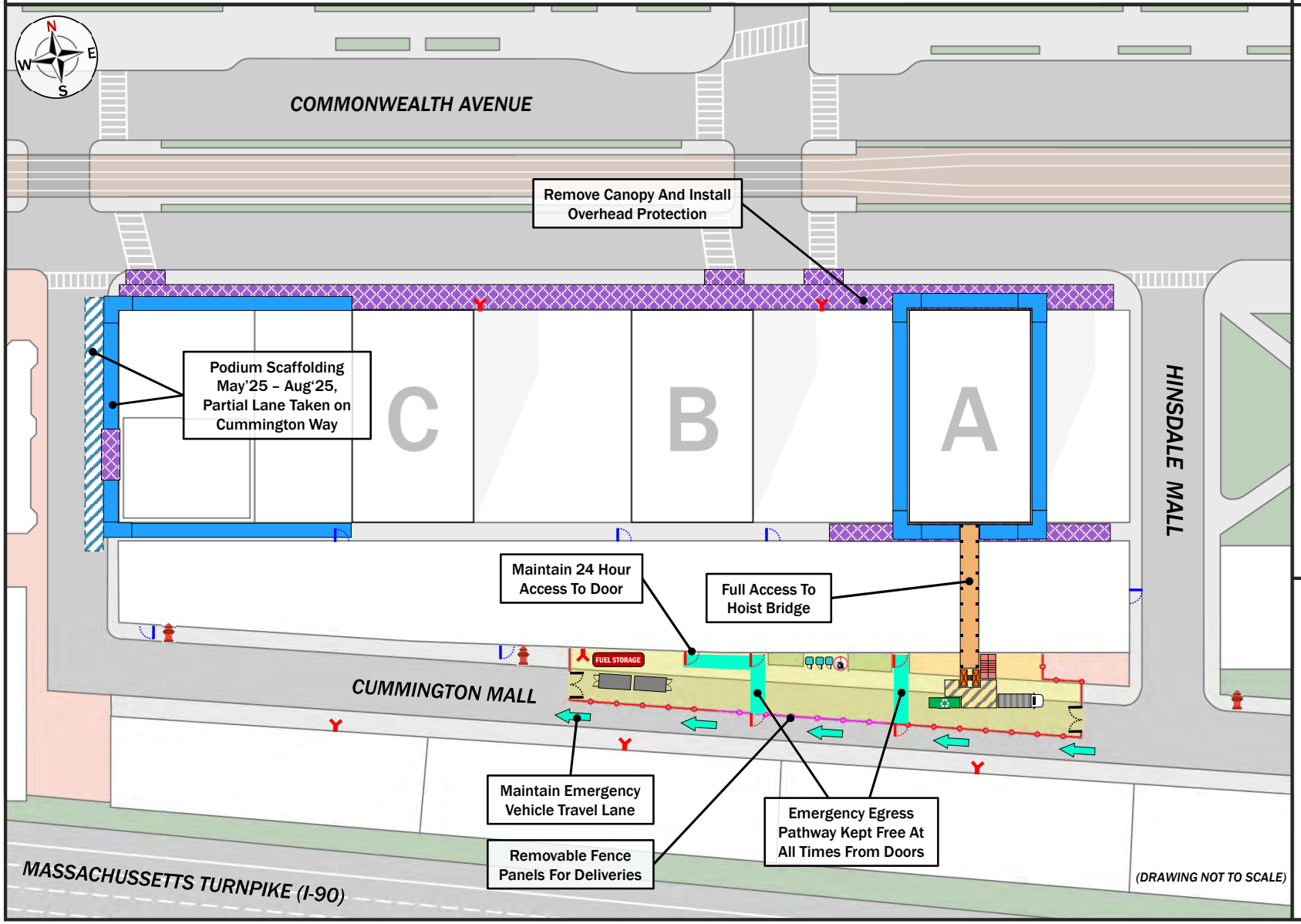
Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- Fuel Storage Area (FUEL STORAGE)

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 1 – Tower A May ‘25 Thru August ‘26



BOSTON UNIVERSITY

SHAWMUT

Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 1 – Winter Break (Dec'25 – Jan'26) Tower B

