BTUHWF Building Replacement Project

188 Mount Vernon Street, Boston (Dorchester), MA 02125

Joint Filing:

Expanded Project Notification Form/ Expanded Environmental Notification Form

January 15, 2015

Presented to:

Boston Redevelopment Authority

Massachusetts Executive Office of Energy and Environmental Affairs

Prepared for:

B.T.U.H.W.F. Building Corporation

Presented by:

Tetra Tech, Inc., Civil Engineer

Posternak, Blankstein & Lund LLP, Attorney

Perkins+Will, Architect

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PREPARED FOR

B.T.U.H.W.F. Building

Corporation

EXECUTIVE SUMMARY

The B.T.U.H.W.F. Building Corporation ("The Applicant" or "BTUHWF") submits this proposal to replace its existing 32,500 gross square foot (gsf) building located at 188 Mount Vernon Street in Dorchester (the "Property"). The replacement building (the "Project") will contain 52,469 gsf (exclusive of the mechanical penthouse) to be used for Boston Teachers Union Health and Welfare Fund Offices, Boston Teachers Union ("BTU") offices, an optical shop, a credit union, meeting spaces, conference rooms and function halls. All of these uses are present in the existing building. The Project also includes the construction of a two-story parking garage to the south of the replacement building. The Project will be constructed in two phases. Phase I is the demolition and replacement of the building and construction of on-site improvements including landscaping, 135 surface-grade parking areas, internal vehicular circulation and sidewalks; Phase II is the two-story parking garage that will be constructed over the surface parking lot constructed in Phase I. Phase II will include a total of 308 spaces, of which 29 will be outdoor at-grade, 76 at-grade below the parking structure, 100 spaces on garage floor one and 103 spaces on garage floor two.

BTUHWF has occupied the existing building since the 1960's, first as a tenant and later as the owner. The existing building was not originally designed as office space; it is inefficient and has deteriorated such that it is no longer economical to continue its maintenance and repair. For that reason, BTUHWF plans to replace it with a LEED qualifying, low maintenance building. This will ensure that the Property can continue to meet the program needs of BTUHWF, BTU and its members without significant future cost and expense.

Expanded Project Notification Form ("EPNF") and Request for Waiver

Because the proposed Project involves the construction of more than 50,000 gsf, it is subject to Article 80 Large Project Review by the Boston Redevelopment Authority (BRA). However, with this Expanded Project Notification Form (EPNF), the Applicant is requesting a waiver from further review and from the submission of Draft and Final Project Impact Reports. As grounds for this waiver request, the Applicant states that the replacement project will not result in significant negative impacts to the surrounding area. Complete studies and mitigation analyses covering transportation, environmental protection, LEED compliance and infrastructure impacts are presented in this document to provide support for the requested waiver.

Expanded Environmental Notification Form ("EENF") and Request for Waiver

Because the Property includes filled private tidelands and a Chapter 91 license is required for the building replacement and site improvements, the Project is subject to review under the Massachusetts Environmental Policy Act ("MEPA"). In pre-filing meetings with the applicable state authorities, it was confirmed that an Environmental Impact Report ("EIR") is required because the uses on the Property will occupy more than one acre of filled tidelands. By filing this EENF, the Applicant requests that only a Single EIR (SEIR) be required for the Project. Documentation supporting the eligibility of the SEIR is provided in this EENF filing, including descriptions of environmental impacts and associated mitigation measures for unavoidable impacts. The Environmental Notification Form is provided in Appendix A.

While the building will increase in size in terms of gross floor area (from 32,500 gsf to 52,469 gsf), the at-grade footprint of the building will decrease from 32,500 sf to 30,172 sf. The redevelopment will not exceed the Floor Area Ratio of 1:1 that applies in the base zoning district. The Applicant proposes improvements to landscaping and the installation of a sidewalk that can connect to future redevelopment projects on abutting parcels and the adjacent Boston HarborWalk along Carson Beach. Further, the driveway and building design takes into consideration the future modification of adjacent properties and roadways as proposed in the Columbia Point Master Plan.

The Applicant filed a Letter of Intent with the BRA on November 11, 2014 and has reached out to City and State agencies, neighborhood representatives and groups, abutters, and other interested parties over the past several months with respect to the Project.

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1.0 APPLICANT INFORMATION

Pursuant to Article 80B of the Boston Zoning Code and 301 CMR 11.00, the Applicant is filing this joint Project Notification Form/Expanded Environmental Notification Form (see Appendix A), respectively, for the replacement of the existing Boston Teachers Union Health and Welfare Fund (BTUHWF) building and site redevelopment located at 188 Mount Vernon Street in Boston (Dorchester), MA, see Figure 1-1 Locus Map, and Figures 1-2 and 1-3 Site Aerials.

1.1 DEVELOPMENT TEAM

Applicant:
Eugene McGlynn
BTUHWF Building Corporation
180 Mount Vernon Street
Boston, MA 02125
617-288-2000

Applicant's Representative:
David Brunelle
Jones Lang LaSalle
One Post Office Square
Boston, MA 02109
617-531-4218

Attorney:
Ann Sobolewski
Posternak, Blankstein & Lund LLP
800 Boylston Street
Boston, MA 02199
617-973-6100

Civil Engineer:
Richard Alfonso
Tetra Tech
One Grant Street
Framingham, MA 01701
508-903-2000

Architect/LEED:
Sandra Smith
Perkins+Will
225 Franklin Street Suite 1100
Boston, MA 02110
617-478-0300

Air/Noise:
Marc Wallace
Tech Environmental
303 Wyman Street, Suite 295
Waltham, MA 02451
781-890-2220

1.2 LEGAL INFORMATION

Legal Judgments Adverse to the Proposed Project:

The Applicant is not aware of any legal judgments in effect or other legal actions pending which involve the Project.

History of Tax Arrears on Property:

The Applicant does not own any real estate in Boston on which real estate tax payments are in arrears.

Property Title Report:

The Property is owned by the BTUHWF by deed from Bayside Associates Limited Partnership, dated August 7, 1984. It is shown as Lot 6 on a plan of land entitled "Subdivision Plan of Land 'Being a Subdivision of Lot 2 on L.C. No. 28699C' Boston (Dorchester), Mass." by Harry R. Feldman, Inc, - Land Surveyors, dated February 16, 1984 and filed with the Engineer's office of the Land Court as Land Court Plan 28699D. Copies of the Deed and Plan 28699D are provided in Appendix B. The Property is also shown on the plan titled "Existing Conditions Survey," prepared by Surveying and Mapping Consultants, and dated Revised November 12, 2014; a copy of this survey is included in Appendix C.

2.0 EXISTING SITE CONDITIONS

The Property consists of 117,720 square feet (2.7 acres) of land and improvements include a 32,500 gross square foot single story masonry building and 140 surface parking spaces. The Property is located in the B-1-55 Zoning District (Business), the Harborpark Overlay District and the Restricted Parking Overlay District. A portion of the Property is also located in the Greenbelt Protection Overlay District.

As shown on the Existing Conditions Survey Plan provided in Appendix C, access to the site is by a roadway from William J. Day Boulevard; the roadway is owned by the Massachusetts Department of Conservation and Recreation (DCR). The Applicant, together with other owners of property were permitted to use this roadway to access their properties in accordance with a lease that has recently expired. The Applicant plans to seek a license from DCR for the continued use of the access way. The Applicant also has a secondary right of access over a twenty-five (25) foot wide right of way that passes over and through parking lots located on the property to the west of the subject Property. This twenty-five foot right of way provides access to the Property from Mount Vernon Street. The Project does not require any takings. The location of the 25 foot wide easement is shown on Figure 1-3 and in the survey provided in Appendix C.

The existing BTUHWF building is located on the southern portion of the Property with at-grade parking located on the northern portion. The abutting property to the north and northeast is the DCR's Carson Beach/Mother's Rest; to the northwest is the Massachusetts Water Resource Authority's (MWRA) Odor Control Facility; to the south, east and west the property is surrounded by buildings and surface parking areas owned by the University of Massachusetts Building Authority ("UMass").

Other site features include two landscaped islands running east –west that are separated by the 25 foot access easement driveway. The property is separated from Carson Beach by a chain link fence and vegetated screening along the landscaped islands. Vehicular access is provided along the south and west sides of the building. With the exception of landscaped islands within the parking area, the remainder of the site is occupied by the building and pavement. Site Photographs are provided as Figures 2-1, 2-2 and 2-3.

Several utility easements traverse the northern portion of the site running parallel to the northern property line and consist of a 40 foot wide MWRA and BWSC easement (shown on Figure 1-3 and in the existing conditions Survey Plan provided in Appendix C).

Approximately 2 acres or 88,580 square feet of the Property are Filled Private Tidelands, as set forth in a Determination of Applicability, issued by the Massachusetts Department of Environmental Protection ("DEP"), Waterways Division ("Waterways") dated May 3, 2007 under WRP File No. JD07-1958. (See Figure 2-4 for Waterways Jurisdiction).

The Property also includes one resource area subject to protection under the Massachusetts Wetlands Protection Act. It is located within the 100 year flood zone and therefore is "Land Subject to Coastal Storm Flowage" (LSCSF) as that resource area is defined in the Wetlands Protection Act Regulations (310 CMR 10. 00 et seq). The northeast corner of the Property is approximately 104 feet from the edge of the adjacent Coastal Beach resource area, just outside of the 100 foot buffer zone to Coastal Beach. See Figure 2-5 for FEMA Flood Zone and LSCSF.

2.1 ZONING INFORMATION

The Property is located in the Harborpark District, Dorchester Bay/Neponset River Waterfront Subdistrict under Article 42A of the Boston Zoning Code (the "Code"), see Figure 2-1 for Zoning information and overlay districts. It also falls within the Restricted Parking Overlay District ("RPOD"), the Greenbelt Protection Overlay District (GPOD), and the Columbia Point Special Study Overlay Area and is located in Subdistrict (d): B-1-55 as set forth in Section 42A-22 of the Code and as depicted on Map 4C/4D Harborpark District: Dorchester Bay/Neponset River Waterfront. See Figure 2-6 for Zoning Diagram.

Dimensional Requirements

Phase I of the Project is compliant with the dimensional requirements applicable in a B-1-55 Subdistrict. There are no minimum requirements applicable to a non-residential development in the B-1-55 Subdistrict for: lot size, lot width, useable open space, front yard or side yards, per Table B, and no minimum lot frontage requirement, per Section 14-4. Phase I of the Project's compliance with the remaining dimensional requirements is set forth in the following table:

Table 1. Zoning Requirements

	Required	Provided by Project Phase I
Maximum Floor Area Ratio	1:1	1:1
Maximum Building Height	55'	50' from elevation 16 feet (Datum = Boston City Base)
Minimum Rear Yard	23'-6"	126'-8" to the building edge
Setback of Parapet	54'-2"	65'-6"

Phase II of the Project includes the construction of the two story parking garage and will require zoning relief from the Zoning Board of Appeals. Specifically, a Conditional Use Permit is required for the construction of a parking garage in the Restricted Parking Overlay District. Variances from the minimum rear yard and setback of parapet will also be required for the parking garage because the rear yard depth and setback of the parapet will be 4'-0".

Parking and Loading

No parking is required for the proposed uses under Sections 3-1A.c; 23-4 and 42A-10 of the Code because the Property is located in the Restricted Parking Overlay District. In this overlay district only residential uses are required to provide parking. Phase I of the Project will provide 135 surface parking spaces and Phase II will construct a garage that will increase the number of parking spaces to 308.

The gross floor area of the proposed building is over 10,000 square feet, thereby requiring the off-street loading analysis applicable to properties in the Harborpark district under Section 42A-11. As designed the Project includes a forty (40) foot wide off-street concrete loading area accessed from the rear of the building (adjacent to the rear entrance), that can accommodate two delivery trucks. Because the proposed Project is simply a replacement of the existing uses on the Property in a new building, the Applicant has reviewed the historic loading needs of the facility to determine the loading requirements for the proposed Project. Deliveries to the Property at present consist primarily of: office supplies; supplies and equipment used by the optical shop; armored car service for the credit union and delivery of food and beverages for the function halls and meeting rooms. Deliveries occur at staggered intervals during the day. Based on site history, the loading requirements of the proposed Project are met by the proposed two-bay loading area. There are currently no loading docks servicing the building, instead, deliveries are made through the front and rear doors. By providing a designated loading area, the proposed Project is an improvement over the current delivery methods.

Harborpark Review

The Project complies with the requirements of Section 42A-5, Chapter 91 Requirements, as described in greater detail in Section 14.0 below.

The Project also complies with 42A-8, Urban Design Guidelines, as described in greater detail in Section 11.0 below.

Greenbelt Protection Overlay District

A portion of the Property is within 500 feet of the centerline of William J. Day Boulevard and, therefore is located within the GPOD, pursuant to Section 29-7 of the Code. That part of the Property is located behind the State Police Barracks and the odor control facility owned by the Massachusetts Water Resources Authority (MWRA) and operated by the Boston Water and Sewer Commission ("BWSC").

A portion of the proposed building is located within the GPOD as set forth on Figure 1-3. The total gross floor area of that portion of the building located in the GPOD exceeds 5,000 square feet and, therefore must comply with the requirements of Article 29. As proposed, the building is in conformity with the standards applicable to projects within a GPOD. Specifically, the proposed driveway, loading dock area and on-site traffic circulation have been designed to ensure adequate on-site access and to prevent traffic problems or parking on Day Boulevard. Although the Property is located behind the existing State Police and the odor control facilities and is not easily visible at grade from Day Boulevard, landscaping is proposed in the GPOD. Finally, the surrounding properties are likely to be the subject of future redevelopment, some of which has already begun.

Site Plan Requirements within the Greenbelt Protection Overlay District

As required for a project located within the Greenbelt Protection Overlay District, the following information is provided:

- An existing condition Survey including topography (Appendix C);
- Photographs of significant site features (Figures 2-1, 2-2 and 2-3)
- Proposed Site plan including grading, landscaping, streets, sidewalks, utilities (Appendix D);
- Stormwater Management Report (Appendix H);
- Soils information (Sections 3.1, 7.10 and Section 2.4 of the Stormwater Management Report included in Appendix H;
- Maintenance Program (Appendix H Stormwater Management Report); and
- Plans for preservation/protection of other natural resources (See Site Plans Appendix D)

Columbia Point Master Plan

The Applicant has reviewed the Columbia Point Master Plan ("CPMP") and designed the building and on-site roadways to be physically consistent with the planning goals of that document. Consistency with the CPMP is discussed in greater detail in Section 5.1 below.

3.0 EXISTING SITE FEATURES

3.1 TOPOGRAPHY AND SOILS

The Project site is relatively flat, ranging in elevation from 16.9 feet Boston City Base Datum (BCB) in the vicinity of the rear of the existing building to elevation 14.75 feet BCB within a low point of the northeast portion of the parking lot. According to the USDA NRCS Web Soil Survey, the site is mapped as Urban Land, wet substratum, with 0 to 3% slopes.

In November 2014, Tetra Tech witnessed the excavation of four (4) test pits within the paved parking lot for the purpose of determining the suitability of the soil to provide effective stormwater infiltration and recharge to groundwater. Each test pit was excavated to a minimum depth of 10 feet below grade surface; one test pit depth was excavated to 15 feet below grade surface.

In all four test pits, the bituminous concrete pavement was underlain by a 6" to 8" layer of clean sand (installed during pavement construction), underlain by urban fill material for the remaining depth of the excavation. The fill was a mix of varying soil texture, color and structure; it can be characterized as "ash and cinder," with debris mixed in consisting of brick and asphalt chunks, bottles and jars, and scrap metal.

3.2 WILDLIFE HABITAT/NATURAL FEATURES

The majority of the site is either paved or occupied by the building. The plantings on-site are located in three areas adjacent to the building, on landscaped islands both along the internal access driveway and on several islands scattered throughout the parking lot, and along the northern parcel boundary between the site and the DCR Park at Carson Beach and the MWRA Odor Control Facility.

The plantings next to the building include a few larger trees and low ground planting. The landscaped islands located along the site drive and on the landscaped islands have a mix of low plantings and a few trees. At the northern border of the site the existing plantings are located in two areas, in front of the MWRA Facility and along the DCR Park. The plantings in front of the MWRA facility are smaller newer plantings that were planted as part of the MWRA Odor Control facility improvements project. The plantings between the Project Site and the DCR Park include several large Linden trees.

3.2.1 Wetlands

Dorchester Bay lies to the north and northeast of the Project site. The site is separated from the Bay by Carson Beach; Mother's Rest is located northeast of the site. The parcel is located approximately 104 feet from the edge of the coastal beach, just outside of the 100 foot buffer zone. As previously discussed, the site is located within the 100 year flood zone or Land Subject to Coastal Storm Flowage; no other impacts to resource areas subject to jurisdiction under the Massachusetts Wetlands Protection Act are proposed. See Figure 3-1 for the wetland resources.

3.3 HISTORIC RESOURCES

According to the Massachusetts Cultural Resource Information System database and Boston GIS Landmarks database, there are no inventoried historic or archaeological resources or landmarks located on the Project site. Within the vicinity of the site, William J. Day Boulevard is listed on the National Register of Historic Places as part of the Old Harbor Reservation Parkways. A review of the Boston Landmarks Commission web site mapping shows that the site is not mapped in a Historic and Landmark District.

A review of the National and State Registers of Historic Places and archaeological files was performed at the Massachusetts Historical Commission offices and confirmed the above web based findings. Since the Project includes the replacement of the existing building it is not expected to impact historic resources.

3.4 SCENIC/RECREATIONAL/OPEN SPACE

Directly abutting the site to the north and east is Old Harbor Park Reservation owned by the DCR Urban Division of Parks and Recreation. The Park includes Carson Beach, Mother's Rest, and the Boston HarborWalk.

3.5 SURROUNDING LAND USE AND/OR RESTRICTIONS

3.5.1 DCR Article 97

Land currently owned by DCR abuts the entire northern lot line of the Property. Land in DCR's ownership continues along the South Boston shoreline of Dorchester Bay in both directions. The DCR property is protected by Article 97 of the Massachusetts Constitution which requires that any land or easements taken or acquired for natural resource purposes shall not be used for other purposes unless the Massachusetts legislature approves the change by a two thirds vote. Any transfer of ownership, change in control or change in use would be considered an Article 97 Land Disposition. A five (5) year license to use the access way, which BTUHWF will pursue, would not require Article 97 approval.

3.5.2 UMass

University of Massachusetts Building Authority owns the former Bayside Exposition Center which surrounds the Property on its eastern, southern and western sides. UMass Boston currently uses its property for student parking. In discussions with UMass Boston, it was stated that it is their intention to use their property for student parking for the next seven (7) years.

3.5.3 Easements

A twenty-five (25) foot right of way easement runs parallel to the Property's northern lot line as does a forty (40) foot wide sewer easement held by the Massachusetts Water Resources Authority and the Boston Water and Sewer Commission. These easements constrain the development area on the Parcel by precluding the construction of a building in their footprint. See Figure 1-3 and existing conditions survey provided in Appendix C for easement locations.

4.0 PROJECT OBJECTIVE

The current 32,500 square foot building was constructed in the 1960's and contains the BTU offices, BTUHWF offices, conference rooms, and function hall space. The building also contains an eye care center and credit union that provide services to BTU members and their families. The BTUHWF facility employees 35 people. In addition to patrons of the eye care center and credit union, there are frequent visitors to the building. The function halls and conference rooms are routinely used for meetings; workshops, trainings and social functions, with the number of visitors fluctuating based upon the BTU calendar and the function hall calendar. The reconstruction Project will enable BTUHWF to reconfigure the internal space to better meet the current needs of the BTU, its members and employees.

BTUHWF has occupied the existing building since the 1960's, first as a tenant and later as the owner. The existing building was not originally designed as office space, is inefficient and has deteriorated such that it is no longer economical to continue its maintenance and repair. For that reason, BTUHWF plans to replace it with a LEED qualifying, low maintenance building. This will ensure that the Property can continue to meet the program needs of BTUHWF, BTU and its members without significant future cost and expense.

4.1 PROJECT DESIGN OVERVIEW

The BTUHWF proposes to replace its existing building on the 2.7 acre Property. Phase I of the Project will include the demolition of the existing building and the construction of a three story (52,469 gsf) building with a footprint of 30,172 sf building supported by 135 at-grade parking spaces; the full project build out will include 308 spaces, a combination of at-grade and structured two level parking, considered Phase II. Due to the limited parcel size, vertical expansion of the building from one to three stories is proposed. Site Plan Graphics Views and Perspectives are provided as Figures 4-1 through 4-12 and Site Plans are provided in Appendix D. The number of employees will remain unchanged at 35.

The Property currently includes 140 parking spaces and BTUHWF has the ability to park additional vehicles in existing parking spaces on the abutting UMass property when necessary. The abutting property parking rights are set forth in an Easement Agreement dated August 7, 1984, and recorded with the Suffolk County Registry of Deeds (the "Registry") in Book 11080, Page 172, as amended by an Amendment to Easement Agreement dated August 31, 2000, and recorded with the Registry in Book 33546, Page 143. See Appendix E for a copy of the Easement Agreements. The BTUHWF and its membership rely on up to 320 spaces on the UMass property as needed for meetings and functions. However, the UMass spaces are based solely on availability. The Easement Agreement does not preclude UMass from developing its property and eliminating parking spaces. UMass may reconfigure their existing parking areas which could potentially result in the occupation of spaces that BTUHWF and the membership rely on. Thus, there is no guarantee that the parking spaces on the UMass property will remain available for use in the long term.

BTUHWF's goal is to be able to accommodate the day to day operations and functions and meetings on their own property and not rely on the UMass spaces since availability varies and conditions may change in the future. For these reasons, BTUHWF intends to construct a parking structure to accommodate all of their parking needs on their own property. Phase I includes 135 at-grade spaces, Phase II will include a total of 308 spaces, of which, 29 will be outdoor at-grade; 76 at-grade below the parking structure; 100 spaces on garage floor one and 103 spaces on garage floor two.

The construction of the garage will likely occur at a later date than the building and at-grade parking provided during Phase I. In the interim, the new building will be serviced by at-grade on-site parking areas, including those within the Phase II garage footprint. This filing and the future permit applications include the full build scenario with the Phase II parking garage.

Other site plan features will include a one-way vehicle loop drive to a passenger drop-off located at the main building entrance; an eight-foot wide pedestrian walkway along the entire northerly properly line in the direction towards Carson Beach for future connection to the Boston HarborWalk; and a 6,500-square foot event plaza (located within the Project's front parking area) designed for planned outdoor functions and events; public benches, three parking spaces dedicated to public use located in the northwest corner of the parcel and bicycle racks for both BTUHWF and public use. Both the building entrance passenger drop-off area and the function/event plaza area are designed using permeable paver blocks, rather than standard asphalt pavement, to provide both aesthetic appeal and infiltration of stormwater runoff. The site design also includes a loading area and waste/recycle enclosure area, handicapped parking spaces and accessible routes in conformance with ADA and AAB Regulations, electric vehicle charging station, new site lighting, landscaping and utility infrastructure.

4.2 SUMMARY OF REQUIRED PERMITS AND APPROVALS

Table 2. List of Permit and Approvals

Issuing Authority	Permit	Status of Filing
	Federal	
Environmental Protection Agency	National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities	Notice of Intent filing with EPA -14 days prior to the start of demolition activities
	State	
Secretary of Energy and Environmental Affairs	MEPA Certificate (EIR)	EENF January 15, 2015 SEIR March 31, 2015
MA Department of Environmental Protection	Chapter 91 Waterways License (BRP WW01)	April 2015
Department of Conservation and Recreation	Construction Access Permit	April 2015
Massachusetts Water Resources Authority	8(M) (work within easement)	April 2015
MA Department of Environmental Protection MA	Construction/Demolition Notification	10 days prior to construction
	Local	
Boston Redevelopment Authority	Article 80 Large Project Review	EPNF January 14, 2015
Boston Conservation Commission	Wetlands Protection Act Order of Conditions	March 2015
Boston Parks Commission	Review of Portion of Building within Greenbelt Protection Overlay District	April 2015
Boston Landmarks Commission	Article 85 Demolition Delay Review	April 2015
Boston Transportation Commission	Construction Management Plan Transportation Access Management Plan	During and After BRA Approval
Boston Water and Sewer Commission	Water and Sewer Connection Permits Dewatering Permit Site Plan Review General Service Application	After BRA approval

Issuing Authority	Permit	Status of Filing
Boston Zoning Board of Appeals	Conditional Use Permit for Portion of Building in Greenbelt Protection Overlay District Conditional Use Permit for Parking Garage Variance from Rear Yard Setback and Setback of parapet for Parking Garage	After BRA approval
Inspectional Services Department	Building Permit Flammable Storage Permit Certificate of Occupancy Permit	After ZBA Approval
Boston Committee on Licenses	Parking Garage License Flammable Storage License	After ZBA Approval
Boston Fire Department	Approval of Fire Safety Equipment	After BRA approval

4.3 SUMMARY OF ALTERNATIVES

The BTUHWF and design team considered a number of alternative building programs and parking configurations on the lot. The no build, off site build, on site without structured parking and on site with structured parking were considered. The on-site building along with structured parking achieves the project purpose, goal and needs of the BTUHWF to construct a new building that meets the space needs and configuration while providing sufficient parking for events. The existing building was not originally designed as office space, is inefficient and has deteriorated such that it is no longer economical to continue its maintenance and repair. For that reason, BTUHWF plans to replace it with a LEED qualifying, low maintenance building. This will ensure that the property can continue to meet the program needs of BTUHWF, the BTU and its members without significant future cost and expense.

4.4 SUMMARY OF IMPACTS

Operation Term – Tidelands and Wetlands

Impacts relative to the replacement Project are limited to the proposed building and site improvements located partially (2 acres +/-) within filled tidelands jurisdiction and the entire Project (2.7 acres) within Land Subject to Coastal Storm Flowage.

Construction Term- Air Quality & Noise

There are two primary categories of potential air quality impacts from construction activities at the Site. These are impacts associated with diesel emissions from construction equipment and impacts from fugitive dust generated by construction activities.

Demolition and construction activities will result in a temporary increase in sound levels near the Site. The demolition and construction process will require the use of equipment that will be audible from off-site locations during certain time periods. Project construction consists of demolition, excavation, foundation work, steel erection, and finishing work.

4.5 SUMMARY OF MITIGATION MEASURES

Operation Term Design Features

Mitigation measures for impacts to Chapter 91 jurisdiction are provided in Section 4.6 below. Mitigation measures relative to LSCSF are included in the discussion below. The Greenhouse Gas Mitigation Alternative will reduce overall Project energy use (stationary sources) by 23.7% and will reduce stationary source CO_2 emissions by 23.8%, compared to the Base Case. Greenhouse Gas emissions for the Project will be reduced by the building design and operational energy efficiency measures (EEMs) described in Section 8.3.

Accommodation for Sea Level Rise & Resiliency

The first floor elevation of the building has been set at 20 feet Boston City Base (BCB), well above the predicted sea level rise in the next 50 years. In addition, the majority of the HVAC equipment for the Project is located on upper floors or on the roof.

Construction Term Measures- Air

To reduce potential impacts from diesel construction equipment emissions, the Applicant proposes that contractors associated with the construction of the Facility adopt the goal of compliance with the DEP's Clean Air Construction Initiative. The main requirements of the Clean Air Construction Initiative that will be applied to the Project are provided in Section 9.1 below.

In accordance with the City of Boston Environment Department Guidelines for Construction, the following practices will be employed during demolition activities:

- Dumpsters will be covered and sprayed with water to keep debris wet;
- Sidewalks and streets used by the public will be kept broom-clean at all times; a vacuum truck may also be used on larger paved areas;
- Construction netting will be installed over windows to allow airflow but trap dust; and
- Trucks carrying debris or other material off site will be covered per MGL Ch. 85 Section 36.

During the demolition phase of the Project, the following specialized dust control measures for demolition are expected to be used:

- Pre-cleaning of large surfaces and structural members to remove large concentrations of dusting materials prior to demolition
- Water suppression sprays and misting of potential dust-creating situations to prevent spreading of airborne particulates.
- Enclosure of areas with tarps and screening when necessary to prevent the migration of dust.

In addition to these measures, construction and demolition activities will proceed in accordance with the City of Boston Environment Department's Guidelines for Construction. Dust control measures to be employed during demolition will be included in the project specifications for bidding and include the following: dumpsters must be covered and sprayed with water to keep debris wet; sidewalks and streets will be kept broom clean at all times and regenerative sweeper and water truck used if sediment track out occurs; and trucks carrying demolition debris off site will be covered.

4.6 SUMMARY OF PUBLIC BENEFITS

The Applicant will redevelop the Property with a sustainably designed building and will provide an anchor for future redevelopment of the former Bayside Expo Center. The Project will include numerous benefits to the neighborhood and the City of Boston, including the following:

- Replacement of a deteriorating obsolete building with an architecturally creative building that will enhance the surrounding area;
- Creation of approximately 380 yearly construction jobs during the Phase I building construction;
- Creation of approximately 152 yearly construction jobs during the Phase II garage construction;
- Increase property taxes levied due to higher appraisal value than the currently functionally obsolete building;
- Provisions for a new public walkway, capable of connection to future sidewalks on adjacent property, to provide an additional means of pedestrian access to the DCR property and the waterfront;
- Provisions for three public benches adjacent to the new public walkway;
- Provisions for three parking spaces dedicated to public use;
- Bicycle racks for public use;
- Removal of the fence between the Project Site and Carson Beach thereby visually and physically connecting the site to the adjacent parkland;
- Installation of lighting and landscaping to improve the appearance of the neighborhood in conformity with potential future development under the Columbia Point Master Plan;
- Introduction of permeable pavement and reduction of impervious surface to promote on-site stormwater recharge and reduce stormwater runoff from the site;
- Meeting the requirements of Article 37 of the Boston Zoning Code with a goal of achieving the Silver level (with a concerted effort to meet Gold) of the Leadership in Energy and Environmental Design (LEED) for New Construction rating system.
- Design provisions to create an active edge to the public spaces along Boston's HarborWalk through a number of design strategies:
  - Interior and exterior spaces are laid out to create synergies between Carson Beach and the events and activities held within the building.
  - Pre-function spaces for the meeting halls and conference spaces form a transparent edge to the public parks.
  - A landscaped outdoor event hard-scape and public path connecting to the HarborWalk is planned for the area between the Carson Beach lawn and the building.
  - The north and west facades are treated with windows and materiality that engage the public space and are appropriately proportioned for distant as well as close views of the building.

4.7 PROJECT SCHEDULE

The table below provides the major activities and schedule associated with the Project:

Table 3. Major Activities and Schedule

Activity	Schedule-Estimated Start/End
Phase I Construct Building & Surface Parking & Amenities	12/2015 to 2/2017
Phase II Construct Parking Garage	12/2015 to 2/2018
Miscellaneous (building remediation & demolition)	6/2015 to 12/2015

4.7.1 Building Program

The proposed building will occupy 30,172 square feet at ground level. The building will contain three floors and a penthouse totaling 52,469 gsf without the penthouse and 56,834 gsf with the penthouse. The proposed building will be 50 feet in height and up to 66 feet including the penthouse. The following table provides the Building Program Summary by floor.

Table 4. Proposed Building Program Summary

Space Type/Use	Area in Gross Square Feet (gsf)	Notes
	FLOOR 1	
Lobby & Pre-function	6,399	
Meeting Halls A, B & C	13,409	1,200 seats for special events; 300 seats bi-weekly events
Conference Rooms A, B & C	1,924	
Credit Union	1,244	3 full time employees
Kitchen	1,381	1 full time employee
Lounge	1,204	
Core/Loading[1]	4,611	
	Subtotal = 30,172 gsf	
	FLOOR 2	
Eye Care	5,117	8 full time employees
Health & Welfare	3,735	8 full time employees
Health & Welfare Storage	772	
Core/Mechanical/Circulation	2,664	
	Subtotal =12,288 gsf	
	FLOOR 3	
Union Offices	8,950	15 full time employees
Core	1,059	
	Subtotal =10,009 gsf	
	PENTHOUSE	
	4,365 gsf	
Total without Penthouse = 52,469 gsf; with Penthouse = 56,834 gsf		

[1] Core refers to non-dedicated spaces such as hallways, bathrooms and storage areas.

The parking structure will include 2 levels with 31,586 gsf on Level 1 and 32,184 gsf on Level 2 for a total of 63,770 gsf.

4.7.2 Building Layout and Design

The proposed building has been situated closer to the north property line than the current building to allow for surface parking in the rear. By eliminating the large parking area next to the DCR Park and replacing it with public access, landscaping and public benches and parking spaces, the area offers a seamless transition to the abutting public parkland. The access to the parking and loading will be via roadway on the west side of the Property. The western side of the loading area includes a wall that will screen the view from the future Columbia Point Master Plan (CPMP) roadway to the west. (See Figures 4-1 through 4-12 for the building layout on the Property).

The first floor of the building will house a large meeting hall that can be subdivided into three spaces. The open hall will provide seating for 1,200 persons. A large pre-function area extends from the main drop off entry to the front of the halls with glazing and views to the DCR Park and the harbor. Back of house functions are in the rear of the halls connecting to a warming kitchen. Other functions on the ground floor include a small credit union, break out meeting rooms and lounge area along with typical core functions. (See Figure 4- 3 First floor Plan)

The second floor and third floors are office functions. The second floor houses the BTUHWF eye care center and BTUHWF offices. The third floor houses the BTU offices. Both floors have daylight views on three sides with the third floor having daylight views on all four sides. (See Figure 4-5 Second floor Plan and Figure 4-6 Third Floor Plan)

The building massing is a direct response to maximizing views from prefunction area and upper office floors. The office portions of the upper floors have been kept shallow to allow for cross ventilation and maximizing daylighting and views. The massing is also a direct response to the site constraints of a small site, landscaped island and drop off area that provides grade transitions from existing to the elevated first floor (for sea level rise and flood zone purposes), open space requirements of the Chapter 91 regulations and allowable FAR. The building mass is stepped down towards the Carson Beach lawn and held back from the lawn edge creating an appropriate scale to the building within the context.

Fill material will be placed on site in order to accommodate the transition from existing grades to the first floor elevation which is designed to accommodate future sea level rise. The amount of fill has been minimized to the greatest extent practicable while taking into consideration site grading, ADA accessibility, access to the front entrance and management of stormwater runoff.

4.7.3 Landscape Design

The landscape plan for the Project proposes significant improvements which will benefit both the building's users and the community at large. The design shifts the majority of the parking to a shielded location behind the new building. This move reduces the amount of parking visible from the adjacent park and breaks the length of existing parking into smaller, less expansive paved areas framed by planting. Included in the design is a multi-use event plaza composed of permeable pavers.

An 8 foot wide walkway will be added along the edge of the event Plaza to provide improved pedestrian access to the adjacent HarborWalk. The removal of the existing fence will also strengthen this connection while improving visibility. Along this edge and throughout the Property, the design will employ native and salt-tolerant trees, shrubs, and grasses that complement the mass plantings found at the adjacent HarborWalk. Three benches will also be provided along the walkway for public use. See Landscape Plan provided in Appendix D Site Plans.

5.0 CONSISTENCY WITH AREA MASTER PLANS

5.1 COLUMBIA POINT MASTER PLAN

At the request of BRA staff, the Project team reviewed the Columbia Point Master Plan prepared by the BRA in June 2011. The Plan includes future development surrounding the BTUHWF property but does not detail future changes at the BTUHWF Property. The CPMP anticipated that BTUHWF and BTU would remain on the Property. The land use and urban design goals in the immediate vicinity of the BTU parcel include provisions for a vehicular and pedestrian connection from Mount Vernon Street, through the Bay Side Exposition site (now UMass owned) to William J. Day Boulevard. The purpose of this connection is two-fold, one to alleviate local traffic on Kosciuszko Circle and to also provide a tree lined pedestrian scale block street grid within Columbia Point. The "New Street" as it is called, would be located along the west side of the BTUHWF parcel (See Figure 5-1 Illustrative Plan from CPMP with the Project overlay). To accommodate the potential New Street, the proposed building façade and driveway entrance were designed to be accessible from both the New Street and the existing access from Day Boulevard.

The most significant feature of the Columbia Point Master Plan that directly affects the BTUHWF parcel is the planned "New Street." Old Colony Avenue will be extended through the JFK/UMass MBTA Station property and through the property currently occupied by the Shaw's Supermarket. The extension of Old Colony Avenue intersects at right angles with New Street which crosses Morrissey Boulevard and continues between Boston College High School and Santander Bank to Mt. Vernon Street. New Street then continues over Mt. Vernon Street through the Bayside Expo site to Day Boulevard. One of the primary purposes of New Street is to provide an alternative to Kosciuszko Circle for local traffic within Columbia Point. This New Street will run along the west boundary of the BTUHWF property. As such, the site design responds both to the existing alignment of the access road from Day Boulevard and the future realignment of the extension created by New Street. The proposed BTUHWF building and site plan responds to the Columbia Point Master Plan in the following ways:

- Ground floor uses are devoted to active functions with the credit union, union halls, meeting spaces and lounge;
- The building is parallel to the future New Road;
- Ground level spaces are approximately 4 feet above the existing roadway elevation (to accommodate for sea level rise (SLR) and the 100 year flood zone) and have clear glass storefronts;
- The building height is consistent with current zoning (55') and Chapter 91 regulations;
- The surface parking is behind the front entry of the building and the planned future parking expansion will be a parking garage also located behind the front entry to the building;
- The Project will be designed to a minimum of a LEED Silver Rating (with a concerted effort to meet Gold) and meet the City of Boston Stretch Code (20% greater efficiency than ASHRAE). A greater description of the sustainability measures that the Project will be designed to is contained in Section 12.0; and
- The Project has also been designed for resiliency and climate change, also described in Section 12.0 and the Climate Change Preparedness and Resiliency Checklist included in Appendix L.

5.2 ADDITIONAL MASTER PLANS

5.2.1 Mt. Vernon Street Design

In March 2014, the BRA began a public process to redesign Mt. Vernon Street. The purpose of the Project is to beautify Mt. Vernon Street and make it safe and comfortable for all users. Mt. Vernon Street is a key connector between the two parts of the UMass Campus. This planning effort is in its early stages.

5.2.2 UMass Campus Planning

In addition to the Columbia Point Master Plan, UMass has also developed a 25- year master plan. UMass property surrounds the BTUHWF parcel with buildings and surface parking on the south, east and west and the surface parking and access easement to the north. Future redevelopment by UMass would have a direct impact on the BTUHWF facility. Based on discussions with UMass, the projected 7 year near term plan includes surface parking on three sides of the BTUHWF parcel (west, south and north); development plans beyond the seven year parking plan are unknown to the Applicant.

5.2.3 MetroFuture Regional Plan

The Metropolitan Area Planning Council's ***MetroFuture Making a Better Boston Region*** dated May 2008 includes visions, goals objectives and implementation strategies for the greater Boston Region. The Plan recognizes that in urban areas and neighborhoods new growth will mainly occur through the reuse of previously developed land and buildings without the loss of open space. The redevelopment of the BTUHWF property indeed meets this goal by providing a sustainably designed building, an anchor for future redevelopment of the former Bayside Expo Center. Construction of a new sidewalk, capable of connection to future sidewalks on adjacent property, to provide an additional means of pedestrian access to the DCR property and the waterfront clearly meets the goal of enhancing the public open space experience.

5.2.4 HarborWalk Planning

The City of Boston's HarborWalk program is a continuous public walkway along the water's edge. At the north Property perimeter, the site program includes an 8 foot wide walkway that will connect to the future parcel developments to the east and west of the site. These walkways will then connect to the established HarborWalk on the DCR parkland.

6.0 ALTERNATIVES ANALYSIS

6.1 OBJECTIVES BASED ON FEASIBILITY

The existing outdated building would require extensive maintenance and repairs in order to meet the space configuration and needs of the BTUHWF. The objective is to replace the building with one that meets the needs of the BTUHWF in terms of functional ample space. The existing building was not originally designed as office space, is inefficient and has deteriorated such that it is no longer economical to continue its maintenance and repair. For that reason, BTUHWF plans to replace it with a LEED qualifying, low maintenance building. This will ensure that the property can continue to meet the program needs of BTUHWF, BTU and their members without significant future cost and expense.

6.2 ALTERNATIVES

BTUHWF and the design team considered a number of alternative building programs and parking configurations on the lot. The no build, off site build, off site lease, on site without structured parking and on site with structured parking alternatives were considered, and, as discussed below only the current proposal met the Project objectives and goals. All alternatives were analyzed using influential factors, including the site access drive location, the required floor area ratio, economic considerations, and consistency with the CPMP. Initial concepts included phased demolition and construction to facilitate the continued use of the existing building until the new one was constructed. Once it was determined that temporary relocation of facility operations during construction was possible, there was more flexibility in terms of the layout considering the building did not have to remain during construction and various layouts using the site in its entirety were evaluated. The summary of alternatives considered include:

- No Action Alternative, which assumes that Applicant does not undertake the Project;
- Off-site Alternatives including purchasing a new building and/or land to construct a new facility and Off-site leasing;
- On-site without structured parking;
  - L shaped building with all surface parking in rear
  - U shaped building with parking in the rear and island in the front
- On-site phased construction;
- On-site:
  - Alternative Building layouts 1, 2 and 3; and
- Preferred alternative (presented herein as the "Project Design") On-site with structured parking

6.2.1 Constraints & Design Influences on Alternatives

A number of factors influenced the layout and design of the site, including the Chapter 91 50% open space requirements for the filled tidelands portion, the Floor Area Ratio of 1:1 which includes the parking structure, the parking needs of the building users and agreements with UMass, the influence of the Columbia Point Master Plan in terms of height and new street layout, and the current condition and uses of the abutting UMass property. Regardless of the layout on the site, the building footprint will be located within Chapter 91 jurisdiction because it bisects the site and occupies approximately 70% of the Property. Also, the entire site is within LSCSF and there are no alternatives that could be located outside of the flood zone.

In accordance with 310 CMR 9.51(3)(d) of the Chapter 91 Regulations at least one square foot of the Project site at ground level shall be preserved as open space for every square foot of tidelands area within the combined footprint of buildings, including garages, containing nonwater-dependent uses. Approximately 2.03 acres of the 2.7 acre parcel are within filled tidelands. Therefore, a minimum of 1 acre of the site must be dedicated to open space. The remaining acre may be used for building area.

In addition to the configuration of the new building, a major component to the site feasibility was the option and need to construct a parking garage. Visitors travel to the Property predominantly by motor vehicle. The driving factor in the decision was the limited number of parking spaces, 140, currently present on the Property and the realization that redevelopment would necessarily result in a reduction in the number of surface parking spaces. With only 140 parking spaces, BTUHWF and their agents, invitees and guests must frequently park on the adjacent UMass parcel, where spaces are available, under the existing easement agreement covering such parking. The number of attendees for meetings, events and functions at the building exceeds the number of existing parking spaces at the Property on a routine basis each month. While the Applicant has been able to use the UMass property for parking purposes under the agreement, an ongoing ability to do so is not guaranteed. UMass may redevelop its property and remove parking spaces, thereby reducing the number available for use under the easement. Additionally, increased parking demand by UMass students has made it more difficult for BTUHWF's agents, invitees and guests, to exercise parking rights under the easement.

6.3 NO-ACTION ALTERNATIVE

If the No Action alternative was implemented, BTUHWF would continue to own a functionally obsolete building that requires significant maintenance expenditures. The existing building is not energy efficient and is not located above the 100 year flood zone, which could lead to significant future damage in the event of a storm surge coupled with sea level rise. The No Action alternative would maintain the current property condition without improvement and there would be no additional lighting, landscaping or public sidewalk. The proposed improvements, including the construction of on-site infiltration and pretreatment of stormwater prior to discharge, the construction of a LEED certified building and the addition of fill to raise the ground floor level of the building provide such environmental benefits not offered by the No Action Alternative as energy efficiency, resource efficiency (water/waste etc.), and the ability to cope with climate change, over the No Action alternative. For these reasons the No Action alternative was considered undesirable and was eliminated from further consideration.

6.4 OFF-SITE ALTERNATIVES CONSIDERED

BTUHWF owns the Project site and any off-site alternatives were not considered due to the cost of purchasing a new parcel of land in the City of Boston and /or entering into a lease agreement. The current facility provides a convenient location in terms of access for teachers throughout the city.