BOSTON UNIVERSITY | SHAWMUT

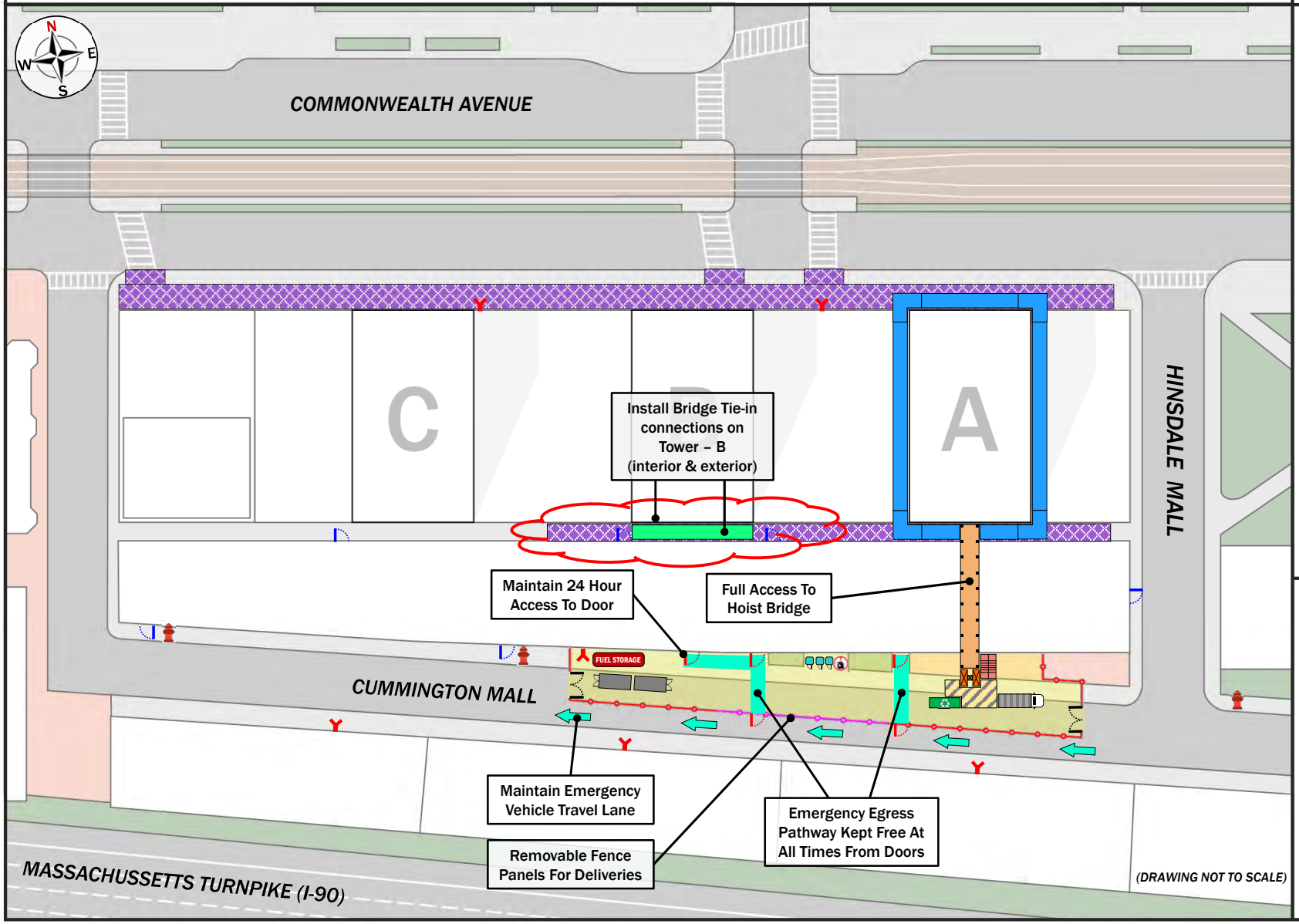


Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 1 – Tower B Spring 2026

BOSTON UNIVERSITY | SHAWMUT

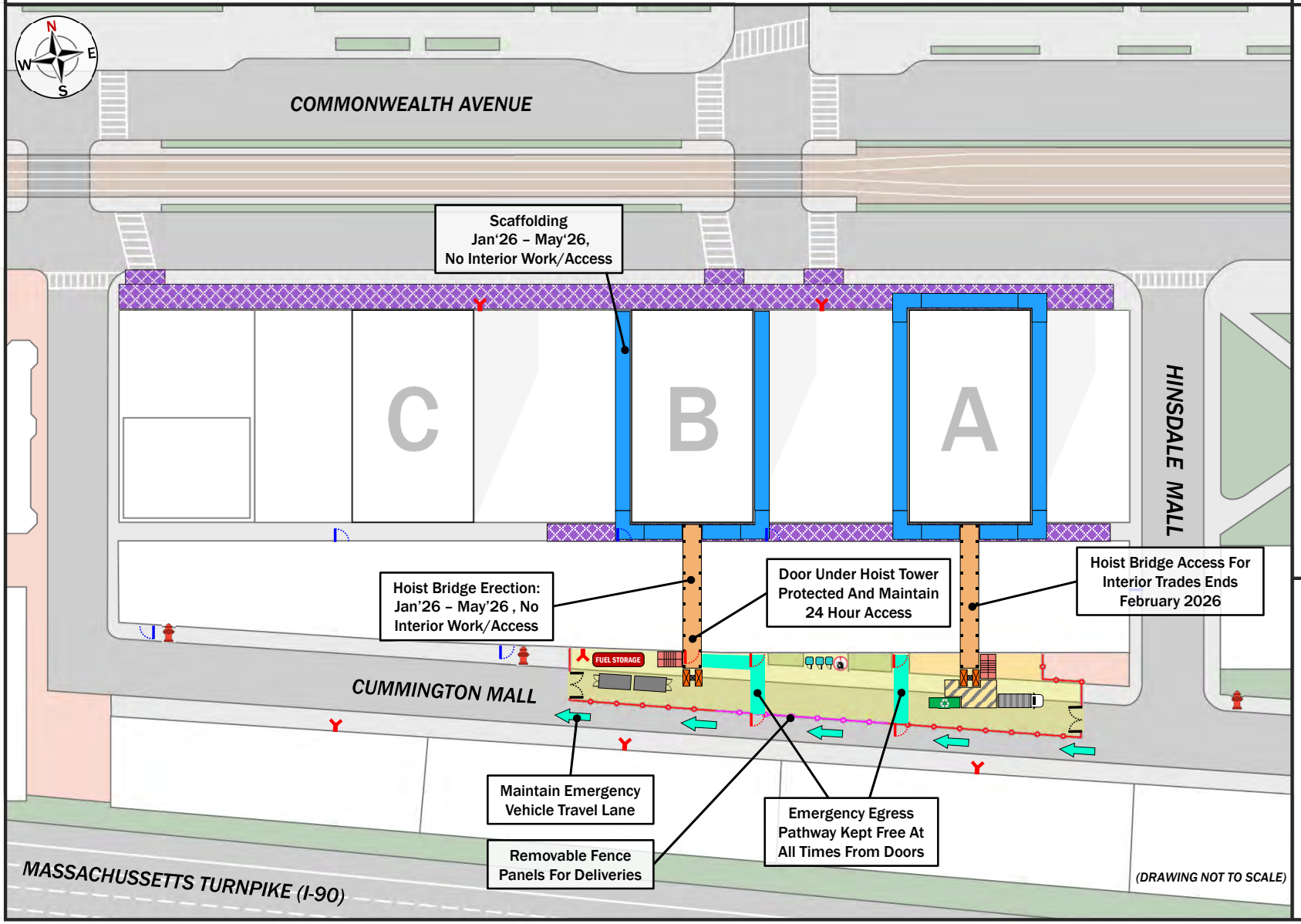


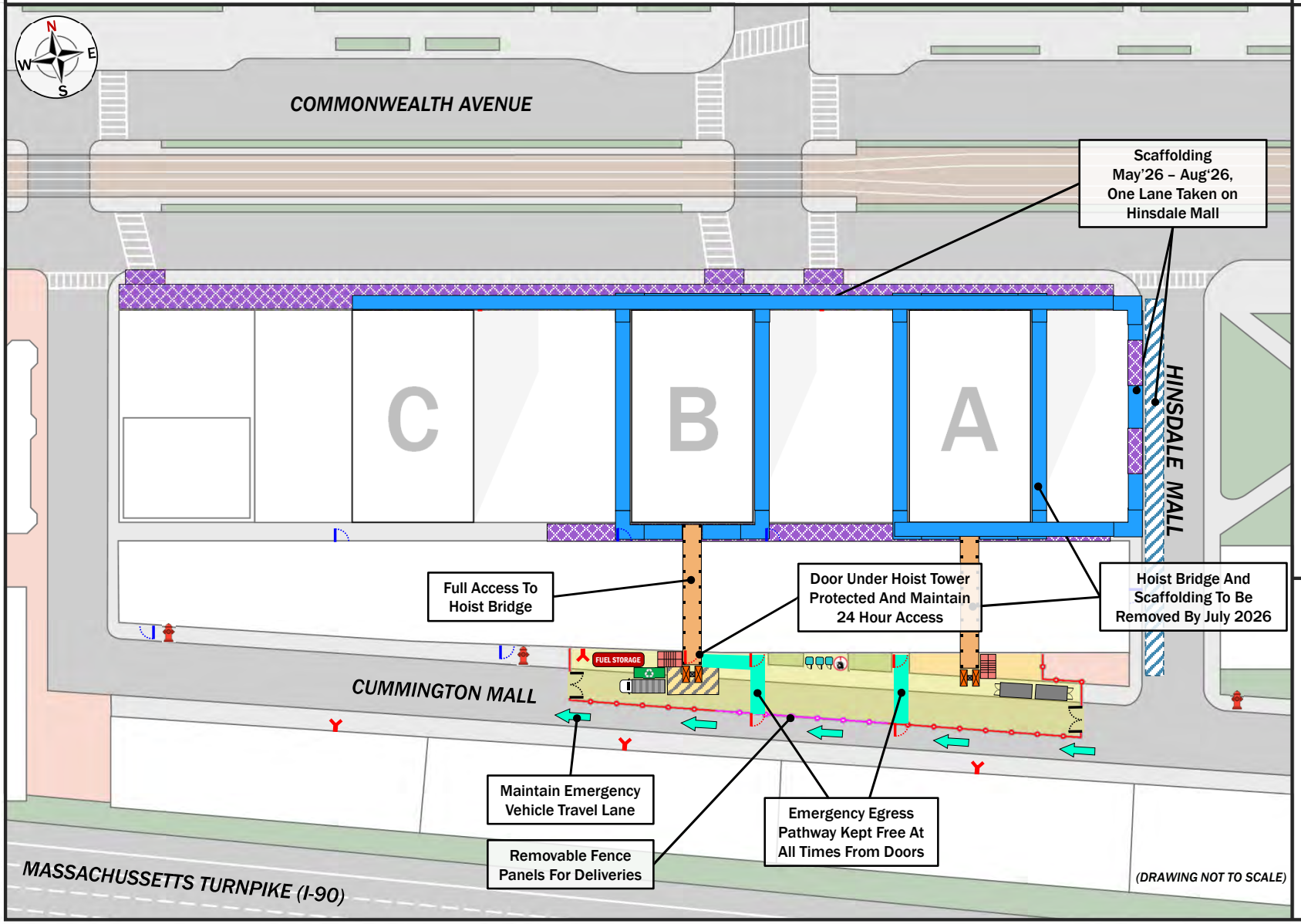
Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 2 – Tower A/B May ‘26 Thru July ‘26



BOSTON UNIVERSITY

SHAWMUT

Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 2 – Tower B May 2026 thru August 2027

BOSTON UNIVERSITY | SHAWMUT

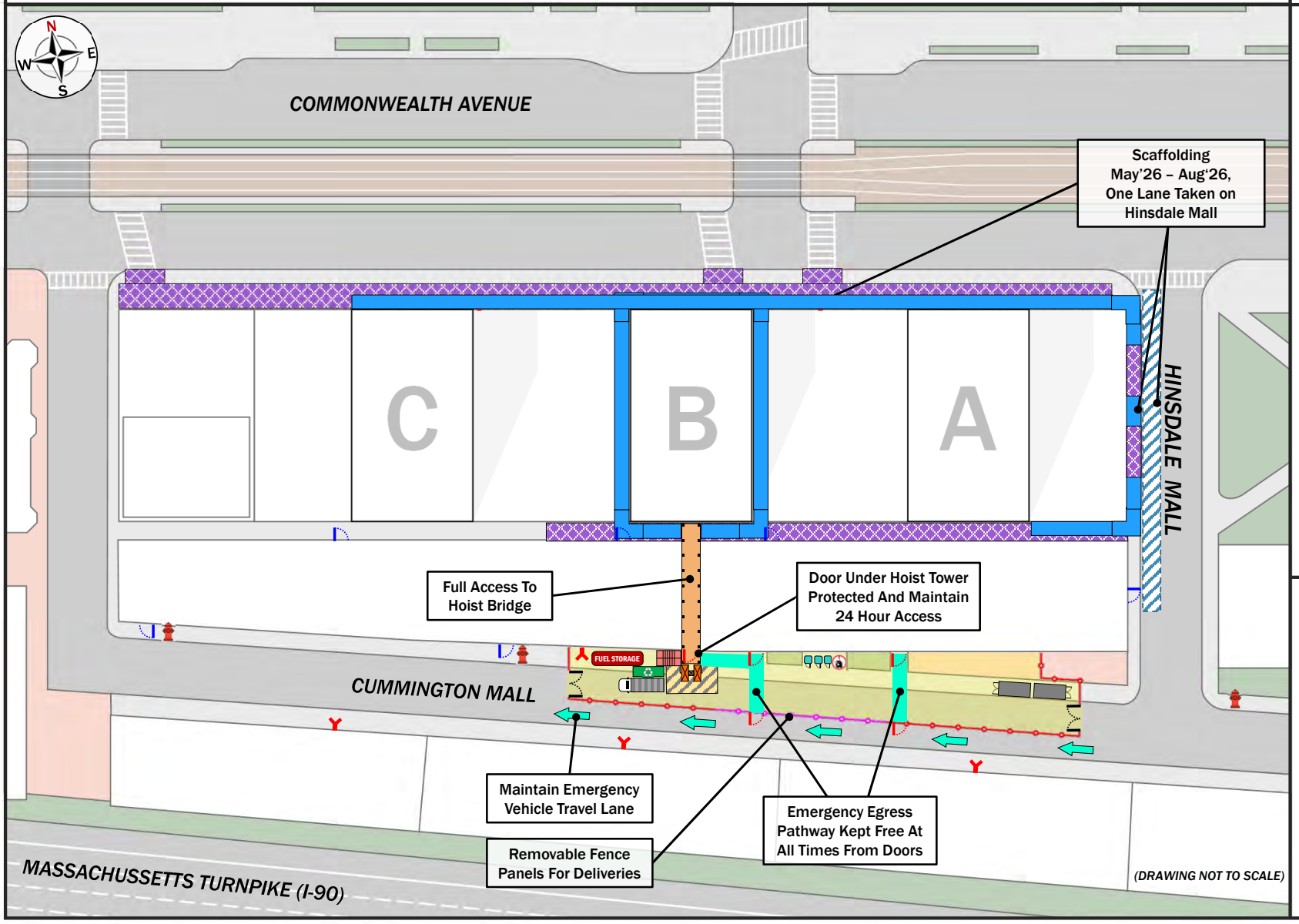


Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE — Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 2 Winter Break (Dec'26 – Jan '27) Tower C

BOSTON UNIVERSITY | SHAWMUT

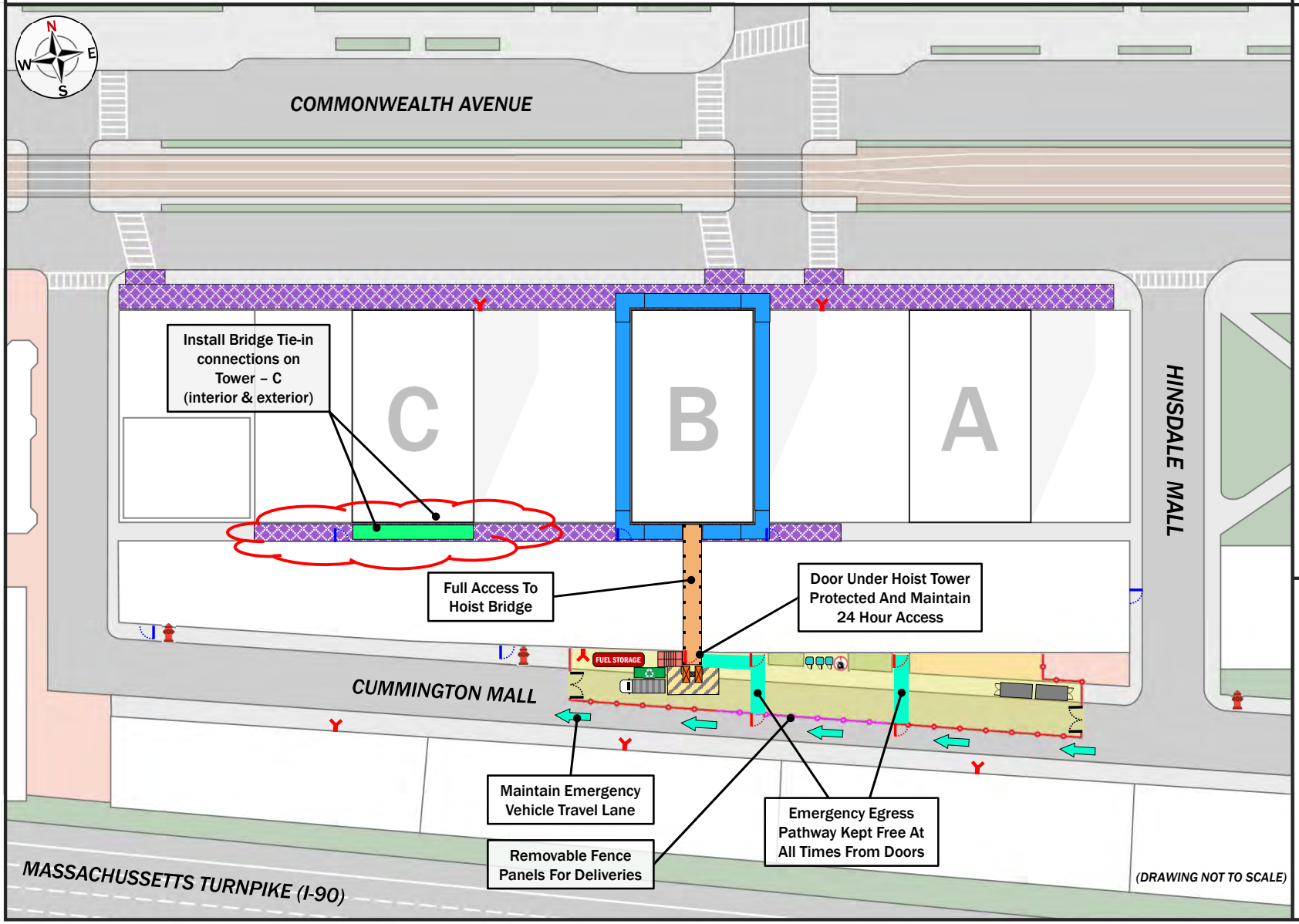


Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 2 – Tower C Spring 2027

BOSTON UNIVERSITY | SHAWMUT

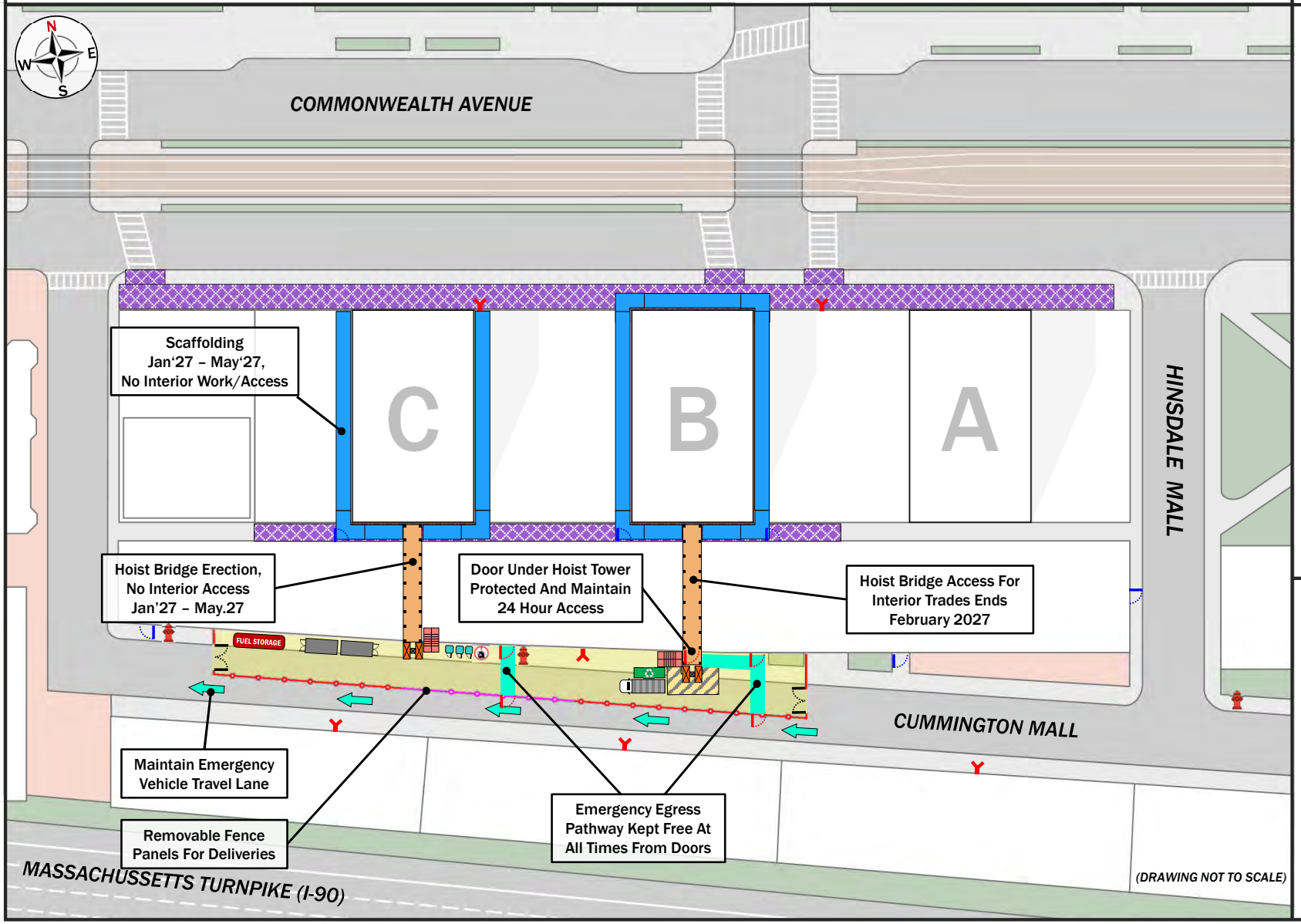


Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE — Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 3 – Tower B/C May ‘27 - July ‘27