The Applicant analyzed an alternative to sell its property, purchase a parcel in a different location and construct a new building off-site. This alternative was determined to be economically infeasible. For several months, alternative sites (for lease, purchase, or development) were considered in locations spanning between Quincy and South Boston. This search process did not yield any suitable opportunity that could replicate or accommodate the specific needs of the Applicant nor enable the Applicant to provide the same level of amenities to its membership in terms of access to free parking for daily member services, access to large meeting facilities for membership meetings and functions, and immediate access to MBTA. Additionally, the Applicant's current location is at the epicenter of its active teacher and membership base and relocating too far from the existing location would create a hardship for many members.

The Applicant analyzed an alternative of leasing space in an existing building elsewhere in the City. After a search of off-site properties, BTUHWF was not able to locate an existing property that could accommodate all of the uses currently in existence at the Property, with parking, at a rental price within the limits of BTUHWF's budget In early 2014, Applicant, with the assistance of its professional consultants, determined that its current 50 plus year old facility had become functionally obsolete, and that any further capital expenditures toward maintaining the deteriorating facility was fiscally imprudent. After further due diligence, the Applicant concluded that building a replacement facility on its existing site was not only the most logical and prudent financial decision, but also best represented the long term interests of its members.

Both off-site Alternatives would leave the existing building in its present condition, with the same undesirable conditions as set forth in the No Build Alternative. Moreover, the objective of BTUHWF is to preserve and maintain its assets for the ongoing benefit of the BTUHWF, BTU and their membership. An alternative that is more costly than the preferred alternative is not in accordance with BTUHWF's mission and is therefore, undesirable.

6.5 ON-SITE ALTERNATIVES WITHOUT STRUCTURED PARKING

The Applicant analyzed the alternative to construct the building without structured parking. Both an “L” and “U” shaped building layout configurations were developed early in the design process, however these configurations with at-grade parking in the rear did not accommodate provisions for the increase in first floor elevation (4+feet) to account for sea level rise and therefore was not a viable alternative.

Although this alternative would be an improvement over the No Action alternative, the users of the building to be constructed on the Property require on-site parking on a routine basis that is in excess of the surface parking spaces which would be provided in this alternative. For example, in the month of November 2014, ten meetings, trainings or events occurred with attendance in excess of 125 people. Of those meetings, the retiree's lunch routinely has between 600 and 800 persons in attendance and approximately 250 people attend the monthly meetings. Attendees typically access the BTUHWF facilities by car, particularly since they may reside in different locations than the schools in which they work. Construction of the building without structured parking would reduce the number of available parking spaces from 140 to 135. This reduction, coupled with the anticipated increased parking demand of UMass and the associated reduction in parking spaces available to BTUHWF on the UMass parcel, led to the conclusion that the on-site without structured parking alternative is not feasible in light of the objectives of the Applicant.

6.6 ON-SITE PHASED CONSTRUCTION

The initial building programs considered maintaining operations at the existing facility while constructing a new building within the parking area to the north of the existing building. Once the new building was constructed, the existing building would have been replaced with a parking garage. Demolition phasing would allow for the continued use of the existing facility while the new building was under construction. This alternative was eliminated due to the construction costs and logistics of maintaining the facility and parking while performing demolition and construction. In sum, the parcel is simply not large enough to accommodate all projected demolition and construction needs while maintaining the existing facility operations in a safe manner. Therefore this alternative was eliminated from further consideration and the focus shifted to demolishing the building followed by the construction of the new building.

6.7 ON-SITE ALTERNATIVES WITH STRUCTURED PARKING

Alternatives 1, 2 and 3

The Applicant considered three additional layouts of the building with a separate parking structure (See Figure 6-1). Regardless of the layout on the site, the building would be located within Chapter 91 jurisdiction and LSCSF. All of the layouts set the building in a similar location on the northern portion of the lot, because placing the parking structure to the rear or south of the lot made the most sense in terms of separating parking from the DCR park and creating a building that will be situated and articulated to reinforce the public space and pedestrian environment of Carson Beach and create a compatible architecture with the northern, public edge. Once it was determined that the building would be in the northerly half of the lot, the existing 25 foot wide access easement required the building to be set back beyond the limits of the easement.

Alternatives 1 and 2, planned the main entrance solely around the existing access roadway from William J. Day Boulevard, without consideration of the CPMP whereby a street scape would be located along the western property line. These alternatives also did not take into consideration the potential realignment of the access way to Day Boulevard and they would not permit on-site traffic flows to function effectively if the access way was realigned as set forth in the CPMP.

Alternative 1 illustrates a solution that maintains a continuous northern edge to the Carson Beach lawn and positions all of the parking in the rear of the building. This solution was rejected because achieving a first floor elevation that accommodates sea level rise would require a prohibitive amount of interior ramping. This scheme would also yield a long, unvaried façade that would not be appropriate to the scale of the public park space.

Alternative 2 illustrates a scheme that provides the required parking for the Project at the first level raising the building program above on the upper levels. This scheme was rejected because it integrates the parking without allowing a phased parking approach. This approach would not be financially feasible for the Project. This scheme also places the most public, active spaces in the building up at the 2nd level creating an inactive pedestrian street frontage for the building.

Alternative 3 illustrates a solution with parking in the rear and a raised drop-off area in the front. The first floor is designed to accommodate the projected SLR and 100 year flood zone (projected to be 4 feet). This scheme was rejected due to its singular focus from the existing approach road. Alternatives 1, 2 and 3, are all planned with the main entrance focused towards the existing access roadway from William J. Day Boulevard, without consideration of the CPMP whereby a street scape would be located along the western property line. These alternatives also did not take into consideration the potential realignment of the access way to Day Boulevard and they would not permit on-site traffic flows to function effectively if the access way was realigned as set forth in the CPMP.

6.8 PREFERRED ALTERNATIVE

The on-site building along with structured parking achieves the Project purpose, goal and needs of BTUHWF to construct a new building that meets the space needs and configuration while providing sufficient parking for events. This design is compatible with both the current conditions in the neighborhood and the projected changes set forth in the CPMP. The design complies with the Chapter 91 required 50% open space and provides landscaped areas together with a meandering sidewalk interspersed with mature trees. The placement of the building preserves views from the open space over Carson Beach and toward Dorchester Bay.

The preferred alternative responds to three primary site drivers:

- Creates a raised main entry that can accommodate an approach and identity from both the west and the north that responds to both the current condition of the site circulation as well as anticipated changes set forth in the CPMP.
- Creates adequate space in front of the building to allow accessible drop off at a raised first level and allows a gracious landscape design to make the transition between the site's edge grades and the new resilient first floor level.
- Creates a varied, active first floor level and massing that helps to animate the edge of the public space.

6.9 COMPARISON OF ALTERNATIVES

The following table provides a comparison of on-site alternatives based on impacts to LSCSF/SLR, non- water dependent use/occupation of private tidelands within Chapter 91 jurisdiction, consistency with the Columbia Point Master Plan and meeting the Project objective:

Table 5. Comparison of Impacts

Alternative	Comparison of Impacts			
	LSCSF/SLR	***Chapter 91 Jurisdiction***	***Consistency with Master Plans***	***Meets Project Objective***
No Action	All facilities within flood zone and not designed to accommodate SLR	Continued unlicensed use of building /No Public Benefits	No	No
Off Site purchase or lease	Facilities would remain within flood zone	Unlicensed building would remain/No Public Benefits	No	No
On site without garage	Design accommodates flood zone, SLR	Occupation of Private tidelands Licenses Use/ Public Benefits Constructed	Yes	No
On Site Phased	Design	Occupation of	Yes	No

Alternative	Comparison of Impacts			
Construction	accommodates flood zone, SLR	Private tidelands Licenses Use/ Public Benefits Constructed		
On site Alternative Layouts 1, 2 & 3	Design accommodates flood zone, SLR	2.03 acres Occupation of Private tidelands Licenses Use	No	Yes
Preferred Alternative	Design accommodates flood zone, SLR	2.03 acres occupation of Private Tidelands Licenses Use	Yes	Yes

7.0 ENVIRONMENTAL

The following sections discuss the existing environmental resources and the relationship to the Project build out.

7.1 WIND

A qualitative pedestrian level wind assessment was prepared by Rowan Williams Davies & Irwin Inc. and is provided in Appendix F. The report concludes that the wind climate around the building site is expected to be comfortable for standing or walking. The addition of the proposed building is not expected to influence the wind speeds in the area.

7.2 SHADOW

7.2.1 Introduction and Methodology

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

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

The shadow analysis presents the existing shadow, shadow created by the as-of-right alternative, and new shadow that would be created by the Project, illustrating the incremental impact of the Project. The analysis focuses on nearby open spaces and sidewalk (HarborWalk) in the vicinity of the Project site. Shadows have been determined using the applicable Altitude and Azimuth data for Boston. Graphics showing the net new shadow from the Project are provided in Figures 7-1 to 7-10.

During the vernal and autumnal equinox, at 9 am and 12 am, the proposed Project's shadow will fall completely within the parcel property and will not impact the Harbor Side Walk on the Project's property or adjacent parkland, Carson Beach. At 3 pm, the proposed Project's shadow will fall over the parcel property line on the parcel to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted.

During the Winter Solstice at 9 am, the proposed Project's shadow will extend beyond the property line and onto the green adjacent to Carson Beach. This shadow should have minimal impact due to the low use of the green space in cold weather and the minimal amount of impact time. By mid-day, the proposed Project's shadow will fall over the parcel to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted. Most of the Harbor Side Walk contained within the parcel will not be impacted with shadow. Late in the day, the proposed Project's shadow will extend beyond the parcel property line on the parcel to the east of the Project site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted. Again, most of the Harbor Side Walk or Carson Beach will not be impacted with shadow.

During the Summer Solstice at 9 am and 12 pm, the proposed Project's shadow will fall completely within the parcel property line with no impacts to the Harbor Side Walk contained within the parcel. At 3 pm and 6 pm, the proposed Project's shadow will fall within the parcel property with a small amount of shadow to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted. Again, none of the HarborWalk or Carson Beach will be impacted with shadow.

7.3 DAYLIGHT AND SOLAR GLARE

7.3.1 Daylight

The Large Project Review guidelines define daylight quality as the amount of the "skydome" that will be obstructed by new building elements when viewed from an adjacent public way. Daylight analysis, if applicable, is to be made for each major building facade fronting on a public way or passage. There are no public ways in proximity to the Property. No daylight obstruction will occur on streets and pedestrian areas in the immediate vicinity of the Property due to the setbacks of the building from the proposed sidewalk and existing roadways.

7.3.2 Solar Glare

Solar glare analysis takes into consideration impacts occurring when the sun is reflected onto a public way or public open spaces and the potential for solar heat buildup in nearby buildings that would receive reflective sunlight from the Project. The Project does not front any public streets and does not have any adjacent buildings close to the property other than the Bayside Expo Center which has no windows and is slated to be demolished by UMass Boston. The public space associated with the Carson Beach lawn is north of the building and as a result will not receive reflections or glare from the building's windows. For these reasons, the Project will not cause any significant solar glare impacts to the public right of way, adjacent buildings or open space.

7.4 AIR QUALITY

A Greenhouse gas (GHG) emissions analysis was performed for the Project consistent with the EOEEA "Greenhouse Gas Emissions Policy and Protocol" (May 5, 2010; the "Policy"). The GHG Analysis is provided in Appendix G.

The GHG Policy requires a project to quantify carbon dioxide (CO2) emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect of proposed mitigation in terms of energy savings and emissions reduction. The Project's GHG emissions will include: 1) direct emissions of CO2 from natural gas combustion for space heating and hot water; 2) indirect emissions of CO2 from electricity generated off-site and used on-site for lighting, building cooling and ventilation, and the operation of other equipment; and 3) transportation demand management measures to reduce CO2 emissions from Project traffic. CO2 emissions were quantified for: (1) the Base Case corresponding to the 9th Edition of the Massachusetts Building Code that includes the IECC 2012 code (the "Code"), and (2) the Mitigation Alternative, which includes all energy saving measures.

The City of Boston has adopted the Massachusetts Stretch Energy Code, which requires higher levels of energy efficiency. Since the building will be smaller than 100,000 sf, the Project is only subject to Section 501.1.4 of the Stretch Code, the Prescriptive Option, and the 20% energy reduction requirement in Section 501.1.1 does not apply. The GHG analysis assumes energy mitigation measures consistent with, and greater than, the Prescriptive Option of the Stretch Code.

Mitigation Alternative will reduce overall Project energy use (stationary sources) by 23.7%and will reduce stationary source CO_2 emissions by 23.8%, compared to the Base Case. Although it is anticipated that the new building uses will not increase traffic volumes compared to the existing building uses, the BTUHWF is proposing Transportation Demand Management (TDM) measures that will reduce motor vehicle CO_2 emissions by an estimated 2.0%.

7.5 FLOOD HAZARD ZONE, WETLANDS AND SEA LEVEL RISE

7.5.1 Flood Hazard Zone

According to the Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Maps , the site is mapped within the 100 year Flood Zone AE with a base flood elevation of 10.00 feet North American Vertical Datum of 1988 (elevation 16.46 feet Boston City Base) (See Figure 2-5). The 100 year flood zone also qualifies as Land Subject to Coastal Storm Flowage under the Massachusetts Wetlands Protection Act. The current site varies generally between elevation 9 and 10 (NAVD88)/elevation 15.46 and 16.46 feet (BCB), whereby the entire parcel is located within the mapped 100 year flood zone. Impacts will be limited to the work in LSCSF and measures to minimize potential flood damage and future sea level rise are integral to the resilient elements of the Project design as described in Section 12.0. The 2013 Preliminary Flood Insurance Rate Maps (FIRMs) for Boston were reviewed and showed an increase in the Flood Zone AE base flood elevation of 1 foot, however, the City of Boston has filed an appeal on the 2013 FIRMs with FEMA. This appeal came after a study, completed by an independent consultant hired by the City, that indicated inconsistencies and potential errors in the mapping and flood study approach used by FEMA.

7.5.2 Wetlands

Dorchester Bay lies to the north and northeast of the Project site. The site is separated from the Bay by Carson Beach; Mother's Rest is located northeast of the site. The parcel is located approximately 104 feet from the edge of the coastal beach, just outside of the 100 foot buffer zone. As previously discussed, the site is located within the 100 year flood zone or Land Subject to Coastal Storm Flowage; no other impacts to resource areas subject to jurisdiction under the Massachusetts Wetlands Protection Act are proposed. See Figure 3-1 for wetland resource areas.

7.5.3 Sea Level Rise

The site is located within the coastal flood zone and subject to projected sea level rise. Adaptation strategies to increase resiliency in the site, building structure, building systems and operations provided the basis for the design.

Locally, there are several studies prepared to date that attempt to identify the projected sea level rise. According to The Boston Harbor Association (TBHA) report entitled "Preparing for the Rising Tide " the UMass Coast Line/Morrissey Boulevard and Bayside Exposition project site shows a projected sea level rise of 2 feet by the year 2050. By 2100 the report stated that sea level rise is expected to increase by 3 to 6 feet.

According to the December 2013 Coastal Zone Management's "Sea Level Rise, Understanding and Applying Trends and Future Scenarios for Analysis and Planning" there are four Global Sea Level Rise Scenarios projected for 2100, namely Highest, Intermediate High, Intermediate Low and Lowest varying from 6.6 feet, 3.9 feet, 1.6 feet and 0.7 feet respectively.

In addition to the above referenced documents, MassDOT has recently undertaken a study entitled “MassDOT – FWHA Climate Resilience Pilot Project” whereby local extreme weather is analyzed. The Boston Harbor Flood Risk Model simulates the effects of storm surges, tide, wind, waves, wave set up, sea level rise and future climate changes. The results of the MassDOT study are pending and if the information becomes available during the permitting process, it will be reviewed relative to the Project design.

The current elevation of the site varies from elevation 16.9 in the rear of the existing building, to elevation 14.75 feet in the northeast corner of the property. With a building design life of 50 years, consideration to the 2100 projected sea level rise for the Project site was designed such that the first floor building elevation is elevation 20 feet BCB or 5.3 feet above the lowest elevation on site and 3.5 feet above the 100 year flood zone elevation.

Table 6. Sea Level Rise (SLR) Comparison Elevations

SLR SCENARIO	Elevation in feet NAVD 88	Elevation in feet (BCB +6.46 feet*)
FEMA 100 year flood zone AE - 2009 current effective map	10.0	16.46
TBHA SLR -UMass Coast Line Projected Rise +2.0’	12.5’	18.96
CZM SLR Highest +6.6’	16.6’	23.2
CZM SLR Intermediate High +3.9’	13.9’	20.4
Proposed First Floor Elevation 20.0 BCB		
CZM SLR Intermediate Low +1.6’	11.6’	18.1
CZM SLR Lowest +0.7’	10.7’	17.2

NOTE: The current Site varies from elevation 16.9 feet to elevation 14.75 feet BCB.
***6.46 feet = From MassHighway Relation of Datum Planes worksheet**

As shown on the table above, the proposed first floor elevation at elevation 20 feet along with building design resiliency features, represents a conservative approach to minimize risk and avoid impacts associated with flooding and future projected sea level rise. See Figure 7-11 for Resiliency Strategy Diagram.

7.6 STORMWATER MANAGEMENT & WATER QUALITY

7.6.1 Existing Conditions

The existing site contains a stormwater management system consisting of three catch basins in the main parking area and an additional basin in the drive aisle along the access road. The basins connect to a series of drain manholes and flows are directed to an existing 24 inch drainline that discharges off site to Dorchester Bay. The runoff generated on site is not pretreated prior to discharge to the Bay.

7.6.2 Proposed Conditions and Practices

The redevelopment Project design proposes saving several existing mature trees located in a row along the northerly property line, and also adding large areas of new landscape trees, shrubs and ground cover that do not currently exist. This increase in landscaped area provides not only aesthetic appeal, but also results in a significant reduction in impervious area and corresponding decrease in the rate and volume of stormwater runoff. The use of permeable pavers at the drop-off area and in the front parking area (that doubles for use as the event plaza) allows rainfall to permeate through the pavement, essentially eliminating puddles from the surface and promoting direct infiltration into the ground, significantly reducing stormwater runoff volume, peak discharge rates and pollutant transport.

Standard bituminous concrete pavement is proposed for site access drives and parking spaces elsewhere through the site, with a conventional closed drainage collection system of deep sump hooded catch basins, drain manholes, high-density polyethylene (HDPE) pipe, and two Stormceptor water quality units to provide treatment. The stormwater design approach, in conformance with DEP Stormwater Standards, is to reduce runoff and improve water quality compared to existing conditions.

The combined 7,000 sf landscaped areas and permeable pavers result in a significant 15.5% reduction in impervious surface areas, from an existing impervious area of 107,300 square feet (91.1% of total site area) to 90,600 square feet (77% of total site area) in the proposed post-development condition.

Similar to existing conditions, runoff will be directed to a new stormwater management system consisting of a network of catch basins and drain manholes to capture and convey runoff in post development conditions. Both conventional and proprietary best management practices will be used to both manage runoff and provide water quality improvements. The Project will include deep sump catch basins, and hydrodynamic separators to collect and treat stormwater runoff generated on the site during storm events. Deep sump catch basins will have a 4-foot sumps below the outlet invert and include a hood over the outlet pipe to trap floatables and oil inside the structure. Stormceptor units or hydrodynamic separators are specialty manholes that swirl or direct water inside the unit in such a way as to separate the floatables and coarser sediments. The pipe network will tie into the existing 24 inch line and continue to discharge to Dorchester Bay through the same outfall as it does today. Since the Project will actually result in a reduction of impervious surface area and associated runoff, the stormwater volumes and flow rates discharging from the site's drainage system to the off-site BWSC drainage system will be reduced and therefore, no upgrades, in terms of increased capacity, are necessary to the BWSC drain pipe network or outfall.

7.6.3 Compliance with DEP Stormwater Management Standards

Improvements to the stormwater management system will meet the 2008 Massachusetts Stormwater Management Standards to the maximum extent practicable as required for redevelopment projects. See Appendix H Stormwater Management Report for compliance documentation with the DEP Stormwater Standards.

7.6.4 Water Quality

The existing stormwater management system does not require any upgrades in terms of capacity and in fact, the volume of runoff entering the system and discharging to Dorchester Bay will decrease from existing conditions due to the introduction of additional pervious surfaces, such as the permeable pavement and landscaped areas, which will allow for infiltration above and beyond existing conditions.

The Project will result in an improvement to the quality of stormwater runoff that discharges from the site and enters Dorchester Bay. The introduction of deep sump hooded catch basins and Stormcepter units will provide treatment of runoff for pollutants such as oil, grease and total suspended solids. The existing site conditions are such that the runoff is not currently treated prior to discharge.

7.6.5 Compliance with the EPA National Pollutant Discharge Elimination System Permit

In accordance with EPA NPDES Construction General Permit (CGP), construction activities that result in a total land disturbance of equal to or greater than one (1) acre, where those discharges enter surface waters of the U.S. or a municipal separate storm sewer system leading to a surface water of the U.S., are required to obtain coverage under the EPA's CGP (2012). In addition, Stormwater Management Standard 8 requires the preparation of a Stormwater Pollution Prevention Plan. A copy of the Project specific SWPPP will be provided in conjunction with the Notice of Intent filing with the Boston Conservation Commission. Site specific erosion prevention and sediment control measures are outlined in Section 9.8.

7.7 NOISE

7.7.1 Introduction

Tech Environmental, Inc., performed a noise study to determine whether the operation of the proposed Project will comply with the City of Boston Noise Regulations and the Massachusetts Department of Environmental Protection ("DEP") Noise Policy.

7.7.2 Noise Terminology

The unit of sound pressure is the decibel (dB). The decibel scale is logarithmic to accommodate the wide range of sound intensities to which the human ear is subjected. A property of the decibel scale is that the sound pressure levels of two separate sounds are not directly additive. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3-decibel increase (or 73 dB), not a doubling to 140 dB. Thus, every 3 dB increase represents a doubling of sound energy. For broadband sounds, a 3 dB change is the minimum change perceptible to the human ear. Table 7 gives the perceived change in loudness of different changes in sound pressure levels.[2]

Table 7. Subjective Effects of Changes in Sound Pressure Levels

Change in Sound Level	Apparent Change in Loudness
3 dB	Just perceptible
5 dB	Noticeable
10 dB	Twice (or half) as loud

Non-steady noise exposure in a community is commonly expressed in terms of the A-weighted sound level (dBA); A-weighting approximates the frequency response of the human ear. Levels of many sounds change from moment to moment. Some are sharp impulses lasting 1 second or less, while others rise and fall over much longer periods of time. There are various measures of sound pressure designed for different purposes. To establish the background ambient sound level in an area, the L_{90} metric, which is the sound level exceeded 90 percent of the time, is typically used. The L_{90} can also be thought of as the level representing the quietest 10

[2] American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1989 ***ASHRAE Handbook--Fundamentals*** (I-P) Edition, Atlanta, GA, 1989.

percent of any time period. Similarly, the L_{10} can also be thought of as the level representing the quietest 90 percent of any time period. The L_{10} and L_{90} are broadband sound pressure measures, i.e., they include sounds at all frequencies. The Leq, or equivalent sound level, is the steady-state sound level over a period of time that has the same acoustic energy as the fluctuating sounds that actually occurred during that same period.

Sound level measurements typically include an analysis of the sound spectrum into its various frequency components to determine tonal characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves, and typically the frequency analysis examines 10 octave bands from 32 Hz to 16,000 Hz.

The acoustic environment in an urban area such as the Project area results from numerous sources. Observations show that major contributors to the background sound level in the Project area include motor vehicle traffic on local and distant streets, highway traffic from Interstate 93, train and rail noise, pedestrians, and general city noises such as street sweepers and police/fire sirens. Typical sound levels associated with various activities and environments are presented in Table 8.

7.7.3 Noise Regulations and Criteria

Commonwealth Noise Policy

The DEP regulates noise through 310 CMR 7.00, “Air Pollution Control.” In these regulations “air contaminant” is defined to include sound and a condition of “air pollution” includes the presence of an air contaminant in such concentration and duration as to “cause a nuisance” or “unreasonably interfere with the comfortable enjoyment of life and property.”

Regulation 7.10 prohibits “unnecessary emissions” of noise. The DEP DAQC Policy Statement 90-001 (February 1, 1990) interprets a violation of this noise regulation to have occurred if the noise source causes either:

An increase in the broadband sound pressure level of more than 10 dBA above the ambient level; or A “pure tone” condition.

The ambient background level is defined as the L_{90} level as measured during equipment operating hours. A “pure tone” condition occurs when any octave band sound pressure level exceeds both of the two adjacent octave band sound pressure levels by 3 dB or more.

The DEP does not regulate noise from motor vehicles accessing a site or the equipment backup notification alarms. Therefore, the provisions described above only apply to a portion of the sources that may generate sound following construction of the Project.

Local Regulations

The City of Boston Environment Department regulates noise through the Regulations for the Control of Noise as administered by the Air Pollution Control Commission. The Project is located in an area consisting of commercial and residential uses. The Project must comply with Regulation 2.2 for noise levels in Residential Zoning Districts at these residential locations. Table 9 lists the maximum allowable octave band and broadband sound pressure levels for residential and business districts. Daytime is defined by the City of Boston Noise Regulations as occurring between the hours of 7:00 a.m. and 6:00 p.m. daily except Sunday. Compliance with the most restrictive nighttime residential limits will ensure compliance for other land uses with equal or higher noise limits.

Table 8. Common Indoor and Outdoor Sound Levels

Outdoor Sound Levels	Sound Pressure (μPa)[3]	Sound Level (dBA)	Indoor Sound Levels
	6,324,555	110	Rock Band at 5 m
Jet Over-Flight at 300 m		105	
	2,000,000	100	Inside New York Subway Train
Gas Lawn Mower at 1 m		95	
	632,456	90	Food Blender at 1 m
Diesel Truck at 15 m		85	
Noisy Urban Area—Daytime	200,000	80	Garbage Disposal at 1 m
		75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	70	Vacuum Cleaner at 3 m
Suburban Commercial Area		65	Normal Speech at 1 m
	20,000	60	
Quiet Urban Area—Daytime		55	Quiet Conversation at 1m
	6,325	50	Dishwasher Next Room
Quiet Urban Area—Nighttime		45	
	2,000	40	Empty Theater or Library
Quiet Suburb—Nighttime		35	
	632	30	Quiet Bedroom at Night
Quiet Rural Area—Nighttime		25	Empty Concert Hall
Rustling Leaves	200	20	Average Whisper
		15	Broadcast and Recording Studios
	63	10	
		5	Human Breathing
Reference Pressure Level	20	0	Threshold of Hearing

[3] μPa, or micro-Pascals, describes sound pressure levels (force/area). DBA, or A-weighted decibels, describes sound pressure on a logarithmic scale with respect to 20 μPa (reference pressure level).

Table 9. City of Boston Maximum Allowable Sound Pressure Levels (dB)

	Zoning Districts		
Octave Band (Hz)	Residential Daytime	 All Other Times	Business (Anytime)
32 Hz	76	68	79
63 Hz	75	67	78
125 Hz	69	61	73
250 Hz	62	52	68
500 Hz	56	46	62
1000 Hz	50	40	56
2000 Hz	45	33	51
4000 Hz	40	28	47
8000 Hz	38	26	44
Broadband (dBA)	60	50	65

7.7.4 Existing Conditions

7.7.4.1 Baseline Noise Environment

The acoustic environment in an urban area such as the Project area results from numerous sources. Observations show that major contributors to the background sound level in the Project area include motor vehicle traffic on local and distant streets, highway traffic from Interstate 93, train and rail noise, pedestrians, and general city noises such as street sweepers and police/fire sirens.

7.7.4.2 Noise Measurement Methodology

Existing baseline sound levels in the Project area were measured during the quietest overnight period when human activity and street traffic were at a minimum, and when the Project's mechanical equipment (the principal sound sources) could be operating. Since the Project's mechanical equipment may operate at any time during a 24-hour day, a weekday between 12:00 a.m. and 4:00 a.m. was selected as the worst-case time period, i.e., the time period when Project-related sounds may be most noticeable due to the quieter background sound levels. Establishing an existing background (L_{90}) during the quietest hours of the facility operation is a conservative approach for noise impact assessment and is required by the DEP Noise Policy.

The nighttime noise measurement locations are as follows (see the Figure 1 in the Appendix I):

- Location #1: 505 Old Colony Avenue
- UMass Boston Bayside Parking Lot (SE of Project site)

7.7.4.3 Measurement Equipment

Broadband (dBA) and octave band sound level measurements were made with a Bruel and Kjaer (B&K) Model 2250 environmental sound level analyzer, at each monitoring location, for a duration of approximately thirty minutes. The full octave band frequency analysis was performed on the frequencies spanning 16 to 16,000 Hertz. A time integrated statistical analysis of the data used to quantify the sound variation was also performed, including the calculation of the L_{90}, which is used to set the ambient background sound level.

The B&K model 2250 is equipped with a ½" precision condenser microphone and has an operating range of 5 dB to 140 dB and an overall frequency range of 3.5 Hz to 20,000 Hz. This meter meets or exceeds all requirements set forth in the ANSI S1.4 1983 Standards for Type 1 quality and accuracy and the State and City requirements for sound level instrumentation. Prior to any measurements, this sound analyzer was calibrated with an ANSI Type 1 calibrator that has an accuracy traceable to the National Institute of Standards and Technology (NIST). During all measurements, the B&K 2250 was tripod mounted at approximately five feet above the ground in open areas away from vertical reflecting surfaces.

7.7.4.4 Baseline Ambient Noise Levels

The nighttime sound level monitoring was conducted on Wednesday, November 12, 2014. Weather conditions during the sound surveys were acceptable to accurate sound level monitoring: the temperature was 52°F, the skies were overcast, and the winds were calm (i.e., less than 3 mph). The microphone of the sound level analyzer was fitted with a 3½" windscreen to negate any effects of wind-generated noise.

The nighttime sound level measurements taken in the vicinity of the Project Site reveal sound levels that are typical for an urban area. A significant source of existing sound at all locations is motor vehicle traffic on nearby highways and local streets, train and rail noise, and pedestrians.

The results of the nighttime baseline sound level measurements are presented in Table 10. The nighttime background L_{90} level ranged from was 44.1 dBA at Location #1 to 44.8 dBA at Location #2. The octave band data in Tables 5.9-4 show that no pure tones were detected in the nighttime noise measurements.

7.7.4.5 Overview of Potential Project Noise Sources

The mechanical systems for the proposed Project are in the early design stage. Typical sound power data for the equipment of the expected size and type for the Project have been used in the acoustic model to represent the Project's mechanical equipment. The sound levels from all potential significant Project noise sources are discussed in this section.

The design for the proposed Project is expected to include the following significant roof-top mechanical equipment:

- 171 ton cooling tower;
- 13,000 CFM package air handling; and
- Enclosed 55 kW emergency generator

Table 10. Nighttime Baseline Sound Level Measurements - November 12, 2014

Sound Level Measurement	Location #1 505 Old Colony Avenue 1:25 – 1:55 a.m.	Location #2 UMass Boston Bayside Parking Lot 2:05 – 2:35 a.m.
Broadband (dBA) Background (L_{90}) Octave Band L_{90} (dB)	44.1	44.8
16 Hz	54.0	52.9
32 Hz	52.8	55.0
63 Hz	50.5	54.1
125 Hz	47.0	52.8

Sound Level Measurement	Location #1 505 Old Colony Avenue 1:25 – 1:55 a.m.	Location #2 UMass Boston Bayside Parking Lot 2:05 – 2:35 a.m.
250 Hz	41.8	45.5
500 Hz	39.6	40.6
1000 Hz	40.6	39.7
2000 Hz	34.7	35.0
4000 Hz	22.6	28.1
8000 Hz	15.0	16.3
16000 Hz	12.2	12.1
Pure Tone	No	No

The equipment listed above, which will be located in a penthouse above the building roof of the 3rd floor level, was included in the noise impact analysis. The Project's traffic was not included in the noise analysis because motor vehicles are exempt under both the City of Boston and DEP noise regulations.

The sound generation profiles for the mechanical equipment noise sources operating concurrently under full-load conditions were used to determine the maximum possible resultant sound levels from the Project Site as a whole, to define a worst-case scenario. To be in compliance with City and DEP regulations, the resultant sound level must not exceed the allowable octave band limits in the City of Boston noise regulation and must be below the allowable incremental noise increase, relative to existing noise levels, as required in the DEP Noise Policy.

This sound level impact analysis was performed using sound generation data for representative equipment to demonstrate compliance with noise regulations. As the building design evolves, the sound generation for the actual equipment selected may differ from the values that were utilized for the analysis.

To minimize the sound level at nearby residences, the following noise mitigation specifications will be incorporated into the final engineering design of the Project, as necessary, to comply with the applicable sound level criteria:

- The emergency generator will be equipped with a weather protective enclosure with an industrial silencer for sound reduction.

7.7.5 Modeling Methodology

Future maximum sound levels at the upper floors of all existing residences bordering the Project, and at the nearest residential property lines, were calculated with acoustic modeling software assuming simultaneous operation of all mechanical equipment at their maximum loads.

The Cadna-A computer program, a comprehensive 3-dimensional acoustical modeling software package was used to calculate Project generated sound propagation and attenuation[4]. The model is based on ISO 9613, an internationally recognized standard specifically developed to ensure the highly accurate calculation of environmental noise in an outdoor environment. ISO 9613 standard incorporates the propagation and attenuation

[4] ***Cadna-A Computer Aided Noise Abatement Program***, Version 4.3

of sound energy due to divergence with distance, surface and building reflections, air and ground absorption, and sound wave diffraction and shielding effects caused by barriers, buildings, and ground topography.

The closest/worst-case sensitive (residential) location is to the southeast of the project area in the Harbor Point Apartments. This locations was selected based on the proximity of the equipment (smaller distances correspond to larger noise impacts) and the amount of shielding by other buildings (taller nearby residential locations will experience less shielding from the Project's rooftop mechanical equipment, which may result in larger potential noise impacts from the Project). This location is expected to receive the largest sound level impacts from the Project's rooftop mechanical equipment. It can be classified as a residential zone.

The sound level impacts from the Project's mechanical equipment were predicted at the closest residential location, as well as at the 10 Kemp Street Housing complex located off of Old Colony Avenue. Figure 1 in Appendix I shows the locations of the modeled noise receptors. Noise impacts at other nearby noise-sensitive locations (residences, parks, etc.) farther from the Project Site will be less than those predicted for these receptors.

7.7.6 Future Sound Level Project

The City of Boston and DEP noise standards apply to the operation of the mechanical equipment at the proposed Project. The details of the noise predictions are presented in Tables 11 and 12. The sound impact analysis includes the simultaneous operation of the Project's rooftop mechanical equipment. The predicted sound levels are worst-case predictions that represent all hours of the day, as the analysis assumes full operation of the mechanical equipment 24-hours a day. The typical sound level impacts from the mechanical equipment will likely be lower than what is presented here, since most of the mechanical equipment will operate at full-load only during certain times of the day and during the warmer months of the year, it is not likely that all of the mechanical equipment will operate at the same time. Sound level impacts at locations farther from the Project (e.g. other residences, etc.) will be lower than those presented in this report.

7.7.6.1 City of Boston Noise Standards

The noise impact analysis results, presented in Tables 11 and 12, reveal that the sound level impact at the noise-sensitive receptors will be between 38 and 42 dBA. Noise impacts predicted at all locations are in compliance with the City of Boston's nighttime noise limit (50 dBA) for a residential area. Note that sound levels from the Project will be below the residential nighttime limits at all times. The results also demonstrate compliance with the City of Boston, residential, non-daytime, octave band noise limits at all locations.

The Project will also easily comply with the City of Boston residential area noise limits at all surrounding commercial properties.

7.7.6.2 DEP Noise Regulations

The predicted sound level impacts at the noise-sensitive locations were added to the measured L_{90} value of the quietest daily hour to test compliance with DEP's noise criteria. Assuming the Project's mechanical noise is constant throughout the day, the Project will cause the largest increase in sound levels during the period when the lowest background noise occurs. Minimum background sound levels (diurnal) typically occur between 12:00 a.m. and 4:00 a.m.

As shown in Tables 11 and 12, the Project is predicted to produce a less than 2 dBA change in the background sound levels at all modeled locations. Therefore, the Project's worst-case sound level impacts during the quietest nighttime periods will be in compliance with the DEP allowed noise increase of 10 dBA. The noise predictions for each octave band indicate that the mechanical equipment will not create a pure tone condition at any location.

Table 11. Harbor Point Apartments (Location R1) - Estimated Future Level Impacts at Anytime

Octave Bands	Residential Nighttime Noise Standards	Maximum Predicted Sound Levels*
32 Hz	68	39
63 Hz	67	41
125 Hz	61	44
250 Hz	52	40
500 Hz	46	40
1000 Hz	40	38
2000 Hz	33	33
4000 Hz	28	23
8000 Hz	26	0
Broadband (dBA)	**50**	**42**
Compliance with the City of Boston Noise Regulation?		**Yes**

Sound Level Metric	Maximum Sound Levels* (dBA)
Existing Nighttime Background, L_{90} (Location # 2)	44.8
Project*	42.2
Calculated Combined Future Sound Level	46.7
Calculated Incremental Increase	+1.9
Compliance with DEP Noise Policy?	Yes

* Assumes full-load operation of all mechanical equipment.
Note: DEP Policy allows a sound level increase of up to 10 dBA.

Table 12. 10 Kemp Street Housing (Location R2) - Estimated Future Level Impacts at Anytime

Octave Bands	Residential Nighttime Noise Standards	Maximum Predicted Sound Levels*
32 Hz	68	35
63 Hz	67	38
125 Hz	61	40
250 Hz	52	35
500 Hz	46	36
1000 Hz	40	34
2000 Hz	33	28
4000 Hz	28	13
8000 Hz	26	0
Broadband (dBA)	**50**	**38**
Compliance with the City of Boston Noise Regulation?		**Yes**

Sound Level Metric	Maximum Sound Levels* (dBA)
Existing Nighttime Background, L_{90} (Location # 2)	44.1
Project*	37.6
Calculated Combined Future Sound Level	45.0
Calculated Incremental Increase	+0.9
Compliance with DEP Noise Policy?	Yes
* Assumes full-load operation of all mechanical equipment. Note: DEP Policy allows a sound level increase of up to 10 dBA.	

7.7.6.3 Conclusions

Sound levels at all nearby sensitive locations and at all property lines will fully comply with the most stringent City of Boston and DEP daytime and nighttime sound level limits, and the HUD design Noise Levels. This acoustic analysis demonstrates that the Project's design will meet the applicable acoustic criteria.

7.8 HAZARDOUS AND SOLID WASTES

Based on a review of the MassDEP Reportable Releases Lookup Waste Site Database, there are no documented hazardous wastes or contaminants pursuant to 21E listed at the project site. The occupants of the building do not generate hazardous waste. A Hazardous Material Building Survey was performed in 2014 which identified asbestos. Prior to demolition, asbestos containing materials will be abated in accordance with all applicable notification and work plan requirements and removed from the facility. The removal of this material will be overseen by an appropriate licensed professional and handled and disposed of in accordance with state and federal regulations.

Universal waste such as mercury containing lamps, light ballasts, and batteries will be recycled or disposed of at a licensed facility. Demolition debris that cannot be recycled will be disposed of at a licensed construction and demolition debris (C&D) landfill.

Interior or exterior blasting, chemical cleaning or lead paint removal will be completed in accordance with a permit to be issued by the Boston Air Pollution Control Commission per the City of Boston Environment Department Guidelines for Construction.

According to the Applicant and a review of the MassGIS Underground Storage Tank (UST) datalayer, there are no USTs located on the project site.

Operation Term Solid Waste Generation and Disposal

Operation term waste is generated by current uses including offices, eye care center, credit union and function hall. The waste stream generated by the offices, eye care center and credit union mainly includes paper, packaging materials such as cardboard boxes, bottles, cans, plastic ware, paper towels and cups, and mail. The function hall waste is similar to the office waste however it also includes a more diverse waste stream that also includes organic waste from food scraps.

Operation Term Measures to Promote Recycling

The current waste collection and disposal program includes the separation and pick up of recyclable materials at the BTUHWF facility, eye care center and credit union. Recycled items include paper (including newspaper, card board, white paper), aluminum and other metal cans, plastic and glass.

7.9 GROUNDWATER

The project site is not located within the Groundwater Conservation Overlay District (GCOD) of the Boston Zoning Code. Groundwater at the site is anticipated to vary from between 10 to 15 feet below the existing ground surface, corresponding to about Elevation +1 to Elevation +6 on the Boston City Base (BCB) datum.

Based on the proposed scope of construction and the anticipated depth of excavation for the building foundations consisting of pile caps and grade beams which is anticipated to extend to depths ranging from about 7 to 9 feet below the existing ground surface, impacts to the groundwater levels at adjacent properties and buildings are anticipated to be negligible.

Construction of the garage building foundations will consist of the installation of piles, excavation of pile caps, grade beams and an elevator pit. Excavation depths associated with excavation for foundations are anticipated to range from about 5 to 7 feet below the existing site ground surface levels. Based on the anticipated groundwater levels at the site, construction dewatering required during excavation of the building foundations is anticipated to consist of localized sumps in conjunction with on-site recharge of groundwater. Full-time dewatering is not anticipated, and is only anticipated to be required when localized areas of perched groundwater are encountered during excavation activities. In consideration of the location of the lowest level garage slab with respect to the surrounding finish grades, the garage's lowest level slab will be provided with underslab and perimeter foundation drainage to protect the below grade areas against groundwater intrusion. Continuous active pumping of groundwater is not anticipated to be required as part of the permanent/final building operation.

7.10 GEOTECHNICAL

The design concept includes the construction of an open air two-story concrete framed garage structure. The lowest level (or ground floor level) will be located about 2 to 4 feet below the existing ground surface surrounding the project site.

Based on a previous subsurface exploration program performed by McPhail Associates, LLC in the areas surrounding the Bayside Exposition Center, the existing ground surface is anticipated to be underlain by a miscellaneous fill soil typically varying in thickness from 10 to 15 feet. A highly compressible organic deposit, representative of the previous tidal flats, is anticipated to be present below the fill and vary from about 5 to 10 feet in thickness. Underlying the deposits of fill and organics, a 5 to 10-foot thick deposit of glacial outwash sand is anticipated to be present and overly an extensive deposit of marine clay known locally as Boston Blue Clay which is anticipated to extend to a depth of 120 feet or greater beneath the existing ground surface. The clay deposit is expected to be underlain by a dense deposit of glacial till which is typically plastered on the bedrock surface.

Foundation support for the proposed building structure is anticipated to consist of a deep foundation system. Based on the preliminary foundation loads and the anticipated subsurface conditions, end bearing piles installed into the glacial till and/or bedrock deposits or pressure injected footings installed into the marine sand layer in conjunction with concrete pile caps and grade beams are being considered. Based on the presence of the compressible fill and organic soil deposits located below the project site, the lowest level floor slab will be designed as a structural framed floor slab. The final foundation support system (the pile type) is currently under review and design based upon information obtained during the completion of the subsurface exploration program in early December 2014.

With respect to ground vibrations associated with the installation of pile supported foundations, the pile type used on this project is anticipated to consist of driven piles installed into the glacial till and/or bedrock deposits or PIFs which are installed into the marine sand deposits.

Pile driving procedures associated driven end bearing piles and PIFs will induce ground vibrations during their installation. The magnitude of these vibrations typically decrease with increased distance from the vibration source. If necessary, and to minimize potential adverse impacts to the adjacent buildings and utilities, each pile location could be pre-drilled to the surface of the organic deposit.

Ground vibration monitoring will be performed during the installation of the piles. In addition, a preconstruction condition survey will be performed of the buildings and below grade utilities surrounding the project site. Furthermore, settlement monitoring points will be installed as needed on the buildings and below grade utilities that abut the project site. These points will be monitored periodically during the pile installations.

The project's geotechnical engineer and construction contractor will work closely together throughout building construction to avoid adverse impacts on adjacent structures and utilities.

Prior to the determination of the pile type utilized on this project, the Applicant will initiate discussions with Owner's and/or tenants of the buildings and utilities that abut the project site. Furthermore, additional studies will be conducted during the final design phase to evaluate potential benefits and impacts of the various pile types.

To the greatest extent possible the excavated soil will be reused on-site as backfill around new foundations and as backfill below the new lowest level floor slab. Based on the proposed scope of construction temporary earth support along the perimeter of the site is not anticipated to be required.

To the extent necessary the Applicant will retain an appropriate licensed professional to manage the environmental aspects of the project, including on-site management and/or off-site disposal of excess soil encountered during construction, for compliance with the Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Contingency Plan (MA MCP).

8.0 ASSESSMENT OF OPERATION TERM IMPACTS & MITIGATION

8.1 ASSESSMENT OF OPERATION TERM IMPACTS

Impacts relative to the replacement project are limited to the proposed building and site improvements location partially (2 acres +/-) within filled tidelands jurisdiction and the entire Project (2.7 acres) within Land Subject to Coastal Storm Flowage.