BOSTON UNIVERSITY | SHAWMUT

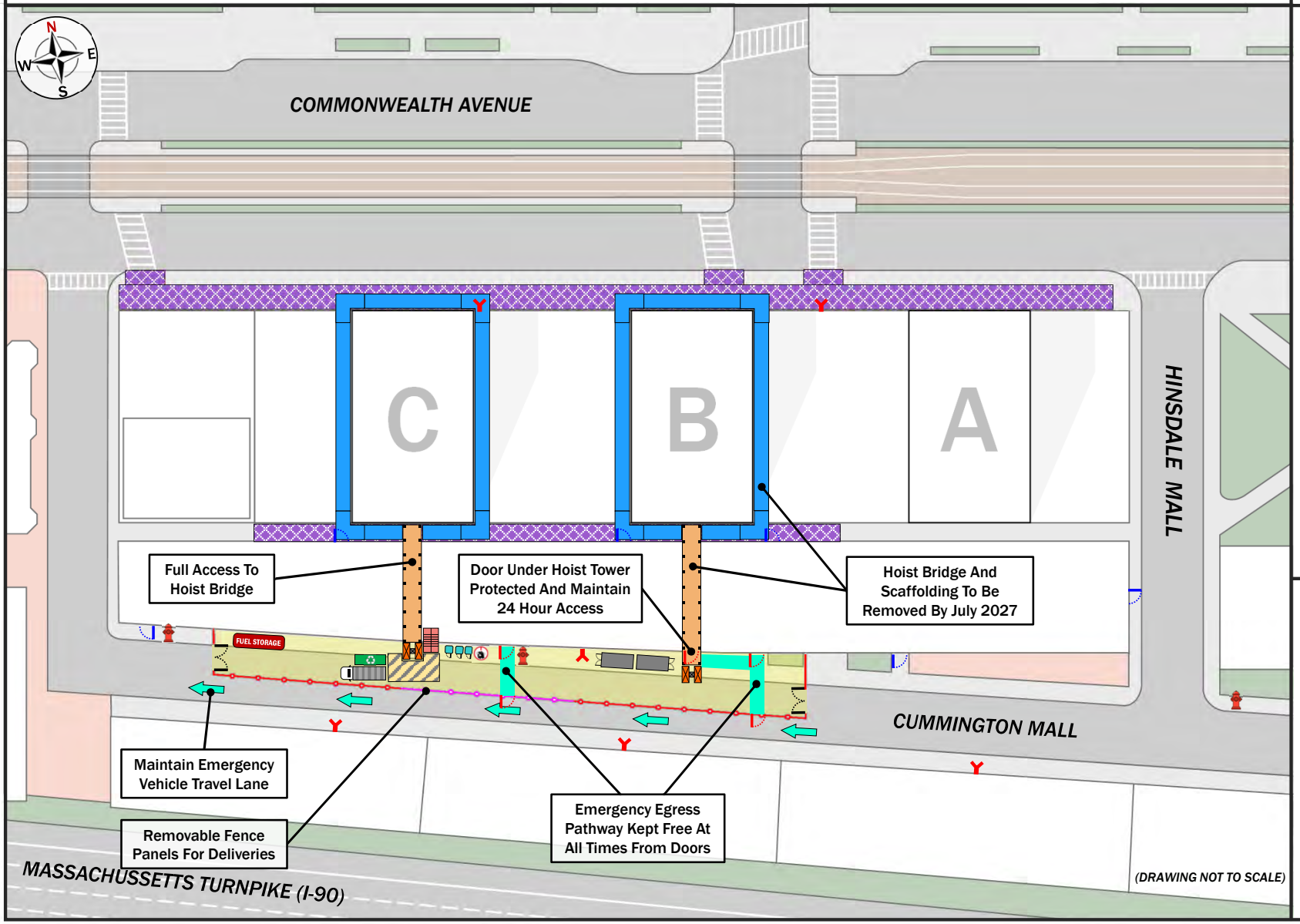


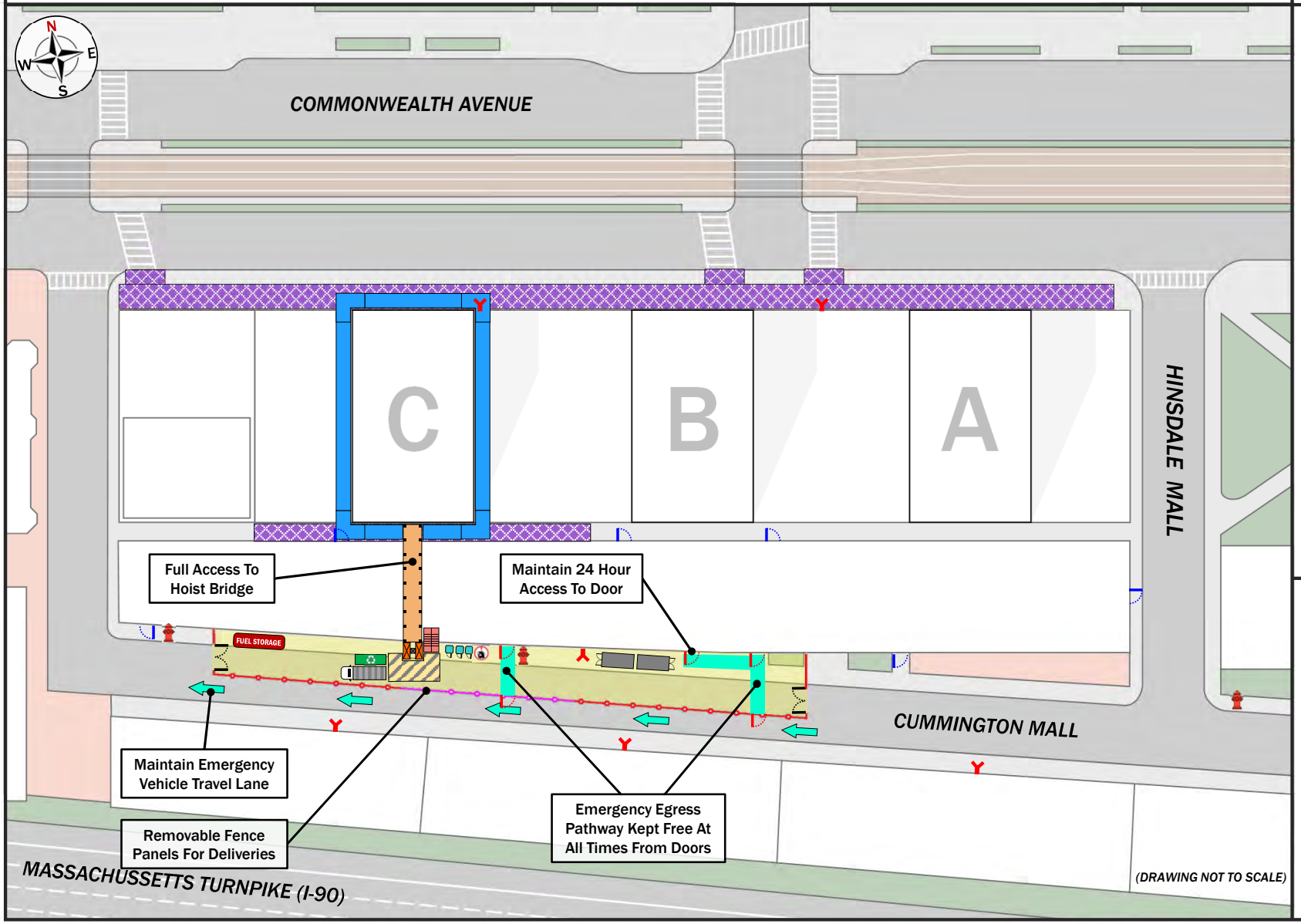
Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE — Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 3 – Tower C May'27 Thru August '28



BOSTON UNIVERSITY | SHAWMUT

Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE — Fuel Storage Area

Shawmut Site Signage:

BU – WARREN TOWERS RENOVATION PROJECT

Logistics Plan: PHASE 3 – August 2028

BOSTON UNIVERSITY | SHAWMUT

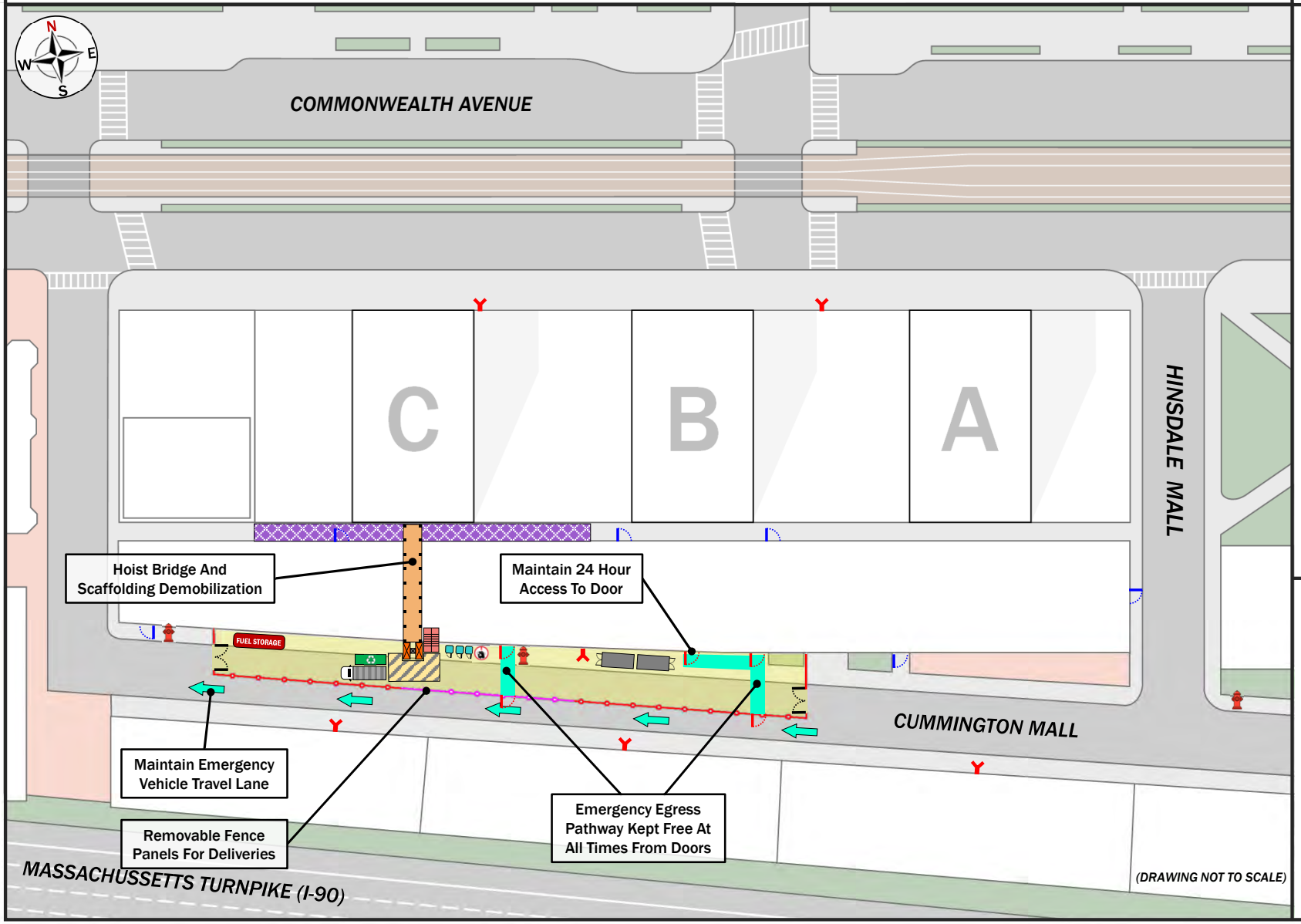


Diagram Key:

- Site Fence w/Scrim
- Swing Gate Access
- FDC Connections
- Existing Access Door
- Hand Wash Station
- Worker Toilets
- Dumpster / Recycling
- Trade Storage Boxes
- Stair Tower
- Loading Dock
- Dual Hoist
- Hoist Bridge Tower
- Overhead Protection
- Scaffolding Staging
- Swing Staging
- FUEL STORAGE — Fuel Storage Area

Shawmut Site Signage:

Attachment 8

HISTORIC RESOURCES IN THE APE

ATTACHMENT 8: Historic Inventory in the APE

Location	Historic Name	Impact of Project on Resource
Districts		
Brookline	Beacon Street Historic District	N/A
Brookline	Commonwealth Avenue Area	N/A
Brookline	Cottage Farm Historic District	N/A
Brookline	Cottage Farm Local Historic District	N/A
Boston	Charles River Basin Historic District	N/A
Boston	Bay State Road - Back Bay West Architectural	N/A
Boston	Audubon Circle	N/A
Boston	Charles River Esplanade	N/A
Boston	Keswick Street, 5-17 and Park Drive, 456-468	N/A
Cambridge	Charles River Basin Historic District	N/A
Resources		
132 Carlton St	Jenney, Bernard Jr. Garage	N/A
15 Euston St	Grishaver and Gerrish Apartment Building	N/A
45 Buswell St	Vinal, Warren Row House	N/A
101 Ivy St	Woodworth, Herbert G. House	N/A
225 Bay State Rd	Lindsey, William House	N/A
264-270 Bay State Rd	Bay State Terrace Apartments	N/A
21 Buswell St		N/A
1004-1010 Beacon St	Kaplan, A. Building	N/A
111 Bay State Rd	M. I. T. Student House	N/A
677 Beacon St	Shell Eastern Petroleum Products Office Building	N/A
143 Bay State Rd		N/A
605 Commonwealth Ave	Lahey Clinic	N/A
10 Lenox St	Curtis, Carrie S. - Mills, Edward House	N/A
25 Euston St	Grishaver and Gerrish Apartment Building	N/A
745 Commonwealth Ave	Boston University - School of Theology	N/A
854 Beacon St		N/A
7 Miner St	Hutchinson, Catherine E. Town House	N/A
1002 Beacon St	Russell, Arthur Building	N/A
621 Commonwealth Ave	Hurlburt Row House - Commonwealth Avenue Hospital	N/A
7 Buswell St	Vinal, W. D. Apartment Building	N/A
17 Buswell St		N/A
15 Buswell St		N/A
122 Carlton St	Hight, Clarence A. House	N/A
765 Commonwealth Ave	Boston University School of Law	N/A
858 Beacon St		N/A

14 Buswell St	Ambassador, The Apartments	N/A
41 Buswell St	Vinal, Warren Row House	N/A
6 Keswick St	Wentworth, Marshall Row House	N/A
877 Beacon St	Coon, Howard Town House	N/A
108 Ivy St	Lawrence, Amos A. House	N/A
806-820 Beacon St	Wedgemere Chambers Apartments	N/A
840-842 Beacon St		N/A
499-503 Park Dr	Strathcona Terrace Apartment House	N/A
874-880 Beacon St	Second Church in Boston	N/A
50-52 Buswell St	Ivy Court	N/A
916 Beacon St	Shapleigh, J. W. - Wheatland, G. W. Jr. Row House	N/A
46 Mountfort St	Mountfort Chambers	N/A
868 Beacon St		N/A
830 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
617 Commonwealth Ave	Covel Row House - Commonwealth Avenue Hospital	N/A
844 Beacon St	Arundel, The Apartments	N/A
906 Beacon St	Shapleigh, S. M. Row House	N/A
11 Buswell St	Vinal, W. D. Rowhouse	N/A
1018 Beacon St	Merrill, Luther Building	N/A
915 Beacon St	Merrill, Luci F. Row House	N/A
870 Beacon St	Vinal, W. D. Rowhouse	N/A
875 Beacon St	Coon, Howard - Morse, Jacob Row House	N/A
506 Park Dr		N/A
735 Commonwealth Ave	Boston University - Alpert, Warren Mall	N/A
468 Park Dr	Wentworth, Marshall Town House	N/A
602 Commonwealth Ave	Temple Adath Israel	N/A
635 Commonwealth Ave	Remington Rand Building	N/A
828 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
3 Buswell St	Vinal, W. D. Row House	N/A
34 Buswell St	Jasmine Chambers	N/A
16 Prescott St	Sturgis, Irving J. Garage	N/A
871 Beacon St	Arnold, A. F. Row House	N/A
862 Beacon St	Wheatland and Vinal Rowhouse	N/A
919 Beacon St	Gleason, Elizabeth J. Row House	N/A
2-24 Euston St	Grishaver - Gerrish Apartments	N/A
921 Beacon St	Lombard, Mary C. Row House	N/A
771 Commonwealth Ave	Boston University - Mugar Memorial Library	N/A
459-461 Park Dr		N/A
918 Beacon St	Shapleigh, J. W. - Wheatland, G. W. Jr. Row House	N/A
675 Commonwealth Ave	Boston University - Stone Science Building	N/A
24 Buswell St	Carminea Apartments	N/A
87 Ivy St	Von Arnim, Albertina House	N/A
908 Beacon St	Shapleigh, S. M. Rowhouse	N/A

90 Ivy St	Lawrence, Amos A. House	N/A
1 Buswell St	Longford Apartments, The	N/A
850 Beacon St	Vinal, W. D. Row House	N/A
500-504 Park Dr	Audubon Terrace Apartments	N/A
1012-1016 Beacon St	Brown and Mugar Building	N/A
832 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
110-112 Cummington St	Turner, Henry Stable and Blacksmith Shop	N/A
851 Beacon St	Feldman, Joseph Row House	N/A
755 Commonwealth Ave	Boston University - Student Activities Office	N/A
14 Aberdeen St	White, George Robert Two-Family House	N/A
736-738 Commonwealth Ave		N/A
12 Keswick St	Wentworth, Marshall Row House	N/A
132 Carlton St	Jenny, Bernard Jr. House	N/A
514-522 Park Dr	Audubon Court	N/A
80-81 Ivy St		N/A
100 Mountfort St	Auburndale Chambers	N/A
869 Beacon St	Arnold, A. F. Row House	N/A
2 Cummington St		N/A
7 Euston St	Snider, Ellis L. Apartment Building	N/A
33 Buswell St	Vinal, Warren Row House	N/A
145 Bay State Rd	Weld, Dr. Charles Goddard House	N/A
765 Commonwealth Ave	Boston University School of Law Courtyard	N/A
757 Commonwealth Ave	Boston University Power Plant	N/A
5 Buswell St		N/A
98 Mountfort St	Fairbanks Chambers	N/A
150 Mountfort St	Lee, Richard M. House	N/A
131 Carlton St	Dana, Francis B. House	N/A
29 Buswell St	Vinal, Warren Row House	N/A
903 Beacon St	Wentworth, Marshall Row House	N/A
625 Commonwealth Ave	Holden, Mary E. - Hallian, Anna C. Row House	N/A
899 Beacon St	Wentworth, Marshall Row House	N/A
822 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
211 Bay State Rd	Boston University - Newman House Catholic Center	N/A
121-125 Bay State Rd		N/A
37 Buswell St	Vinal, Warren Row House	N/A
48 Buswell St	Holly Court	N/A
456 Park Dr	Wentworth, Marshall Town House	N/A
465 Park Dr	Lucerne Apartment Building	N/A
Buswell St	Vinal, Warren Row House	N/A
722-726 Commonwealth Ave	Pretoria, The	N/A
704 Commonwealth Ave	Alden Hall Apartments	N/A

775 Commonwealth Ave	Boston University - Sherman, George Student Union	N/A
33 Euston St	Clements, Hazen House	N/A
464 Park Dr	Wentworth, Marshall Town House	N/A
6 Buswell St	Harris, Joseph Apartment Building	N/A
509 Park Dr	Plymouth, The Apartments	N/A
96 Mountfort St	Mayfield Chambers	N/A
907 Beacon St	Wentworth, Marshall Row House	N/A
917 Beacon St	Bing, Constant O. Row House	N/A
718 Commonwealth Ave	Commonwealth Hall - Capron Apartments	N/A
515 Park Dr	Royal, The Apartments	N/A
9 Buswell St		N/A
630-640 Commonwealth Ave	Boston University - Communication Park	N/A
50 Saint Mary's St	McKinley, William Public Middle School	N/A
37-41 Saint Mary's St	Dowling, Frank Apartment Building	N/A
40 Buswell St	Tower Court	N/A
79-83 Ivy St	Davidson, W. A. House	N/A
235 Bay State Rd	Boston University - The Beach	N/A
100-102 Saint Mary's St	Davidson, William A. Apartment Building	N/A
855 Beacon St	Feldman, Joseph Row House	N/A
462 Park Dr	Wentworth, Marshall Town House	N/A
685 Commonwealth Ave	Boston University - Hayden Memorial Building	N/A
714 Commonwealth Ave	Braman, Grenville T. W. Row House	N/A
735 Commonwealth Ave	Boston University - Marsh Chapel	N/A
30-38 Cummington St	Nash New England Auto Company Building	N/A
826 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
141 Carlton St	Parker, Philip S. House	N/A
849 Beacon St	Coon, Howard Row House	N/A
12 Aberdeen St	White, George Robert Two-Family House	N/A
896 Beacon St	Dewey, Judge Henry S. Apartment House	N/A
96 Ivy St	Lawrence, Amos A. House	N/A
860 Beacon St	Wheatland and Vinal Rowhouse	N/A
766 Commonwealth Ave	Colonial Beacon Oil Company Gas Station	N/A
852 Beacon St	Vinal, W. D. Row House	N/A
640 Commonwealth Ave	Nash New England Auto Company Showroom and Garage	N/A
857 Beacon St	Inverness Apartments	N/A
21-29 Saint Mary's Ct	Kirby, Charles Carriage Houses	N/A
864 Beacon St	Wheatland and Vinal Rowhouse	N/A
847 Beacon St	Coon, Howard Row House	N/A
1A Buswell St	Melbourne Apartments, The	N/A
7 Keswick St	Wentworth, Marshall Town House	N/A
873 Beacon St	Arnold, A. F. Row House	N/A