The Project's GHG emissions will include: 1) direct emissions of CO_2 from natural gas combustion for space heating and hot water; 2) indirect emissions of CO_2 from electricity generated off-site and used on-site for lighting, building cooling and ventilation, and the operation of other equipment; and 3) transportation demand management measures to reduce CO_2 emissions from Project traffic.

8.2 MITIGATION FOR OPERATION TERM IMPACTS

Regardless of the layout on the site, the building footprint will be located within Chapter 91 jurisdiction because it bisects the Property and occupies approximately 70% of the Property. Also, the entire Property is within LSCSF and there are no alternatives that would be located outside of the food zone.

The Applicant will redevelop the Property with a sustainably designed building and will provide an anchor for future redevelopment of the former Bayside Expo Center. The Project will include numerous benefits to the neighborhood and the City of Boston, including the following mitigation elements:

- Replacement of a deteriorating obsolete building with an architecturally creative building that will enhance the surrounding area;
- Creation of approximately 380 yearly construction jobs during the Phase I building construction;
- Creation of approximately 152 yearly construction jobs during the Phase II garage construction;

- Increase property taxes levied due to higher appraisal value than the currently functionally obsolete building;
- Provisions for a new public walkway, capable of connection to future sidewalks on adjacent property, to provide an additional means of pedestrian access to the DCR property and the waterfront;
- Provisions for three public benches adjacent to the new public walkway;
- Provisions for three parking spaces dedicated to public use;
- Bicycle racks for public use;
- Removal of the fence between the Project Site and Carson Beach thereby visually and physically connecting the site to the adjacent parkland;
- Installation of lighting and landscaping to improve the appearance of the neighborhood in conformity with potential future development under the Columbia Point Master Plan;
- Introduction of permeable pavement and reduction of impervious surface to promote on-site stormwater recharge and reduce stormwater runoff from the site;
- Meet the requirements of Article 37 of the Boston Zoning Code with a goal of achieving the Silver level (with a concerted effort to meet Gold) of the Leadership in Energy and Environmental Design (LEED) for New Construction rating system.
- Designed to create an active edge to the public spaces along Boston's HarborWalk through a number of design strategies:
  - Interior and exterior spaces are laid out to create synergies between Carson Beach and the events and activities held within the building.
  - Pre-function spaces for the meeting halls and conference spaces form a transparent edge to the public parks.
  - A landscaped outdoor event hard-scape and public path connecting to the HarborWalk is planned for the area between the Carson Beach lawn and the building.
  - The north and west facades are treated with windows and materiality that engage the public space and are appropriately proportioned for distant as well as close views of the building.

8.3 GREENHOUSE GAS MITIGATION

The Greenhouse Gas Mitigation Alternative will reduce overall Project energy use (stationary sources) by 23.7% and will reduce stationary source CO2 emissions by 23.8%, compared to the Base Case. Greenhouse Gas emissions for the Project will be reduced by the following building design and operational energy efficiency measures (EEMs):

- Using higher efficiency windows and building envelopes;
- Providing demand control ventilation in the meeting hall space of approximately 15,000 sf;
- Providing daylighting controls;
- Specifying high-efficiency heating and cooling system;
  - Using interior lighting systems with a lower light power density;
  - Sealing, insulating, and testing HVAC supply ducts;
  - Employing light-colored membrane roof (cool roof);
  - Using LED exterior lighting;
  - Designing the parking garage for natural ventilation to the extent allowable by code;
  - Installing Energy Star electrical appliances in kitchen and office areas;
  - Using Energy Star computers and other equipment; and
  - Setting aside solar-ready roof space either on the new building or the new parking garage for a possible third party photo-voltaic (PV) installation.

9.0 ASSESSMENT OF CONSTRUCTION TERM IMPACTS & MITIGATION

9.1 AIR QUALITY

DEP regulations at 310 CMR 7.09 require mitigation measures to minimize potential air quality impacts associated with construction activities. Such impacts include those resulting from the demolition of existing structures, open soil and excavation activities, transport of materials, operation of construction vehicles and other powered equipment, and the use of volatile chemicals for construction activities. There are two primary categories of potential air quality impacts from construction activities at the Site. These are impacts associated with diesel emissions from construction equipment and impacts from fugitive dust generated by construction activities. Both of these will be well controlled during construction at the Site and these mitigation measures are addressed with diesel emissions impacts in this section and with dust suppression measures in the following section.

To reduce potential impacts from diesel construction equipment emissions, the Applicant proposes that contractors associated with the construction of the Facility adopt the goal of compliance with the DEP's Clean Air Construction Initiative. The main requirements of the Clean Air Construction Initiative that will be applied to the project are:

All contractors shall use ultra-low sulfur diesel ("ULSD") fuel in diesel-powered non-road vehicles.

All non-road engines used on the construction site shall meet the applicable non-road engine standard per 40 CFR 89.112 or 40 CFR 1039 (as applicable).

All contractors shall turn off diesel combustion engines on construction equipment not in active use and on dump trucks that are idling for five minutes or more while waiting to load or unload materials.

All contractors shall establish a staging zone for trucks that are waiting to load or unload materials at the work zone in a location where diesel emissions from the trucks will not be noticeable to the public.

With implementation of the mitigation measures discussed above combined with additional fugitive dust control measures addressed in the following section, it is expected that the demolition and construction will result in no adverse air quality impacts to any of the areas surrounding the site.

In accordance with the City of Boston Environment Department Guidelines for Construction, the following practices will be employed during demolition activities:

- Dumpsters will be covered and sprayed with water to keep debris wet;
- Sidewalks and streets used by the public will be kept broom-clean at all times; a vacuum truck may also be used on larger paved areas;
- Construction netting will be installed over windows to allow airflow but trap dust; and
- Trucks carrying debris or other material off site will be covered per MGL Ch. 85 Section 36;

See Section 9.8, Construction Term Erosion Prevention and Sediment Control for measures to be employed during construction activities.

9.2 DUST SUPPRESSION

In order to prevent pollutants from being discharged to the atmosphere and into surface waters to the extent feasible, dust generation and off-site tracking of dust will be minimized through the appropriate application of water or other dust suppression techniques. Dust suppression consists of various means and methods of preventing soil erosion by wind. During all phases of the project generation of dust must be minimized to prevent air and water pollution as well as minimize risks to human health. Any sand blasting operations that may be required at the site will use containment or “dustless” systems. Dust suppression methods are also required by the EPA CGP and will be included in the project Stormwater Pollution Prevention Plan.

During the demolition phase of the Project, the following specialized dust control measures for demolition are expected to be used:

- Pre-cleaning of large surfaces and structural members to remove large concentrations of dusting materials prior to demolition
- Water suppression sprays and misting of potential dust-creating situations to prevent spreading of airborne particulates.
- Enclosure of areas with tarps and screening when necessary to prevent the migration of dust.

Earthmoving activities are the primary source of dust generation during construction, but traffic on unstabilized access roads and sediment transport by wind blowing across exposed soil surfaces can also be contributing factors. The most effective dust control practices for preventing wind erosion involve temporary or permanent stabilizing of exposed soils. However, where soil stabilization is not practical, techniques that increase soil moisture and encourage the formation of soil clods, or that reduce wind velocity at the soil surface, are also effective.

The following specialized dust control measures for construction are expected to be used at the Site:

- Watering/Irrigation: Operation of water trucks to wet the ground surface with water until it is moist.
- Soil Stabilization: Vegetative cover, mulch, riprap, pavement or any method that covers the soil surface and reduces the potential for soil particles to become airborne.
- Wind Breaks: Barriers (either natural or constructed) that reduce wind velocity across exposed soil surfaces and reduce the potential for soil particles to become airborne. Wind breaks can be trees or shrubs left in place during site clearing, or constructed barriers such as a wind fence.

In addition to these measures during construction, for demolition activities, in accordance with the City of Boston Environment Department’s Guidelines for Construction, dust control measures to be employed during demolition will be included in the project specifications for bidding and include the following: dumpsters must be covered and sprayed with water to keep debris wet; sidewalks and streets will be kept broom clean at all times and regenerative sweeper and water truck used if sediment track out occurs; and trucks carrying demolition debris off site will be covered.

9.3 EQUIPMENT NOISE GENERATION AND MEASURES TO MINIMIZE IMPACTS

Demolition and construction activities will result in a temporary increase in sound levels near the Site. The demolition and construction process will require the use of equipment that will be audible from off-site locations during certain time periods. Project construction consists of demolition, excavation, foundation work, steel erection, and finishing work. Work on these phases will overlap. No blasting will be performed on the Site.

The noise levels resulting from construction activities vary greatly depending on such factors such as the type of equipment, the specific equipment model, the operations being performed, and the overall condition of the equipment. Although there are no sensitive receptors such as residential areas abutting the project, there are active/passive recreation areas associated with DCR owned Carson Beach abutting to the north and east. Actual received sound levels will fluctuate, depending on these factors and others including equipment type, and separation distances between source and receiver. Reasonable efforts will be made to minimize the impact of noise resulting from construction activities and pile driving. The following noise mitigation measures are planned:

- Construction equipment used on the site will comply with the construction hour limits specified by the City of Boston.
- Construction site and access road speed limits will be established and enforced during the construction period;
- All noise-producing construction equipment and vehicles using internal combustion engines will be equipped with mufflers maintained in proper working order;
- Noisy equipment on-site will be located as far as possible from sensitive receptors; and
- Engine housing panels on all equipment will be kept closed.

9.4 STAGING AREAS AND WORKER PARKING

During the demolition and construction phase of the Project, the entire Site will be an active construction zone with equipment operating throughout the 2.7 acre Site. Due to the limited size of the site, select areas will be dedicated for certain uses taking into consideration the active work zone and access. The location of temporary construction laydown, equipment storage and construction worker parking will shift as the demolition and construction progresses. Worker carpooling from the construction yards will be encouraged. In addition, the JFK/UMass MBTA Station is located approximately one-half mile northwest of the Site and workers will be encouraged to use public transportation due to the limited parking/laydown/demolition shared uses.

9.5 CONSTRUCTION SCHEDULE AND OPERATING HOURS

As presented in Table 3 major activities are expected to occur beginning September 2015 and conclude with the construction of the Phase II garage in early 2018. The City of Boston Noise and Work Ordinance dictates construction between the hours of 7 am and 6 pm Monday through Friday. Any work outside of these hours requires a permit from the Inspectional Services Department.

9.6 ACCESS ROUTES FOR TRUCKS AND VOLUME

BTUHWF will apply to DCR for permission to use the access way from Day Boulevard. If granted construction vehicles conveying demolition debris will utilize access from Day Boulevard; construction equipment importing materials to the Site will utilize the same route. Estimated volume of construction traffic is based on the importation of fill in order to raise the site above the flood zone and projected SLR. It is estimated that approximately 225 trucks will be hauling fill material to the Project site.

9.7 DEMOLITION METHOD AND CONTROLS

The Proponent intends to develop a demolition and construction waste management plan. In general, relatively high proportions of construction waste can be recycled, but the percentage is dependent on the types and relative amounts of materials used in construction. Construction waste will be sorted on site in accordance with the waste management plan. Plans will be developed with a minimum recycling/reuse goal of 50%.

Re-use of crushed asphalt, brick, or concrete may proceed without a Beneficial Use Determination (BUD) if the materials are not coated or otherwise impacted with potential contaminants. The project will consider a BUD for the reuse of masonry materials such as brick and concrete generated during dismantlement of the current facility, if such materials are uncoated.

Recycling of materials generated in both the construction and demolition processes will be implemented wherever possible. From a demolition perspective, the Proponent will seek to reuse materials and equipment where practicable (whether on-site or through sale to end users) and, where it is not practicable, to recycle such materials. The Proponent will have as a goal the LEED certification, a process that puts a heavy emphasis on reduction, reuse and recycling of materials.

9.8 EROSION PREVENTION AND SEDIMENT CONTROL

A SWPPP will be prepared describing the specific practices, installation methods and inspection requirements for temporary and permanent erosion and pollution prevention and sediment control practices. The practices to be included in the SWPPP to be filed in conjunction with the Notice of Intent filing with the Boston Conservation Commission will include the following measures:

- Minimize the extent and time of exposed soils;
- Provide perimeter sediment control, including silt fence and/or compost filter tubes;
- Provide catch basin inlet protection including geotextile filter fabric;
- Minimize sediment track out with stabilized construction exits and street sweeping;
- Control discharges from soil stockpiles include temporary erosion measures and perimeter sediment controls;
- Minimize dust by the use of water trucks;
- Use of wet saws for brick and masonry cutting.
- Provisions for dedicated concrete washout areas;
- Provide temporary storage of runoff, including sediment traps and linear sediment trenches;
- Provisions for dewatering including sediment tanks, geotextile filter bags;
- Stabilization requirements for soils exposed for more than 14 days;
- Good housekeeping pollution prevention measures, including secondary containment and storage of materials under cover;
- Maintenance requirements including repair/replacement criteria for sediment controls;
- Temporary and permanent stabilization requirements, including mulching and seeding; and
- Recordkeeping/inspection requirements.

A kick off meeting will be held by the stormwater team including the SWPPP preparer, project operators (owner of plans and specifications (Applicant) and the entity in charge of day to day activities responsible for implementing the SWPPP (contractor) to review the SWPPP and conditions required by the CGP.

9.9 RODENT CONTROL

In accordance with the City of Boston Ordinance City Ordinance Article 16, Section 31, Rodent Inspection Prevention Measures at Construction Site, no building permit shall be issued for renovation, conversion, or new construction until the applicant shows evidence that the premises have been treated for, or are free from insects and rodents in compliance with all applicable codes. The contractor/applicant shall be held responsible for corrective measures should the construction, renovation or conversion work cause infestation to immediate abutters. The applicant will provide such documentation to the City Inspectional Services Department prior to the start of demolition activities.

9.10 PUBLIC SAFETY MEASURES

The project construction documents will include provisions for maintenance of access to the surrounding property owned by UMass. In addition, specifications will include provisions for material staging, laydown and access that will not interference with users of adjacent parkland.

9.11 COORDINATION WITH OTHER CONSTRUCTION PROJECTS

According to the Boston Redevelopment Authority's web site, there are two projects located within the Project vicinity. The expansion of the Bayside Doubletree Hotel is under review by the Authority and the University Place Residences project was approved by the Authority.

10.0 TRANSPORTATION / ACCESS

10.1 INTRODUCTION

The proposed project includes the replacement of the site's existing 32,500 gsf building with a new 52,469 gsf building. Under Phase I of the Project, the proposed building will be supported by 135 at-grade parking spaces. Phase II entails the construction of a parking structure which would increase the on-site parking supply from 135 spaces to 308 spaces (an increase of 173 spaces). The site's single building is presently occupied by the BTUHWF offices, BTU offices, an eye care center, a credit union and approximately 13,000 s.f. of function space. The function area is used by the BTUHWF and BTU for its monthly member meetings and rented to members for personal events. There are approximately 35 employees in the building. These uses and events will be the same in the new building. No new building uses or additional employees are anticipated. Therefore, the additional 19,969 gsf of building area is not anticipated to increase site trip generation or parking requirements, and as such, impact analyses of the Project on the local transportation systems were not conducted.

The Boston Transportation Department (BTD) requested that existing peak hour trip generation and parking demand be established for the existing site as a means to understand the site's traffic characteristics as it will be the same as for the new building. This section provides details regarding site access/circulation, a summary of the traffic and parking characteristics of the site, and concludes with proposed traffic mitigation measures.

10.2 VEHICLE ACCESS AND CIRCULATION

10.2.1 Existing Conditions

The main entrance to the existing site is via an access road which forms a T-intersection with the east side of William J. Day Boulevard approximately 800 feet east of Kosciuszko Circle. Both William J. Day Boulevard and the access road are under the jurisdiction of the Massachusetts Department of Conservation and Recreation (DCR). BTUHWF had a lease allowing use of the 36-foot-wide two way traffic flow access road and currently plans to pursue a license from DCR to continue that use. A six-foot wide bituminous concrete sidewalk is located along the easterly side of the road which connects to the existing William J. Day Boulevard sidewalk. Access to the MWRA Odor Control Facility is also provided from the access road.

The site connects to the UMass property at four locations including two at the 25 foot right-of-way located just south of the northerly property line (ROW Driveway) and two curb cuts located at the southwest and southeast corners of the site's existing parking lot. The existing vehicular site access and circulation are shown on Figure 10-1.

10.2.2 Proposed Conditions

Access. With DCR approval, the access road from Day Boulevard will continue to be used by the BTUHWF as its primary access point until the roadway network described in the Columbia Point Master Plan is constructed (see Section 5.1– Consistency with CPMP). Access between the site and the UMass parking areas will continue at both ends of the ROW Driveway and via the southwesterly curb-cut. The existing southeasterly curb-cut will be closed. The primary access/egress points of the proposed parking structure, developed in Phase II, will be via two entrances located on the structure's west side.

As noted in Section 5.0, the site is designed to accommodate "New Street" as discussed and illustrated in the Columbia Point Master Plan. New Street, when constructed, would provide a direct connection from Mount Vernon Street, through the UMass property to William J. Day Boulevard. It would have a north-south orientation and will parallel the westerly façades of the proposed building and parking garage.

Circulation. On-site circulation is accommodated by 24-foot-wide driveways running along the north side of the proposed building (ROW Drive) and along the westerly property line. The access road forms an unsignalized T-intersection with the north side of ROW Drive. A one-way drop off/pick-up area is provided at the main entrance to the building. The proposed vehicular site access and circulation are shown on Figures 10-2 and 10-3 for Phase I and Phase II, respectively. Both figures show an outline of the "New Street" proposed in the Columbia Point Master Plan.

10.3 PEDESTRIAN AND BICYCLE CIRCULATION

10.3.1 Existing Conditions

Sidewalks are located along the northerly façade of the existing building and along the easterly side of access road. There is no connection to the existing Boston HarborWalk, located on Old Harbor Park Reservation which abuts the BTUHWF site. In general, pedestrian and bicycle circulation is not well defined on the existing site.

10.3.2 Proposed Conditions

As shown on Figures 4-1, 4-2 and 4-3, the proposed site design includes a new sidewalk along its northerly property line. The 8 foot- wide sidewalk will connect to the existing sidewalk located on the access road. This segment of sidewalk allows for future east/west pedestrian links to the HarborWalk.

The site's driveways, designed as low speed facilities, will accommodate both automobiles and bicycles. Crosswalks are proposed on-site at the northerly and easterly approaches to access road/ROW Drive intersection. The entrances to the proposed building are located on the north and south façades. A sidewalk will be provided adjacent to the main entrance, located on the north side of the building, and between the south side of the building and the parking area.

10.4 LOADING AND SERVICES

10.4.1 Existing

Along the south side of the existing building is a 40-foot-wide concrete surface which provides access to the rear of the building. Deliveries are made through the front and rear doors. There are no loading docks servicing the existing building.

10.4.2 Proposed

The new building is designed with a 25' by 25' loading area located at the southwest corner of the building. All services including trash, recycling and deliveries will occur on-site in this area. Access to the loading area is by the existing William J. Day Boulevard, the access road and the 24-foot-wide interior roadway which parallels the westerly property line.

10.5 PUBLIC TRANSPORTATION

The site is located within walking distance (one half mile) of the MBTA JFK/UMass Station located on Old Colony Avenue. Services provided at this station are summarized in Table 13. BTUHWF is committed to increasing its employee's use of public transportation as discussed below in Section 10.7. However, as the number of BTUHWF employees is small (approximately 35), it is unlikely that the project will have a perceivable impact on transit services.

Table 13. Public Transportation (Weekdays)

	Morning		Afternoon	
Transit Line/Bus Route	Inbound (NB)	Outbound (SB)	Inbound (NB)	Outbound (SB)
Commuter Rail Lines (Schedules)				
Greenbush Commuter Rail Line-	6:30 a.m. 7:28 a.m.	-	-	4:08 p.m. 5:26 p.m.
Kingston/Plymouth Commuter Rail Line	6:10 a.m. 6:21 a.m. 7:48 a.m. 8:03 a.m. 8:11 a.m. 8:28 a.m. 8:58 a.m.	-	-	3:57 p.m. 4:53 p.m. 5:25 p.m. 5:51 p.m. 6:11 p.m.
Middleborough/Lakeville Commuter Rail Line	6:10 a.m. 6:21 a.m. 7:48 a.m. 8:03 a.m. 8:11 a.m. 8:28 a.m. 8:58 a.m.	-	-	4:26 p.m. 5:06 p.m. 6:03 p.m.
Red Line and Bus Lines (Headways in Minutes)				
Red Line	5	9	12	12
Bus Route 5, (City Point – McCormack Housing)	20	10 to 20	24	24
Bus Route 8, (Harbor Point/U-Mass – Kenmore)	14	25 to 30	14	25 to 30
Bus Route 16, (Forest Hills Station – Andrew or	17	17	21	20
Bus Route 41, (Centre @ Eliot Sts. – JFK/UMass	20 to 25	20 to 25	20 to 25	30

10.6 VEHICULAR TRAFFIC

The uses and events accommodated in the existing building will be the same in the new building. No new building uses or additional employees are anticipated. Therefore, the existing and proposed trip generation for the site is the same. Trip generation, vehicle occupancy and mode split for the site was established for a normal day (no events and based on 35 employees), during a typical event (BTUHWF's monthly member's meeting) and during a large event (BTUHWF retiree's luncheon) by conducting traffic counts at the site. The traffic count data and trip generation calculations are provided in Appendix J.

10.6.1 Traffic Generation

Normal Day. Traffic counts were performed on Wednesday, November 19, 2014 to establish trip generation for a "normal" day. The counts were obtained from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. to capture the periods when the building would generate its highest level of traffic. A summary of the peak hour trips for the existing building are provided in Table 14. As seen in the table, normal operations at the BTUHWF facility generate approximately 20 trips during the morning peak hour and 40 trips during the afternoon peak hour.

Table 14. Trip Generation - Normal Day

Time Period	In	Out	Total
Morning Peak Hour, (8:00 a.m. to 9:00 a.m.)	17	2	19
Afternoon Peak Hour, (4:00 p.m. to 5:00 p.m.)	18	22	40

Typical Event. Similar to the existing building, the proposed facility includes approximately 13,409 s.f. of function hall space. These halls are used by BTUHWF and BTU for monthly meetings and can be rented by BTUHWF and BTU members for personal events. Traffic counts were conducted during the BTU monthly meeting held on Wednesday, December 10, 2014. BTUHWF indicated that approximately 250 teachers attended the meeting which started at 4:15 p.m. and ended approximately at 5:15 p.m. The counts were obtained from 3:00 p.m. to 8:00 p.m. A summary of the peak hour trips for the typical event are provided in Table 15.

Table 15. Trip Generation - Typical Event

Time Period	In	Out	Total
Arrival Peak Hour, (3:30 p.m. to 4:30 p.m.)	190	69	259
Departure Peak Hour, (4:45 p.m. to 5:45 p.m.)	59	150	209

Large Event. The largest event held at the BTUHWF building is the annual retirees' luncheon. This event which is held once a year, draws approximately 600 to 800 retired teachers and is typically held in November. This year the event was held on Thursday, November 20, 2014 from 11:00 a.m. to 1:00 p.m. and included 602 attendees. Traffic counts were conducted at the site from 10:00 a.m. to 2:00 p.m. to determine the event's trip generation. Although the luncheon officially ended at 1:00 p.m., the attendees didn't begin leaving the site until approximately 2:00 p.m. Thus, the departure peak hour was not captured by the traffic counts. It is reasonable to assume that the total trips generated by the site during the event's departure peak hour would be approximately the same as measured during the event's peak arrival hour. A summary of the peak hour trips for the large event are provided in Table 16.

Table 16. Trip Generation - Large Event

Time Period	In	Out	Total
Arrival Peak Hour, (10:15 a.m. to 11:15 a.m.)	352	46	398
Departure Peak Hour, (2:00 p.m. to 3:00 p.m.)*	45	350	395

*Estimated based on Arrival Peak Hour

10.6.2 Vehicle Occupancy

Based on the number of BTUHWF employees, the number of event attendees provided by the BTUHWF and based on parking count data (see Section 10.7) vehicle occupancy is approximately one person/vehicle on normal days and during the monthly BTUHWF meeting (typical event). For the retiree's luncheon held on November 20, 2014, the vehicle occupancy was measured at approximately 1.3 persons/vehicle. These vehicle occupancy rates are not expected to significantly change once the BTUHWF occupies their new facility.

10.6.3 Mode Split

Approximately 35 employees work in the existing BTUHWF building. BTUHWF estimates that approximately 95 percent of employees drive alone to work and 5 percent use public transit. The employees live in 22 different communities and 80 percent live outside of Boston.

For the monthly BTU meetings (typical event) held in the late afternoon, teachers arrive from school and drive alone. For large events attendees are more likely to carpool as indicated by the measured vehicle occupancy at the recent retiree's luncheon of 1.3 persons/vehicle.

Mode share is not expected to significantly change once the new facility is constructed. However, in the future the BTUHWF will encourage alternative transportation modes by designating an employee transportation coordinator, posting MBTA schedules, providing covered and secure bicycle storage, providing lockers and showers, and by offering emergency ride home programs and a carpool matching program.

10.6.4 Project Impact to Transportation Systems

The project is not anticipated to impact local or regional transportation systems as the project will not generate new trips and changes are not proposed to existing site connections to the street system.

10.7 PARKING SUPPLY AND DEMAND

The site presently includes 140 at-grade parking spaces with no adjacent on-street parking. The site is abutted on its easterly and westerly boundaries by parking lots owned and maintained by the University Massachusetts (UMass) Building Authority. The UMass Boston Bayside Lot parking lot located to the east and south of the site provides approximately 1,300 parking spaces while the parking area along the westerly boundary provides approximately 120 spaces.

Based on an access agreement with UMass, BTUHWF currently has access to these adjacent parking areas, based on availability, for overflow parking for special events. However, UMass has indicated, in the future, it may develop the parking areas currently used by BTUHWF for special event parking.

Phase I of the site development will provide 135 at-grade parking spaces, including five handicapped spaces, three spaces for public use and a duel charging station. The site presently includes 140 at-grade spaces, therefore there is a reduction of five parking spaces over existing conditions between Phases I and II.

Phase II entails the construction of a three-level parking structure, including a ground level and two upper levels. With the structure, the Project will provide 308 parking spaces including 29 surface parking spaces and 279 spaces within the confines of the structure (76 spaces on the ground level, 100 spaces on level one and 103 spaces on level two).

As far as building uses, the number of employees and type of events held within the function area are not anticipated to change with the transition from the existing building to the new facility; the requirement for parking will not change and can be estimated from existing conditions. Therefore, to establish the parking demand/requirements for the new facility, parking counts were conducted at the site on five separate occasions including two counts on a normal day, a count during a typical event and one count during a large event.

BTU members meetings are held monthly and are considered typical of the types of events held at the BTUHWF facility. Counts were obtained during the November monthly meeting. The largest event held at the building is the annual retiree's luncheon which occurs in November and counts were conducted during this event. The count data along with the number of employees or attendees is summarized in Table 17. The data indicates that on a normal day, the parking demand is approximately 45 spaces, during a typical event is approximately 250 spaces and during a large event 460 spaces.

Phase I of the project, with 135 surface parking will accommodate the normal daily demand of approximately 45 parking spaces and small events held in the facility's function spaces. The existing UMass parking lots adjacent to site will continue to be used during events, as available and as allowed per the existing easement agreement.

Table 17. Parking Demand

Time Period	Occupied Parking Spaces	Employees/Attendees
Normal Day (no events)		
Wednesday, 11/12/14 at 1:30 p.m.	43	50
Wednesday, 11/19/14 at 10:00 a.m.	46	50
Typical Event (BTUHWF Monthly Meeting)		
Wednesday, 11/12/14 at 4:45 p.m.	251	250
Large Annual Event (Retirees Luncheon)		
Thursday, 11/20/14 at 12:00 p.m.	467	602

Construction of the new parking structure under Phase II of the project would enable BTUHWF to accommodate the parking demand of a typical event. However, the site will not accommodate parking requirements for large events. BTUHWF will develop a parking management plan for large events such as the annual retiree's luncheon.

10.8 TRANSPORTATION MITIGATION MEASURES

BTUHWF is committed to implementing a Transportation Demand Management plan to reduce vehicular traffic by encouraging the use of alternative transportation modes by its employees and event attendees. TDM measures may include the following elements:

Designate an Employee Transportation Coordinator. The BTUHWF will designate an employee who will post MBTA schedules, assist employees with setting-up carpools and establish an emergency ride home program for employees that carpool or use public transit.

Participate in NuRides Program. Encourage use employees to participate in MassRIDES' NuRide program which rewards employees that use alternative transportation modes.

Bicycle and Pedestrian Accommodations. The project includes bicycle accommodations in the form of interior and exterior (covered and secure) bicycle storage and on-site locker rooms/showers. The site's driveways, designed as low speed facilities, will accommodate both automobiles and bicycles.

Transit. Each department within the BTUHWF will provide a commuter information center. Maps and schedules for the MBTA commuter rail/subway/bus services will be posted in the commuter information center and on the BTUHWF website. Public transportation will be promoted to event attendees by posting a link the MBTA's website on electronic invitations to events held at the BTUHWF facility. BTUHWF will evaluate the possibility of providing pre-tax sale of transit passes.

Join the local TMA. Although a TMA does not presently exist for Columbia Point, the BTUHWF would be interested in joining a TMA when one is established for Columbia Point.

Construction Management Plan. The BTUHWF will submit a Construction Management Plan (CMP) for review and approval by the BTD. The plan will include details related to schedule, number of workers, parking, staging and delivery routes.

Transportation Access Plan Agreement (TAPA). The BTUHWF will submit a TAPA for review and approval by the BTD. The TAPA will summarize the site's access/circulation plan and the project's mitigation commitments.

11.0 URBAN DESIGN

In terms of architectural compatibility and enhanced sub-district features, the building is designed to reinforce the surrounding urban space in a number of ways. The building's internal layout, exterior hierarchy and site strategies all support its compatibility with the surrounding area. The urban area surrounding the proposed project consists of two distinct sets of characteristics. South of the site lies the former Bayside Expo Center and its surrounding parking, largely a vehicular focused environment with little architectural character and few pedestrian amenities. North of the site lies Carson Beach and its associated lawns, HarborWalk system and public recreation spaces. The building is situated and articulated to reinforce the public space and pedestrian environment of Carson Beach and create a compatible architecture with the northern, public edge. It does so in the following ways.

Architectural Compatibility and Enhanced Sub-District Features:

- The building's massing steps down to the Carson Beach lawn allowing a smaller scale facade to define the edge of the adjacent green space;
- A new public path is proposed at the sites northern edge that will connect to and extend the HarborWalk into the surrounding neighborhood when continued on adjacent parcels;
- The proposed project's northern edge will be landscaped to "soften" the current edge of the site which is now bound by a chain-link fence;
- The most active/open spaces of the building reinforce the adjacent public spaces by "lining" the front of the building;
- An "event plaza" is located between the building and the Carson Beach Lawn reinforcing the activity and vitality of the public park; and
- The landscape will be designed to integrate the native and resilient plantings of the adjacent HarborWalk creating a seamless link to the ocean's tidal environment.

Augmenting the Pedestrian Environment:

- The building is held back from the property edge to respect existing easements and minimize the shadowing of adjacent public green spaces;
- Site lighting and the placement of public building spaces along new pedestrian ways will help to create a safe environment on the project site; and
- The majority of parking is situated at the back of the building away from the adjacent park helping to reinforce the pedestrian focused environment.

12.0 CLIMATE CHANGE PREPAREDNESS/ RESILIENCY/LEED

12.1 CLIMATE CHANGE PREPAREDNESS

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

The expected life of the Project is anticipated to be approximately 50 years. Therefore, the Proponent planned for climate change conditions projected at a 50-year time span. A copy of the completed checklist is included in

Appendix L. Given the preliminary level of design, the responses are also preliminary and may be updated as the Project design progresses.

Extreme Heat Events

The Intergovernmental Panel on Climate Change (IPCC) has predicted that in Massachusetts the number of days with temperatures greater than 90°F will increase from the current five- to-twenty days annually, to thirty-to-sixty days annually [5]. The Project design will incorporate a number of measures to minimize the impact of high temperature events, including:

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

Energy modeling for the Project has not yet been completed; however, as indicated on the LEED Checklist, the Proponent will strive to reduce the Project's overall energy demand and greenhouse gas emissions that contribute to global warming. The Project's proposed TDM program described in Section 10.8 will also help to lessen fossil fuel consumption.

Rain Events

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

- Increasing pervious surfaces through the introduction of landscaped areas and permeable pavers;
- Reducing stormwater runoff from the 2, 10, 25 and 100 year 24-hour design storm event compared to existing conditions.

Drought Conditions

Under the high emissions scenario, the occurrence of droughts lasting one to three months could go up by as much as 75% over existing conditions by the end of the century. To minimize the Project's susceptibility to drought conditions, the landscape design is anticipated to incorporate native and adaptive plant materials. Aeration fixtures and appliances will be chosen for water conservation qualities, conserving potable water supplies. In public areas, sensor operated faucets and toilets will be installed.

12.2 RESILIENCY / SEA LEVEL RISE

According to the IPCC, if the sea level continues to rise at historic rates, the sea level in Massachusetts as a whole will rise by one foot by the year 2100. However, using a high emissions scenario of climate change, sea level rise could reach six feet by 2100. Adding this potential rise to the mean higher high water (MHHW) level, in 50 years the MHHW could be as high as 15.2 feet Boston City Base (BCB), assuming a sea level rise of approximately four feet.[6] The first floor elevation of the Project has been set at 20 feet BCB, well above the predicted sea level rise in the next 50 years. Please refer to Figure 7-11 for SLR Resiliency Diagram.

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

[6] ***Preparing for the Rising Tide***. The Boston Harbor Association. February 2013

Sea level rise is also a concern when combined with a large storm. If a major storm, such as another "Superstorm Sandy" with significant storm surge, were to impact Boston at high tide, the potential for flooding would markedly increase. Such a storm would be anticipated to increase sea level to approximately 18.7 feet BCB, which would not impact the first floor of the building, as the first floor elevation has been designed at 20 feet BCB.[7] By setting the building at 20 feet BCB, which raises the building 4 feet from the existing grade, impacts from flooding to the first floor will be minimized for the next 50 years. In addition much of the HVAC equipment for the project is located on upper floors or on the roofs.

The BTUHWF facility will encourage sustainable commuting by bicycle by providing the following amenities:

- Adequately sized secure, covered bicycle storage for its permanent full time employees with space for 6-8 bicycles (located on the first floor).
- A shower and locker area for employees located on the second floor of the building.
- Secure bicycle racks for public use located adjacent to the landscape path giving access to the HarborWalk and Carson Beach.

See Appendix L for the Climate Change and Preparedness and Resiliency Checklist for New Construction.

12.3 LEED

The goal of the design team is to focus on an integrated design approach to meet the following goals:

- LEED 2009 for New Construction and Major Renovations. No decision has been made as to whether the project will be registered with the USGBC.
- Energy performance targeting a 20 to 25% reduction below the ASHRAE 90.1-2007 baseline based on use.
- Water consumption at least 30% below the prescribed baseline in LEED Version 3.
- Using local and low-toxicity materials wherever possible and incorporating reflective roofs and paving materials. The Project architect maintains a lengthy precautionary list of environmentally unfriendly and hazardous materials, and endeavors to eliminate any such materials from the Project specifications.
- Designing with natural daylighting and natural ventilation in the office areas.

The Applicant intends to measure the results of their sustainability initiatives using the framework of the LEED rating system to show compliance with Article 37. The LEED rating system tracks the sustainable features of a project by achieving points in the following categories: Sustainable Sites; Water Efficiency; Energy and Atmosphere; Materials and Resources; Indoor Environmental Quality; and Innovation in Design.

A LEED checklist is included in Appendix M, and shows the credits the Project anticipates achieving. The checklist will be updated regularly as the design develops and engineering assumptions are substantiated. Presently, 62 points have been targeted. The project will achieve a minimum of Silver Rating with a concerted effort to meet Gold.

SUSTAINABLE SITES

SS Prerequisite 1, Construction Activity Pollution Prevention.

The Project will implement a full erosion prevention and sedimentation control plan; this plan will be prepared in accordance with the requirements of 2012 EPA Construction General Permit.

[7] Ibid

SS Credit 1, Site Selection.

This Project meets all the criteria for site selection; the site is not Prime Farmland or undeveloped site. It is not a habitat for threatened or endangered species, it is not within 100 feet of wetlands, and it is not public parkland. It is a previously developed urban site.

SS Credit 2, Development Density and Community Connectivity.

The Project is in compliance with Option 2, Community Connectivity and is located in Columbia Point, Dorchester, Boston. Within a one-half mile radius of the building's main entrance, there are residential areas and many basic services with pedestrian access. These basic services include parks, banks, places of worship, supermarket, restaurants, flower shop, gas stations, automotive repair, automotive dealer, hotel, and school.

SS Credit 4.1, Alternative Transportation-Public Transportation Access.

The Project easily meets the requirement of this credit. The project is located within one-quarter mile of public subway station and bus stop.

SS Credit 4.2, Alternative Transportation- Bicycle Storage and Changing Rooms.

The Project will provide bike storage for 5% of full-time equivalent employees with bike racks within 200 yards of the building entrance. The Project will also provide a shower and changing facility for the full-time equivalent employees.

SS Credit 4.3, Low Emitting and Fuel Efficient Vehicles.

The Project will place an electric charging station for visitor and employee use at parking area.

SS Credit 6.2, Storm Water Design - Quality Control.

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

SS Credit 7.1, Heat Island Effect- Non-Roof.

As this Project Site Plan illustrates, this site has a limited amount of space for landscaping and plantings. The building and associated drives, loading and parking occupies most of the entire site. The Project will use pedestrian-oriented hardscape materials that will be light-colored with a compliant SRI value of 29 or higher. Street trees will provide some shading.

SS Credit 7.2, Heat Island Effect – Roof.

The Project will achieve the roof credit by having a combined roofing system that consists of a high reflective SRI membrane roof system on the building and light colored materials in combination with landscape on the occupied roof decks. The hardscape materials will be light-colored with a compliant SRI value of 29 or higher.

WATER EFFICIENCY

WE Prerequisite 1, Water Use Reduction- 20% Reduction.

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

WE Credit 1.1, Water Efficient Landscaping.

The Project will not include a permanent irrigation system beyond a maximum two-year establishment period.

WE Credit 3.1, Water Use Reduction.

The Project will reduce the potable water consumption by at least 30% less water used when compared to a baseline case by using low-flow and efficient plumbing fixtures (not including irrigation).

ENERGY AND ATMOSPHERE

EA Prerequisite 1, Fundamental Commissioning of the Building Energy Systems.

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

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

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

EA Credit 1, Optimize Energy Performance.
The Project will at least achieve a minimum energy performance improvement of 20-25% compared to the ASHRAE 90.1-2007 baseline standard for use and a 15% improvement based on energy cost. This is achieved by using an energy-efficient building envelope, lighting systems, and HVAC systems. Daylighting and natural ventilation in the shoulder seasons are also strategies that are contributing to the energy reductions.

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

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

EA Credit 6, Green Power.
The Applicant has agreed to select a Green-e-certified power provider for a two year contract for a minimum of 35% of the annual electrical power consumption for the building from a Green-e-certified provider.

MATERIALS AND RESOURCES

MR Prerequisite 1, Storage and Collection of Recyclables.
The Project will provide recycling areas for paper, corrugated cardboard, glass, plastics, and metals.

MR Credit 2, Construction Waste Management.
The Project will recycle/salvage nonhazardous construction and demolition debris for a minimum of 50% of the total construction and demolition debris. The construction manager for the Project will develop and implement a construction waste management plan (CWMP).

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

MR Credit 5, Regional Materials.
The Project will use building materials or products that have been extracted, harvested or recovered, as well as manufactured within 500 miles of the site for a minimum of 20%, based on cost, of the total materials value. This

is based on specification divisions 03-10, 31, 32 (furniture may be included at Project's decision) and excludes mechanical, electrical plumbing, elevators and other specialty items.

MR Credit 7, Certified Wood.

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

INDOOR ENVIRONMENTAL QUALITY

Prerequisite, Minimum Indoor Air Quality Performance.

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

IEQ Credit 1, Outdoor Air Delivery Monitoring.

The Project will install monitoring systems to ensure that ventilation systems maintain design minimum requirements. The monitoring equipment will be configured to generate an alarm when the airflow values or carbon dioxide levels may vary by 10% or more from the design values via either a building automation system alarm to the building operator. The CO2 monitors will be tied to the building BMS system.

IEQ Prerequisite 2, Environmental Tobacco Smoke Control.

The Project will comply with the prerequisite requirements by prohibiting smoking within all areas of the building and prohibit smoking from 25 foot of any entry or air intake with exterior signage.

IEQ Credit 3.1, Construction IAQ Management Plan- During Construction.

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

IEQ Credit 3.2, Construction IAQ Management Plan- Before Occupancy.

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

IEQ Credit 4.1, Low-Emitting Materials- Adhesives & Sealants.

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

IEQ Credit 4.2, Low-Emitting Materials- Paints & Coatings.

The Project will use paints and coatings applied to interior walls and ceilings that do not exceed the volatile compound (VOC) content limits established in the Green Seal Standard GS-11 for paints and primers; Green Seal Standard GS-03 for anticorrosive paints; and the South Coast Air Quality Management District (SCAQMD) Rule #1113 for finishes, stains, and sealers. The contractor will submit Material Safety Data Sheets (MSDS) highlighting the VOC content (g/L) for verification in the construction administration process.

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

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

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

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

- *Janitors' closets or housekeeping rooms where chemicals are stored are provided with ventilation; the room will be negatively pressurized in order to prevent any odors from leaking out. Also, all janitors' closet doors will be constructed to reduce the leakage, and the wall around each closet will have full height walls or be tight to a hard ceiling.*
- *All air handlers will be equipped with a MERV 13 air filter to reduce dust and particles in the air supply.*
- *At every main, high-volume entryway there will be special floor mats to prevent outside materials from being carried into the building. Each of these mats will be cleaned on a regular basis.*

IEQ Credit 6.1, Controllability of Systems – Lighting. *The Project will provide individual lighting controls for at least 90% of the building occupants. All office and conference rooms will have lighting switches and occupancy sensors.*

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

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

INNOVATION IN DESIGN

The Project anticipates that several points will be achieved in the Innovation & Design category.

ID Credit 1.1, Green Housekeeping Program. *The Project will establish a program for cleaning supplies for the building. The policy that will be developed will include cleaning products, disinfectants, metal polishes, floor finishes, strippers, disposable janitorial paper products and trash bags, and hand soaps.*

ID Credit 1.2, Sustainable Education. *The Project will establish an educational program that is actively instructional. The following elements will be included in the educational program:*

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

ID Credit 1.3, Resiliency and Sea Level Rise: *There are a number of design features within the project that respond to Sea Level Rise and resiliency:*

- *Siting the building 4 feet above existing grade to account for FEMA 100 year flood plain elevation, projected sea level rise for the design life span of the building and projected storm surges.*
- *Landscaping that can withstand salt air and sea water flooding.*
- *Careful selection of interior materials at the first floor.*

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

REGIONAL PRIORITY

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

1. RP Credit 1.2, SS Credit 6.1, Storm water Design- Quantity Control.
2. RP Credit 1.3, SS Credit 7.1, Heat Island Effect- Non-Roof
3. RP Credit 1.4, SS Credit 7.2, Heat Island Effect- Roof

See Appendix M for the LEED Checklist.

13.0 INFRASTRUCTURE SYSTEMS COMPONENT

The BTUHWF building is serviced by existing infrastructure including water, sewer, gas, electric, and telephone. The existing services will be cut and capped within the footprint of the proposed building and extended to provide services to the new building. The new service connections will be made within the property boundary.

13.1 CAPACITIES AND PROJECT DEMANDS

Since the number of employees and the existing uses will remain unchanged, the new facility is not expected to result in an increased demand for potable water and sewage generation. The new facility will continue to be serviced my MWRA water and BWSC infrastructure for discharges to the sewer system. There are no upgrades required for the operation of the existing uses at the facility.

Since the number of employees and the existing uses will remain unchanged, the new facility is not expected to result in significant increased demand for potable water and sewage generation. The existing and proposed wastewater flows were estimated using 310 CMR 15.203 Title 5 System Sewage Flow Design Criteria.