750-754 Commonwealth Ave	Cottage Farm Motor Sales Company	N/A
565 Commonwealth Ave	General Tire and Rubber Company Building	N/A
845 Beacon St	Coon, Howard Row House	N/A
226 Bay State Rd	Rudnick, Morris Apartment Building	N/A
25 Aberdeen St	Lewis, Mark Row House	N/A
867 Beacon St	Arnold, A. F. Row House	N/A
693 Beacon St	Edison Electric Illuminating Transformer Station	N/A
872 Beacon St	Vinal, W. D. Rowhouse	N/A
834 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
905 Beacon St	Wentworth, Marshall Row House	N/A
10 Aberdeen St	White, George Robert Two-Family House	N/A
96 Ivy St	Rockwood Carriage Barn	N/A
466 Park Dr	Wentworth, Marshall Town House	N/A
730 Commonwealth Ave	Fay, C. E. Auto Sales Company	N/A
111 Ivy St	Baker, C. M. House	N/A
155 Bay State Rd		N/A
5 Euston St	Snider, Ellis L. Apartment Building	N/A
111 Cummington St	Back Bay Realty Association Garage	N/A
44 Buswell St	Laurel Chambers	N/A
64-86 Cummington St	Hathaway, C. C. - Dodge, Charles A. Building	N/A
838 Beacon St	Audubon Restaurant	N/A
2 Buswell St	Nathan Apartments, The	N/A
27 Buswell St		N/A
627 Commonwealth Ave	Cummings, E. Louise - Wolf, Alice L. Row House	N/A
48-60 Cummington St	Flaherty, William H. Auto Repair	N/A
629 Commonwealth Ave	Chadwick, N. Henry Row House	N/A
866 Beacon St	Wheatland and Vinal Rowhouse	N/A
710 Commonwealth Ave	Braman, Grenville T. W. Row House	N/A
38 Buswell St	Cypress Chambers	N/A
21 Euston St	Grishaver and Gerrish Apartment Building	N/A
909 Beacon St	Wentworth, Marshall Row House	N/A
767 Commonwealth Ave	Boston University Law Library	N/A
43 Buswell St	Vinal, Warren Row House	N/A
519 Park Dr	Amsterdam, The Apartments	N/A
8 Aberdeen St	White, George Robert Two-Family House	N/A
31 Buswell St	Vinal, Warren Row House	N/A
236 Bay State Rd	Ashby Apartments	N/A
512 Park Dr		N/A
138 Mountfort St	Lawrence, Amos A. - Bates House	N/A
728 Commonwealth Ave	Belview Apartments	N/A
824 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
708 Commonwealth Ave	Neal, James P. Row House	N/A

Beacon St	Rapid Transit Illuminated Time Sign	N/A
463 Park Dr	Rudnik, Samuel Apartment Building	N/A
3 Euston St	Snider, Ellis L. Apartment Building	N/A
232 Bay State Rd	Bay State Hall Aparments	N/A
619 Commonwealth Ave	Shapleigh Row House - Commonwealth Avenue Hospital	N/A
22 Buswell St	Clemetis Apartments	N/A
924 Beacon St	Shapleigh, J. W. - Wheatland, G. W. Jr. Row House	N/A
590 Commonwealth Ave	Commonwealth Avenue Plaza	N/A
36 Euston St	Pitman House	N/A
458 Park Dr	Wentworth, Marshall Town House	N/A
5 Keswick St	Wentworth, Marshall Town House	N/A
836 Beacon St	Vinal, W. D. - Wheatland, George Jr. Row House	N/A
856 Beacon St	Wheatland and Vinal Rowhouse	N/A
13 Buswell St		N/A
496 Park Dr	Park Drive Apartment House	N/A
10 Keswick St	Wentworth, Marshall Row House	N/A
914 Beacon St	Shapleigh, J. W. - Wheatland, G. W. Jr. Row House	N/A
853 Beacon St	Feldman, Joseph Row House	N/A
111 Carlton St	Walker, Dr. Harold House	N/A
15 Saint Mary's St	Merry, Harold S. Garage	N/A
27 Aberdeen St	Lewis, Mark Row House	N/A
922 Beacon St	Shapleigh, J. W. - Wheatland, G. W. Jr. Row House	N/A
47 Buswell St	Vinal, Warren Row House	N/A
19 Euston St	Grishaver and Gerrish Apartment Building	N/A
460 Park Dr	Wentworth, Marshall Town House	N/A
96-100 Cummington St	Hayes, William Allen Automobile Garage	N/A
42 Buswell St	Myrtle Court	N/A
900 Beacon St	National Shawmut Bank Branch	N/A
920 Beacon St	Shapleigh, J. W. - Wheatland, G. W. Jr. Row House	N/A
93 Ivy St	Greenough, Dr. Robert B. House	N/A
455-457 Park Dr		N/A
771 Commonwealth Ave	Boston University - Mugar Library Courtyard	N/A
8 Keswick St	Wentworth, Marshall Row House	N/A
39 Buswell St	Vinal, Warren Row House	N/A
901 Beacon St	Wentworth, Marshall Row House	N/A
147 Bay State Rd	Weld, Dr. Charles Goddard House	N/A
90 Saint Mary's St	Lawrence, The Apartments	N/A
33 Buswell St	Vinal, Warren Row House	N/A
121 Carlton St	Pitman, Benjamin F. House	N/A
848 Beacon St	Vinal, W. D. Row House	N/A
43-47 Saint Mary's St	Dowling, Frank Apartment Building	N/A
923 Beacon St	Clapp, Susan P. S. Row House	N/A

11 Euston St	Grishaver and Gerrish Apartment Building	N/A
735 Commonwealth Ave	Boston University - Marsh, Daniel Plaza	N/A

Attachment 9

BROADBAND READY BUILDING QUESTIONNAIRE

From: Google Forms
To: Richards, Sonia
Subject: ARTICLE 80 DESIGN REVIEW BROADBAND READY BUILDINGS QUESTIONNAIRE
Date: Wednesday, January 3, 2024 11:41:56 AM

Thanks for filling out ARTICLE 80 DESIGN REVIEW BROADBAND READY BUILDINGS QUESTIONNAIRE

Here's what was received.

Edit response

ARTICLE 80 DESIGN REVIEW BROADBAND READY BUILDINGS QUESTIONNAIRE

The City of Boston is working to cultivate a broadband ecosystem that serves the current and future connectivity needs of residents, businesses, and institutions. The real estate development process offers a unique opportunity to create a building stock in Boston that enables this vision. In partnership with the development community, the Boston Planning and Development Authority and the City of Boston will begin to leverage this opportunity by adding a broadband readiness component to the Article 80 Design Review. This component will take the form of a set of questions to be completed as part of the Project Notification Form. Thoughtful integration of future-looking broadband practices into this process will contribute to progress towards the following goals:

1. Enable an environment of competition and choice that results in all residents and businesses having a choice of 2 or more wireline or fixed wireless high-speed Internet providers

2. Create a built environment that is responsive to new and emerging connectivity technologies

3. Minimize disruption to the public right of way during and after construction of the building

The information that is shared through the Broadband Ready Buildings Questionnaire will help BPDA and the City understand how developers currently integrate telecommunications planning in their work and how this integration can be most responsive to a changing technological landscape.

Upon submission of this online form, a PDF of the responses provided will be sent to the email address of the individual entered as Project Contact. Please include the PDF in the Project Notification Form packet submitted to BPDA.

If necessary, you may edit form responses prior to final submission. A link to edit the form will be generated upon submission.

Learn more about the Broadband Ready Buildings Questionnaire at the link below: http://www.bostonplans.org/projects/development-review/article-80-design-review-broadband-ready-buildings

Email *

soniar@bu.edu

SECTION 1: GENERAL INFORMATION ABOUT PROJECT

Project name

Boston University Warren Towers Renovation

Owner / Developer

Trustees of Boston University

Address of project

700 Commonwealth Avenue

Address cont.

Contact person for this project

Sonia Richards

Contact person title

Associate Vice President for Planning, Design and Construction

Contact person email

soniar@bu.edu

Contact person phone

(617) 353-4313

Expected completion date

MM DD YYYY

08 / 01 / 2027

Architect

MDS Architects

Engineer (building systems):

RW Sullivan

Permitting:

Fort Point Associates, Inc.

Construction Management

Shawmut Design and Construction

SECTION 2: RIGHT OF WAY TO BUILDING

This section focuses on the following:
- Point of entry planning

Point of Entry Planning

Point of entry planning has important implications for the ease with which your building's telecommunications services can be installed, maintained, and expanded over time.

Please provide the following information for your building's point of entry planning (conduits from building to street for telecommunications). Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

Number of Points of Entry

Single point of entry (existing)

Locations of Points of Entry

Point of entry is at the lower level of the garage, southwest area, up to the third floor MDF

Quantity and size of conduits

4 at 4" (being confirmed, existing to be utilized)

Location where conduits connect (e.g. building-owned manhole, carrier-specific manhole or stubbed at property line)

Boston University (BU) Campus from Cummington Mall

Other information/comments

N/A

Do you plan to conduct a utility site assessment to identify where cabling is located within the street? This information can be helpful in determining the locations of POEs and telco rooms. Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

- ○ Yes
- ◉ No
- ○ Unknown

SECTION 3: INSIDE OF THE BUILDING

This section focuses on the following:
- Riser planning
- Telecom room planning
- Delivery of service within building

Riser Planning

Riser capacity can enable multiple telecom providers to serve tenants in your building.

Please provide the following information about the riser plans throughout the building. Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

Number of risers

Single riser location

Distance between risers (if more than one)

N/A

Dimensions of riser closets

8'-0" x 2'-11" (typical for each tower)

Riser or conduit will reach to top floor

- (●) Yes
- ( ) No
- ( ) Unknown

Number and size of conduits or sleeves within each riser

4 at 4" (still being evaluated)

Proximity to other utilities (e.g. electrical, heating)

Closets are dedicated to low voltage on every floor for maximum flexibility

Other information/comments

N/A

Telecom Room

A well designed telecom room with appropriate security and resiliency measures can be an enabler of tenant choice and reduce the risk of service disruption and costly damage to telecom equipment.

Please provide the following information about the telecom room plans. Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

What is the size of the telecom room?

Existing (20'-0" x 19'-0")

Describe the electrical capacity of the telecom room (i.e. # and size of electrical circuits)

Each closet will have one house circuit and one UPS circuit

Will the telecom room be located in an area of the building containing one or more load bearing walls?

- ○ Yes
- ◉ No
- ○ Unknown

Will the telecom room be climate controlled?

- ◉ Yes
- ○ No
- ○ Unknown

If the building is within a flood-prone geographic area, will the telecom equipment will be located above the floodplain?

- ◉ Yes
- ○ No
- ○ Unknown

Will the telecom room be located on a floor where water or other liquid storage is present?

- ○ Yes
- ○ No
- ○ Unknown

Will the telecom room contain a flood drain?

- (●) Yes
- ( ) No
- ( ) Unknown

Will the telecom room be single use (telecom only) or shared with other utilities?

- ( ) Yes
- (●) No
- ( ) Unknown

Other information/comments

There are no sources of water programmed above the telecom rooms. The telecom rooms will include low voltage security panels.