The new facility will continue to be serviced by BWSC water and infrastructure for discharges to the sewer system and will connect to the existing structures on site. There are no upgrades required for the operation of the existing uses at the facility. Refer to Tables 18 and 19 for existing and proposed estimated sewer flows.

Table 18. Existing Wastewater Generation Estimate

Use Description	Units	Generation Rate (Title 5)	Average Flow (gpd)
Lounge	50 Seats	20 gpd/seat	1,000
Functional Hall	1,200 Seats	15 gpd/seat	18,800
Eye Care Office	2,240 sf	75 gpd/1000 sf	170
Credit Union Office	1,360 sf	75 gpd/1,000 sf	105
General Office	5,120 sf	75 gpd/ 1,000 sf	385
		Total GPD	**19,600**

Table 19. Proposed Wastewater Generation Estimate

Use Description	Units	Generation Rate (Title 5)	Average Flow (gpd)
Lounge	100 Seats	20 gpd/seat	2,000
Functional Hall	1,200 Seats	15 gpd/seat	18,000
Eye Care Office	5,117 sf	75 gpd/1000 sf	384
Credit Union Office	1,244 sf	75 gpd/1,000 sf	93
General Office	12,685 sf	75 gpd/ 1,000 sf	951
		Total GPD	**21,428**

Based on 310 CMR 15.203 Title 5 System Sewage Flow Design Criteria the proposed uses will generate a total of 21,428 gallons of sewage per day, representing a nominal increase of 1,828 gallons per day. The increase in flows to the system are de-minimis and will not require any upgrades to the existing 6 inch service connection to the 8 inch BWSC line currently conveying wastewater flows from the facility.

Water consumption. The estimated water use will be similar to the wastewater generation with an additional 10% that is not captured through building sanitary systems, such as uses of water for outdoor purposes. Therefore it's anticipated that the water demand will be approximately 23,570 gpd. Measures to conserve water consumption will include low flow fixtures throughout the new building.

The following section presents the interior space hearing energy sources, consideration for the reuse of condensate and the air conditioning system and make up water.

- Reuse of stormwater for toilet flushing was considered, however due to the limited amount of space on site to store the rainwater this measure was not practical. In addition, the size of the site will not generate an intensive amount of reuse for this application.
- Interior space heating will be provided by gas using gas fired condensing boilers.
- The condensate from the boilers will be treated to be pH neutral but is not planned to be reused due to the limited amount of water that will be generated.
- There will be cooling coil condensate at the building's main air handling units, however reuse is not proposed because only a small amount of water would be generated and only available during the most humid months of the summer.
- The Applicant is evaluating several cooling systems for the building. The systems under consideration consider the life span of the project and projected utility costs and the Applicant will be selecting the most efficient and cost effective in terms of their operational needs.

13.2 ENERGY SYSTEMS

The following section discusses energy system and associated measures that optimizes energy conservation. The Applicant is currently evaluating several energy systems with the goal of energy savings and optimum performance for their building. The following measures will be integral to the building regardless of the chosen system:

- The systems are configured to utilize electric cooling and gas heat and initial meetings with local utilities suggest adequate distribution in the area of the project site.
- Space will be available for roof mounted PV arrays and also the possibility of stanchions on the upper floor of the parking garage. The roof shape and layout at the meeting hall are specifically designed to accept photovoltaic panels. The Applicant is aware that future building construction (of unknown height and location) immediately adjacent to the new building could cast shadows on the arrays and therefore interfere with optimal operation of the arrays. In support of potential arrays, space is allocated in the main electric room for inverter equipment and tie into the main distribution. As an office building with a fairly low and intermittent load for domestic hot water a solar thermal option would likely not be viable for this project.
- Daylight harvesting and conference center based on north facing roof monitors
- Daylight harvesting at perimeter spaces in office areas
- Reduced Lighting Power Density (LPDs)
- Reduce lighting using LED fixtures at Garage and office building
- Integrated lighting control and solar control.
- Demand control ventilation in conference rooms
- Envelope enhancements
  - Wall and/or curtain wall U-Value
  - Glazing U-value
  - Glazing Solar Heat Gain Coefficient (SHGC)
  - Transformer is outside at grade and no ventilation is required. Generator is on the roof to minimize noise.

14.0 TIDELANDS JURISDICTION

The entire Property is 117,720 square feet (s. f.) (2.70 Acres) of which 88,580 s.f. (2.03 Acres) is located on filled tidelands and 29,140 s.f. (0.67 Acres) are non-jurisdictional uplands (See Figure 14-1).

According to a review of the historic licenses, the formerly flowed area of the Property was filled by two Department of Public Works Licenses: 611 issued on 11/12/1925 and 4263 issued on 11/13/1959 (See Appendix K). One other Chapter 91 License was issued on the project site, DPW License 1483, issued in 1933, for the construction of a concrete conduit. Based on the historic high water mark depicted on the earliest Chapter 91 License for the Property (License No. 611 issued 11/12/1925), the Chapter 91 jurisdictional line generally runs in an arc starting from a point midway along the westerly lot line to a point midway along the southern lot line.

On February 20, 2007 a Request for Determination of Applicability (2007 RDA) was filed by Bayside Associates LP with the Waterways Regulation Program of the Department of Environmental Protection for the entire Bayside Exposition area including the Property. On May 3, 2007 DEP Waterways issued a positive determination (WRP File No. JD07-1958) (2007 Determination) that the Department's Jurisdiction (under MGL Ch. 91 and the Waterways Regulations found at 310 CMR 9.00) extended seaward from the historic high water mark as delineated in the 2007 RDA.

Table 20. Chapter 91 Jurisdictional Areas

Chapter 91 Jurisdiction	
	Area in Square Feet / Acres
Total Site Area	117,720 / 2.70
Area Within Chapter 91 Jurisdiction	88,580 / 2.03
Area Outside of Chapter 91 Jurisdiction	29,140 / 0.67
Commonwealth Tidelands	0 SF

Under the DEP Waterways Regulations, filled tidelands located within 100 feet of the shoreline (or within 25 percent of the average property depth, whichever is less) are within the water dependent use zone (WDUZ) and reserved exclusively for water dependent uses. The closest corner of the site parcel is separated approximately 160 feet from the current high water mark. Because the site is located more than 100 feet from mean high water (MHW) there is no water-dependent use zone located on the Project site.

14.1 COMMONWEALTH VS. PRIVATE TIDELANDS

Commonwealth Tidelands are held in trust by the state for the benefit of the public. Commonwealth Tidelands lie seaward of the historic low water (HLW) mark or of a line running 100 rods (1,650 feet) seaward of the historic high water mark, whichever is farther landward. Private Tidelands are held by a private person and are subject to an easement of the public for the purposes of fishing, fowling and navigation. Private Tidelands are located landward of the HLW mark or of a line running 100 rods (1,650 feet) seaward of the historic high water mark, whichever is farther landward.

The 2007 Determination confirmed that the Project Site is located completely in Private Tidelands and included a delineation of HLW based on the 1848 United States Coastal Survey and Department of Public Works License 611 issued in 1925. Figure 14-2 shows an overlay of the Project Site on the 1848 coast survey along with the HLW line that is located well offsite to the east. Based on the historic low water mark shown on License No 611, the 1848 Coast Survey, and the 2007 Determination the Project site is landward of the historic low water mark and, therefore, the filled tidelands on the site are not Commonwealth Tidelands.

14.2 LICENSING HISTORY

The Project team researched the Chapter 91 Licenses issued for the Property at DEP's Boston office and the Suffolk County Registry of Deeds. There have been three Chapter 91 Licenses issued within the Project Site, all of which were included in the 2007 RDA as listed in Table 21 below.

Table 21. Chapter 91 Authorizations

Authorization Book & Page	Date	Agency	Uses
License # 611 **B- 4746 P-481**	11/12/1925	DPW	Construct bulkhead and fill solid
License # 1483 **B- 5387 P-268**	5/23/1933	DPW	Construct and maintain conduit, dredge
License # 4263 **B- 7445 P-314**	11/13/1959	DPW	Maintain fill

Authorization Book & Page	Date	Agency	Uses
Jurisdictional Determination WRP File No. JD07-1958	May 3, 2007	DEP	Jurisdictional Determination

The filling of flowed tidelands on the Project Site was authorized by two Chapter 91 Licenses, DPW License #611 and DPW License #4263. License #611 was issued in 1925 to the Willard Walsh Realty Company of Boston and authorized the construction of bulkheads and placement of solid fill in Old Harbor in Dorchester. License #611 filled the majority of the site with the exception of an approximate 50-foot wide area located parallel to the northern property boundary. A review of License #1483 issued to the City of Boston in 1933 confirms that License #611 did not fill all of the way to the property line. License Plan #1483 clearly identifies the "Bottom of Bank" and the 50-foot wide area within the Project Site that was not filled under License #611.

License #4263 was issued in 1959 to the Coleman Disposal Company to maintain existing fill in Old Harbor in Dorchester. Based on a review of License Plan #4263 it appears that fill authorized by this license was placed in a 50-foot wide area that was not filled under License #611 thus completing the filling of the Project Site. Copies of all three of the licenses are include in Appendix K.

14.3 COMPLIANCE WITH CHAPTER 91 STANDARDS

14.3.1 Proper Public Purpose (310 CMR 9.31(2))

The Project is nonwater-dependent pursuant to 310 CMR 9.12(4) of the Waterways Regulations because it consists of an office and commercial development. As set forth in M.G.L. Chapter 91, Section 18, "No structures or fill for nonwater-dependent uses of tidelands may be licensed unless a written determination by the department [of Environmental Protection] is made following a public hearing that said structures or fill shall serve a proper public purpose and that said purpose shall provide a greater public benefit than public detriment to the rights of the public in said lands."

For a nonwater-dependent use Project that is not located on Commonwealth Tidelands, the Department presumes this standard is met if the project complies with the standards for conserving and utilizing the capacity of the project site to accommodate water-dependent use, according to the applicable provisions of 310 CMR 9.51 through 9.52 and is consistent with the policies of the Massachusetts Office of Coastal Zone Management (CZM). A detailed explanation of how the Project complies with the waterways regulations is presented below.

14.3.2 Categorical Restriction on Fill and Structures (310 CMR 9.32)

The Department has determined that in certain situations fill or structures categorically do not meet the statutory tests for approval under M.G.L. c. 91 or are otherwise not in keeping with the purposes of 310 CMR 9.00. Accordingly, a project shall be eligible for a license only if it is restricted to fill or structures which accommodate the uses specified in 310 CMR 9.32. According to the regulations, fill or structures for any use on previously filled tidelands are eligible for licensing if they are located outside of Areas of Critical Environmental Concern (ACEC) and Designated Port Areas (DPA). The project is located entirely on filled tidelands and is not within an ACEC nor DPA and is therefore eligible for licensing.

14.3.3 Environmental Protection Standard (310 CMR 9.33)

The Project will comply with all applicable environmental regulatory programs of the Commonwealth as specified in 310 CMR 9.33. Table 2 provides a list of required federal, state and local approvals required to construct the Project.

14.3.4 Conformance with Municipal Zoning Law and Harbor Plans (310 CMR 9.34)

Section 9.34(1) of the Waterways Regulations requires that projects in private tidelands are consistent with local zoning requirements. Such compliance is presumed if the applicable municipal official submits a written certification “stating that the activity to be licensed is not in violation of said ordinances and by-laws (310 CMR 9.34(1)). A Zoning Compliance Certificate will be included in Section G of the Waterways application form when it is filed. Accordingly, the Project will be presumed to be in compliance with local zoning requirements.

There is no Municipal Harbor Plan (MHP) in the Project Area so the requirement to conform to a MHP does not apply.

14.3.5 Conserve Capacity for Water Dependent Use (310 CMR 9.51)

In accordance with the Waterways Regulations, a nonwater-dependent use project that includes fill or structures on any tidelands shall not unreasonably diminish the capacity of such lands to accommodate water-dependent use. In applying this standard, the Department shall take into account any relevant information concerning the utility or adaptability of the site for present or future water-dependent purposes, especially in the vicinity of a water-dependent use zone and shall adhere to the greatest reasonable extent to applicable guidance specified in a municipal harbor plan, as provided in 310 CMR 9.34(2)(b)2. In the case of this Project, no municipal harbor plan exists in the Project area and the Project is located outside of the water-dependent use zone.

For projects that do not have a municipal harbor plan, the Department shall find that the standard is not met if the project does not comply with the conditions outlined in 310 CMR 9.51(3), these conditions promote the policy objectives stated in the regulations with comparable or greater effectiveness, and are necessary to prevent undue detriments to the capacity of tidelands to accommodate water-dependent use. Standards for Pile Supported Structures (310 CMR 9.51 (3) (a)), Facilities of Private Tenancy (310 CMR 9.51 (3) (b)) and Water Dependent Use Zones (310 CMR 9.51 (3) (c)) do not apply because the Project is not located on flowed tidelands and is not within the water-dependent use zone. The two remaining standards found at 310 CMR 9.51(3) that the Project must comply with involve open space and height requirements.

14.3.5.1 Standard: Open Space (310 CMR 9.51 (3) (d))

At least one square foot of the project site at ground level, exclusive of areas lying seaward of a project shoreline, shall be reserved as open space for every square foot of tideland area within the combined footprint of buildings containing nonwater-dependent use on the project site; in the event this requirement cannot be met by a project involving only the renovation or reuse of existing buildings, ground level open space shall be provided to the maximum reasonable extent; as provided in 310 CMR 9.34(2)(b)1.

Compliance with Standard:

The Project meets the required 1:1 open space ratio. The entire Project site contains approximately 88,580 sf (+/- 2.03 acres) of filled tidelands. The combined footprint of the proposed buildings and parking garage containing nonwater-dependent uses will be 43,628 sf (+/- 1.00 acre) which will leave 44,952 sf (+/- 1.03 acres) of the filled tidelands as open space.

14.3.5.2 Standard: Height (310 CMR 9.51 (3) (e))

New or expanded buildings for nonwater-dependent use shall not exceed 55 feet in height if located over the water or within 100 feet landward of the high water mark; at greater landward distances, the height of such buildings shall not exceed 55 feet plus one-half foot for every additional foot of separation from the high water mark; as provided in 310 CMR 9.34(2)(b)1.

Compliance with Standard:

The Chapter 91 Regulations limit building heights within 100 feet of MHW to 55 feet, beyond which the building height may be increased one foot for every two feet of additional distance from the water (a 1:2 slope).The proposed building will be located approximately 240 feet from the mean high water mark. Based on this location, the proposed allowed building height under the Chapter 91 Regulations would be approximately 125 feet high. The proposed building will be 50 feet in height (66 feet including penthouse), well under the maximum height allowed under the Chapter 91 Regulations.

14.3.5.3 Utilization of Shoreline for Water-Dependent Purpose (310 CMR 9.52)

A nonwater-dependent use project that includes fill or structures on any tidelands shall devote a reasonable portion of such lands to water-dependent use, including public access in the exercise of public rights in such lands. In applying this standard, the Department shall take into account any relevant information concerning the capacity of the project site to serve such water-dependent purposes, especially in the vicinity of a water-dependent use zone; and shall give particular consideration to applicable guidance specified in a municipal harbor plan, as provided in 310 CMR 9.34(2)(b)2.

The Project site does not include a water-dependent use zone as defined by 301 CMR 9.02 so the Project must comply with the standards found at 310 CMR 9.52 (2) and not those found at 310 CMR.9.52(1). The only standard found under 310 CMR 9.52 (2) involves pedestrian facilities.

15.3.5.4 Standard: Pedestrian Facilities 310 CMR 9.52 (2)

In the event the project site does not include a water-dependent use zone, the project shall provide connecting public walkways or other public pedestrian facilities as necessary to ensure that sites containing water-dependent use zones will not be isolated from, or poorly linked with, public ways or other public access facilities to which any tidelands on the project site are adjacent.

Compliance with Standard:

There is no water-dependent use zone located on the Project site. There is a water-dependent use zone located on the abutting parcels that are owned by University of Massachusetts to the east and the DCR to the north and east. The DCR Parcel includes a public park and HarborWalk. The Applicant proposes an 8-foot wide walkway along the entire length of the northern property line that is located adjacent to Carson Beach. It is anticipated that this walkway will connect to the future parcel developments to the east and west of the site thus creating a continuous public walkway that would connect to the DCR HarborWalk.

14.4 PUBLIC BENEFIT REVIEW AND DETERMINATION

14.4.1 Overview

Consistent with the Public Benefit Determinations Regulations found at 301 CMR 13.02 (1) a mandatory public benefit review by the Secretary of Environmental Energy and Affairs is required for any project that is required to file and EIR and is completely or partially located in tidelands. The BTUHWF Project is located in filled tidelands and requires the filing of an EIR. Therefore it requires a Public Benefit Determination. In accordance with the requirements of the 301 CMR 11.05(4)(b) and 310 CMR 13.03, this section provides the following information regarding Public Benefit Determination for projects in tidelands that are subject to the EIR review process.

14.4.2 Nature of Tidelands Affected by the Project

The majority of Project site was filled in the 1930 and is entirely separated from flowed tidelands. These tidelands have been used for non- water dependent purposes since it was filled. The Project site and surrounding area is completely developed with either buildings or parking and no formal public access has been established.

14.4.3 Purpose and Effect of the Project

The purpose and effect of the Project is to create a new and attractive building with associated sidewalk and landscape improvements, to enhance views from the harbor and to encourage pedestrians to access the HarborWalk. The Project is consistent with the City of Boston's Columbia Point Master Plan, and has been designed as an anchor in the future redevelopment of the surrounding parcels. The replacement building is situated to provide attractive views from Carson Beach and Dorchester Bay.

The Project will provide improved pedestrian access to the waterfront by creating the first leg of a sidewalk network that can be connected to future sidewalks when the abutting parcels are redeveloped. By removing the existing fence between the Property and the DCR parcel, which currently acts as a barrier, public access to the tidelands will be encouraged. With the reduction in the building footprint, the Project will increase the amount of open space provided on site from that currently present. The additional landscaping will also enhance the amount of greenspace in the neighborhood.

14.4.4 Impact on Abutters and the Surrounding Community

There will be relatively few impacts on the abutters and surrounding community. The Project is located on a previously developed parcel that is surrounded by other developed parcels with the exception of the DCR Park located to the north. The only direct abutters to the site are the UMass and the DCR Park. UMass has stated that it is their intention to use their property for student parking for next 7 years and the proposed construction of the BTUHWF facility is not anticipated to negatively affect this use. No work is anticipated in the DCR Park so the construction of the Project will not negatively affect the park. Although there may be some temporary noise generated during construction, which may have extended hours, it is not expected to have any impacts due to the distance from abutters.

After construction during operations, there will not be any new traffic impacts. There are approximately 35 employees in the building. These uses and events will be the same in the new building. No new building uses or additional employees are anticipated.

The development is consistent with Columbia Point Master Plan including the Plan's proposed street grid.

14.4.5 Enhancement to the Property

The existing 32,500 sf building that has outlived its functional life. The existing one story building was built in the 1960's with no windows, a few skylight monitors and a concrete block exterior. There is no formal public access located on the site.

The new building is situated and articulated to reinforce the public space and pedestrian environment of Carson Beach and create a compatible architecture with the northern, public edge. Currently there is no formal pedestrian access located on the Project Site. As part of the Project a new 8-foot wide public walkway will be constructed along the northern Project Boundary. It is anticipated that this walkway will be the first segment of a future public walkway that will eventually connect to the DCR HarborWalk. Bike racks are also proposed adjacent to the DCR Park. Installation of lighting and landscaping will improve the appearance of the neighborhood and is in conformity with potential future development under the Columbia Point Master Plan.

14.4.6 Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Project will improve public access to the waterfront through the creation of the first leg of a sidewalk that can be connected to sidewalks on adjacent properties when they are redeveloped. The Project also includes the creation of new open space, the installation of additional landscaping and parking spaces for public use. By shifting the majority of user parking to the rear of the property and orienting the building to provide an attractive facade-view from the waterfront, the redevelopment will significantly improve the public's visual impression and experience on the adjacent recreation areas.

14.4.7 Community Activities on the Site

The Project will allow BTUHWF and the BTU to continue providing valuable programming to its members and the community as a whole. The function and conference areas in the replacement building will be more efficient, with greater flexibility to permit gatherings of many different types and sizes. The function and conference areas provide a valuable service to BTU members and their families, as well as students and other members of the community as a whole. Many different types of functions are held in the building, from the retiree's lunch, to training sessions, to holiday parties, to family reunions. The building's redevelopment will enhance the existing community activities undertaken on the property.

14.4.8 Environmental Protection and Preservation

The Project consists of the redevelopment of an existing, fully developed site containing pavement and a functionally obsolete building. The Property does not contain any significant natural resources or publicly protected open space or parkland.

After redevelopment, the Property will include areas of pervious pavement and landscaping to promote groundwater recharge. The Project will result in an improvement to the quality of stormwater runoff that discharges from the site and enters Dorchester Bay. The introduction of deep sump hooded catch basins and water quality units will provide treatment of runoff for pollutants such as oil, grease and total suspended solids. The existing site conditions are such that the runoff is not currently treated prior to discharge.

After redevelopment, the building on the Property will minimize energy consumption and reduce waste generation. The Project will be designed to achieve a minimum of a LEED Silver Rating (with a concerted effort to meet Gold) and meet the City of Boston Stretch Code. The location and design of the building also take into account rising sea levels, and significant improvement over the existing at-grade building.

14.4.9 Public Health and Safety, and the General Welfare

The Project will not result in adverse impacts to the general welfare of the public. Streetscape improvements, such as lighting landscaping and curbing will increase pedestrian safety over existing conditions.

14.4.10 Conclusion

As the foregoing discussion demonstrates, the Project complies with the state Chapter 91 regulations. Consistent with goals of Chapter 91, the public will benefit from the removal of the existing fence, the installation of a sidewalk and the improvements that maintain views and provide better access to and from Carson Beach, Mother's Rest and the existing HarborWalk along Dorchester Bay

14.5 CONSISTENCY WITH COASTAL ZONE MANAGEMENT POLICIES

The Project site is located within the Coastal Zone, and as set forth below, the replacement of the BTUHWF facility is consistent with CZM Program Policies. The Project complies with the Massachusetts Coastal Zone

Management (CZM) Program Policies. This Program exists to protect and manage the use of the coastal zone under the provisions of the Federal Coastal Zone Management Act of 1972. To accomplish that objective, CZM reviews proposed developments in the coastal zone to determine whether they are consistent with CZM Coastal Policies and Management. The Project's consistency with relevant policies/principles is described below.

14.5.1 Coastal Hazards

Coastal Hazard Policy #1- Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean.

The proposed Project will comply with Coastal Hazard Policy #1. The Project will result in alterations to land subject to coastal storm flowage, but will not result in adverse impacts to the storm damage and flood control functions. The floodplain associated with Dorchester Bay is regulated as land subject to coastal storm flowage under the Massachusetts Wetlands Protection Act.

The proposed building and parking will be located within LSCSF or the 100-year floodplain and will be constructed in compliance with Massachusetts State Building Code requirements for structures within the floodplain. The first floor elevation of the building will be set above the flood zone and also accounts for the projected sea level rise. By setting the first floor of the building at 20 feet BCB, raising the building 4 feet from the existing grade, impacts from flooding will be minimized. In addition much of the HVAC equipment for the Project is located on upper floors or on the roofs

Coastal Hazard Policy #2 - Ensure that construction in water bodies and contiguous land areas will minimize interference with water circulation and sediment transport. Flood or erosion control projects must demonstrate no significant adverse effects on the project site or adjacent or downcoast areas.

The Project will comply with Coastal Hazard Policy #2. The Project does not include in-water construction work. Construction activities on the Site will not affect the nearby Bay, nor will it interfere with existing water circulation and sediment transport patterns within the Bay.

Coastal Hazard Policy #3 - Ensure that state and federally funded public works projects proposed for location within the coastal zone will:

- *Not exacerbate existing hazards or damage natural buffers or other natural resources.*
- *Be reasonably safe from flood and erosion related damage.*
- *Not promote growth and development in hazard-prone or buffer areas, especially in velocity zones and Areas of Critical Environmental Concern.*
- *Not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvement Acts.*

The Project is private and does not include acquisition of hazardous coastal areas. As such, this policy does not apply. The Project is not located in hazard prone or buffer areas or in a velocity zone or ACEC. The Project is not located in a Coastal Barrier Resource Unit.

Coastal Hazard Policy #4 - Prioritize acquisition of hazardous coastal areas that have high conservation and/or recreation values and relocation of structures out of coastal high-hazard areas, giving due consideration to the effects of coastal hazards at the location to the use and manageability of the area.

The Project is private and does not include acquisition of hazardous coastal areas. As such, this policy does not apply. The Project will not involve the placement of any structures in coastal high hazard areas.

14.5.2 Energy

Energy Policy #1 - For coastally dependent energy facilities, assess siting in alternative coastal locations. For non-coastally dependent energy facilities, assess siting in areas outside of the coastal zone. Weigh the environmental and safety impacts of locating proposed energy facilities at alternative sites.

The proposed Project is not a coastally dependent energy facility.

Energy Policy #2 - Encourage energy conservation and the use of renewable sources such as solar and wind power in order to assist in meeting the energy needs of the Commonwealth.

The Facility will include low flow toilets as energy conservation measures and the buildings are designed to achieve LEED Silver status with an attempt to meet Gold.

14.5.3 Growth Management

Growth Management Policy #1 - Encourage sustainable development that is consistent with state, regional, and local plans and supports the quality and character of the community.

The proposed Project will conform with Growth Management Policy #1. The Project was designed to be consistent with the Columbia Point Master Plan and accommodates the future HarborWalk connection. The Project will enhance the community by providing parking spaces, bicycle racks and open space.

Growth Management Policy #2 - Ensure that state and federally funded infrastructure projects in the coastal zone primarily serve existing developed areas, assigning highest priority to projects that meet the needs of urban and community development centers.

The proposed Project is a private project and will not receive state or federal funding. As such, Growth Management Policy #2 does not apply.

Growth Management Policy #3 - Encourage the revitalization and enhancement of existing development centers in the coastal zone through technical assistance and financial support for residential, commercial, and industrial development.

The Project is a private project and the Commonwealth is not providing technical assistance. As such, Growth Management Policy #3 does not apply.

14.5.4 Habitat

Habitat Policy #1 - Protect coastal, estuarine, and marine habitats—including salt marshes, shellfish beds, submerged aquatic vegetation, dunes, beaches, barrier beaches, banks, salt ponds, eelgrass beds, tidal flats, rocky shores, bays, sounds, and other ocean habitats—and coastal freshwater streams, ponds, and wetlands to preserve critical wildlife habitat and other important functions and services including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and processes.

The Project conforms with Habitat Policy #1. There are no coastal, marine or estuarine habitats as listed in Habitat Policy #1 occur on the Project Site. There is no critical wildlife habitat located on the Site. As the Project will not affect the existing coastal resources associated with the nearby Bay and beach, there will be no impacts to existing nutrient and sediment attenuations, wave and storm damage protection, and landform movement and processes associated with the protection of coastal habitat on the Site.

Habitat Policy #2 - Advance the restoration of degraded or former habitats in coastal and marine areas.

The Project conforms to Habitat Policy #2. There are no known former or degraded habitats at the Site.

14.5.5 Ocean Resources

Ocean Resources Policy #1 - Support the development of sustainable aquaculture, both for commercial and enhancement (public shellfish stocking) purposes. Ensure that the review process regulating aquaculture facility sites (and access routes to those areas) protects significant ecological resources (salt marshes, dunes, beaches, barrier beaches, and salt ponds) and minimizes adverse effects on the coastal and marine environment and other water-dependent uses.

The proposed Project does not involve an aquaculture facility. As such, Ocean Resources Policy #1 does not apply.

Ocean Resources Policy #2 - Except where such activity is prohibited by the Ocean Sanctuaries Act or other applicable provision of law, the extraction of oil, natural gas, or marine minerals (other than sand and gravel) in or affecting the coastal zone must protect marine resources, marine water quality, fisheries, and navigational, recreational and other uses.

The proposed Project does not involve extraction of oil, natural gas or marine minerals. As such, Ocean Resources Policy #2 does not apply.

Ocean Resources Policy #3 - Accommodate offshore sand and gravel mining needs in areas and in ways that will not adversely affect marine resources, navigation, or shoreline areas due to alteration of wave direction and dynamics. Mining of sand and gravel, when and where permitted, will be primarily for the purpose of beach nourishment or shoreline stabilization.

The proposed Project does not involve offshore mining of sand and gravel. As such, Ocean Resources Policy #3 does not apply.

14.5.6 Port and Harbor Infrastructure

Ports Policy #1 - Ensure that dredging and disposal of dredged material minimize adverse effects on water quality, physical processes, marine productivity, and public health and take full advantage of opportunities for beneficial re-use.

The proposed Project does not involve dredging. As such, Ports Policy #1 does not apply.

Ports Policy #2 - Obtain the widest possible public benefit from channel dredging and ensure that Designated Port Areas and developed harbors are given highest priority in the allocation of resources.

The proposed Project does not involve dredging. The Project also does not involve public funds or allocation of public resources. As such, Ports Policy #2 does not apply.

Ports Policy #3 - Preserve and enhance the capacity of Designated Port Areas to accommodate water-dependent industrial uses and prevent the exclusion of such uses from tidelands and any other DPA lands over which an EEA agency exerts control by virtue of ownership or other legal authority.

The proposed site is not located within a Designated Port Area.

Ports Policy #4 - For development on tidelands and other coastal waterways, preserve and enhance the immediate waterfront for vessel-related activities that require sufficient space and suitable facilities along the water's edge for operational purposes.

The Project will conform to Ports Policy #4. The Project site is not situated on the immediate waterfront and will not interfere with vessel related activities.

Ports Policy #5 - Encourage, through technical and financial assistance, expansion of water-dependent uses in Designated Port Areas and developed harbors, re-development of urban waterfronts, and expansion of physical and visual access.

The proposed Project is private and will not provide direct technical or financial assistance to expand water-dependent uses, redevelopment of urban waterfronts, or expansion of physical or visual access. As such, Ports Policy #5 does not apply.

14.5.7 Protected Areas

Protected Areas Policy #1 - Preserve, restore, and enhance coastal Areas of Critical Environmental Concern, which are complexes of natural and cultural resources of regional or statewide significance.

There are no ACECs on the Project Site or in the vicinity of the site. As such, Protected Areas Policy #1 does not apply.

Protected Areas Policy #2 - Protect state designated scenic rivers in the coastal zone.

There are no designated scenic rivers in the Project area. As such, Protected Areas Policy #2 does not apply.

Protected Areas Policy #3 - Ensure that proposed developments in or near designated or registered historic places respect the preservation intent of the designation and that potential adverse effects are minimized.

The proposed Project will conform to Protected Areas Policy #3. The Site is located in proximity to Day Boulevard which is included in the National Register of Historic Places. The Project will not affect Day Boulevard, since it is a replacement project and will continue to operate as it does today.

14.5.8 Public Access

Public Access Policy #1 - Ensure that development (both water-dependent or nonwater-dependent) of coastal sites subject to state waterways regulation will promote general public use and enjoyment of the water's edge, to an extent commensurate with the Commonwealth's interests in flowed and filled tidelands under the Public Trust Doctrine.

The proposed Project will conform with Public Access Policy #1. The Applicant is committed to continuing to provide physical and visual access to Dorchester Bay parkland by providing parking spaces, open space, benches and an 8 foot wide walkway.

Public Access Policy #2 - Improve public access to existing coastal recreation facilities and alleviate auto traffic and parking problems through improvements in public transportation and trail links (land- or water-based) to other nearby facilities. Increase capacity of existing recreation areas by facilitating multiple use and by improving management, maintenance, and public support facilities. Ensure that the adverse impacts of developments proposed near existing public access and recreation sites are minimized.

The proposed Project will conform to Public Access Policy #2. The Project will not affect public access to the abutting Carson Beach coastal recreational facilities. The Project will provide improved public access by providing an 8-foot wide sidewalk along the northern edge of the property.

Public Access Policy #3 - Expand existing recreation facilities and acquire and develop new public areas for coastal recreational activities, giving highest priority to regions of high need or limited site availability. Provide technical assistance to developers of both public and private recreation facilities and sites that increase public access to the shoreline to ensure that both transportation access and the recreation facilities are compatible with social and environmental characteristics of surrounding communities.

The Site abuts a major public recreational coastal facility, Carson Beach. The applicant will expand improve the existing pedestrian experience by providing a sidewalk along the northern edge of the property, benches and parking spaces.

14.5.9 Water Quality

Water Quality Policy #1 - Ensure that point-source discharges and withdrawals in or affecting the coastal zone do not compromise water quality standards and protect designated uses and other interests.

The Project will result in an improvement to the quality of stormwater runoff that discharges from the site and enters Dorchester Bay. The introduction of deep sump hooded catch basins and water quality units will provide treatment of runoff for pollutants such as oil, grease and total suspended solids. The existing site conditions are such that the runoff is not currently treated prior to discharge.

Water Quality Policy #2 - Ensure the implementation of nonpoint source pollution controls to promote the attainment of water quality standards and protect designated uses/ other interests.

The proposed Project will conform to Water Quality Policy #2. Stormwater runoff from construction activities and operation of the Facility will be managed in full compliance with the EPA NPDES CGP and the Massachusetts Stormwater Management Standards, respectively, prior to discharge to the MS4 system and into Dorchester Bay.

Water Quality Policy #3 – Ensure that subsurface waste discharges conform to applicable standards, including the siting, construction, and maintenance requirements for on-site wastewater disposal systems, water quality standards, established Total Maximum Daily Load limits, and prohibitions on facilities in high-hazard areas.

There will be no subsurface waste discharges associated with the Project. As such, Water Quality Policy #3 does not apply.

BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 2,000 feet

0 1,000 2,000

Feet

BTUHWF
Dorchester, Massachusetts

Locus Map

FIGURE
1-1

BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

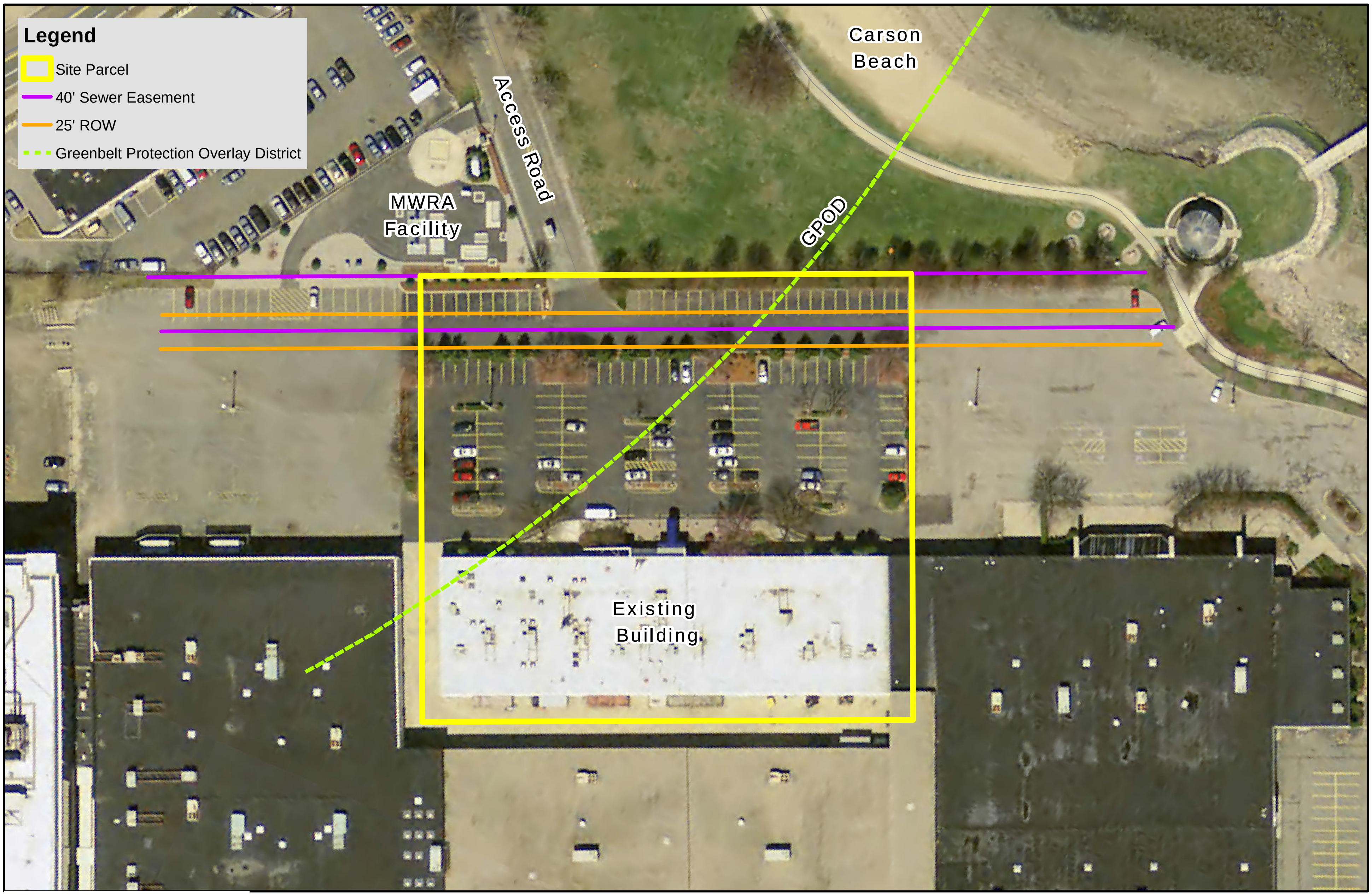
1 inch = 300 feet

0 150 300
Feet

BTUHWF
Dorchester, Massachusetts

Site Aerial (Overview)

FIGURE
1-2



BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 100 feet
0 50 100
Feet

BTUHWF
Dorchester, Massachusetts

Site Aerial (Detail View)

FIGURE
1-3

BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 100 feet
0 50 100
Feet

BTUHWF
Dorchester, Massachusetts

Photo Key

FIGURE
2-1

1

2

3

4

5

6

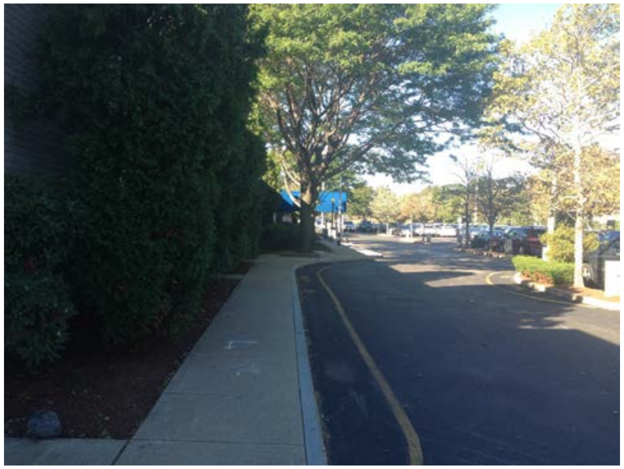
BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

BTUHWF
Dorchester, Massachusetts

Site Photos

FIGURE
2-2

7



8

9

10

11

12

BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

BTUHWF
Dorchester, Massachusetts

Site Photos

FIGURE
2-3

BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 100 feet

0 50 100

Feet

BTUHWF
Dorchester, Massachusetts

Chapter 91 Jurisdiction

FIGURE
2-4

BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 300 feet

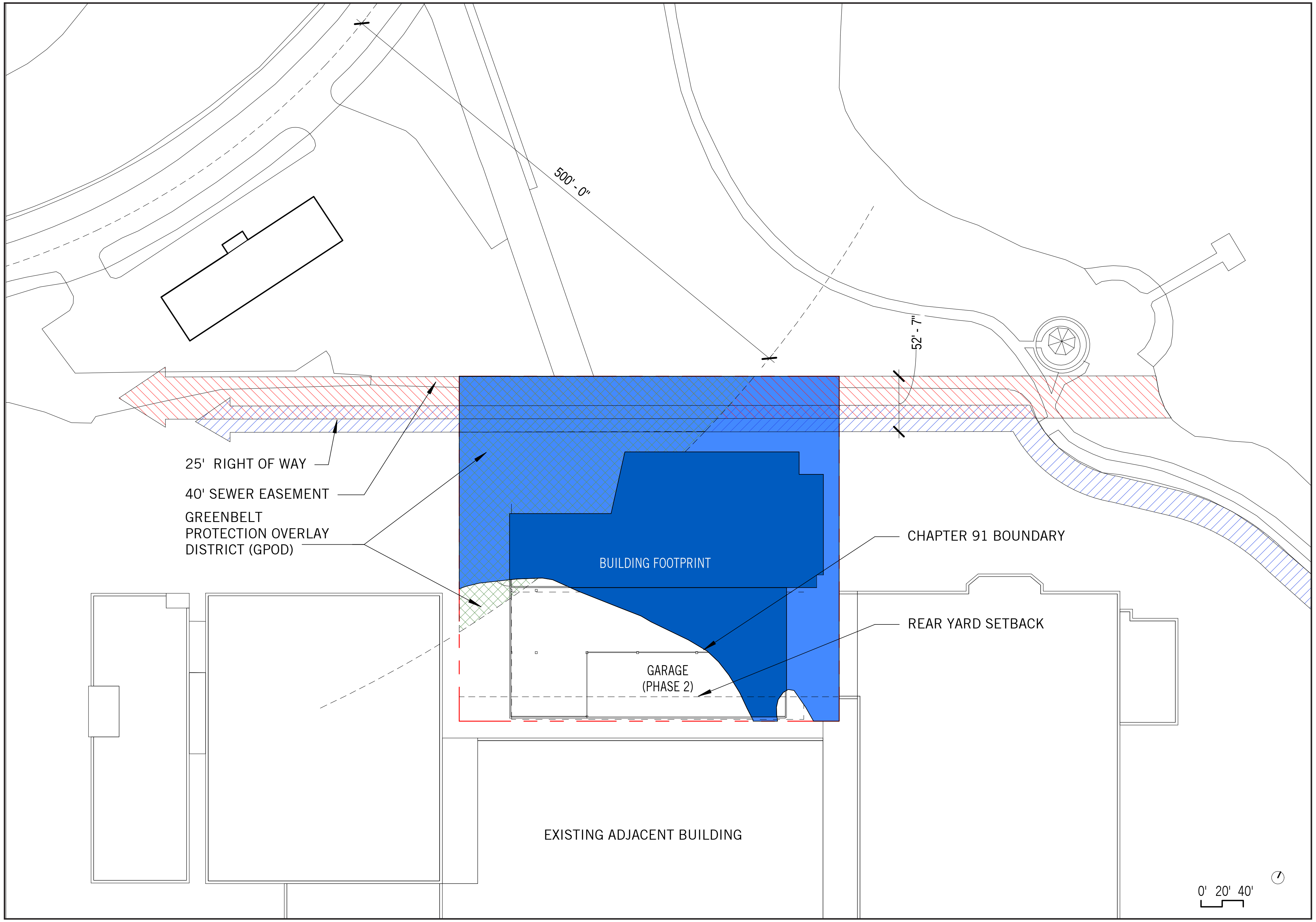
0 150 300

Feet

BTUHWF
Dorchester, Massachusetts

FEMA Flood Zones

FIGURE
2-5



Zoning Diagram

- Open Space within CH-91 Juristiction
- Proposed built area within CH-91 Juristiction

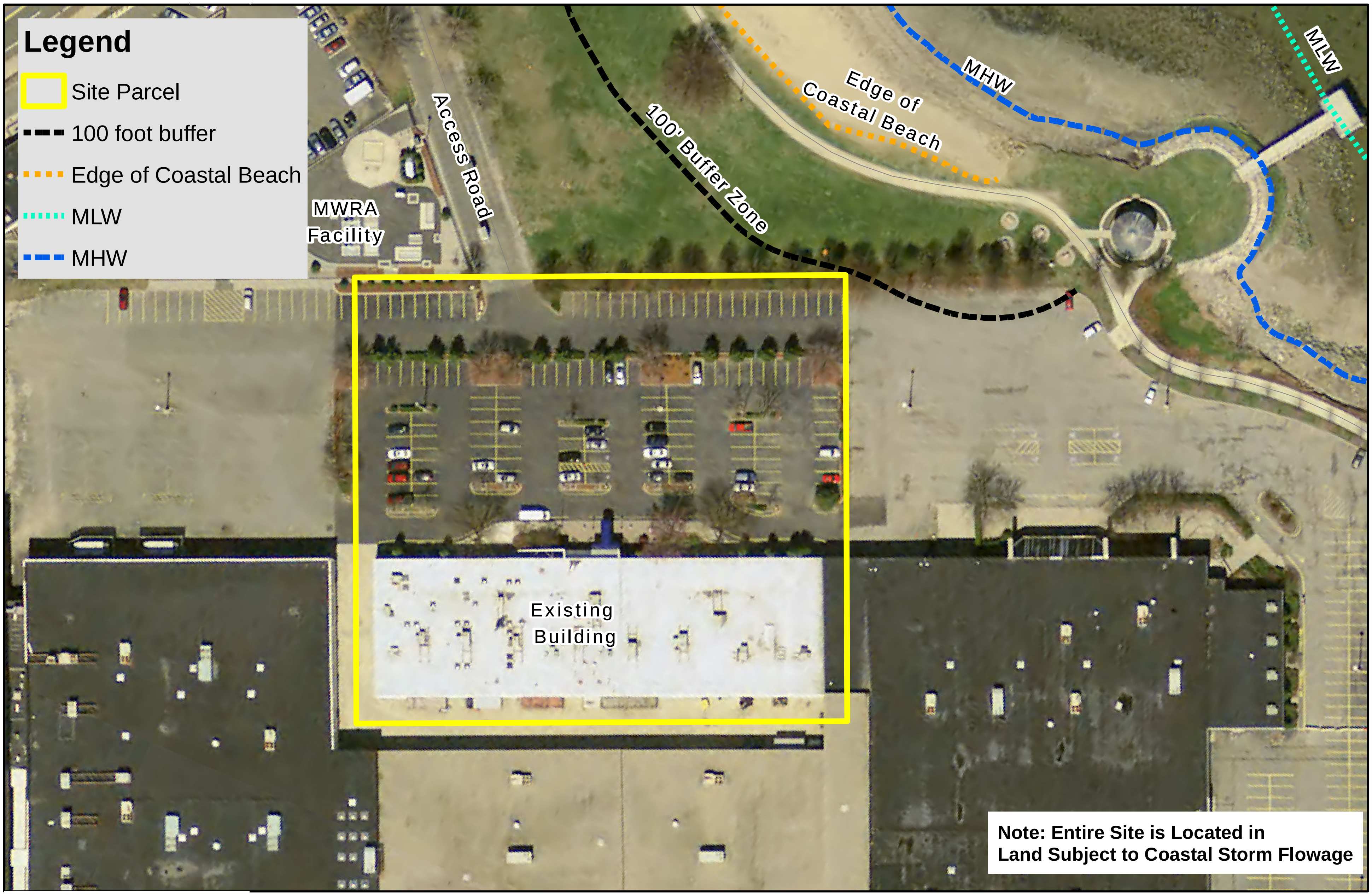
Zoning:

District: **B-1-55 Business**
Lot Size- **117,720 SF**
FAR- **1**
Total FAR Area Including Garage- **115,826 GSF**
Max Height- **55'-0"**
No Side Yard Setbacks
Rear Yard Setback: 10' + building length/20: 24-0"'

Chapter 91:

Area of Site Within Ch-91 Juristiction (Filled Tidelands):
88,580 SF
Required Open Space (50% Filled Tidelands):
44,290 SF

Building Foorprint including garage within Ch-91 Juristiction:
43,628SF
Proposed Open Space:
44,952 SF



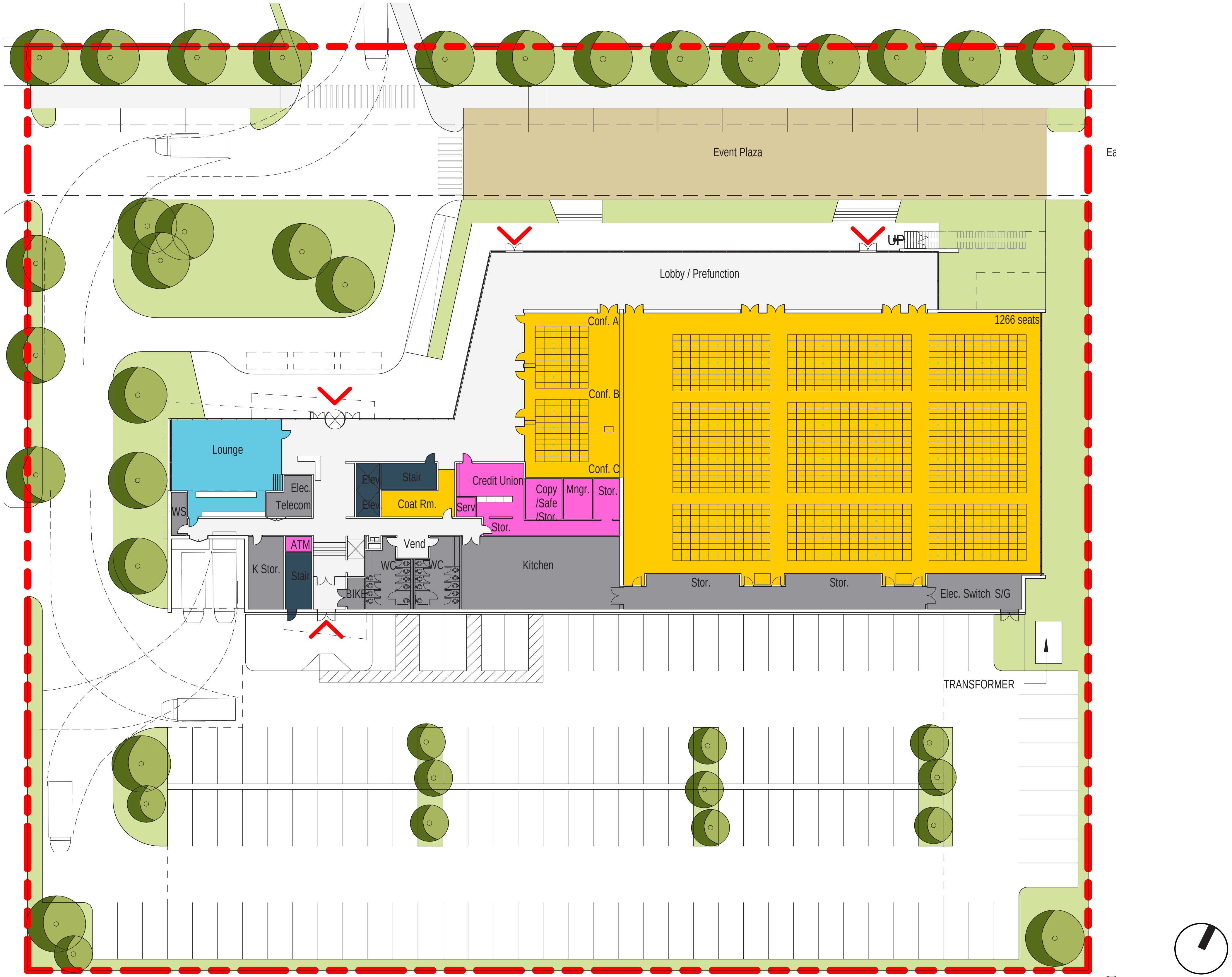
BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 100 feet
0 50 100
Feet

BTUHWF
Dorchester, Massachusetts

Wetland Resources

FIGURE **3-1**



SITE PLAN (PHASE 1)

PROGRAM SUMMARY

Multifunction Meeting Halls

Union Offices

Health & Welfare Fund Offices

Eye Care Office

Credit Union Branch Office

Building GSF: 52,469

Garage: 63,357

Total: 115,826 (FAR GSF)

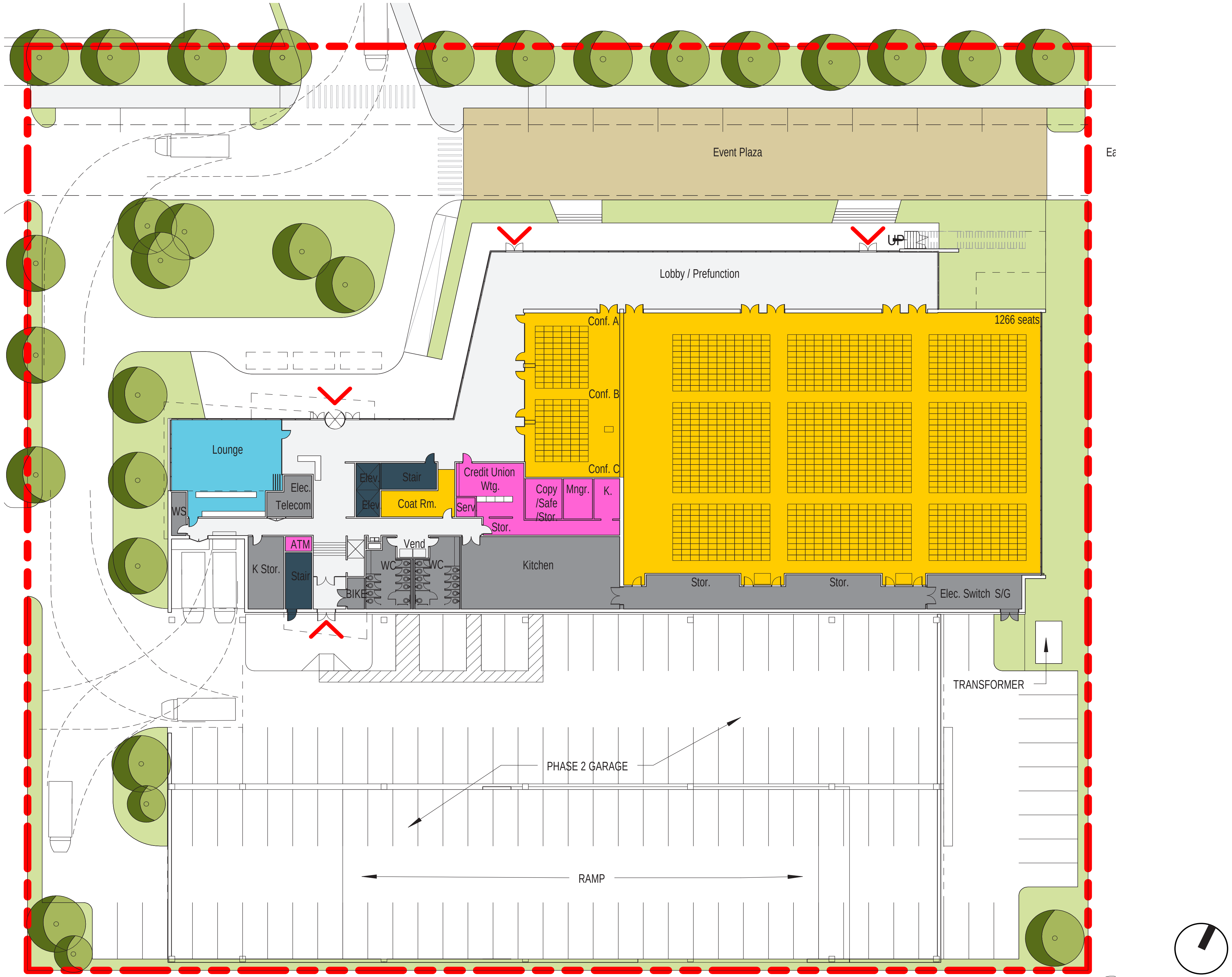
(Not including 5,933 sf of mechanical space)

PARKING SUMMARY

PHASE 1 PARKING TOTAL: 132 OUTDOOR SPACES

PHASE 2 PARKING TOTAL: 29 OUTDOOR SPACES

279 GARAGE SPACES



SITE PLAN (PHASE 2)

PROGRAM SUMMARY

Multifunction Meeting Halls

Union Offices

Health & Welfare Fund Offices

Eye Care Office

Credit Union Branch Office

Building GSF:	52,469
Garage:	63,357
Total:	115,826 (FAR GSF)

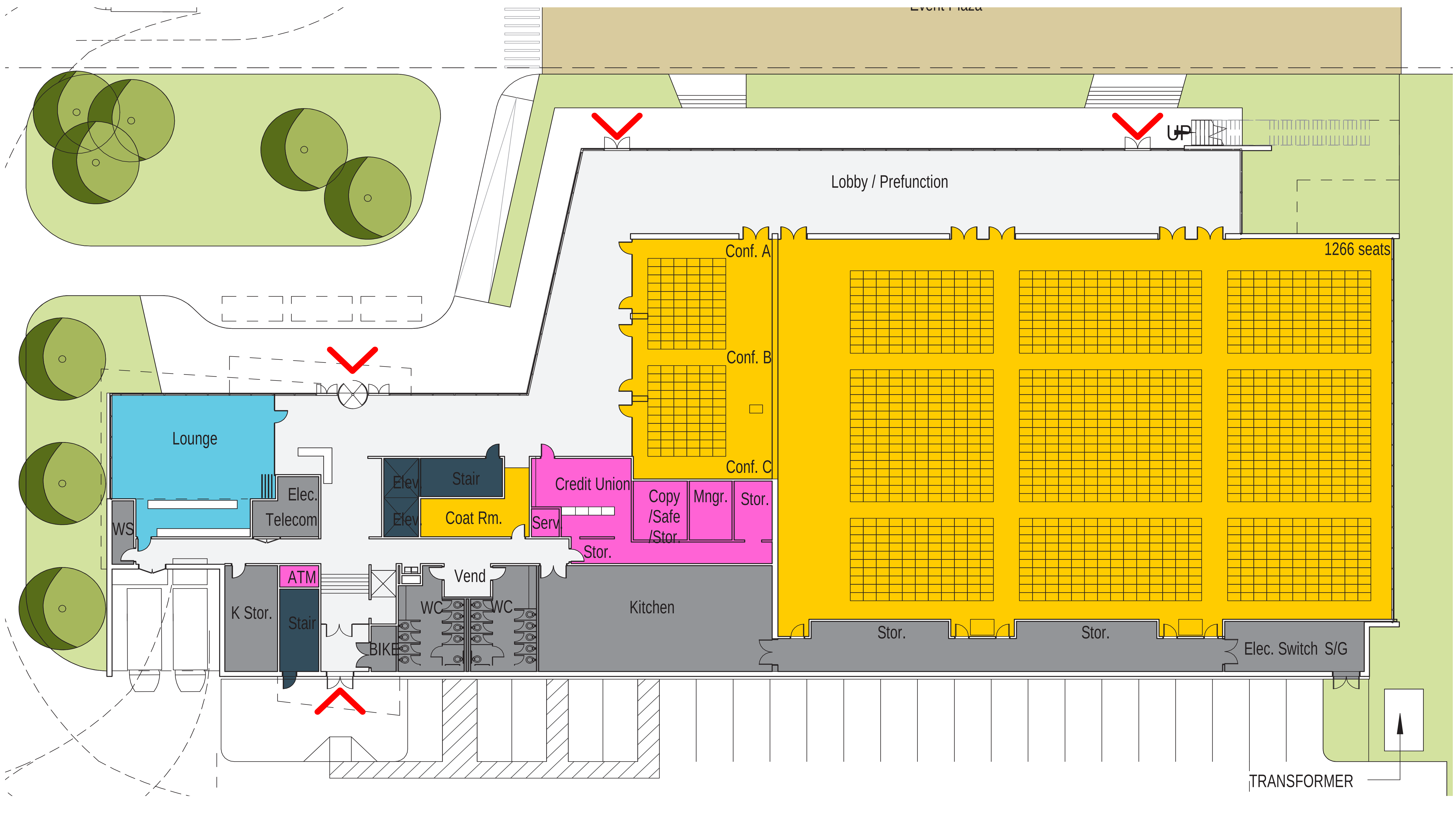
(Not including 5,933 sf of mechanical space)

PARKING SUMMARY

PHASE 1 PARKING TOTAL: 132 OUTDOOR SPACES

PHASE 2 PARKING TOTAL: 29 OUTDOOR SPACES

279 GARAGE SPACES



BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

BTUHWF
Dorchester, Massachusetts
First Floor

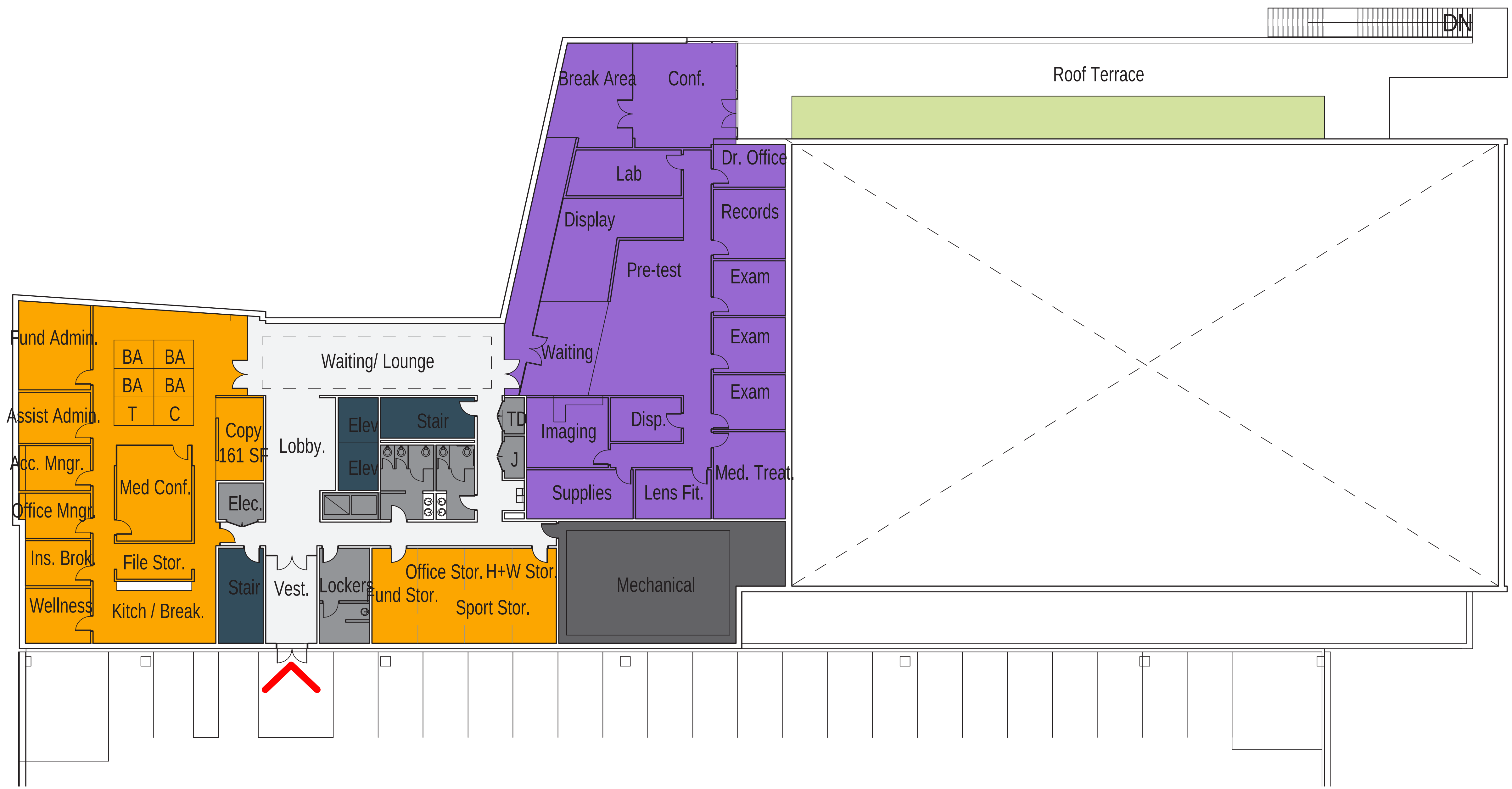
FIGURE
4-3

LOADING DIAGRAM

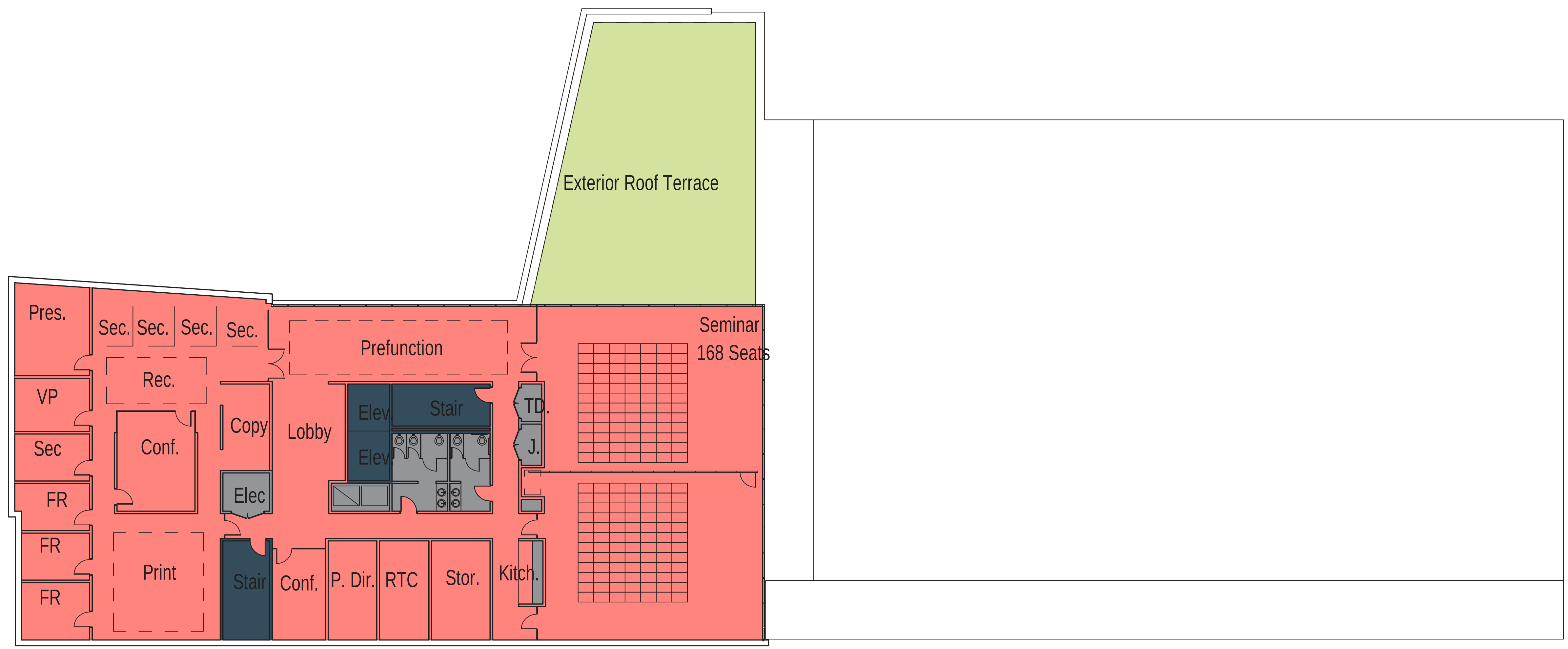
The Building Loading dock will be designed to accomidate one dumpster and one truck bay. The dock will be screened fromthe west and be enclosued by a roll down door on the south facade.

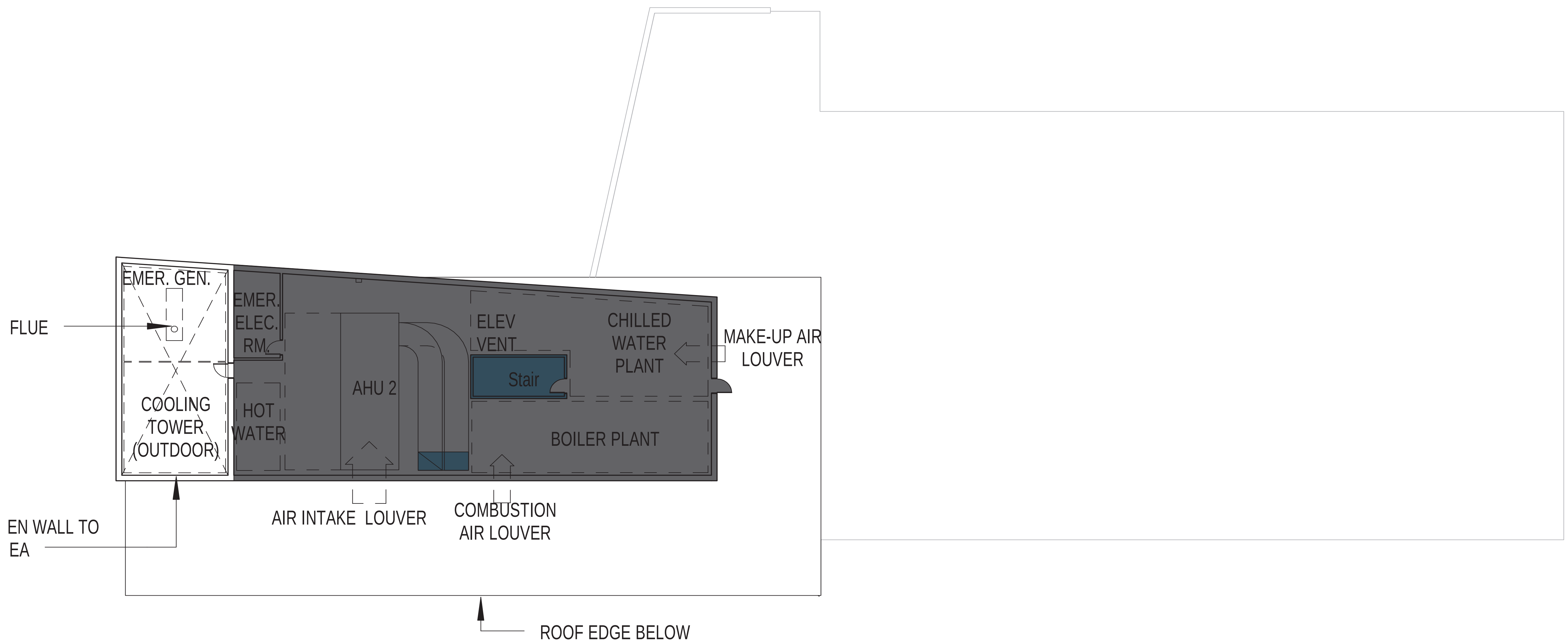
1. Truck Turn Around Area
2. Loading Bay
3. Dumpster Bay
4. Rear Building Entry
5. Full Height Screen Wall
6. Overhead Door

2ND FLOOR

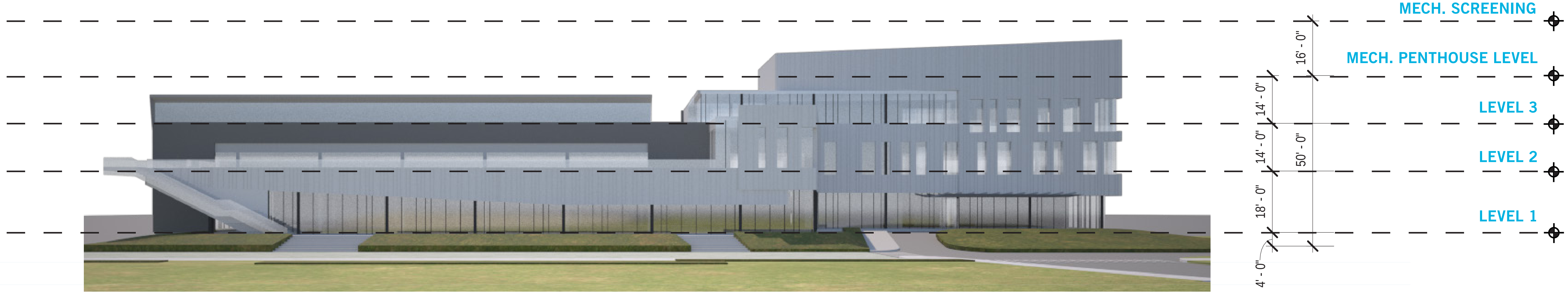


DN
Roof Terrace
Break Area
Conf.
Lab
Dr. Office
Records
Display
Pre-test
Exam
Exam
Exam
Waiting
Imaging
Disp.
Med. Treat.
Supplies
Lens Fit.
Mechanical
Fund Admin.
BA
BA
BA
BA
T
C
Waiting/ Lounge
Assist Admin.
Copy
161 SF
Lobby.
Elev.
Stair
Elev.
TD
J
Acc. Mngr.
Med Conf.
Office Mngr.
Elec.
Ins. Brok.
File Stor.
Stair
Vest.
Lockers
Office Stor.
H+W Stor.
Fund Stor.
Wellness
Kitch / Break.
Sport Stor.


Exterior Roof Terrace
Pres.
Sec.
Sec.
Sec.
Sec.
Prefunction
Seminar
168 Seats
Rec.
VP
Copy
Lobby
Elev
Stair
Elev
TD.
J.
Sec
Conf.
FR
Elec
FR
Print
Stair
Conf.
P. Dir.
RTC
Stor.
Kitch.
FR


EMER. GEN.
FLUE
EMER. ELEC. RM.
AHU 2
ELEV VENT
CHILLED WATER PLANT
MAKE-UP AIR LOUVER
Stair
COOLING TOWER (OUTDOOR)
HOT WATER
BOILER PLANT
EN WALL TO EA
AIR INTAKE LOUVER
COMBUSTION AIR LOUVER
ROOF EDGE BELOW

NORTH ELEVATION



SOUTH ELEVATION

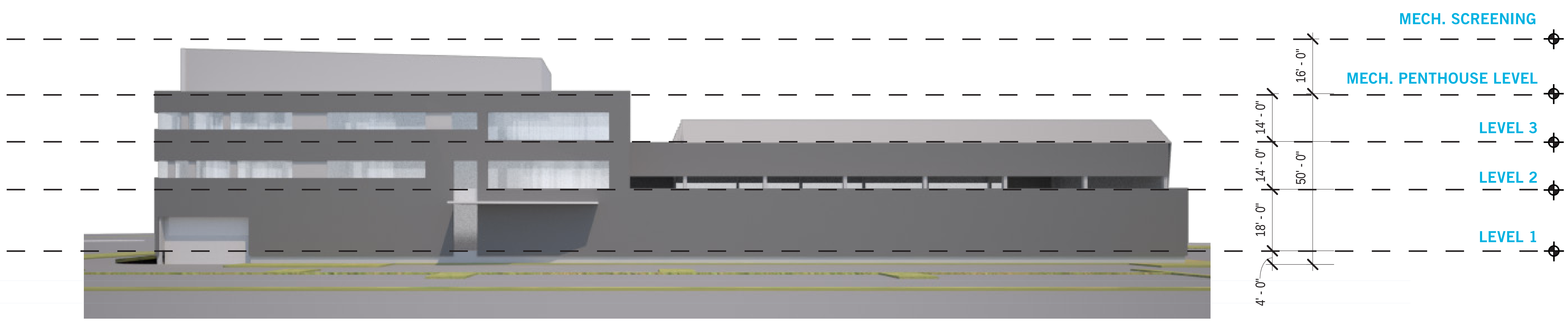
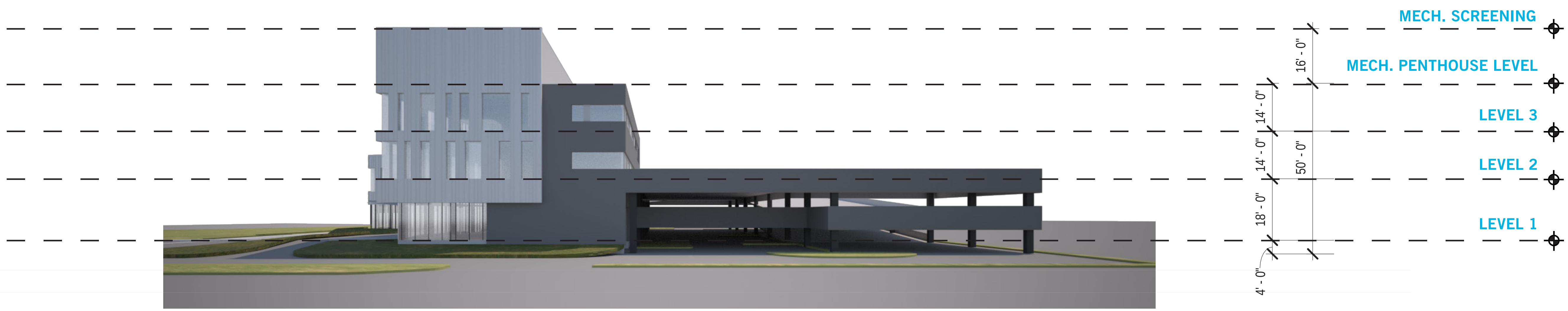
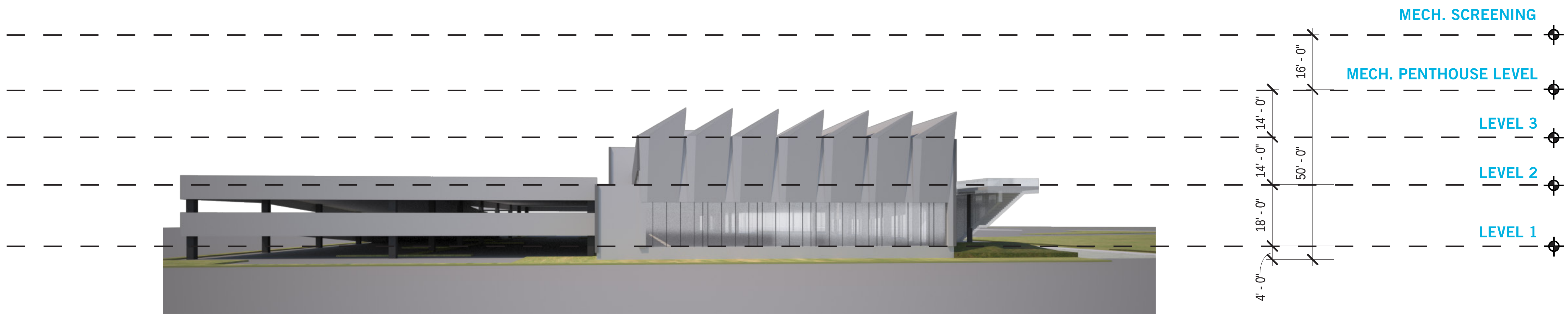


FIGURE 4-8
North & South Elevation Views

WEST ELEVATION



EAST ELEVATION



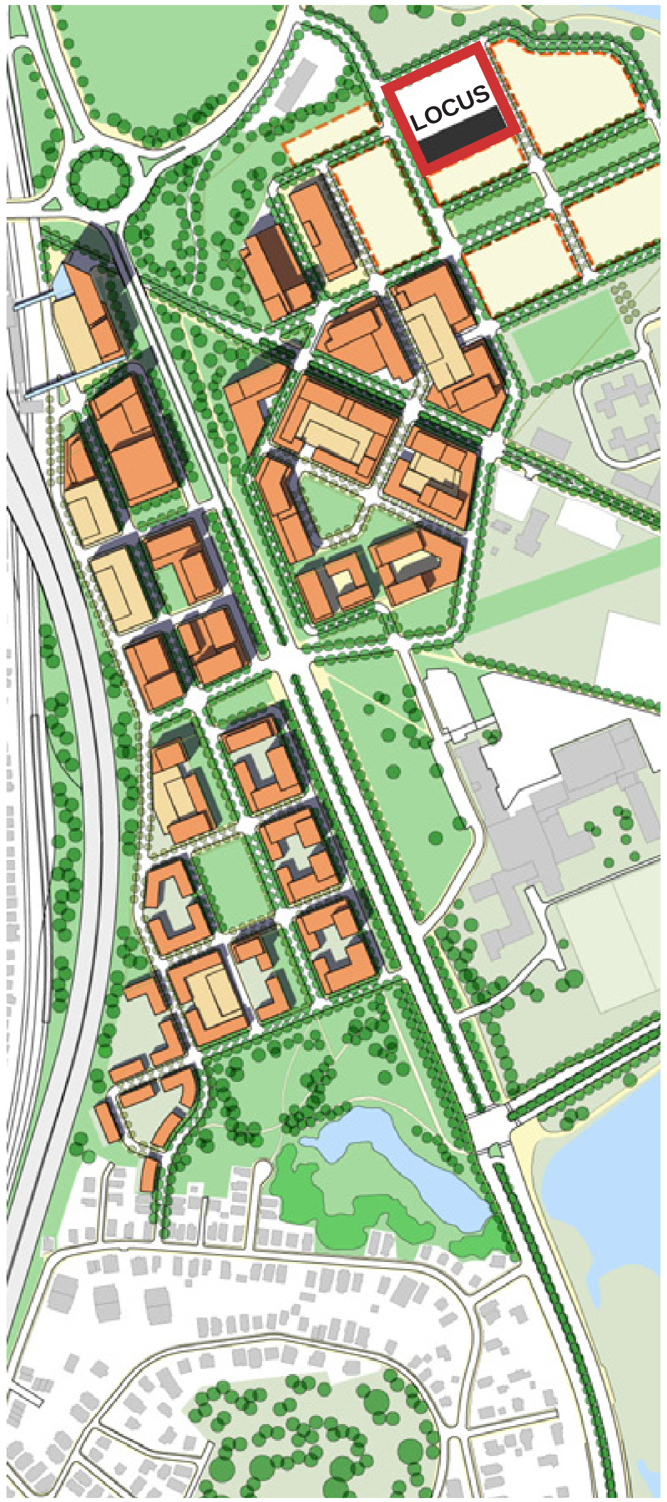
East & West Elevation Views

FIGURE
4-9

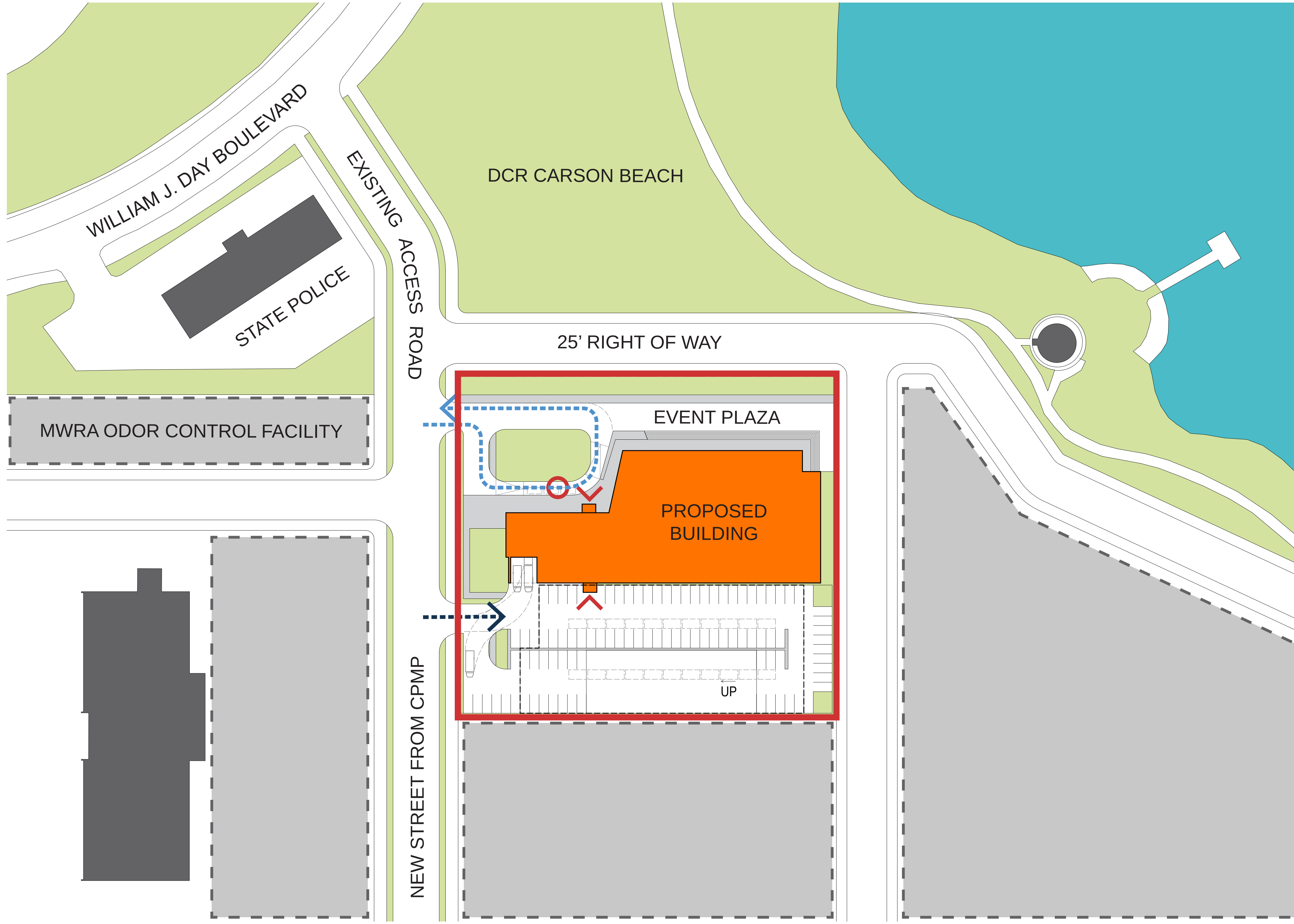
AERIAL VIEW FROM NORTH-WEST (see landscape plan for tree locations)

VIEW FROM NORTH (trees north of building to remain but not shown in this view)