Delivery of Service Within Building (Residential Only)

Please enter 'unknown' if these decisions have not yet been made or you are presently unsure. Questions 5 through 8 are for residential development only.

Will building/developer supply common inside wiring to all floors of the building?

- (●) Yes
- ( ) No
- ( ) Unknown

If yes, what transmission medium (e.g. coax, fiber)? Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

Fiber and copper (CAT-6A)

Is the building/developer providing wiring within each unit?

- (●) Yes
- ( ) No
- ( ) Unknown

If yes, what transmission medium (e.g. coax, fiber)? Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

Copper (CAT-6A)

SECTION 4: ACCOMMODATION OF NEW AND EMERGING TECHNOLOGIES

This section focuses on the following:
- Cellular reception
- Rooftop access

Cellular Reception

The quality of cellular reception in your building can have major impacts on quality of life and business operations.

Please provide the following information on your plans to facilitate high quality cellular coverage in your building. Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

Will the building conduct any RF benchmark testing to assess cellular coverage?

- (●) Yes
- ( ) No
- ( ) Unknown

Will the building allocate any floor space for future in-building wireless solutions (DAS/small cell/booster equipment)?

- ( ) Yes
- ( ) No
- (●) Unknown

Will the building be providing an in-building solution (DAS/ Small cell/ booster)?

- ( ) Yes
- ( ) No
- (●) Unknown

If so, are you partnering with a carrier, neutral host provider, or self-installing?

- (●) Carrier
- ( ) Neutral host provider
- ( ) Self-installing

Rooftop Access

Building rooftops are frequently used by telecommunications providers to install equipment critical to the provision of service to tenants.

Please provide the following information regarding your plans for roof access and usage. Please enter 'unknown' if these decisions have not yet been made or you are presently unsure.

Will you allow cellular providers to place equipment on the roof?

- (●) Yes
- ( ) No
- ( ) Unknown

Will you allow broadband providers (fixed wireless) to install equipment on the roof?

- (●) Yes
- ( ) No
- ( ) Unknown

Will you allow broadband providers (fixed wireless) to install equipment on the roof?

- (●) Yes
- ( ) No
- ( ) Unknown

SECTION 5: Supporting Competition and Choice

Having a choice of broadband providers is a value add for property owners looking to attract tenants and for tenants in Boston seeking fast, affordable, and reliable broadband service. In addition to enabling tenant choice in your building, early outreach to telecom providers can also reduce cost and disruption to

the public right of way. The following questions focus on steps that property owners can take to ensure that multiple wireline or fixed wireless broadband providers can access your building and provide service to your tenants.

Do you plan to abstain from exclusivity agreements with broadband and cable providers?

- (●) Yes
- ( ) No
- ( ) Unknown

Do you plan to make public to tenants and prospective tenants the list of broadband/cable providers who serve the building?

- ( ) Yes
- (●) No
- ( ) Unknown

Broadband Provider Outreach Status

Please provide the date upon which each of the below providers were successfully contacted, whether or not they will serve the building, what transmission medium they will use (e.g. coax, fiber) and the reason they provided if the answer was 'no'.

Comcast

Please provide the date upon which Comcast was successfully contacted, whether or not they will serve the building, what transmission medium they will use (e.g. coax, fiber) and the reason they provided if the answer was 'no'.

Date contacted

MM / DD / YYYY

__ __ ____

Does Comcast intend to serve the building?

- ◯ Yes
- ◯ No
- ◯ Unknown

Transmission Medium

- ◯ Coax
- ◯ Fiber
- ◯ Unknown

If no or unknown, why?

Existing services to remain

netBlazr

Please provide the date upon which netBlazr was successfully contacted, whether or not they will serve the building, what transmission medium they will use (e.g. coax, fiber) and the reason they provided if the answer was ‘no’.

Date contacted

MM / DD / YYYY

__ __ ____

Does netBlazr intend to serve the building?

- ◯ Yes
- ◯ No
- ◯ Unknown

Transmission Medium

- ◯ Coax
- ◯ Fiber
- ◯ Unknown

If no or unknown, why?

Existing services to remain

RCN

Please provide the date upon which RCN was successfully contacted, whether or not they will serve the building, what transmission medium they will use (e.g. coax, fiber) and the reason they provided if the answer was 'no'.

Date contacted

MM / DD / YYYY

__ __ ____

Does RCN intend to serve the building?

- ◯ Yes
- ◯ No
- ◯ Unknown

Transmission Medium

- ◯ Coax
- ◯ Fiber
- ◯ Unknown

If no or unknown, why?

Existing services to remain

Starry

Please provide the date upon which Starry was successfully contacted, whether or not they will serve the building, what transmission medium they will use (e.g. coax, fiber) and the reason they provided if the answer was ‘no’.

Date contacted

MM / DD / YYYY

__ __ ____

Does Starry intend to serve the building?

- ◯ Yes
- ◯ No

- ○ Unknown

Transmission Medium

- ○ Coax
- ○ Fiber
- ○ Unknown

If no or unknown, why?

Existing services to remain

Verizon

Please provide the date upon which Verizon was successfully contacted, whether or not they will serve the building, what transmission medium they will use (e.g. coax, fiber) and the reason they provided if the answer was 'no'.

Date contacted

MM / DD / YYYY

__ __ ____

Does Verizon intend to serve the building?

- ○ Yes
- ○ No
- ○ Unknown

Transmission Medium

- ◯ Coax
- ◯ Fiber
- ◯ Unknown

If no or unknown, why?

Existing services to remain

SECTION 6: FEEDBACK

The Boston Planning and Development Agency looks forward to supporting the developer community in enabling broadband choice for resident and businesses. Please provide feedback on your experience completing these questions.

Attachment 10

SMART UTILITIES CHECKLIST

Boston Smart Utilities Checklist

****This template is intended to help development teams organize their responses. Please use the information here to complete the online form when the checklist is ready for submission.****

Date Submitted:	
Submitted by:	

Background

The Smart Utilities Checklist will facilitate the Boston Smart Utilities Steering Committee's review of:

a) compliance with the Smart Utilities Policy for Article 80 Development Review, which calls for the integration of five (5) Smart Utility Technologies (SUTs) into Article 80 developments

b) integration of the Smart Utility Standards

More information about the Boston Smart Utilities Vision project, including the Smart Utilities Policy and Smart Utility Standards, is available at: www.http://bostonplans.org/smart-utilities

Note: Any documents submitted via email to manuel.esquivel@boston.gov will not be attached to the pdf form generated after submission, but are available upon request.

Part 1 - General Project Information

1.1 Project Name	Boston University Warren Towers
1.2 Project Address	700 Commonwealth Avenue
1.3 Building Size (square feet)	Renovated Project: 482,900 Total Existing: 625,800

Boston Smart Utilities Checklist

**For a multi-building development, enter total development size (square feet)*

1.4 Filing Stage	Expanded Project Notification Form

1.5 Filing Contact Information

1.5a Name	Sonia Richards
1.5b Company	Boston University
1.5c E-mail	soniar@bu.edu
1.5d Phone Number	617-252-4313

1.6 Project Team

1.6a Project Owner/Developer	Boston University
1.6b Architect	MDS Architects
1.6c Permitting	Fort Point Associates, Inc
1.6d Construction Management	Shawmut Design & Construction

Part 2 - District Energy Microgrids

Fill out this section if the proposed project's total development size is equal to or greater than 1.5 million square feet.

Note on submission requirements timeline:

Feasibility Assessment Part A should be submitted with PNF or any other initial filing.

Feasibility Assessment Part B should be submitted with any major filing during the Development Review stage (i.e., DPIR)

Boston Smart Utilities Checklist

District Energy Microgrid Master Plan Part A should be submitted before submission of the Draft Board Memorandum by the BPDA Project Manager (Note: Draft Board Memorandums are due one month ahead of the BPDA Board meetings)

District Energy Microgrid Master Plan Part B should be submitted before applying for a Building Permit

Please email submission to manuel.esquivel@boston.gov

2.1 Consultant Assessing/Designing District Energy Microgrid (if applicable)	N/A
2.2 Latest document submitted	N/A
2.3 Date of latest submission	N/A
2.4 Which of the following have you had engagement/review meetings with regarding District Energy Microgrids? (select all that apply)	N/A
2.5 What engagement meetings have you had with utilities and/or other agencies (i.e., MA DOER, MassCEC) regarding District Energy Microgrids? (Optional: include dates)	N/A
2.6 Additional Information	N/A

Part 3 - Telecommunications Utilidor

Boston Smart Utilities Checklist

Fill out this section if the proposed project's total development size is equal to or greater than 1.5 million square feet OR if the project will include the construction of roadways equal to or greater than 0.5 miles in length.

Please submit a map/diagram highlighting the sections of the roads on the development area where a Telecom Utilidor will be installed, including access points to the Telcom Utilidor (i.e., manholes)

Please email submission to manuel.esquivel@boston.gov

3.1 Consultant Assessing/Designing Telecom Utilidor (if applicable)	N/A
3.2 Date Telecom Utilidor Map/Diagram was submitted	N/A
3.3 Dimensions of Telecom Utilidor (include units)	
3.3a Cross-section (i.e., diameter, width X height)	N/A
3.3b Length	N/A
3.4 Capacity of Telecom Utilidor (i.e., number of interducts, 2 inch (ID) pipes, etc.)	N/A
3.5 Which of the following have you had engagement/review meetings with regarding the Telecom Utilidor? (select all that apply)	N/A

Boston Smart Utilities Checklist

3.6 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding the Telecom Utilidor? (Optional: include dates)	N/A
3.7 Additional Information	N/A

Part 4 - Green Infrastructure

Fill out this section if the proposed project's total development size is equal to or greater than 100,000 square feet.

Please submit a map/diagram highlighting where on the development Green Infrastructure will be installed.

Please email submission to manuel.esquivel@boston.gov

4.1 Consultant Assessing/Designing Green Infrastructure (if applicable)	Nitsch Engineering, Inc/Copley Wolff Design Group
4.2 Date Green Infrastructure Map/Diagram was submitted	N/A
4.3 Types of Green Infrastructure included in the project (select all that apply)	Infiltration Chambers Tree pits/Trenches Permeable Paving
4.4 Total impervious area of the development (in square inches)	9,043,200
4.5 Volume of stormwater that will be retained (in cubic inches)*	11,304,000

Boston Smart Utilities Checklist

**Note: Should equal to at least "Total impervious area (entered in section 4.4)" times "1.25 inches"*

4.6 Which of the following have you had engagement/review meetings with regarding Green Infrastructure? (select all that apply)	BPDA, BWSC, PWD, and PIC will be engaged as the design progresses.
4.7 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding Green Infrastructure? (Optional: include dates)	N/A
4.8 Additional Information	See Figure 6-4: Smart Utility Plan

Part 5 - Adaptive Signal Technology (AST)

Fill out this section if as part of your project BTD will require you to install new traffic signals or make significant improvements to the existing signal system.

Please submit a map/diagram highlighting the context of AST around the proposed development area, as well as any areas within the development where new traffic signals will be installed or where significant improvements to traffic signals will be made.

Please email submission to manuel.esquivel@boston.gov

5.1 Consultant Assessing/Designing Adaptive Signal Technology (if applicable)	N/A
5.2 Date AST Map/Diagram was submitted	N/A

Boston Smart Utilities Checklist

5.3 Describe how the AST system will benefit/impact the following transportation modes	
5.3a Pedestrians	N/A
5.3b Bicycles	N/A
5.3c Buses and other Public Transportation	N/A
5.3d Other Motorized Vehicles	N/A
5.4 Describe the components of the AST system (including system design and components)	N/A
5.5 Which of the following have you had engagement/review meetings with regarding AST? (select all that apply)	N/A
5.6 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding AST? (Optional: include dates)	N/A
5.7 Additional Information	N/A

Part 6 - Smart Street Lights

Fill out this section if as part of your project PWD and PIC will require you to install new street lights or make significant improvements to the existing street light system.

Please submit a map/diagram highlighting where new street lights will be installed or where improvements to street lights will be made.

Please email submission to manuel.esquivel@boston.gov

Boston Smart Utilities Checklist

6.1 Consultant Assessing/Designing Smart Street Lights (if applicable)	N/A
6.2 Date Smart Street Lights Map/Diagram was submitted	N/A
6.3 Which of the following have you had engagement/review meetings with regarding Smart Street Lights? (select all that apply)	N/A
6.4 What engagement meetings have you had with utilities and/or other agencies (i.e., State agencies) regarding Smart Street Lights? (Optional: include dates)	N/A
6.5 Additional Information	N/A

Part 7 - Smart Utility Standards

The Smart Utility Standards set forth guidelines for planning and integration of SUTs with existing utility infrastructure in existing or new streets, including cross-section, lateral, and intersection diagrams. The Smart Utility Standards are intended to serve as guidelines for developers, architects, engineers, and utility providers for planning, designing, and locating utilities. The Smart Utility Standards will serve as the baseline for discussions on any deviations from the standards needed/proposed for any given utility infrastructure.

Please submit typical below and above grade cross section diagrams of all utility infrastructure in the proposed development area (including infrastructure related to the applicable SUTs).

Boston Smart Utilities Checklist

Please submit typical below and above grade lateral diagrams of all utility infrastructure in the proposed development area (including infrastructure related to the applicable SUTs).

Please email submission to manuel.esquivel@boston.gov

7.1 Date Cross Section Diagram(s) was submitted	
7.2 Date Lateral Diagram(s) was submitted	
7.3 Additional Information	See Figure 6-4: Smart Utility Plan

Attachment 11

BTD TDM POINT SYSTEM TOOL

BTD TRANSPORTATION DEMAND MANAGEMENT POINT SYSTEM TOOL

FOR LARGE PROJECT DEVELOPMENT REVIEW

For more information visit:
www.boston.gov/tdmpointsystem

City of Boston Transportation

PROJECT NAME	Warren Towers Renovation
PROJECT ADDRESS	700 Commonwealth Avenue
DEVELOPER	Boston University
MOBILITY SCORE	91-100

TARGET POINTS	100
RESIDENTIAL ONLY?	No

Points for platinum-level bike share membership and at least 50% transit subsidy	0
Total Points Selected	**136**
Point Requirement Achieved	Yes
Impact Strategy Selected	Yes
Bicycle Strategy Selected	Yes
Vehicle Strategy Selected	Yes

This spreadsheet is locked. Selections can be made in the highlighted yellow cells.

CATEGORY	SECONDARY STRATEGY TYPE	STRATEGY	POINTS	DESCRIPTION	SELECT STRATEGY	SELECT FOR MORE OPTIONS	POINTS	REQUEST OR PROVIDE ADDITIONAL INFO FOR BASELINE STRATEGIES
Baseline Strategies are required for all large developments subject to a Transportation Access Plan Agreement (TAPA). If Baseline Strategy is unachievable, please provide more information under "Additional Information."								
BASELINE REQUIREMENTS FOR ALL DEVELOPMENTS	**Programming**	TMA Membership	5 points awarded total	Property owner joins and participates in the local Transportation Management Association (TMA), if available, or if one is formed during the life of the TAPA	☑	*No additional options apply*	5	
		On-Site TDM Coordinator		Property owner provides part- or full-time dedicated staff to coordinate TDM services	☑	*No additional options apply*		
		Marketing		Property owner distributes annual marketing materials promoting multimodal travel options and benefits	☑	*No additional options apply*		
		Annual Events		Property owner conducts at least two annual events promoting multimodal travel	☑	*No additional options apply*		
		Real-Time Transit Information		Developer provides real-time transit information in building lobbies per BTD review	☑	*No additional options apply*		Provided via Terrier Transit, a BU-specific trip-planning app for iOS and Android that uses real-time BUS, MBTA, BLUEbikes, and Zipcar data to help users make informed mobility decisions
		Emergency Ride Home		Property owner provides ride services, such as reimbursement of taxi or rideshare trips, outside of peak travel periods for tenants/employees who use sustainable transportation options	☑	*No additional options apply*		
	Transit	Participation in MBTA Perq Program	15	Property owner or employers facilitate transit pass purchases (with pre-tax benefits, if applicable) through participation in MBTA's Perq Program	☑	*No additional options apply*	15	
	Vehicle	Unbundled, Market-Rate Parking	15	Property owner provides tenants the option to lease or purchase building space without inclusion of a market rate price for on-site parking. Parking may be leased or purchased by tenants separately at a market rate.	☑	*No additional options apply*	15	Project eliminates 30 existing vehicle parking spaces in the Warren Towers garage.
	Bicycling	Bicycle Parking/Bike Share Provision	5	Developer complies with BTD Bike Parking Guidelines, including provision of short- and long-term parking spaces, showers and changing facilities, monetary contribution to Boston's bike share system, and space for a bike share station, as well as provide on-site repair station	☐	*No additional options apply*	0	Project increases total indoor covered bicycle parking spaces from 74 today to 320 with the project.
	At least one Impact Strategy must be selected.							
IMPACT	**Transit**	Transit Subsidy	15-30	Property owner or employer provides a subsidy for monthly MBTA transit passes.	☑	**Transit subsidy of at least 50%**	20	
	Vehicle	Parking Reduction	15-30	Developer provides on-site parking at a rate below the maximum allowed by BTD's Parking Ratio Guidelines	☑	**No parking provided**	30	
		Parking Pricing	5-30	Property owner charges market-rate pricing for use of on-site parking at an hourly, daily, weekly, or monthly rate	☐	**Parking provided above 75% of maximum**	0	
					☑	**Daily-only charging**	10	
ELECTIVE	**Bicycling**	Bike Share Membership Subsidy	5-8	Property owner or employer provides discounted bike share memberships as part of the Bluebikes Corporate Program	☑	**Bike share memberships are bronze-level**	5	
		E-Bike/E-Cargo Bike Program	5	Property owner provides on-site e-bikes and/or e-cargo bikes for use by project tenants. This strategy is more appropriate for use at project sites with challenging topography.	☐	*No additional options apply*	0	
		Additional Bike Parking Spaces	2-5	Developer provides additional short- or long-term bike parking spaces above the minimum rates in BTD's Bike Parking Guidelines	☐	**Parking provided at no less than 125% of maximum**	0	
		Multimodal Transportation Subsidy	10	Property owner provides a monthly subsidy for multimodal travel expenses, such as bicycle maintenance	☑	*No additional options apply*	10	
	Vehicle	Parking Cashout	10	Property owner or employer provides monthly payment for users to forgo on-site parking when parking is made available for free or at a subsidized rate. Payment is equivalent to the monthly market cost of the space.	☐	*No additional options apply*	0	
		Carpool Program w/ Preferential Spaces	5-10	Property owner or tenant provides carpool matching services with preferential and (if parking pricing exists) discounted parking close to building entrances	☑	**Carpool parking priced at a discount of at least 50% of the normal rate**	10	
		Car Share Membership/Subsidy	2-4	Property owner or tenant provides a subsidized membership to a car share service for users	☑	**Subsidy of at least 50% of car share membership cost**	2	
		Car Share Parking	3-6	Developer provides a minimum of one car share vehicle(s) that is accessible 24 hours a day, seven days a week	☐	**Car share parking is EV and publicly-accessible**	0	
	Transit	Shuttle Service	5-10	Property owner provides a shuttle service to connect project users with nearby transit stations or activity centers	☑	**Operations within and outside of peak periods**	10	
		Bus Stop Improvements	2-4	Developer provides improvements, including accessibility upgrades and installation or upgrade of shelters, for bus stops which serve the project	☐	**Provision of a bench**	0	
		Mixed-Use Development	5-20	Developer constructs secondary land uses which can offset trips elsewhere or incorporates a centralized parcel drop-off/receiving stations into any residential component of the project	☐	**Fitness center component (select one, points descend in order listed)**	0	
					☐	**Centralized parcel drop-off/receiving station**	0	

	Development	Bundled Transportation Options (GoHubs!)	4	Developer identifies publicly-accessible space around the development to collocate transportation options such as car share, bike share, bike parking, electric vehicle charging, passenger pick-up/drop, bike parking, and e-bike/e-scooter charging stations. This space may be adjacent to a public street that allows for transportation options to be located curbside.	☑	*No additional options apply*	**4**	