VIEW FROM SOUTH-WEST



BRA COLUMBIA POINT
MASTER PLAN

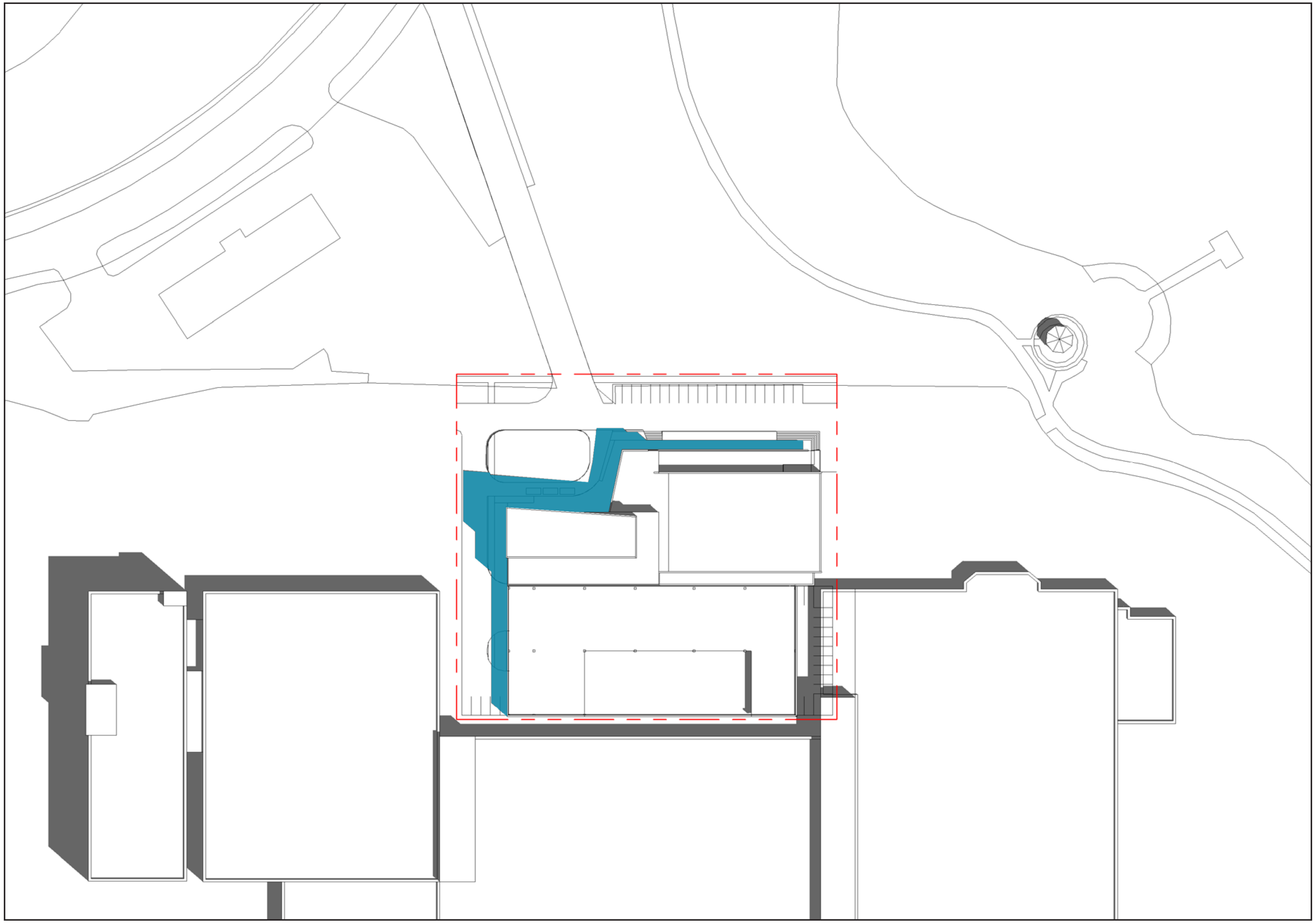


PROPOSED PROJECT OVERLAY WITH CPMP

Alternate 1

Alternate 2

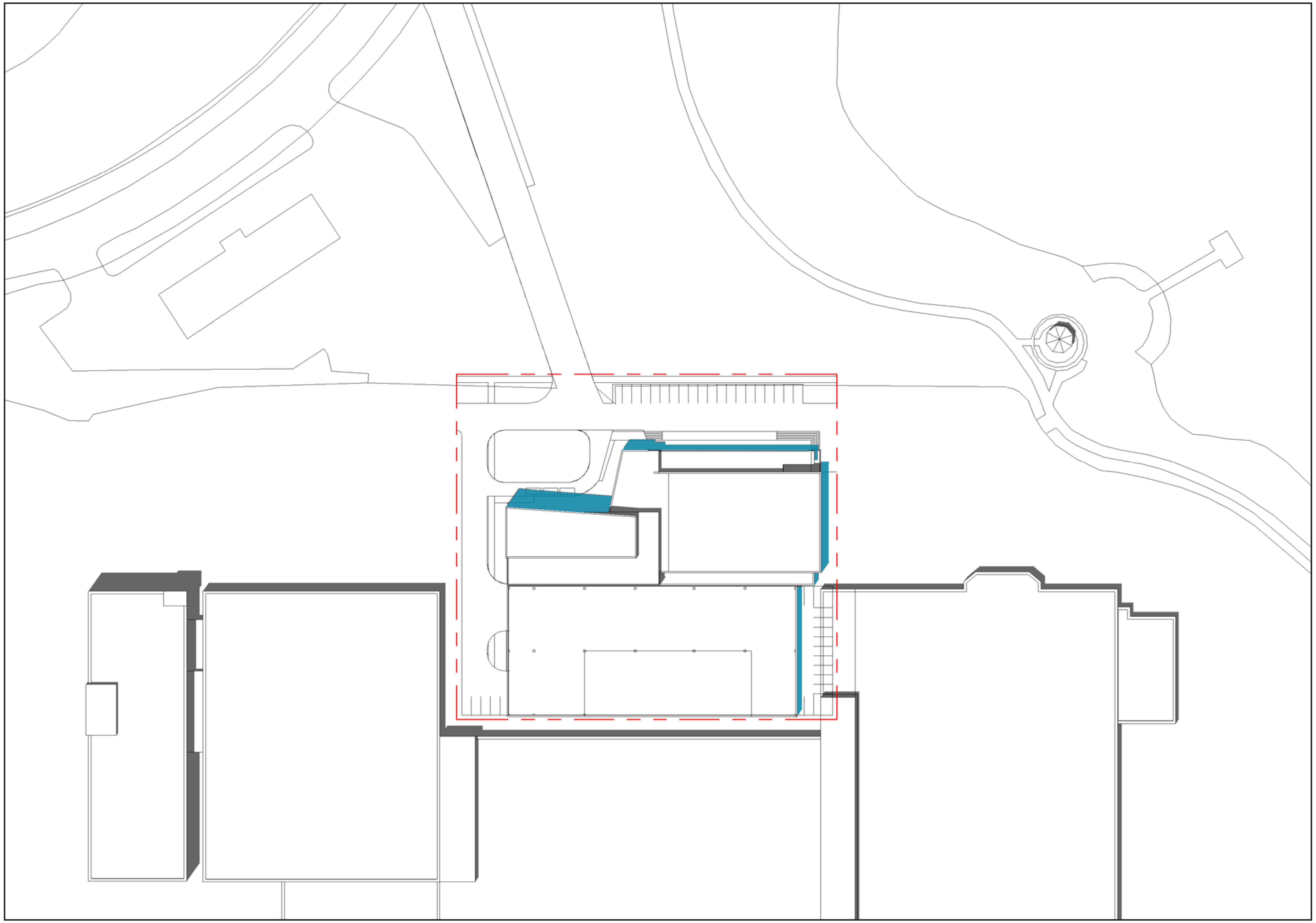
Alternate 3



SHADOW STUDY
Jun 21, 9am

Additional shadowed area created by project

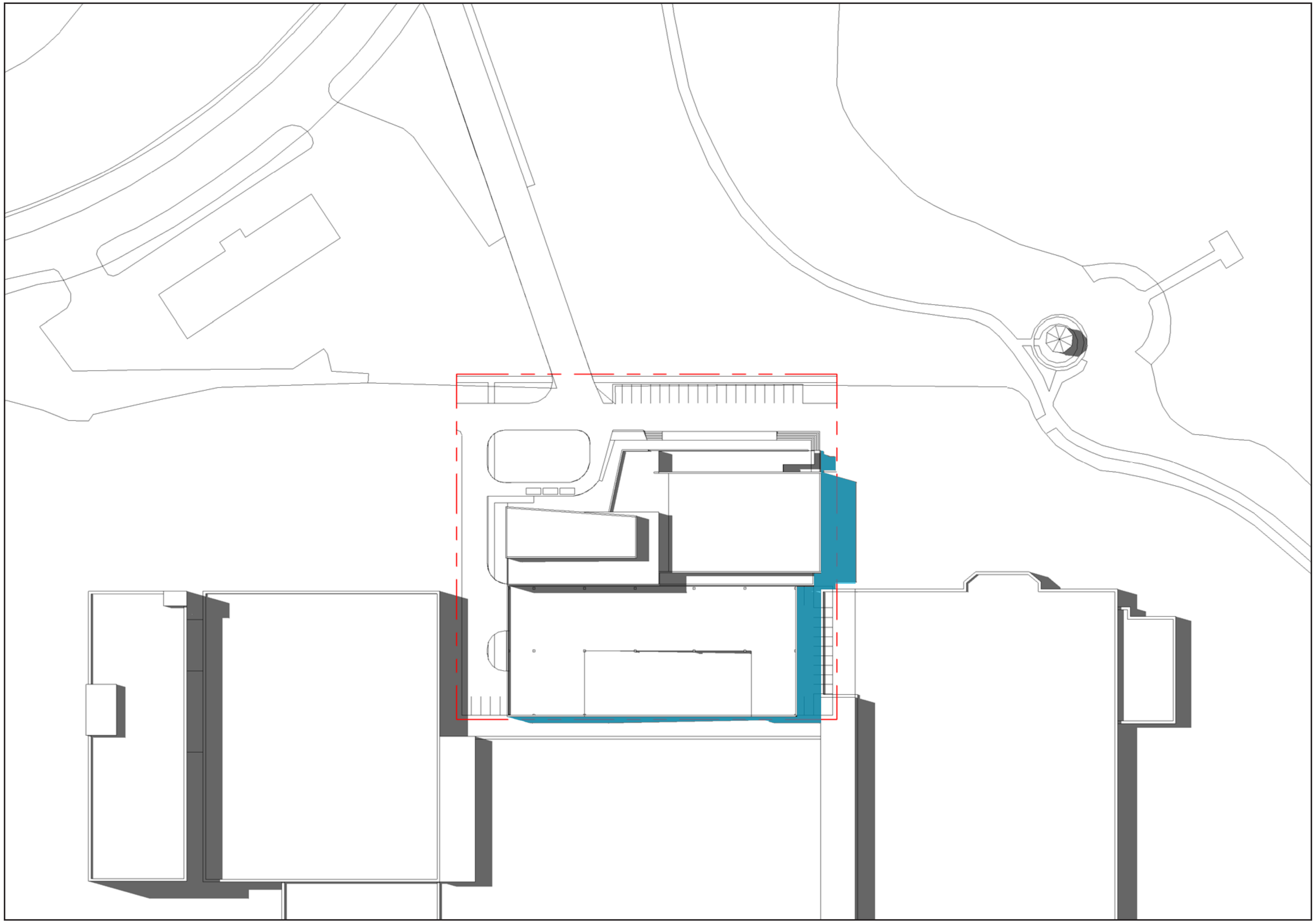
On Summer Mornings the proposed project's shadow will fall completely within the parcel property line.



SHADOW STUDY
Jun 21, 12pm

Additional shadowed area created by project

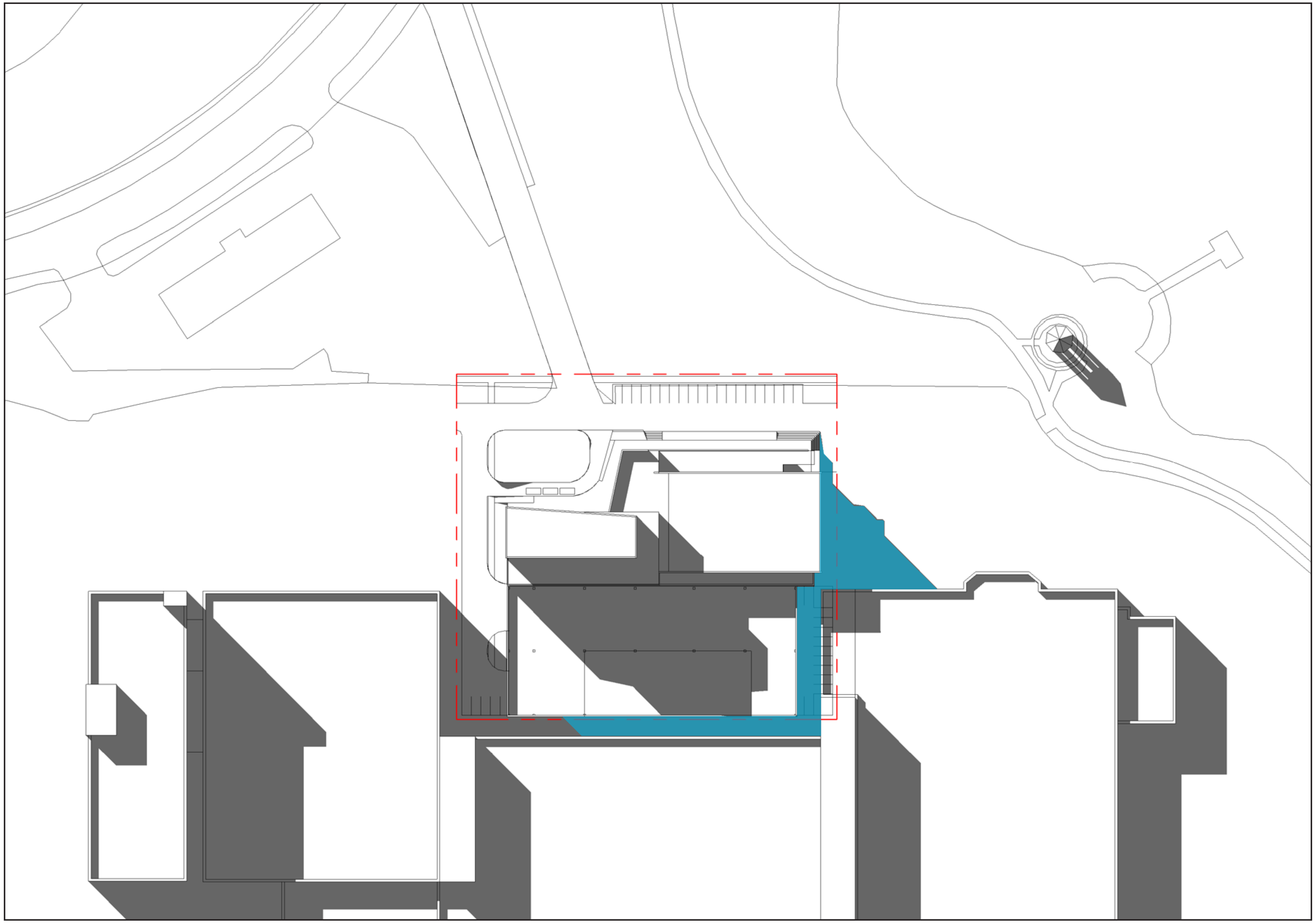
At mid-day in the summer months the proposed project's shadow will fall completely within the parcel property line.



SHADOW STUDY
Jun 21, 3pm

Additional shadowed area created by project

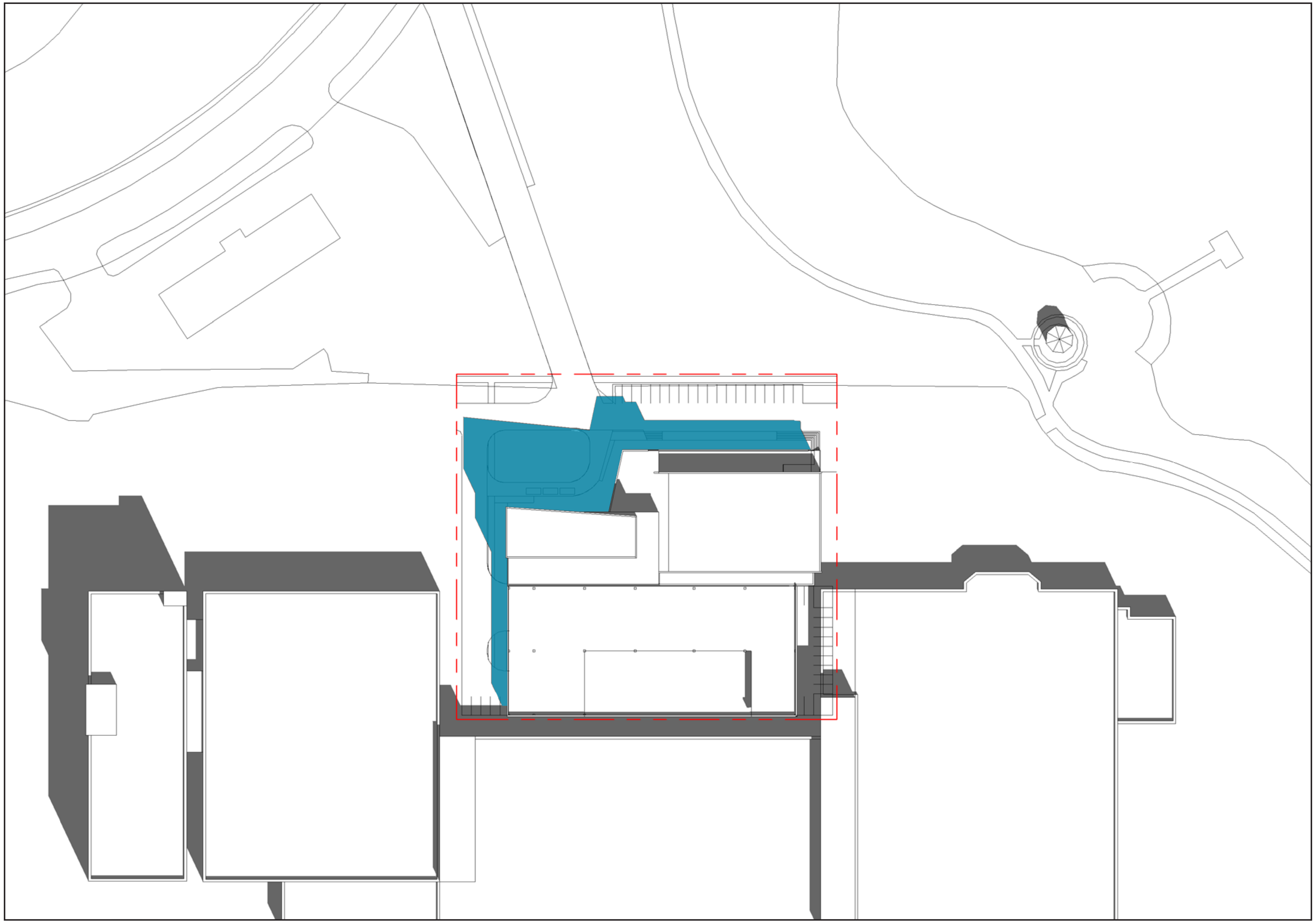
In the early afternoon in the summer months the proposed project's shadow will fall almost completely within the parcel property line, a small amount of shadowing will occer on the parcel to the east of the proposed site..



SHADOW STUDY
Jun 21, 6pm

Additional shadowed area created by project

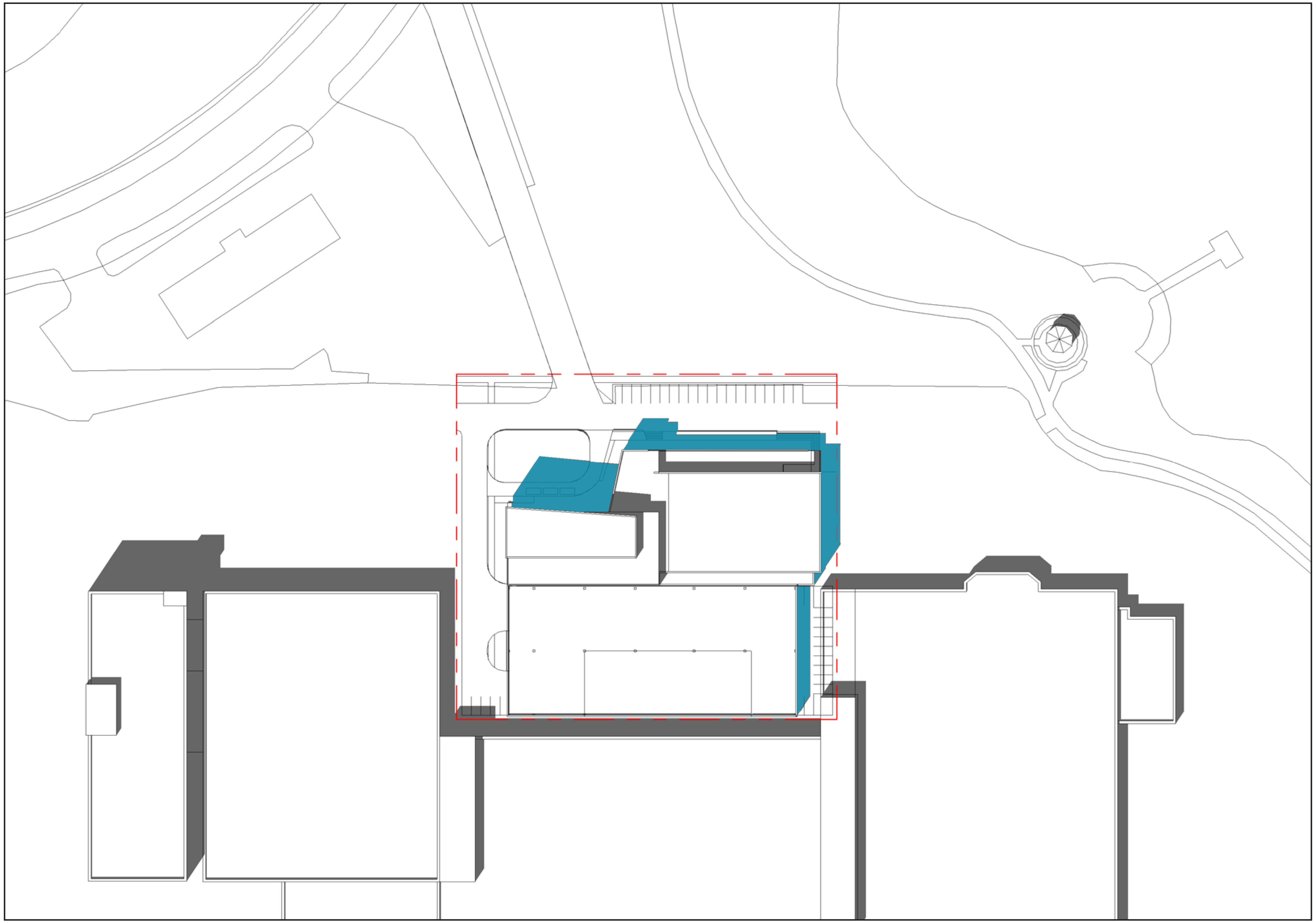
In the late afternoon in the summer months the proposed project's shadow will fall over the parcel property line on the parcel to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted.



SHADOW STUDY
Mar/Sep 21, 9am

Additional shadowed area created by project

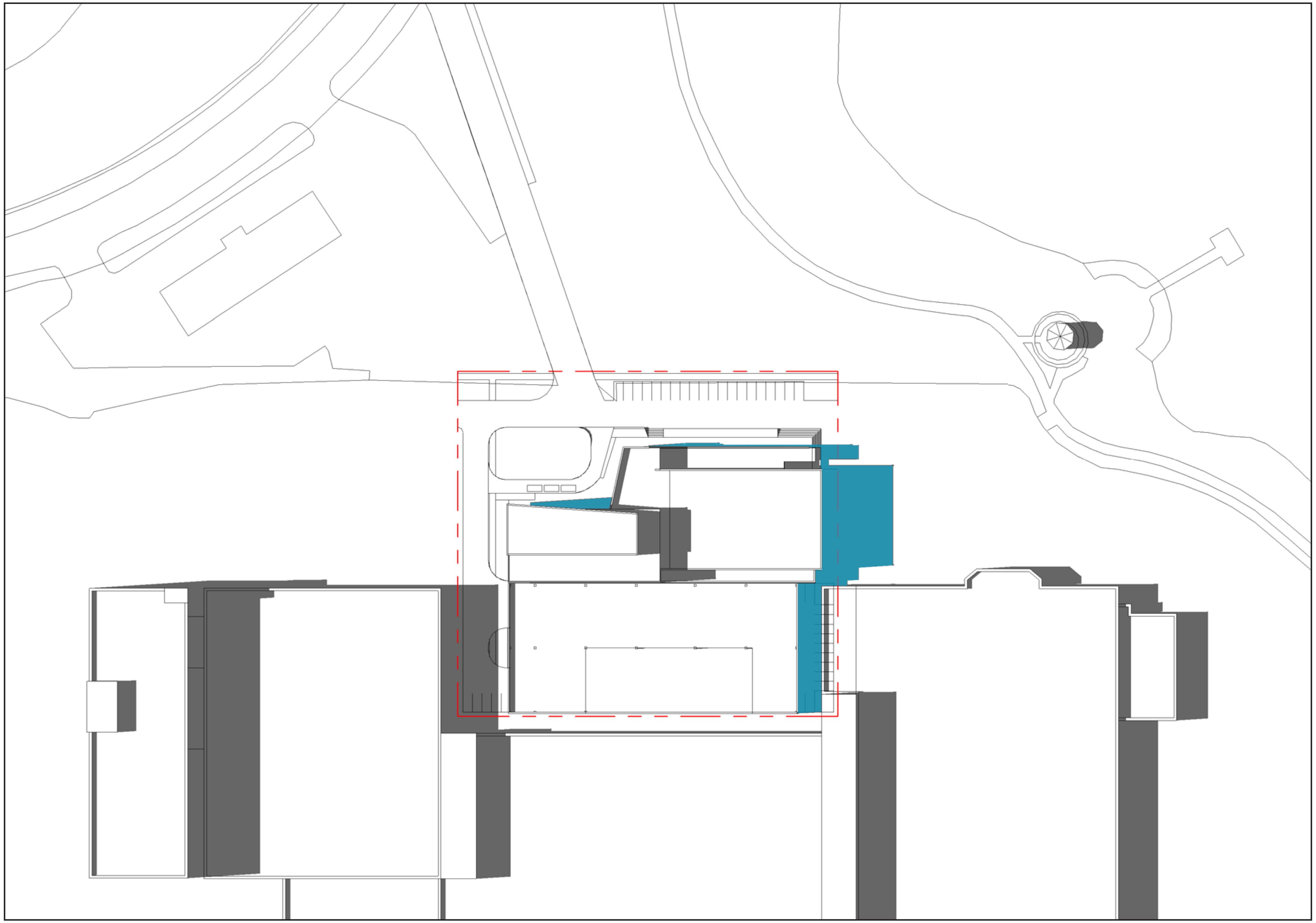
At the vernal and autumnal equinox during the morning, the proposed project's shadow will fall completely within the parcel property line.



SHADOW STUDY
Mar/Sep 21, 12pm

Additional shadowed area created by project

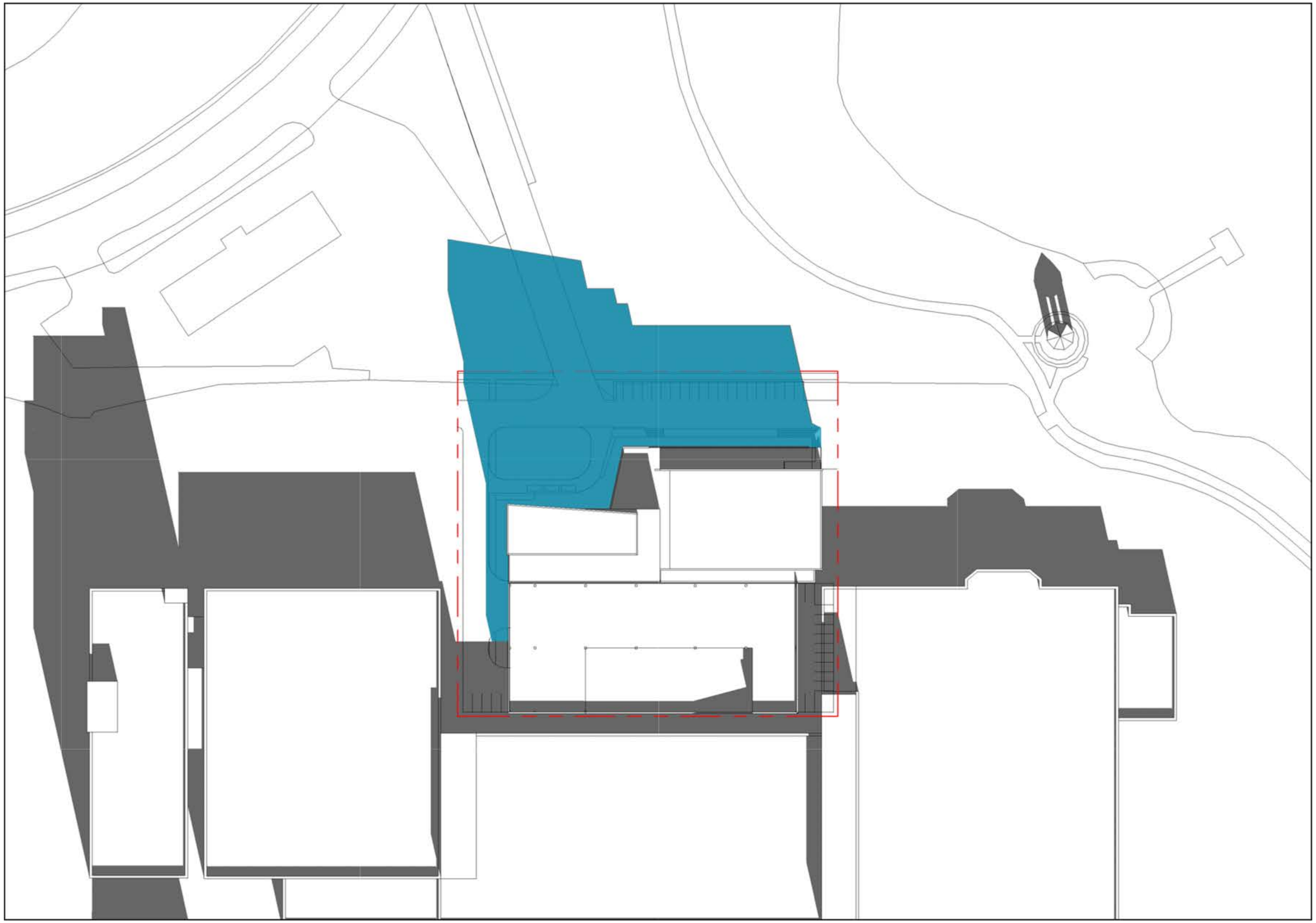
At the vernal and autumnal equinox, at mid day, the proposed project's shadow will fall completely within the parcel property line.



SHADOW STUDY
Mar/Sep 21, 3pm

Additional shadowed area created by project

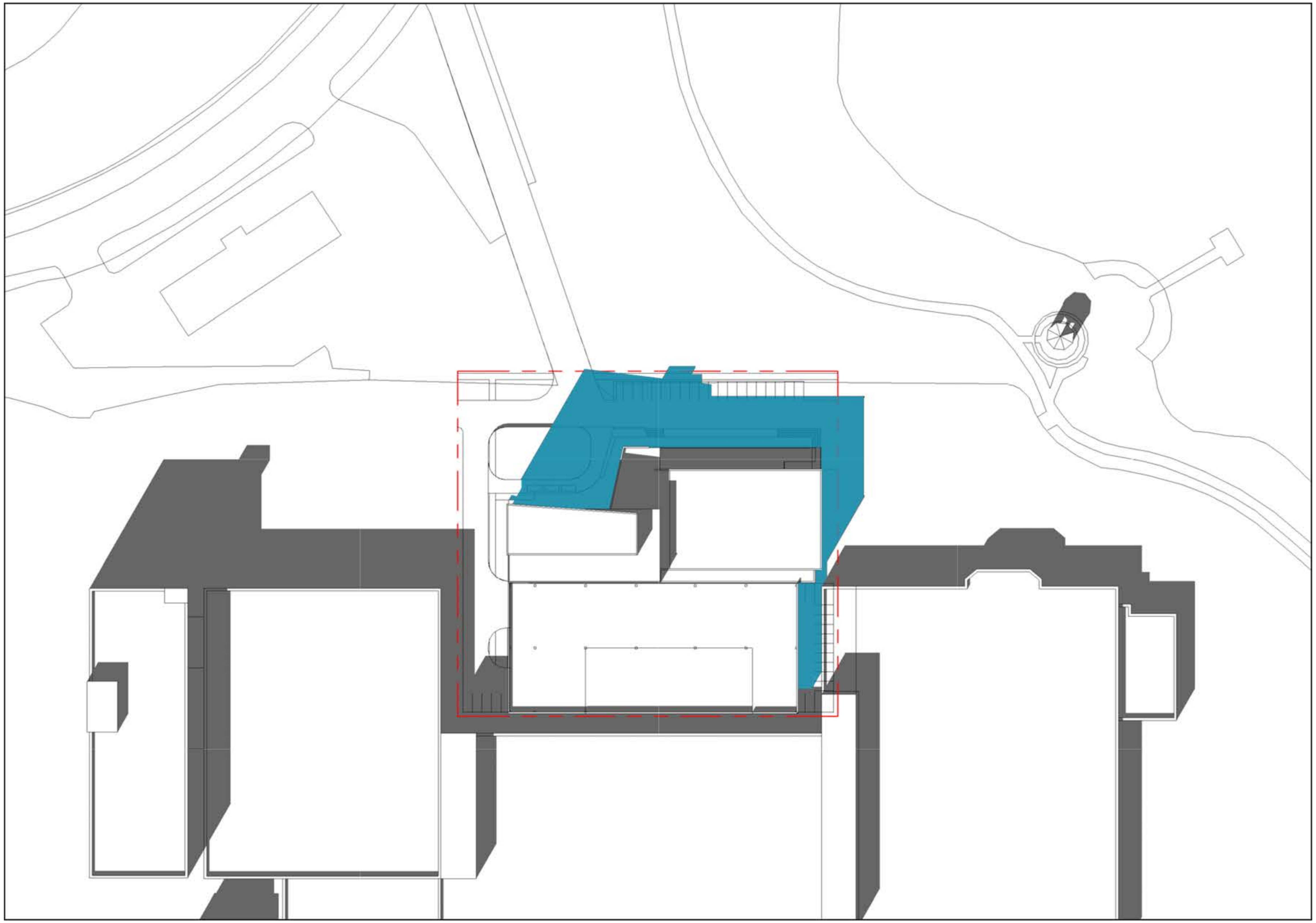
In the late afternoon, at the vernal and autumnal equinox, the proposed project's shadow will fall over the parcel property line on the parcel to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted.



SHADOW STUDY
Dec 21, 9am

Additional shadowed area created by project

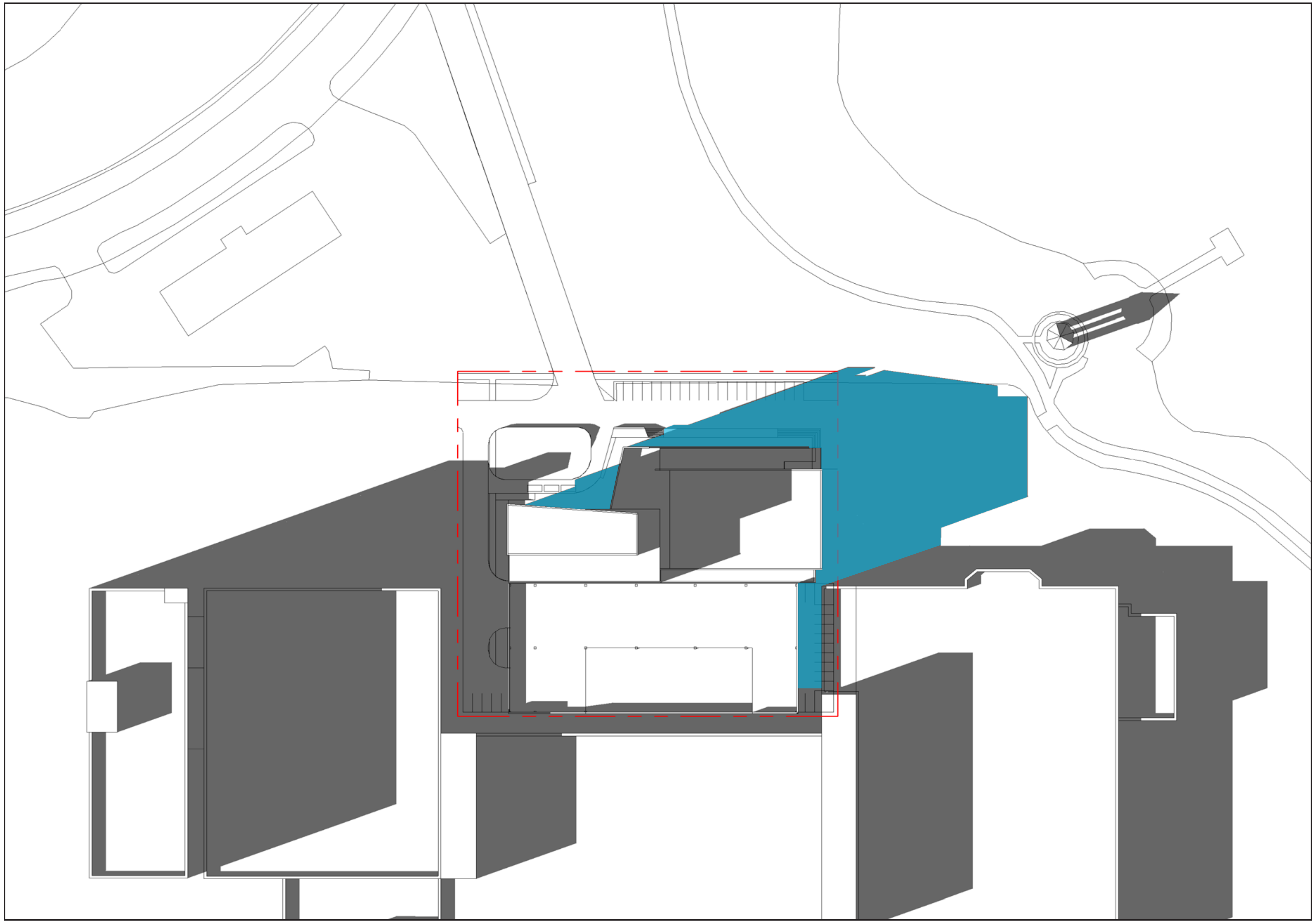
For one to two hours on winter mornings the proposed project's shadow will fall over the proprty line and on to the green adjacent to Carson Beach. This shadow should have minimal impact due to the low use of the green space in cold weather and the minimal impact time.



SHADOW STUDY
Dec 21, 12pm

Additional shadowed area created by project

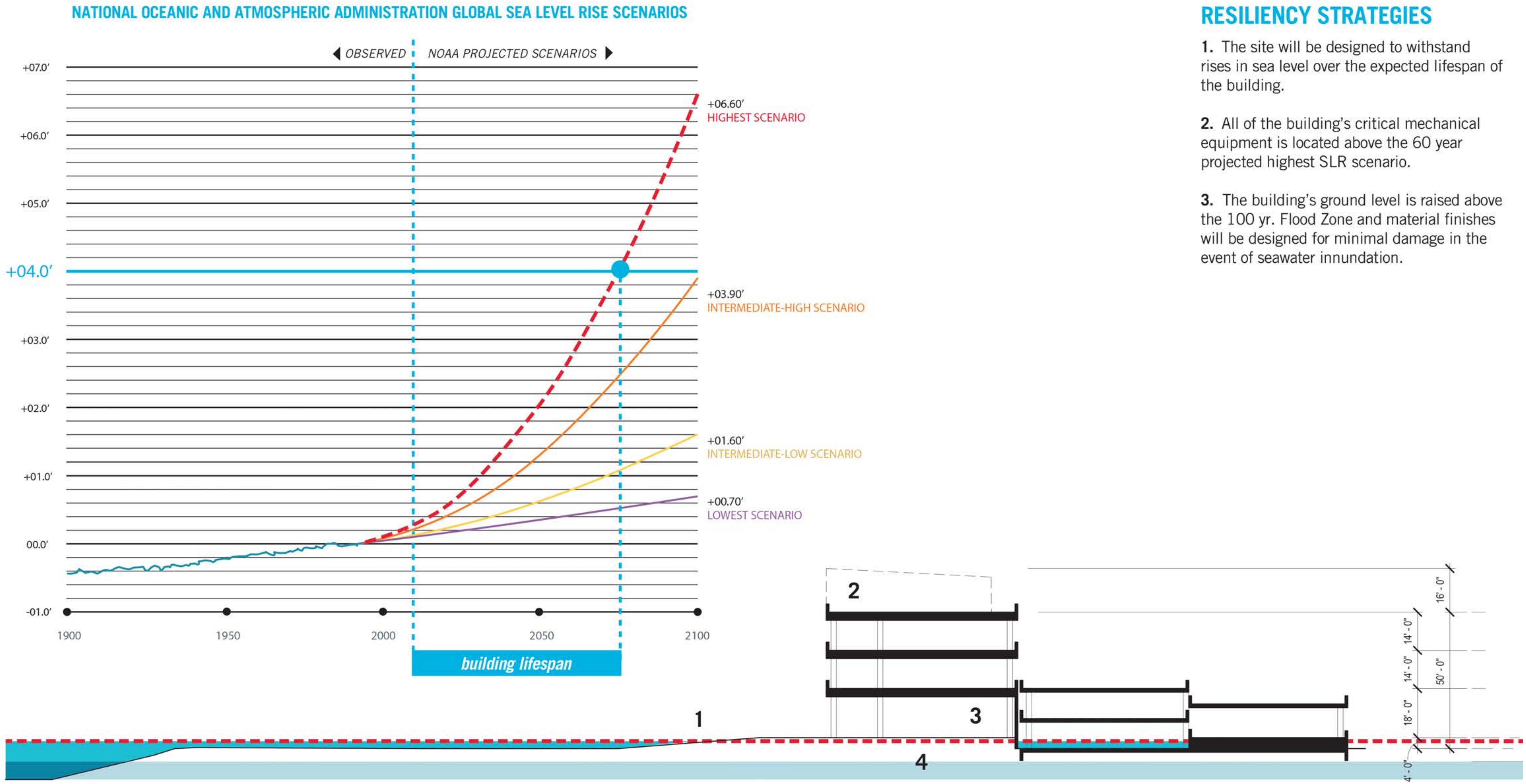
At mid-day, in the winter months, the proposed project's shadow will fall over the parcel property line on the parcel to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted.



SHADOW STUDY
Dec 21, 3pm

Additional shadowed area created by project

Late in the day, in the winter months, the proposed project's shadow will fall over the parcel property line on the parcel to the east of the proposed site. Currently this adjacent parcel contains an asphalt parking surface that will be minimally impacted.

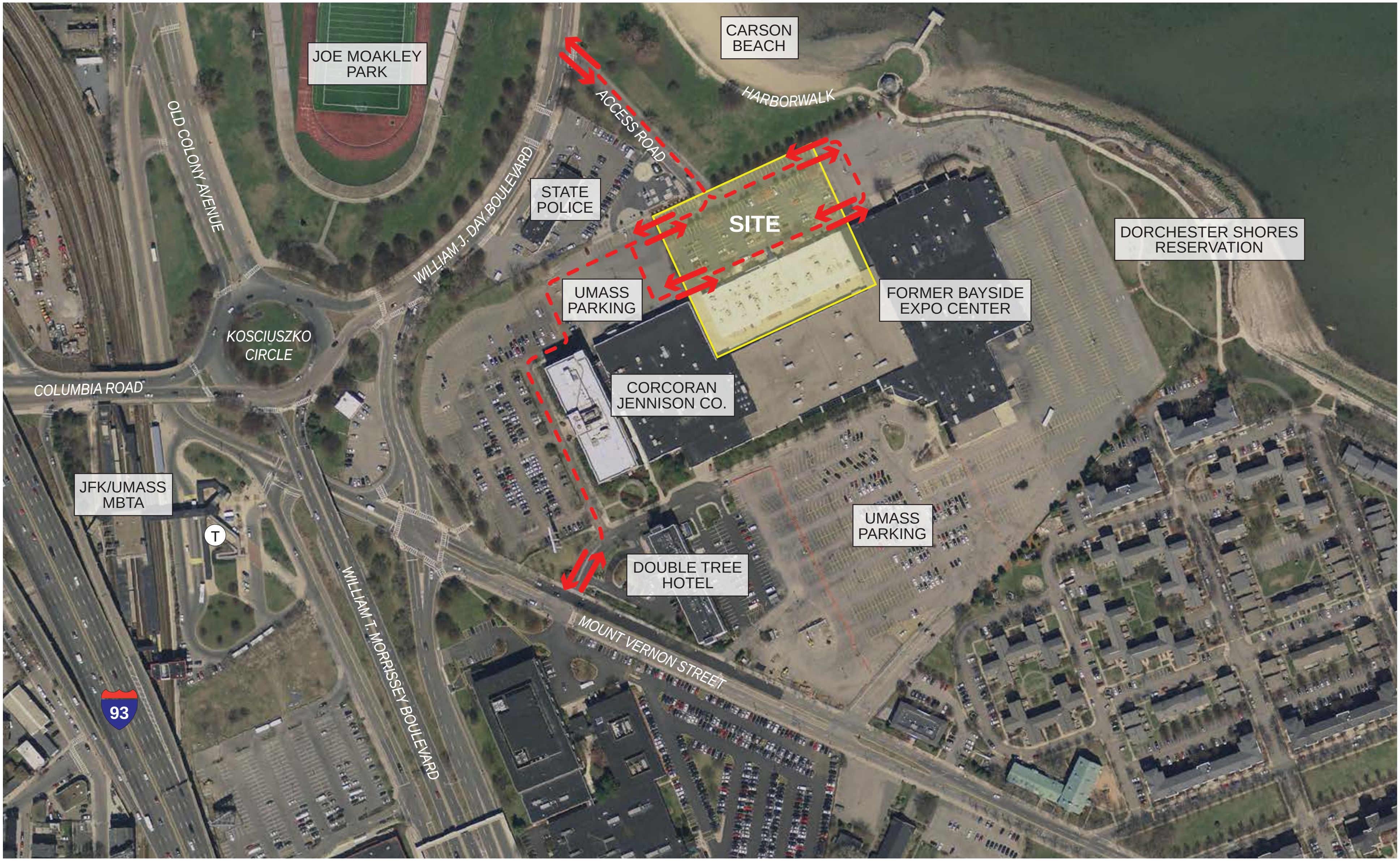


RESILIENCY STRATEGIES

1. The site will be designed to withstand rises in sea level over the expected lifespan of the building.

2. All of the building's critical mechanical equipment is located above the 60 year projected highest SLR scenario.

3. The building's ground level is raised above the 100 yr. Flood Zone and material finishes will be designed for minimal damage in the event of seawater inundation.



BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

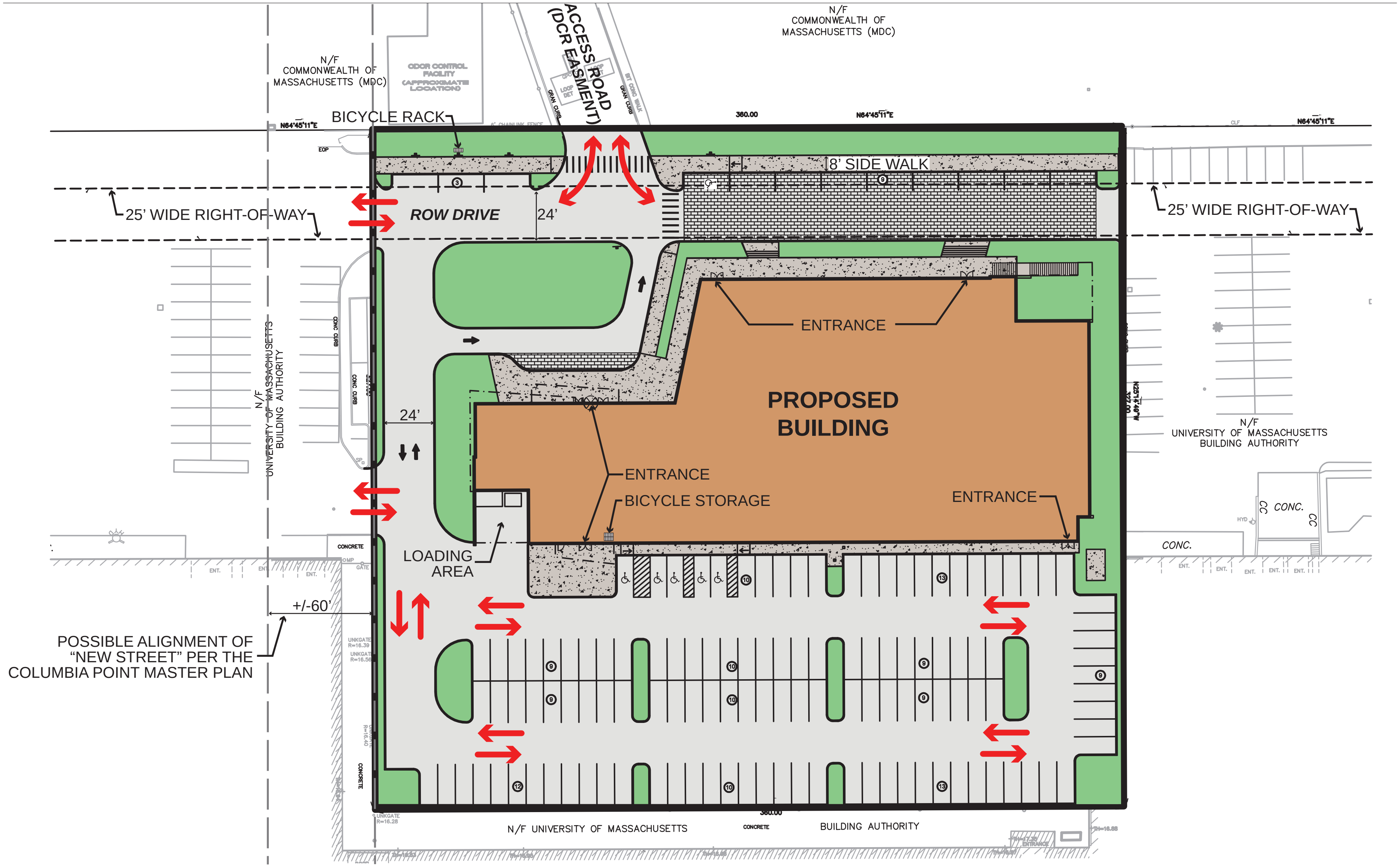
300 0 75 150 300
Approximate Scale in Feet

Base Map:
MA GIS Bing Aerial 2013

BTUHWF
Dorchester, Massachusetts

Existing Site Access and Circulation

FIGURE
10-1

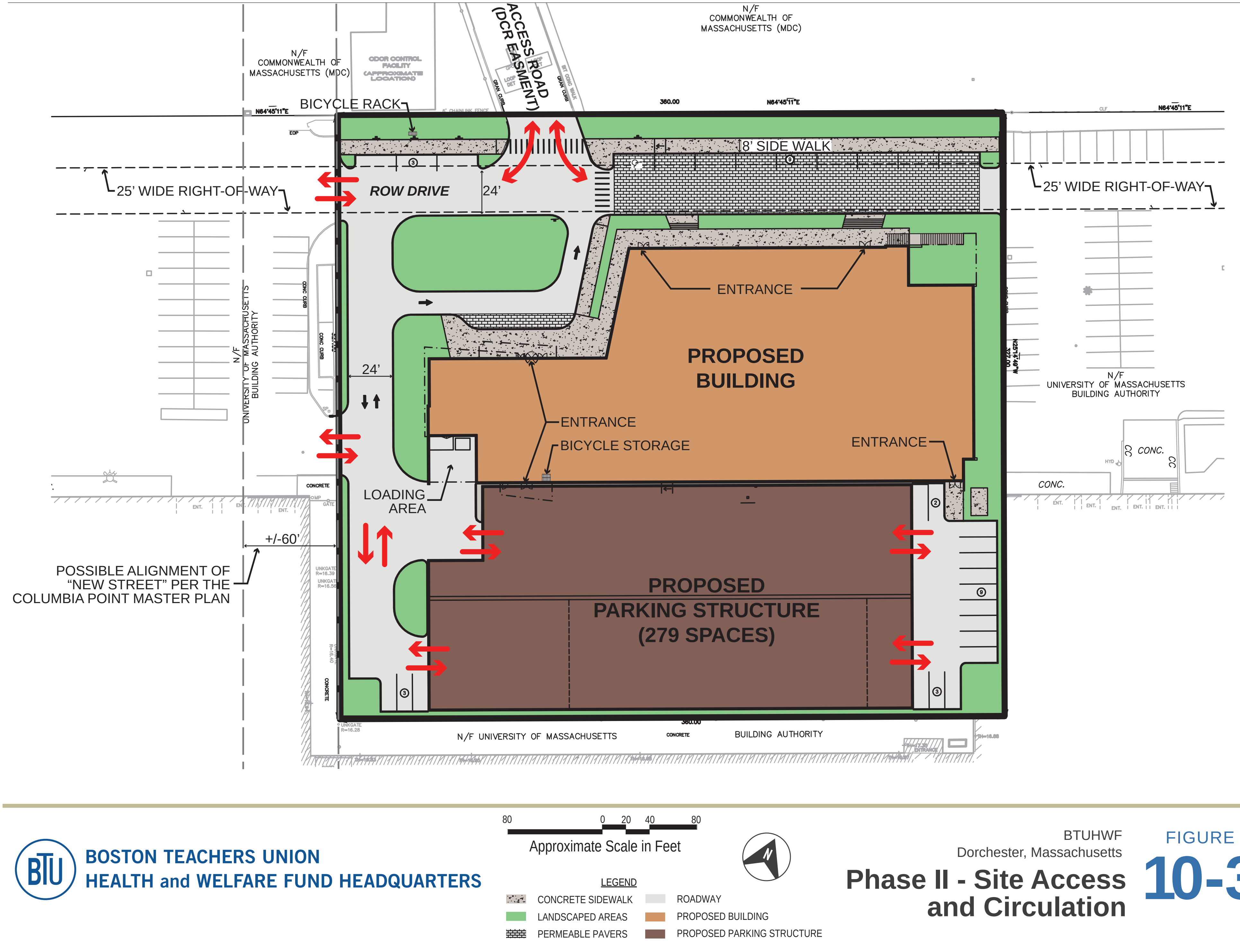


BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

BTUHWF
Dorchester, Massachusetts

Phase I - Site Access and Circulation

FIGURE
10-2

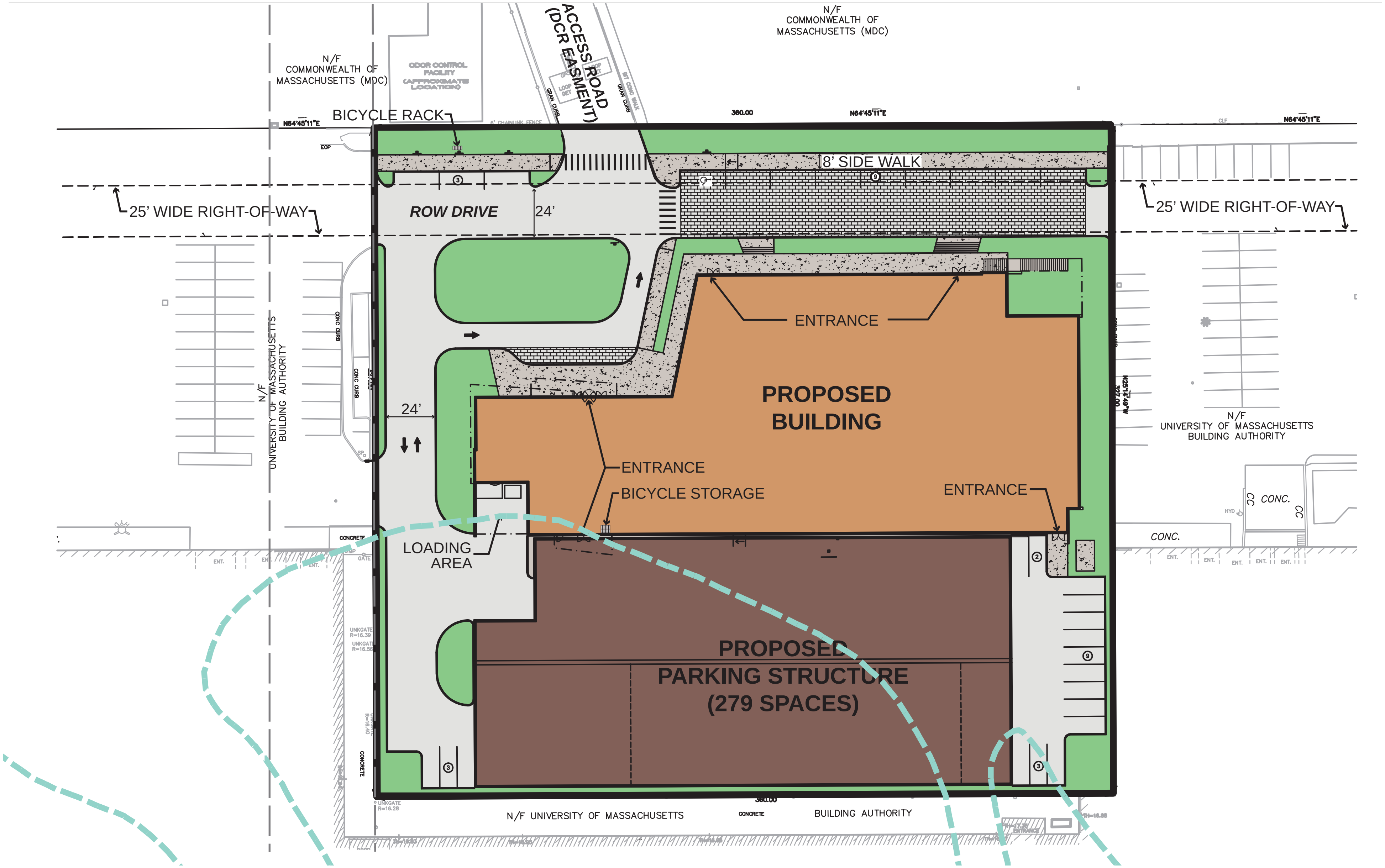


BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

BTUHWF
Dorchester, Massachusetts

Phase II - Site Access and Circulation

FIGURE **10-3**

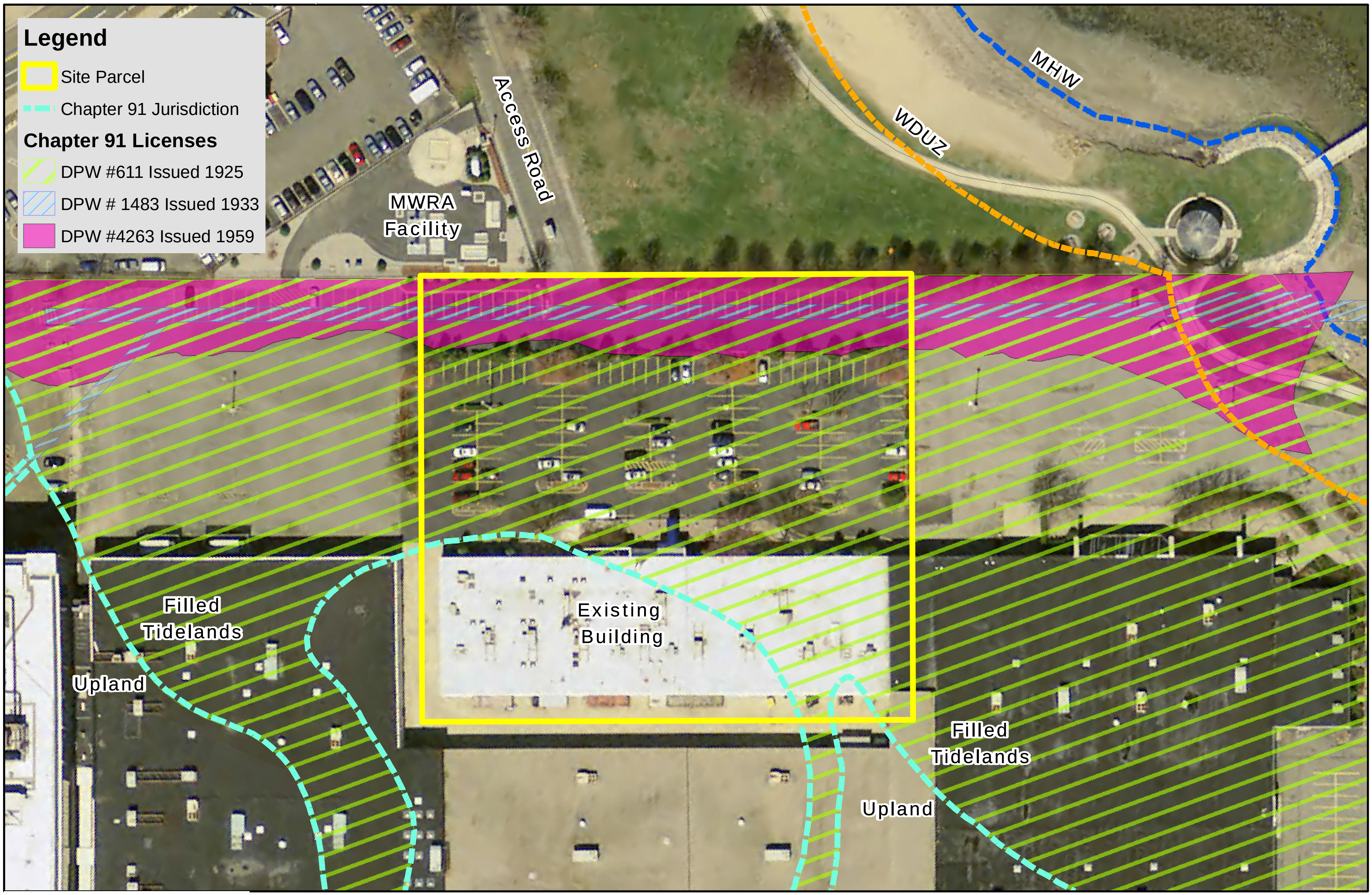


BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

BTUHWF
Dorchester, Massachusetts

Chapter 91 Jurisdiction

FIGURE **14-1**



BOSTON TEACHERS UNION
HEALTH and WELFARE FUND HEADQUARTERS

1 inch = 100 feet

0 50 100

Feet

BTUHWF
Dorchester, Massachusetts

History of Authorized Fill

FIGURE **14-2**

APPENDIX A - ENVIRONMENTAL NOTIFICATION FORM

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act (MEPA) Office

Environmental Notification Form

For Office Use Only

EEA#: ____________________

MEPA Analyst: _____________

The information requested on this form must be completed in order to submit a document electronically for review under the Massachusetts Environmental Policy Act, 301 CMR 11.00.

Project Name: **BTUHWF Building Replacement Project**		
Street Address: **188 Mount Vernon Street**		
Municipality: **Boston (Dorchester)**	Watershed: **Boston Harbor**	
Universal Transverse Mercator Coordinates: **4687574.03N, 331302.42E**	Latitude: 42 19' 19.71" N Longitude:71 02' 50.26" W	
Estimated commencement date: **12/15**	Estimated completion date: **2/18**	
Project Type: **Replacement**	Status of project design: **60** %complete	
Proponent: **B.T.U.H.W.F. Building Corporation**		
Street Address: **180 Mount Vernon Street**		
Municipality: **Boston**	State: **MA**	Zip Code: **02125**
Name of Contact Person: **Mark Fobert**		
Firm/Agency: **Tetra Tech**	Street Address: **1 Grant Street**	
Municipality: **Framingham**	State: MA	Zip Code: **01701**
Phone: **508-903-2306**	Fax: **508-903-2001**	Email: mark.fobert@tetratech.com

Does this project meet or exceed a mandatory EIR threshold (see 301 CMR 11.03)?
☒Yes ☐No

If this is an Expanded Environmental Notification Form (ENF) (see 301 CMR 11.05(7)) or a Notice of Project Change (NPC), are you requesting:

a Single EIR? (see 301 CMR 11.06(8))	☒Yes ☐No
a Special Review Procedure? (see 301CMR 11.09)	☐Yes ☒No
a Waiver of mandatory EIR? (see 301 CMR 11.11)	☐Yes ☒No
a Phase I Waiver? (see 301 CMR 11.11)	☐Yes ☒No

(Note: Greenhouse Gas Emissions analysis must be included in the Expanded ENF.)

Which MEPA review threshold(s) does the project meet or exceed (see 301 CMR 11.03)?
Wetlands, Waterways and Tidelands (3) (a) 5.
Which State Agency Permits will the project require?
DEP Chapter 91 Waterways License/DCR Construction Permit/MWRA 8(M) Permit
Identify any financial assistance or land transfer from an Agency of the Commonwealth, including the Agency name and the amount of funding or land area in acres: **n/a**

Summary of Project Size & Environmental Impacts	Existing	Change	Total
LAND			
Total site acreage	2.7 acres		
New acres of land altered		0	
Acres of impervious area	2.5 acres	-0.4	2.1 acres
Square feet of new bordering vegetated wetlands alteration		0	
Square feet of new other wetland alteration		2.7 acres land subject to coastal storm flowage	
Acres of new non-water dependent use of tidelands or waterways		0	
STRUCTURES			
Gross square footage	32,500 sf 32,500 gsf	-2,328 +19,969	30,172 52,469
Number of housing units	0	0	0
Maximum height (feet)	30+/-	+20	50
TRANSPORTATION			
Vehicle trips per day	400	0	400
Parking spaces	140	Phase I (-5) Phase II (+168)	135 308
WASTEWATER			
Water Use (Gallons per day)	21,626	+1,944	23,570
Water withdrawal (GPD)	-		-
Wastewater generation/treatment (GPD)	19,600	+1,828	21,428
Length of water mains (miles)	-		-
Length of sewer mains (miles)	-		-

Has this project been filed with MEPA before?
☐ Yes (EEA #__________) ☒No

Has any project on this site been filed with MEPA before?
☐ Yes (EEA #__________) ☒No

GENERAL PROJECT INFORMATION – all proponents must fill out this section

NOTE: The project description should summarize both the project's direct and indirect impacts (including construction period impacts) in terms of their magnitude, geographic extent, duration and frequency, and reversibility, as applicable. It should also discuss the infrastructure requirements of the project and the capacity of the municipal and/or regional infrastructure to sustain these requirements into the future.

PROJECT DESCRIPTION:

Describe the existing conditions and land uses on the project site: The B.T.U.H.W.F. Building Corporation ("The Applicant" or "BTUHWF") Property consists of 117,720 square feet (2.7 acres) of land and improvements include a 32,500 gross square foot single story masonry building and 140 surface parking spaces. The existing BTUHWF building is located on the southern portion of the Property with at-grade parking located on the northern portion. The abutting property to the north and northeast is the Commonwealth of Massachusetts Department of Conservation and Recreation's Carson Beach/Mother's Rest; northwest is the Massachusetts Water Resources Authority's Odor Control Facility; to the south, east and west the property is surrounded by buildings and surface parking areas owned by the University of Massachusetts Building Authority.

Other site features include two landscaped islands running east –west that are separated by the 25 foot access easement driveway. The property is separated from Carson Beach by a chain link fence and vegetated screening along the landscaped islands. Vehicular access is provided along the south and west sides of the building. With the exception of landscaped islands within the parking area, the remainder of the site is occupied by the building and pavement. Several utility easements traverse the northern portion of the site running parallel to the northern property line and consist of a 40 foot wide MWRA and BWSC easement.

Describe the proposed project and its programmatic and physical elements: The BTUHWF submits this proposal to replace their existing 32,500 gross square foot (gsf) building located at 188 Mount Vernon Street in Dorchester (the "Property"). The replacement building (the "Project") will contain 52,469 gsf (exclusive of the mechanical penthouse), to be used for: Boston Teacher Union offices, an optical shop, a credit union, meeting spaces, conference rooms and function halls. All of these uses are present in the existing building. The Project also includes the construction of a two story parking garage behind the replacement building. The Project will be constructed in two phases. Phase I is the demolition and replacement of the building and construction of on-site improvements including landscaping, 135 surface-grade parking spaces, internal vehicular circulation and sidewalks; Phase II is the two story parking garage that will be constructed over the surface parking lot constructed in Phase I. Phase II will include a total of 308 spaces, of which, 29 will be outdoor at-grade, 76 at-grade below the parking structure, and 100 spaces on garage floor one and 103 spaces on garage floor two.

BTUHWF has occupied the existing building since the 1960's, first as a tenant and later as the owner. The existing building was not originally designed as office space, is inefficient and has deteriorated such that it is no longer economical to continue its maintenance and repair. For that reason, BTUHWF plans to replace it with a LEED qualifying, low maintenance building. This will ensure that the Property can continue to meet the program needs of BTUHWF and its members without significant future cost and expense. The project does not require any takings.

Approximately 2 acres or 88,580 square feet of the Property are Filled Private Tidelands, as set forth in a Determination of Applicability, issued by the Massachusetts Department of Environmental Protection ("DEP"), Waterways Division ("Waterways") dated May 3, 2007 under WRP File No. JD07-1958. The Property also includes one resource area subject to protection under the Massachusetts Wetlands Protection Act. The property is located within the 100 year flood zone and therefore is "Land Subject to Coastal Storm Flowage"

(LSCSF) as that resource area is defined in the Wetlands Protection Act Regulations (310 CMR 10. 00 *et seq*). The northeast corner of the Property is approximately 104 feet from the edge of the adjacent Coastal Beach resource area, just outside of the 100 foot buffer zone to Coastal Beach.

Summary of Impacts

Operation Term

Impacts relative to the replacement project are limited to the proposed building and site improvements located partially (2 acres +/-) within filled tidelands jurisdiction and the entire Project (2.7 acres) within Land Subject to Coastal Storm Flowage.

Construction Term- Air Quality & Noise

There are two primary categories of potential air quality impacts from construction activities at the Site. These are impacts associated with diesel emissions from construction equipment and impacts from fugitive dust generated by construction activities.

Demolition and construction activities will result in a temporary increase in sound levels near the Site. The demolition and construction process will require the use of equipment that will be audible from off-site locations during certain time periods. Project construction consists of demolition, excavation, foundation work, steel erection, and finishing work.

Describe the on-site project alternatives (and alternative off-site locations, if applicable), considered by the proponent, including at least one feasible alternative that is allowed under current zoning, and the reasons(s) that they were not selected as the preferred alternative:

NOTE*: The purpose of the alternatives analysis is to consider what effect changing the parameters and/or siting of a project, or components thereof, will have on the environment, keeping in mind that the objective of the MEPA review process is to avoid or minimize damage to the environment to the greatest extent feasible. Examples of alternative projects include alternative site locations, alternative site uses, and alternative site configurations*

The BTUHWF and design team considered a number of alternative building programs and parking configurations on the lot. The no build, off site build, on site without structured parking and on site with structured parking were considered. The on-site building along with structured parking achieves the project purpose, goal and needs of the BTUHWF to construct a new building that meets the space needs and configuration while providing sufficient parking for events. The existing building was not originally designed as office space, is inefficient and has deteriorated such that it is no longer economical to continue its maintenance and repair. For that reason, BTUHWF plans to replace it with a LEED qualifying, low maintenance building. This will ensure that the property can continue to meet the program needs of BTUHWF, the BTU and its members without significant future cost and expense.

- No Action Alternative, which assumes that Applicant does not undertake the project;
- Off-site Alternatives including purchasing a new building and/or land to construct a new facility and Off-site leasing;
- On-site without structured parking;
  - L shaped building with all surface parking in rear
  - U shaped building with parking in the rear and island in the front
- On-site phased construction;
- On-site:
  - Alternative Building layouts 1, 2 and 3; and

- Preferred alternative (presented herein as the “Project Design”) On-site with structured parking.

The full Alternatives Analysis discussion is provided in Section 6.0 of the document narrative.

Summarize the mitigation measures proposed to offset the impacts of the preferred alternative:

Operation Term Design Features

Mitigation measures for impacts to Chapter 91 jurisdiction are provided in the Public Benefits section below. Mitigation measures relative to LSCSF are included in the discussion below. The Greenhouse Gas Mitigation Alternative will reduce overall Project energy use (stationary sources) by 23.7% and will reduce stationary source CO_2 emissions by 23.8%, compared to the Base Case. Greenhouse Gas emissions for the Project will be reduced by the following building design and operational energy efficiency measures (EEMs):

- Using higher efficiency windows and building envelopes;
- Providing demand control ventilation in the meeting hall space of approximately 15,000 sf;
- Providing daylighting controls;
- Specifying high-efficiency heating and cooling system;
- Using interior lighting systems with a lower light power density;
- Sealing, insulating, and testing HVAC supply ducts;
- Employing light-colored membrane roof (cool roof);
- Using LED exterior lighting;
- Designing the parking garage for natural ventilation to the extent allowable by code;
- Installing Energy Star electrical appliances in kitchen and office areas;
- Using Energy Star computers and other equipment; and
- Setting aside solar-ready roof space either on the new building or the new parking garage for a possible third party photo-voltaic (PV) installation.

Accommodation for Sea Level Rise & Resiliency

The first floor elevation of the building has been set at 20 feet Boston City Base (BCB), well above the predicted sea level rise in the next 50 years. In addition, the majority of the HVAC equipment for the project is located on upper floors or on the roof.

Construction Term Measures- Air

To reduce potential impacts from diesel construction equipment emissions, the Applicant proposes that contractors associated with the construction of the Facility adopt the goal of compliance with the DEP’s Clean Air Construction Initiative. The main requirements of the Clean Air Construction Initiative that will be applied to the project are provided below:

- . All contractors shall use ultra-low sulfur diesel (“ULSD”) fuel in diesel-powered non-road vehicles.
- All non-road engines used on the construction site shall meet the applicable non-road engine standard per 40 CFR 89.112 or 40 CFR 1039 (as applicable).
- All contractors shall turn off diesel combustion engines on construction equipment not in active use and on dump trucks that are idling for five minutes or more while waiting to load or unload materials.
- All contractors shall establish a staging zone for trucks that are waiting to load or unload materials at the work zone in a location where diesel emissions from the trucks will not be noticeable to the public.

With implementation of the mitigation measures discussed above combined with additional fugitive dust control measures addressed in the following section, it is expected that the demolition and construction will result in no adverse air quality impacts to any of the areas surrounding the site.

In accordance with the City of Boston Environment Department Guidelines for Construction, the following practices will be employed during demolition activities:

- Dumpsters will be covered and sprayed with water to keep debris wet;
- Sidewalks and streets used by the public will be kept broom-clean at all times; a vacuum truck may also be used on larger paved areas;
- Construction netting will be installed over windows to allow airflow but trap dust; and
- Trucks carrying debris or other material off site will be covered per MGL Ch. 85 Section 36.

During the demolition phase of the Project, the following specialized dust control measures for demolition are expected to be used:

- Pre-cleaning of large surfaces and structural members to remove large concentrations of dusting materials prior to demolition
- Water suppression sprays and misting of potential dust-creating situations to prevent spreading of airborne particulates.
- Enclosure of areas with tarps and screening when necessary to prevent the migration of dust.

Public Benefits

The Applicant will redevelop the Property with a sustainably designed building and will provide an anchor for future redevelopment of the former Bayside Expo Center. The Project will include numerous benefits to the neighborhood and the City of Boston, including the following:

- Replacement of a deteriorating obsolete building with an architecturally creative building that will enhance the surrounding area;
- Creation of approximately 380 yearly construction jobs during the Phase I building construction;
- Creation of approximately 152 yearly construction jobs during the Phase II garage construction;
- Increase property taxes levied due to higher appraisal value than the currently functionally obsolete building;
- Provisions for a new public walkway, capable of connection to future sidewalks on adjacent property, to provide an additional means of pedestrian access to the DCR property and the waterfront;
- Provisions for three public benches adjacent to the new public walkway;
- Provisions for three parking spaces dedicated to public use;
- Bicycle racks for public use;
- Removal of the fence between the Project Site and Carson Beach thereby visually and physically connecting the site to the adjacent parkland;
- Installation of lighting and landscaping to improve the appearance of the neighborhood in conformity with potential future development under the Columbia Point Master Plan;
- Introduction of permeable pavement and reduction of impervious surface to promote on-site stormwater recharge and reduce stormwater runoff from the site;
- Meeting the requirements of Article 37 of the Boston Zoning Code with a goal of meeting the Gold level of the Leadership in Energy and Environmental Design (LEED) for New Construction rating system.

Design provisions to create an active edge to the public spaces along Boston's Harbor Walk through a number of design strategies:

- o Interior and exterior spaces are laid out to create synergies between Carson Beach and the events and activities held within the building.
- o Pre-function spaces for the meeting halls and conference spaces form a transparent edge to the public parks.
- o A landscaped outdoor event hard-scape and public path connecting to the Harbor Walk is planned for the

area between the Carson Beach lawn and the building.

- The north and west facades are treated with windows and materiality that engage the public space and are appropriately proportioned for distant as well as close views of the building.

If the project is proposed to be constructed in phases, please describe each phase:

Phase I of the Project will include the demolition of the existing building and the reconstruction of a three story, 30,172 sf (52,469 gsf) building supported by 135 at-grade parking spaces; the full project build out will include 308 spaces, a combination of at-grade and structured two level parking, considered Phase II.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN:

Is the project within or adjacent to an Area of Critical Environmental Concern?

☐Yes (Specify___________________________________)

☒No

if yes, does the ACEC have an approved Resource Management Plan? ___ Yes ___ No;

If yes, describe how the project complies with this plan.

____

Will there be stormwater runoff or discharge to the designated ACEC? ___ Yes ___ No;

If yes, describe and assess the potential impacts of such stormwater runoff/discharge to the designated ACEC.

____

RARE SPECIES:

Does the project site include Estimated and/or Priority Habitat of State-Listed Rare Species? (see http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm)

☐Yes (Specify____________________________________) ☒No

HISTORICAL /ARCHAEOLOGICAL RESOURCES:

Does the project site include any structure, site or district listed in the State Register of Historic Place or the inventory of Historic and Archaeological Assets of the Commonwealth?

☐Yes (Specify____________________________________) ☒No

Source: Review of MHC Files and MACRIS

If yes, does the project involve any demolition or destruction of any listed or inventoried historic or archaeological resources? ☐Yes (Specify____________________________________) ☐No

WATER RESOURCES:

Is there an Outstanding Resource Water (ORW) on or within a half-mile radius of the project site? ___Yes X No;

if yes, identify the ORW and its location. ____

(NOTE: Outstanding Resource Waters include Class A public water supplies, their tributaries, and bordering wetlands; active and inactive reservoirs approved by MassDEP; certain waters within Areas of Critical Environmental Concern, and certified vernal pools. Outstanding resource waters are listed in the Surface Water Quality Standards, 314 CMR 4.00.)

Are there any impaired water bodies on or within a half-mile radius of the project site? X Yes ___No; if yes, identify the water body and pollutant(s) causing the impairment: Dorchester Bay (Boston Harbor Proper), Impaired for: TSS, Turbidity, PCB in fish tissue, Enterococcus and Fecal Coliform.

Is the project within a medium or high stress basin, as established by the Massachusetts Water Resources Commission? ___Yes X No

STORMWATER MANAGEMENT:

Generally describe the project's stormwater impacts and measures that the project will take to comply with the standards found in MassDEP's Stormwater Management Regulations:

The redevelopment project design proposes saving several existing mature trees located in a row along the northerly property line, and also adding large areas of new landscape trees, shrubs and ground cover that do not currently exist. This increase in landscaped area provides not only aesthetic appeal, but also results in a significant reduction in impervious area and corresponding decrease in the rate and volume of stormwater runoff. The use of permeable pavers at the drop-off area and in the front parking area (that doubles for use as the event plaza) allows rainfall to permeate through the pavement, essentially eliminating puddles from the surface and promoting direct infiltration into the ground, significantly reducing stormwater runoff volume, peak discharge rates and pollutant transport.

Standard bituminous concrete pavement is proposed for site access drives and parking spaces elsewhere through the site, with a conventional closed drainage collection system of deep sump hooded catch basins, drain manholes, high-density polyethylene (HDPE) pipe, and two Stormceptor water quality units to provide treatment. The stormwater design approach, in conformance with DEP Stormwater Standards, is to reduce runoff and improve water quality compared to existing conditions.

The combined 7,000 sf landscaped areas and permeable pavers result in a significant 15.5% reduction in impervious surface areas, from an existing impervious area of 107,300 square feet (91.1% of total site area) to 90,600 square feet (77% of total site area) in the proposed post-development condition.
Similar to existing conditions, runoff will be directed to a new stormwater management system consisting of a network of catch basins and drain manholes to capture and convey runoff in post development conditions. Both conventional and proprietary best management practices will be used to both manage runoff and provide water quality improvements. The project will include deep sump catch basins, and hydrodynamic separators to collect and treat stormwater runoff generated on the site during storm events. Deep sump catch basins will have 4-foot sumps below the outlet invert and include a hood over the outlet pipe to trap floatables and oil inside the structure. Stormceptor units or hydrodynamic separators are specialty manholes that swirl or direct water inside the unit in such a way as to separate the floatables and coarser sediments. The pipe network will tie into the existing 24 inch line and continue to discharge to Dorchester Bay through the same outfall as it does today. Since the project will actually result in a reduction of impervious surface area and associated runoff, the stormwater volumes and flow rates discharging from the site's drainage system to the off-site BWSC drainage system will be reduced and therefore, no upgrades, in terms of increased capacity, are necessary to the BWSC drain pipe network or outfall.

MASSACHUSETTS CONTINGENCY PLAN:
Has the project site been, or is it currently being, regulated under M.G.L.c.21E or the Massachusetts Contingency Plan? Source: MassDEP Reportable Release Database
Yes ___ No **X** ; if yes, please describe the current status of the site (including Release Tracking Number (RTN), cleanup phase, and Response Action Outcome classification):___________________

Is there an Activity and Use Limitation (AUL) on any portion of the project site? Yes ___ No X;
if yes, describe which portion of the site and how the project will be consistent with the AUL:
______________________.

Are you aware of any Reportable Conditions at the property that have not yet been assigned an RTN?
Yes ___ No X ; if yes, please describe:______________________________________

SOLID AND HAZARDOUS WASTE:

If the project will generate solid waste during demolition or construction, describe alternatives considered for re-use, recycling, and disposal of, e.g., asphalt, brick, concrete, gypsum, metal, wood: Construction waste will be sorted on site with a minimum recycling/reuse goal of 50%.

(NOTE: Asphalt pavement, brick, concrete and metal are banned from disposal at Massachusetts landfills and waste combustion facilities and wood is banned from disposal at Massachusetts landfills. See 310 CMR 19.017 for the complete list of banned materials.)

Will your project disturb asbestos containing materials? Yes X No ___ ;
if yes, please consult state asbestos requirements at http://mass.gov/MassDEP/air/asbhom01.htm

A Hazardous Material Building Survey was performed in 2014 which identified asbestos. Prior to demolition, asbestos containing materials will be abated in accordance with all applicable notification and work plan requirements and removed from the facility. The removal of this material will be overseen by an appropriate licensed professional and handled and disposed of in accordance with state and federal regulations.

Describe anti-idling and other measures to limit emissions from construction equipment:

The Applicant proposes that contractors associated with the construction of the new building adopt the goal of compliance with the DEP's Clean Air Construction Initiative. The main requirements of the Clean Air Construction Initiative that will be applied to the project are: All contractors shall use ultra low sulfur diesel ("ULSD") fuel in diesel-powered non-road vehicles; all non-road engines used on the construction site shall meet the applicable non-road engine standard per 40 CFR 89.112 or 40 CFR 1039 (as applicable); all contractors shall turn off diesel combustion engines on construction equipment not in active use and on dump trucks that are idling for five minutes or more while waiting to load or unload materials; all contractors shall establish a staging zone for trucks that are waiting to load or unload materials at the work zone in a location where diesel emissions from the trucks will not be noticeable to the public.

DESIGNATED WILD AND SCENIC RIVER:

Is this project site located wholly or partially within a defined river corridor of a federally designated Wild and Scenic River or a state designated Scenic River? Yes ___ No X ;
if yes, specify name of river and designation:

If yes, does the project have the potential to impact any of the "outstandingly remarkable" resources of a federally Wild and Scenic River or the stated purpose of a state designated Scenic River?
Yes ___ No ___ ; if yes, specify name of river and designation: _____________;
if yes, will the project will result in any impacts to any of the designated "outstandingly remarkable" resources of the Wild and Scenic River or the stated purposes of a Scenic River.
Yes ___ No ___;
if yes, describe the potential impacts to one or more of the "outstandingly remarkable" resources or stated purposes and mitigation measures proposed.

ATTACHMENTS:

1. List of all attachments to this document. **(See List of Appendices page vii)**
2. U.S.G.S. map (good quality color copy, 8-½ x 11 inches or larger, at a scale of 1:24,000) indicating the project location and boundaries. **(See Figure 1-1)**
3. Plan, at an appropriate scale, of existing conditions on the project site and its immediate environs, showing all known structures, roadways and parking lots, railroad rights-of-way, wetlands and water bodies, wooded areas, farmland, steep slopes, public open spaces, and major utilities. **(See Appendix C);**
4. Plan, at an appropriate scale, depicting environmental constraints on or adjacent to the project site such as Priority and/or Estimated Habitat of state-listed rare species, Areas of Critical Environmental Concern, Chapter 91 jurisdictional areas, Article 97 lands, wetland resource area delineations, water supply protection areas, and historic resources and/or districts**. (See Figures 2-4 and 3-1);**
5. Plan, at an appropriate scale, of proposed conditions upon completion of project (if construction of the project is proposed to be phased, there should be a site plan showing conditions upon the completion of each phase)**.**(**See Appendix D**);
6. List of all agencies and persons to whom the proponent circulated the ENF, in accordance with 301 CMR 11.16(2). **(See Appendix O)**
7. List of municipal and federal permits and reviews required by the project, as applicable. (**See Section 4.2)**

LAND SECTION – all proponents must fill out this section

I. Thresholds / Permits

A. Does the project meet or exceed any review thresholds related to **land** (see 301 CMR 11.03(1)
___ Yes X No; if yes, specify each threshold:

II. Impacts and Permits

A. Describe, in acres, the current and proposed character of the project site, as follows:

	Existing	Change	Total
Footprint of buildings (sf)	32,500	-2,328	30,172
Buildings (gsf)	32,500	+19,969	52,469
Internal roadways	________	________	________
Parking and other paved areas	107,279 sf	-16,483 sf	90,796 sf
Other altered areas	________	________	________
Undeveloped areas	0	0	0
Total: Project Site Acreage	2.7 acres	0	2.7 acres

B. Has any part of the project site been in active agricultural use in the last five years?
___ Yes X No; if yes, how many acres of land in agricultural use (with prime state or locally important agricultural soils) will be converted to nonagricultural use?

C. Is any part of the project site currently or proposed to be in active forestry use?
___ Yes X No; if yes, please describe current and proposed forestry activities and indicate whether any part of the site is the subject of a forest management plan approved by the Department of Conservation and Recreation:

D. Does any part of the project involve conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97? ___ Yes X No; if yes, describe:

E. Is any part of the project site currently subject to a conservation restriction, preservation restriction, agricultural preservation restriction or watershed preservation restriction?
___ Yes X No; if yes, does the project involve the release or modification of such restriction?
___ Yes ___ No; if yes, describe:

F. Does the project require approval of a new urban redevelopment project or a fundamental change in an existing urban redevelopment project under M.G.L.c.121A? ___ Yes X No; if yes, describe:

G. Does the project require approval of a new urban renewal plan or a major modification of an existing urban renewal plan under M.G.L.c.121B? Yes ___ No X ; if yes, describe:

III. Consistency

A. Identify the current municipal comprehensive land use plan
Title: **Columbia Point Master Plan**
Date: **June 2011**

B. Describe the project's consistency with that plan with regard to:
1) economic development n/a

2) adequacy of infrastructure n/a
3) open space impacts n/a
4) compatibility with adjacent land uses

At the request of BRA staff, the project team reviewed the Columbia Point Master Plan prepared by the BRA in June 2011. The Plan includes future development surrounding the BTUHWF property but does not detail future changes at the BTUHWF Property. The CPMP anticipated that BTUHWF and BTU would remain on the Property. The land use and urban design goals in the immediate vicinity of the BTU parcel include provisions for a vehicular and pedestrian connection from Mount Vernon Street, through the Bay Side Exposition site (now UMass owned) to William J. Day Boulevard. The purpose of this connection is two-fold, one to alleviate local traffic on Kosciuszko Circle and to also provide a tree lined pedestrian scale block street grid within Columbia Point. The "New Street" as it is called, would be located along the west side of the BTUHWF parcel (See Figure 5-1 Illustrative Plan from CPMP with the Project overlay). To accommodate the potential New Street, the proposed building façade and driveway entrance were designed to be accessible from both the New Street and the existing access from Day Boulevard.

In addition to the Columbia Point Master Plan, the team also reviewed the following local Plans:

Mount Vernon Street Design

In March 2014, the BRA began a public process to redesign Mt. Vernon Street. The purpose of the project is to beautify Mt. Vernon Street and make it safe and comfortable for all users. Mt. Vernon Street is a key connector between the two parts of the UMass Campus. This planning effort is in its early stages.

Harborwalk Planning

The City of Boston's Harborwalk program is a continuous public walkway along the water's edge. At the north Property perimeter, the site program includes an 8 foot wide walkway that will connect to the future parcel developments to the east and west of the site. These walkways will then connect to the established Harborwalk on the DCR parkland.

C. Identify the current Regional Policy Plan of the applicable Regional Planning Agency (RPA)
RPA: **Metropolitan Area Planning Council (MAPC)**
Title: **MetroFuture Making a Better Boston Region**
Date **2008**

D. Describe the project's consistency with that plan with regard to:
1) economic development ________________________
2) adequacy of infrastructure ________________________
3) open space impacts ____________________________

MetroFuture Regional Plan

The Metropolitan Area Planning Council's ***MetroFuture Making a Better Boston Region*** dated May 2008 includes visions, goals objectives and implementation strategies for the greater Boston Region. The Plan recognizes that in urban areas and neighborhoods new growth will mainly occur through the reuse of previously developed land and buildings without the loss of open space. The redevelopment of the BTUHWF property meets this goal by providing a sustainably designed building, an anchor for future redevelopment of the former Bayside Expo Center. Construction of a new sidewalk, capable of connection to future sidewalks on adjacent property, to provide an additional means of pedestrian access to the DCR property and the waterfront clearly meets the goal of enhancing the public open space experience.

RARE SPECIES SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **rare species or habitat** (see 301 CMR 11.03(2))? ___ Yes **X No**; if yes, specify, in quantitative terms:

(NOTE: If you are uncertain, it is recommended that you consult with the Natural Heritage and Endangered Species Program (NHESP) prior to submitting the ENF.)

B. Does the project require any state permits related to **rare species or habitat**? ___ Yes **X No**

C. Does the project site fall within mapped rare species habitat (Priority or Estimated Habitat?) in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes X No.

D. If you answered "No" to all questions A, B and C, proceed to the **Wetlands, Waterways, and Tidelands Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Rare Species section below.

II. Impacts and Permits

A. Does the project site fall within Priority or Estimated Habitat in the current Massachusetts Natural Heritage Atlas (attach relevant page)? ___ Yes ___ No. If yes,

1. Have you consulted with the Division of Fisheries and Wildlife Natural Heritage and Endangered Species Program (NHESP)? ___Yes ___No; if yes, have you received a determination as to whether the project will result in the "take" of a rare species? ___ Yes ___ No; if yes, attach the letter of determination to this submission.

2. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate rare species impacts

3. Which rare species are known to occur within the Priority or Estimated Habitat?

4. Has the site been surveyed for rare species in accordance with the Massachusetts Endangered Species Act? ___ Yes ___ No

4. If your project is within Estimated Habitat, have you filed a Notice of Intent or received an Order of Conditions for this project? ___ Yes ___ No; if yes, did you send a copy of the Notice of Intent to the Natural Heritage and Endangered Species Program, in accordance with the Wetlands Protection Act regulations? ___ Yes ___ No

B. Will the project "take" an endangered, threatened, and/or species of special concern in accordance with M.G.L. c.131A (see also 321 CMR 10.04)? ___ Yes ___ No; if yes, provide a summary of proposed measures to minimize and mitigate impacts to significant habitat:

WETLANDS, WATERWAYS, AND TIDELANDS SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wetlands, waterways, and tidelands** (see 301 CMR 11.03(3))? **X Yes** ___ No; if yes, specify, in quantitative terms: The entire Property is 117,720 square feet (s. f.) (2.70 Acres) of which 88,580 s.f. (2.03 Acres) is located on filled tidelands and 29,140 s.f. (0.67 Acres) are non-jurisdictional uplands. The new development will occupy the entire 2.03 acres of filled tidelands.

B. Does the project require any state permits (or a local Order of Conditions) related to **wetlands, waterways, or tidelands**? **X Yes** ___ No; if yes, specify which permit: Chapter 91 Waterways License and Order of Conditions

C. If you answered "No" to both questions A and B, proceed to the **Water Supply Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wetlands, Waterways, and Tidelands Section below.

II. Wetlands Impacts and Permits

A. Does the project require a new or amended Order of Conditions under the Wetlands Protection Act (M.G.L. c.131A)? X Yes ___ No; if yes, has a Notice of Intent been filed? ___ Yes X No; if yes, list the date and MassDEP file number: ______; if yes, has a local Order of Conditions been issued? ___ Yes ___ No; Was the Order of Conditions appealed? ___ Yes ___ No. Will the project require a Variance from the Wetlands regulations? ___ Yes X No.

B. Describe any proposed permanent or temporary impacts to wetland resource areas located on the project site: Site redevelopment will permanently alter 2.7 acres or 117,720 sf (entire site) of Land Subject to Coastal Storm Flowage or the 100 year flood zone.

C. Estimate the extent and type of impact that the project will have on wetland resources, and indicate whether the impacts are temporary or permanent:

Coastal Wetlands	Area (square feet) or Length (linear feet)	Temporary or Permanent Impact?
Land Under the Ocean		
Designated Port Areas		
Coastal Beaches		
Coastal Dunes		
Barrier Beaches		
Coastal Banks		
Rocky Intertidal Shores		
Salt Marshes		
Land Under Salt Ponds		
Land Containing Shellfish		
Fish Runs		
Land Subject to Coastal Storm Flowage	117,720 sf	Permanent

Inland Wetlands		
Bank (lf)		
Bordering Vegetated Wetlands		
Isolated Vegetated Wetlands		
Land under Water		
Isolated Land Subject to Flooding		
Bordering Land Subject to Flooding		
Riverfront Area		

D. Is any part of the project:

1. proposed as a **limited project**? ___ Yes X No; if yes, what is the area (in sf)?____
2. the construction or alteration of a **dam**? ___ Yes X No; if yes, describe:
3. fill or structure in a **velocity zone** or **regulatory floodway**? ___ Yes X No
4. dredging or disposal of dredged material? ___ Yes X No; if yes, describe the volume of dredged material and the proposed disposal site:
5. a discharge to an **Outstanding Resource Water (ORW)** or an **Area of Critical**

Environmental Concern (ACEC)? ___ Yes X No

6. subject to a wetlands restriction order? ___ Yes X No; if yes, identify the area (in sf):
7. located in buffer zones? ___Yes X No; if yes, how much (in sf) ______

E. Will the project:

1. be subject to a local wetlands ordinance or bylaw? ___ Yes X No
2. alter any federally-protected wetlands not regulated under state law? ___ Yes X No; if yes, what is the area (sf)?

III. Waterways and Tidelands Impacts and Permits

A. Does the project site contain waterways or tidelands (including filled former tidelands) that are subject to the Waterways Act, M.G.L.c.91? X Yes ___ No; if yes, is there a current Chapter 91 License or Permit affecting the project site? X Yes ___ No; if yes, list the date and license or permit number and provide a copy of the historic map used to determine extent of filled tidelands: Waterways Jurisdiction is based on Jurisdictional Determination JD07-1958 and DPW Licenses 611 and 4263

B. Does the project require a new or modified license or permit under M.G.L.c.91? X Yes ___ No; if yes, how many acres of the project site subject to M.G.L.c.91 will be for non-water-dependent use? Current 2.03 acres Change 0 Total 2.03 acres

If yes, how many square feet of solid fill or pile-supported structures (in sf)?

C. For non-water-dependent use projects, indicate the following: Area of filled tidelands on the site: 2.03 acres; area of filled tidelands covered by building and parking structure 43,268 sf or 1.0 acres.

For portions of site on filled tidelands, list ground floor uses and area of each use: Lobby & prefunction space (6,399 sf); meeting halls (13,409 sf); conference rooms (1,924 sf); credit union (1,244 sf); kitchen (1,381 sf); and lounge (1,204) and core loading (bathrooms, storage areas) (4,611 sf).

Does the project include new non-water-dependent uses located over flowed tidelands? Yes ___ No X

Height of building on filled tidelands: 50 feet

Also show the following on a site plan: Mean High Water, Mean Low Water, Water-dependent Use Zone, location of uses within buildings on tidelands, and interior and exterior areas and facilities dedicated for public use, and historic high and historic low water marks. See Figures 2-4, 14-1 and 14-2.

D. Is the project located on landlocked tidelands? ___ Yes X No; if yes, describe the project's impact on the public's right to access, use and enjoy jurisdictional tidelands and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

E. Is the project located in an area where low groundwater levels have been identified by a municipality or by a state or federal agency as a threat to building foundations? ___Yes X No; if yes, describe the project's impact on groundwater levels and describe measures the project will implement to avoid, minimize or mitigate any adverse impact:

F. Is the project non-water-dependent **and** located on landlocked tidelands **or** waterways or tidelands subject to the Waterways Act **and** subject to a mandatory EIR? X Yes___ No;

(NOTE: If yes, then the project will be subject to Public Benefit Review and Determination.) See Section 14.4.

G. Does the project include dredging? ___ Yes X No; if yes, answer the following questions:

What type of dredging? Improvement ___ Maintenance ___ Both ____
What is the proposed dredge volume, in cubic yards (cys) _________
What is the proposed dredge footprint ____length (ft) ___width (ft)____depth (ft);
Will dredging impact the following resource areas?

Intertidal Yes__ No__; if yes, ___ sq ft
Outstanding Resource Waters Yes__ No__; if yes, ___ sq ft
Other resource area (i.e. shellfish beds, eel grass beds) Yes__ No__; if yes __ sq ft
If yes to any of the above, have you evaluated appropriate and practicable steps to: 1) avoidance; 2) if avoidance is not possible, minimization; 3) if either avoidance or minimize is not possible, mitigation?
If no to any of the above, what information or documentation was used to support this determination?

Provide a comprehensive analysis of practicable alternatives for improvement dredging in accordance with 314 CMR 9.07(1)(b). Physical and chemical data of the sediment shall be included in the comprehensive analysis.

Sediment Characterization

Existing gradation analysis results? __Yes ___No: if yes, provide results.
Existing chemical results for parameters listed in 314 CMR 9.07(2)(b)6? ___Yes ____No; if yes, provide results.

Do you have sufficient information to evaluate feasibility of the following management options for dredged sediment? If yes, check the appropriate option.

Beach Nourishment ___
Unconfined Ocean Disposal ___
Confined Disposal:
Confined Aquatic Disposal (CAD) ___
Confined Disposal Facility (CDF) ___
Landfill Reuse in accordance with COMM-97-001 ___
Shoreline Placement ___
Upland Material Reuse____
In-State landfill disposal____
Out-of-state landfill disposal ____
(NOTE: This information is required for a 401 Water Quality Certification.)

IV. Consistency:

A. Does the project have effects on the coastal resources or uses, and/or is the project located within the Coastal Zone? X Yes ___ No; if yes, describe these effects and the projects consistency with the policies of the Office of Coastal Zone Management: See Section 14.5 of EENF Document.

B. Is the project located within an area subject to a Municipal Harbor Plan? ___ Yes X No; if yes, identify the Municipal Harbor Plan and describe the project's consistency with that plan:

WATER SUPPLY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **water supply** (see 301 CMR 11.03(4))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **water supply**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Wastewater Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Water Supply Section below.

II. Impacts and Permits

A. Describe, in gallons per day (gpd), the volume and source of water use for existing and proposed activities at the project site:

	Existing	Change	Total
Municipal or regional water supply	________	________	________
Withdrawal from groundwater	________	________	________
Withdrawal from surface water	________	________	________
Interbasin transfer	________	________	________

(NOTE: Interbasin Transfer approval will be required if the basin and community where the proposed water supply source is located is different from the basin and community where the wastewater from the source will be discharged.)

B. If the source is a municipal or regional supply, has the municipality or region indicated that there is adequate capacity in the system to accommodate the project? ___ Yes ___ No

C. If the project involves a new or expanded withdrawal from a groundwater or surface water source, has a pumping test been conducted? ___ Yes ___ No; if yes, attach a map of the drilling sites and a summary of the alternatives considered and the results. ______________

D. What is the currently permitted withdrawal at the proposed water supply source (in gallons per day)? _____Will the project require an increase in that withdrawal? ___Yes ___No; if yes, then how much of an increase (gpd)? ____________________

E. Does the project site currently contain a water supply well, a drinking water treatment facility, water main, or other water supply facility, or will the project involve construction of a new facility? ___ Yes ___No. If yes, describe existing and proposed water supply facilities at the project site:

	Permitted Flow	Existing Avg Daily Flow	Project Flow	Total
Capacity of water supply well(s) (gpd)	_______	________	________	________
Capacity of water treatment plant (gpd)	_______	________	________	________

F. If the project involves a new interbasin transfer of water, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or proposed?

G. Does the project involve:

1. new water service by the Massachusetts Water Resources Authority or other agency of the Commonwealth to a municipality or water district? ___ Yes ___ No
2. a Watershed Protection Act variance? ___ Yes ___ No; if yes, how many acres of alteration?
3. a non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities? ___ Yes ___ No

III. Consistency

Describe the project's consistency with water conservation plans or other plans to enhance water resources, quality, facilities and services:

WASTEWATER SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **wastewater** (see 301 CMR 11.03(5))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **wastewater**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Transportation -- Traffic Generation Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Wastewater Section below.

II. Impacts and Permits

A. Describe the volume (in gallons per day) and type of disposal of wastewater generation for existing and proposed activities at the project site (calculate according to 310 CMR 15.00 for septic systems or 314 CMR 7.00 for sewer systems):

	Existing	Change	Total
Discharge of sanitary wastewater	________	________	________
Discharge of industrial wastewater	________	________	________
TOTAL	________	________	________

	Existing	Change	Total
Discharge to groundwater	________	________	________
Discharge to outstanding resource water	________	________	________
Discharge to surface water	________	________	________
Discharge to municipal or regional wastewater facility	________	________	________
TOTAL	________	________	________

B. Is the existing collection system at or near its capacity? ___ Yes ___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

C. Is the existing wastewater disposal facility at or near its permitted capacity? ___ Yes___ No; if yes, then describe the measures to be undertaken to accommodate the project's wastewater flows:

D. Does the project site currently contain a wastewater treatment facility, sewer main, or other wastewater disposal facility, or will the project involve construction of a new facility? ___ Yes ___ No; if yes, describe as follows:

	Permitted	Existing Avg Daily Flow	Project Flow	Total
Wastewater treatment plant capacity (in gallons per day)	_______	________	________	________

E. If the project requires an interbasin transfer of wastewater, which basins are involved, what is the direction of the transfer, and is the interbasin transfer existing or new?

(NOTE: Interbasin Transfer approval may be needed if the basin and community where wastewater will be discharged is different from the basin and community where the source of water supply is located.)

F. Does the project involve new sewer service by the Massachusetts Water Resources Authority (MWRA) or other Agency of the Commonwealth to a municipality or sewer district? ___ Yes ___ No

G. Is there an existing facility, or is a new facility proposed at the project site for the storage, treatment, processing, combustion or disposal of sewage sludge, sludge ash, grit, screenings, wastewater reuse (gray water) or other sewage residual materials? ___ Yes ___ No; if yes, what is the capacity (tons per day):

	Existing	Change	Total
Storage	________	________	________
Treatment	________	________	________
Processing	________	________	________
Combustion	________	________	________
Disposal	________	________	________

H. Describe the water conservation measures to be undertaken by the project, and other wastewater mitigation, such as infiltration and inflow removal.

III. Consistency

A. Describe measures that the proponent will take to comply with applicable state, regional, and local plans and policies related to wastewater management:

B. If the project requires a sewer extension permit, is that extension included in a comprehensive wastewater management plan? ___ Yes ___ No; if yes, indicate the EEA number for the plan and whether the project site is within a sewer service area recommended or approved in that plan:

TRANSPORTATION SECTION (TRAFFIC GENERATION)

I. Thresholds / Permit

A. Will the project meet or exceed any review thresholds related to traffic generation (see 301 CMR 11.03(6))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to state-controlled roadways? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Roadways and Other Transportation Facilities Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Traffic Generation Section below.

II. Traffic Impacts and Permits

A. Describe existing and proposed vehicular traffic generated by activities at the project site:

	Existing	Change	Total
Number of parking spaces	_______	________	_______
Number of vehicle trips per day	________	________	________
ITE Land Use Code(s):	________	________	________

B. What is the estimated average daily traffic on roadways serving the site?

Roadway	Existing	Change	Total
1. ____________________	________	________	________
2. _____________________	________	________	________
3. _____________________	________	________	________

C. If applicable, describe proposed mitigation measures on state-controlled roadways that the project proponent will implement:

D. How will the project implement and/or promote the use of transit, pedestrian and bicycle facilities and services to provide access to and from the project site?

E. Is there a Transportation Management Association (TMA) that provides transportation demand management (TDM) services in the area of the project site? ____ Yes ____ No; if yes, describe if and how will the project will participate in the TMA:

F. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation facilities? ____ Yes ____ No; if yes, generally describe:

G. If the project will penetrate approach airspace of a nearby airport, has the proponent filed a Massachusetts Aeronautics Commission Airspace Review Form (780 CMR 111.7) and a Notice of Proposed Construction or Alteration with the Federal Aviation Administration (FAA) (CFR Title 14 Part 77.13, forms 7460-1 and 7460-2)?

III. Consistency

Describe measures that the proponent will take to comply with municipal, regional, state, and federal plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services:

TRANSPORTATION SECTION (ROADWAYS AND OTHER TRANSPORTATION FACILITIES)

I. Thresholds

A. Will the project meet or exceed any review thresholds related to roadways or other transportation facilities (see 301 CMR 11.03(6))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to roadways or other transportation facilities? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Energy Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Roadways Section below.

II. Transportation Facility Impacts

A. Describe existing and proposed transportation facilities in the immediate vicinity of the project site:

B. Will the project involve any

1. Alteration of bank or terrain (in linear feet)? ____________
2. Cutting of living public shade trees (number)? ____________
3. Elimination of stone wall (in linear feet)? ____________

III. Consistency -- Describe the project's consistency with other federal, state, regional, and local plans and policies related to traffic, transit, pedestrian and bicycle transportation facilities and services, including consistency with the applicable regional transportation plan and the Transportation Improvements Plan (TIP), the State Bicycle Plan, and the State Pedestrian Plan:

ENERGY SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **energy** (see 301 CMR 11.03(7))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **energy**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Air Quality Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Energy Section below.

II. Impacts and Permits

A. Describe existing and proposed energy generation and transmission facilities at the project site:

	Existing	Change	Total
Capacity of electric generating facility (megawatts)	________	________	________
Length of fuel line (in miles)	________	________	________
Length of transmission lines (in miles)	________	________	________
Capacity of transmission lines (in kilovolts)	________	________	________

B. If the project involves construction or expansion of an electric generating facility, what are:

1. the facility's current and proposed fuel source(s)?
2. the facility's current and proposed cooling source(s)?

C. If the project involves construction of an electrical transmission line, will it be located on a new, unused, or abandoned right of way? ___Yes ___No; if yes, please describe:

D. Describe the project's other impacts on energy facilities and services:

III. Consistency

Describe the project's consistency with state, municipal, regional, and federal plans and policies for enhancing energy facilities and services:

AIR QUALITY SECTION

I. Thresholds

A. Will the project meet or exceed any review thresholds related to **air quality** (see 301 CMR 11.03(8))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to **air quality**? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Solid and Hazardous Waste Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Air Quality Section below.

II. Impacts and Permits

A. Does the project involve construction or modification of a major stationary source (see 310 CMR 7.00, Appendix A)? ___ Yes ___ No; if yes, describe existing and proposed emissions (in tons per day) of:

	Existing	Change	Total
Particulate matter	________	________	________
Carbon monoxide	________	________	________
Sulfur dioxide	________	________	________
Volatile organic compounds	________	________	________
Oxides of nitrogen	________	________	________
Lead	________	________	________
Any hazardous air pollutant	________	________	________
Carbon dioxide	________	________	________

B. Describe the project's other impacts on air resources and air quality, including noise impacts:

III. Consistency

A. Describe the project's consistency with the State Implementation Plan:

B. Describe measures that the proponent will take to comply with other federal, state, regional, and local plans and policies related to air resources and air quality:

SOLID AND HAZARDOUS WASTE SECTION

I. Thresholds / Permits

A. Will the project meet or exceed any review thresholds related to **solid or hazardous waste** (see 301 CMR 11.03(9))? ___ Yes X No; if yes, specify, in quantitative terms:

B. Does the project require any state permits related to solid and hazardous waste? ___ Yes X No; if yes, specify which permit:

C. If you answered "No" to both questions A and B, proceed to the **Historical and Archaeological Resources Section**. If you answered "Yes" to either question A or question B, fill out the remainder of the Solid and Hazardous Waste Section below.

II. Impacts and Permits

A. Is there any current or proposed facility at the project site for the storage, treatment, processing, combustion or disposal of solid waste? ___ Yes ___ No; if yes, what is the volume (in tons per day) of the capacity:

	Existing	Change	Total
Storage	________	________	________
Treatment, processing	________	________	________
Combustion	________	________	________
Disposal	________	________	________

B. Is there any current or proposed facility at the project site for the storage, recycling, treatment or disposal of hazardous waste? ___ Yes ___ No; if yes, what is the volume (in tons or gallons per day) of the capacity:

	Existing	Change	Total
Storage	________	________	________
Recycling	________	________	________
Treatment	________	________	________
Disposal	________	________	________

C. If the project will generate solid waste (for example, during demolition or construction), describe alternatives considered for re-use, recycling, and disposal:

D. If the project involves demolition, do any buildings to be demolished contain asbestos?
___ Yes ___ No

E. Describe the project's other solid and hazardous waste impacts (including indirect impacts):

III. Consistency

Describe measures that the proponent will take to comply with the State Solid Waste Master Plan:

HISTORICAL AND ARCHAEOLOGICAL RESOURCES SECTION

I. Thresholds / Impacts

A. Have you consulted with the Massachusetts Historical Commission? ___ Yes X No; if yes, attach correspondence. For project sites involving lands under water, have you consulted with the Massachusetts Board of Underwater Archaeological Resources? ____Yes ____ No; if yes, attach correspondence

B. Is any part of the project site a historic structure, or a structure within a historic district, in either case listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes X No; if yes, does the project involve the demolition of all or any exterior part of such historic structure? ___ Yes ___ No; if yes, please describe:

C. Is any part of the project site an archaeological site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth? ___ Yes X No; if yes, does the project involve the destruction of all or any part of such archaeological site? ___ Yes ___ No; if yes, please describe:

Source: REVIEW OF MHC FILES and MACRIS database review.

D. If you answered "No" to all parts of both questions A, B and C, proceed to the **Attachments and Certifications** Sections. If you answered "Yes" to any part of either question A or question B, fill out the remainder of the Historical and Archaeological Resources Section below.

II. Impacts

Describe and assess the project's impacts, direct and indirect, on listed or inventoried historical and archaeological resources:

III. Consistency

Describe measures that the proponent will take to comply with federal, state, regional, and local plans and policies related to preserving historical and archaeological resources:

CERTIFICATIONS:

1. The Public Notice of Environmental Review has been/will be published in the following newspapers in accordance with 301 CMR 11.15(1):

   (Name) BOSTON HERALD (Date) JAN 20, 2015

2. This form has been circulated to Agencies and Persons in accordance with 301 CMR 11.16(2).

Signatures:

1/14/15 [signature]	1/13/15 Lisa M Carrozza
Date Signature of Responsible Officer or Proponent	Date Signature of person preparing ~~NPC~~ EENF (if different from above)
EUGENE MCGLYNN	LISA M. CARROZZA
Name (print or type)	Name (print or type)
B.T.U.H.W.F. BUILDING CORP.	TETRA TECH
Firm/Agency	Firm/Agency
180 MOUNT VERNON ST.	1 GRANT ST.
Street	Street
BOSTON (DORCHESTER) MA 02125	FRAMINGHAM, MA 01701
Municipality/State/Zip	Municipality/State/Zip
617 288-2000	508 903 2000
Phone	Phone

APPENDIX B - PROPERTY DEED AND PLAN

SUFFOLK REGISTRY OF DEEDS
REC'D ENTD. & EXAM. ATTEST

11080 190

AUG 9 11 22 AM '84

Paul R. Tierney
REGISTER

140

Property Address: 180 Mt. Vernon Street, Dorchester

QUITCLAIM DEED

BAYSIDE ASSOCIATES LIMITED PARTNERSHIP, a Massachusetts limited partnership having an address at 200 Mt. Vernon Street, Dorchester, Boston, Suffolk County, Massachusetts ("Grantor"), for consideration paid of Five Hundred Fifty Thousand and 00/100 ($550,000.00) Dollars, Grants to BTUHWF BUILDING CORPORATION, a Massachusetts corporation having its address at 180 Mt. Vernon Street, Dorchester, Boston, Suffolk County, Massachusetts ("Grantee"), with QUITCLAIM COVENANTS a certain parcel of registered land with the building and improvements thereon (excluding the portion of the building primarily situated upon Lot 7 as shown on the plan hereinafter mentioned which portion extends southwesterly of the northeasterly boundary line of Lot 6 as shown on said plan), situated in the Dorchester District of the City of Boston, Suffolk County, Massachusetts, shown as Lot 6 on a Plan of Land entitled "SUBDIVISION PLAN OF LAND 'BEING A SUBDIVISION OF LOT 2 ON L.C. NO. 28699C' BOSTON (DORCHESTER) MASS." by Harry R. Feldman, Inc. - Land Surveyors, dated February 16, 1984, filed with the Engineer's Office of the Land Court as Land Court Plan 28699D (the "Plan") and more particularly bounded and described as follows:

NORTHWESTERLY	by land now or formerly of the Commonwealth of Massachusetts Three Hundred Sixty (360 and 00/100) feet;
NORTHEASTERLY	by land of Grantor Three Hundred Twenty Seven (327 and 00/100) feet;
SOUTHEASTERLY	by land of Grantor Three Hundred Sixty (360 and 00/100) feet;
SOUTHWESTERLY	by land of Grantor Three Hundred Twenty Seven (327 and 00/100) feet;

Containing One Hundred Seventeen Thousand Seven Hundred Twenty (117,720) square feet according to said plan.

Said premises are conveyed together with the right appurtenant thereto to use the premises demised to Family City Development Corporation by the Commonwealth of Massachusetts, acting through its Metropolitan District Commission, by lease dated December 30, 1964, recorded with Suffolk Deeds in Book 7917, Page 411, as amended by agreement dated March 24, 1966, recorded with said Deeds in Book 8030, Page 140 (the "Access Road"), of which lease the Grantor is present lessee by assignment (the
AS SHOWN ON A PLAN RECORDED IN SUFFOLK DEEDS BOOK 11040 pg 131
"Access Road Lease"). Grantee's use and occupancy of the Access Road shall be in common with Grantor and others entitled thereto to whom Grantor may grant similar rights and in common with Grantor's agents, employees and invitees. In connection with the Access Road Lease, Grantor agrees to perform its obligations as the lessee under the Access Road Lease. In connection with the Access Road, each party hereby indemnifies the other and holds the other harmless from any loss, claim, damage or causes of action resulting from any injury to person or property arising out of or relating to each party's negligent or wilful acts thereon.

The premises are conveyed also subject to and with the benefit of the provisions of a certain Easement Agreement between Grantor and Grantee of even date to be registered herewith.

The premises are conveyed also subject to and with the benefit of matters of record set forth in Certificate of Title No. 95228 insofar as the same may be in force and applicable, except as they may be modified, amended or released as provided in said Easement Agreement and reserving to the Grantor the right to use the Right of Way as defined and provided in said Easement Agreement and as shown on a plan recorded with Suffolk Registry of Deeds Book 11040 Page 131. in common with others to whom the Grantor may grant similar rights.

For Grantor's title see Certificate of Title No. 95228 filed with the Suffolk County Registry of the Land Court.

Wherever used herein, "Grantor" and "Grantee" shall include their respective successors in interest.

Said premises are conveyed subject to the real estate taxes for fiscal year 1985 and subsequent years, and Grantee assumes and agrees to pay the portion of said taxes allocable to the Premises herein conveyed.

EXECUTED under seal this 7th day of August, 1984.

BAYSIDE ASSOCIATES LIMITED PARTNERSHIP

By: O'Connell Development Co., Inc.
, a General Partner

By: William S. O'Connell
President

By: [signature]
Treasurer

No stamps are affixed hereto, but are affixed to Deed registered August 9, 1984 Document No 392453 with Suffolk Registry District of the Land Court

COMMONWEALTH OF MASSACHUSETTS

Suffolk, ss: August 7, 1984

Then personally appeared the above named William S. O'Connell being by me duly sworn, did say that he is the President of O'Connell Development Co., Inc., a general partner of BAYSIDE LIMITED PARTNERSHIP, a Massachusetts limited partnership, that said instrument was signed under seal on behalf of said Partnership by authority of its general partners, and said instrument is the free act and deed of said Partnership.

Linda R. Goldberg
Notary Public

My Commission Expires: February 23, 1991

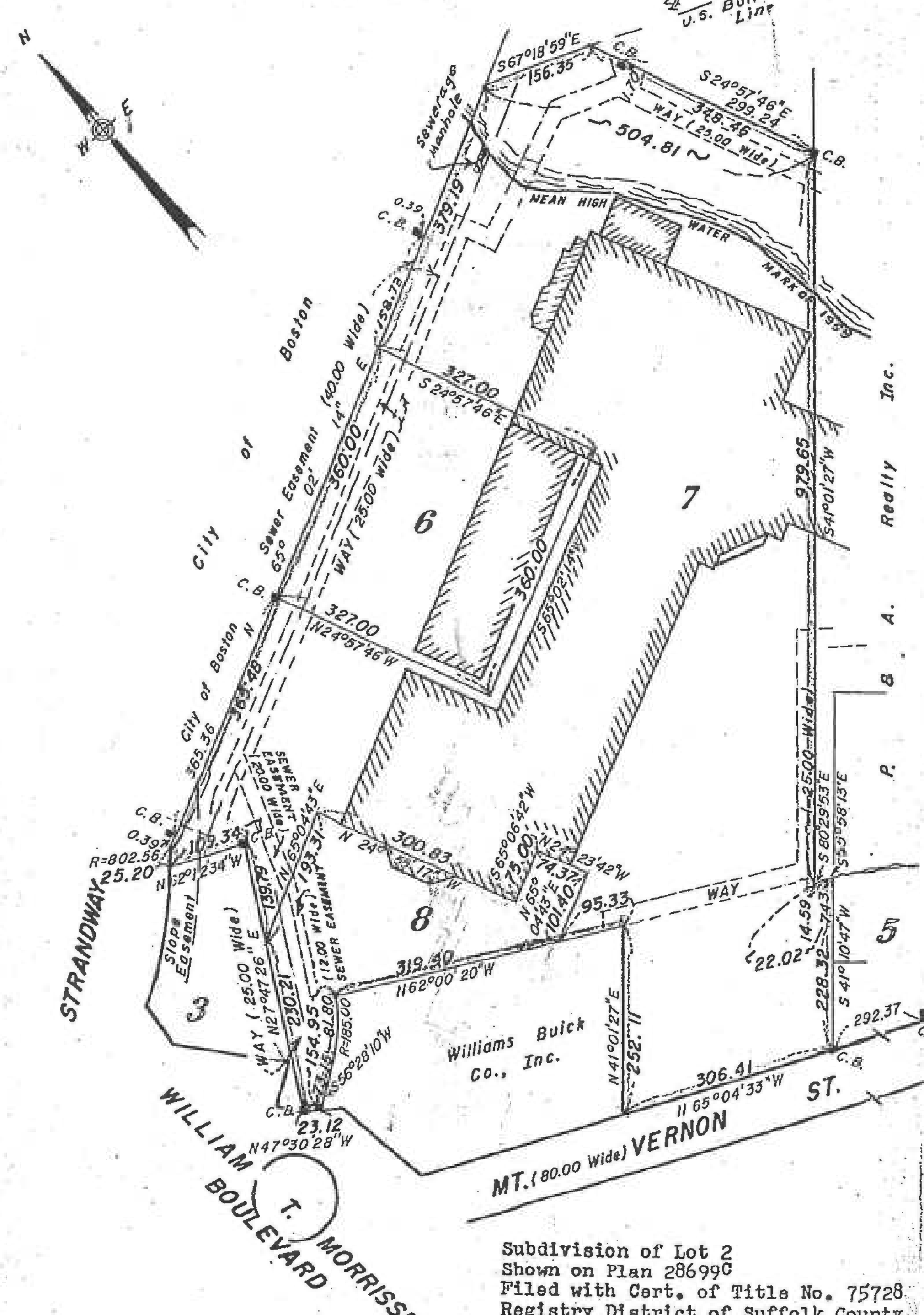
Il.Cert.97090

28699D

SUBDIVISION PLAN OF LAND IN BOSTON (Dor.)

Harry R. Feldman, Inc., Surveyors

February 16, 1984



Subdivision of Lot 2
Shown on Plan 28699C
Filed with Cert. of Title No. 75728
Registry District of Suffolk County

Separate certificates of title may be issued for land shown hereon as Lots 6, 7 and 8

By the Court.

MAY 31, 1984 Jeanne M. Maloney
Deputy Recorder.

Abutters are shown as on original decree plan.

Copy of part of plan filed in LAND REGISTRATION OFFICE

MAY 31, 1984

Scale of this plan 160 feet to an inch

Louis A. Moore, Engineer for Court

FF.

Form LCE-S-3. 3500 3-84

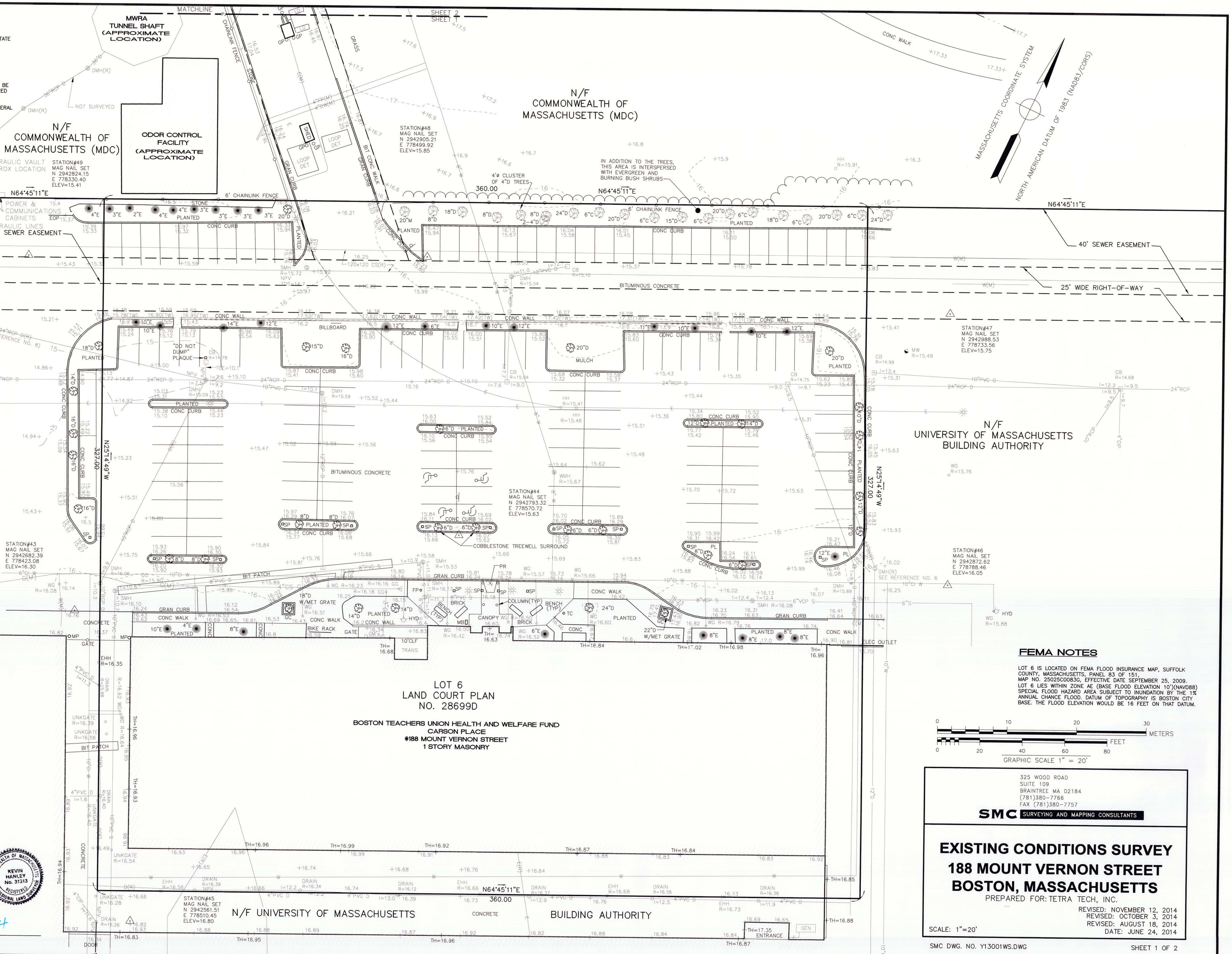
APPENDIX C - EXISTING CONDITIONS SURVEY PLAN

NOTES

1. COORDINATES, IN U.S. SURVEY FEET, ARE REFERENCED TO THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (NAD83/CORS).
2. ELEVATIONS, IN U.S. SURVEY FEET, ARE REFERENCED TO THE BOSTON CITY BASE DATUM (SEE REFERENCE #3).
3. SUBSURFACE UTILITY LINES, AS SHOWN HEREON, WERE COMPILED ACCORDING TO AVAILABLE RECORD INFORMATION FROM THE REFERENCED COMPANIES AND PUBLIC AGENCIES, AND THEIR LOCATIONS ARE APPROXIMATE ONLY. ACTUAL LOCATIONS MUST BE DETERMINED IN THE FIELD. SMC ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED OR INACCURATELY SHOWN.

   GENERALLY THE LINES IN THE PUBLIC AND PRIVATE WAYS ARE SHOWN AND THE LATERAL CONNECTIONS SERVICING INDIVIDUAL USERS ARE NOT SHOWN. BEFORE DESIGNING FUTURE CONNECTIONS, THE APPROPRIATE UTILITIES MUST BE CONSULTED.

   BEFORE CONSTRUCTION, ALL UTILITIES, PUBLIC AND PRIVATE MUST BE NOTIFIED (SEE MASSACHUSETTS GENERAL LAWS, CHAPTER 82 SECTION 40.) CALL "DIG SAFE" 1 (888) 344-7233 HTTP://WWW.DIGSAFE.COM.



LEGEND

△	SURVEY CONTROL STATION
MAG	MAGNETIC
N/F	NOW OR FORMERLY
W/	WITH
	PROPERTY LINE
	TREE LINE
	DECIDUOUS TREE
	EVERGREEN TREE
C	CHERRY TREE
	FENCE
CLF	CHAIN LINK FENCE
	CURBING(TYPE)
BIT CONC	BITUMINOUS CONCRETE
GRAN	GRANITE
PR	PEDESTRIAN RAMP
15.97	TOP OF CURB
16.29	BOTTOM OF CURB
SP	STONE POST
MP	METAL POST
☼	LIGHT POLE
TRANS	TRANSFORMER
TC	TRASH CAN
S	SIGN
TH	THRESHOLD
MB	MAILBOX
HH	HANDHOLE
(M)	MARKED
DMH	DRAIN MANHOLE
CB	CATCH BASIN
R	RIM
I	INVERT
NPV	NO PIPE VISIBLE
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE
CIP	CAST IRON PIPE
TOE	TOP OF ELBOW
TOW	TOP OF WATER
TOS	TOP OF SILT
CU	CONNECTION UNKNOWN
GG	GAS GATE
GM	GAS METER
TMH	TELEPHONE MANHOLE
EMH	ELECTRIC MANHOLE
OT	OTHER MANHOLE
SMH	SEWER MANHOLE
WG	WATER GATE
HYD	HYDRANT
—W—	WATER LINE
—S—	SEWER LINE
—T—	TELEPHONE LINE
—E—	ELECTRIC LINE
—D—	DRAIN LINE
—G—	GAS LINE
MW	MONITORING WELL
+ 15.48	SPOT ELEVATION
- - - - -	INTERMEDIATE CONTOUR
— 15 —	INDEX CONTOUR

Date:	OCTOBER 3, 2014
Date:	AUGUST 18, 2014
Date:	JUNE 24, 2014
Job No.:	Y13000
Drawn By:	SKH
Checked By:	KH
Calc'd By:	EP
Drawing No.:	Y13001WS.DWG
Sheet:	1 OF 2

COMMONWEALTH OF MASSACHUSETTS
KEVIN HANLEY
No. 31313
REGISTERED
PROFESSIONAL LAND SURVEYOR

Kevin Hanley
15th December 2014

KEVIN HANLEY, PLS
MASSACHUSETTS REG. No. 31313

FEMA NOTES

LOT 6 IS LOCATED ON FEMA FLOOD INSURANCE MAP, SUFFOLK COUNTY, MASSACHUSETTS, PANEL 83 OF 151, MAP NO. 25025C0083G, EFFECTIVE DATE SEPTEMBER 25, 2009. LOT 6 LIES WITHIN ZONE AE (BASE FLOOD ELEVATION 10')(NAVD88) SPECIAL FLOOD HAZARD AREA SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD. DATUM OF TOPOGRAPHY IS BOSTON CITY BASE. THE FLOOD ELEVATION WOULD BE 16 FEET ON THAT DATUM.

0 10 20 30 METERS
0 20 40 60 80 FEET
GRAPHIC SCALE 1" = 20'

325 WOOD ROAD
SUITE 109
BRAINTREE MA 02184
(781)380-7766
FAX (781)380-7757
SMC SURVEYING AND MAPPING CONSULTANTS

EXISTING CONDITIONS SURVEY
188 MOUNT VERNON STREET
BOSTON, MASSACHUSETTS

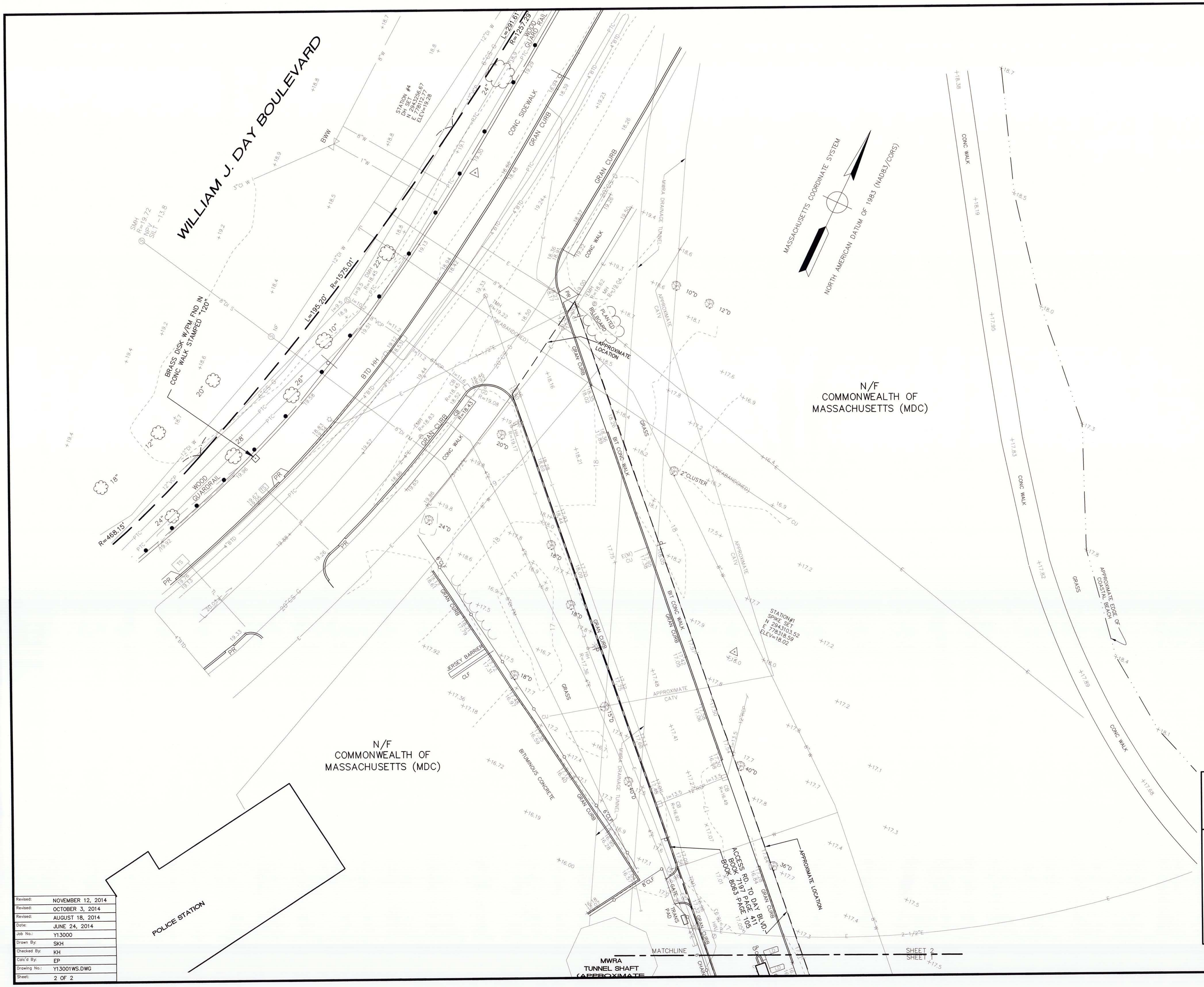
PREPARED FOR: TETRA TECH, INC.

REVISED: NOVEMBER 12, 2014
REVISED: OCTOBER 3, 2014
REVISED: AUGUST 18, 2014
DATE: JUNE 24, 2014

SCALE: 1"=20'

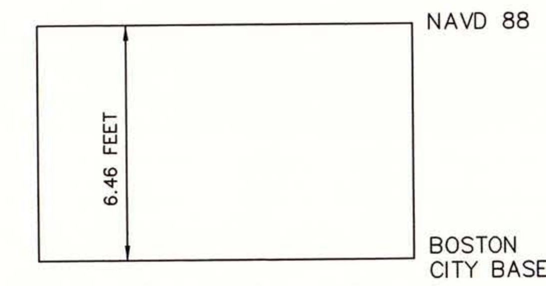
SMC DWG. NO. Y13001WS.DWG

SHEET 1 OF 2



REFERENCES

1. SUBDIVISION PLAN OF LAND
   BEING A SUBDIVISION OF LOT 2 ON L.C. NO. 28599C
   BOSTON (DORCHESTER) MASS.
   PREPARED BY HARRY R. FELDMAN, INC.
   SCALE: 1"=60' DATE: FEBRUARY 16, 1984
   L.C. NO. 28699D
2. AMENDMENT TO EASEMENT AGREEMENT
   BOOK 33546 PAGE 143
3. EXISTING CONDITIONS SURVEY
   MOUNT VERNON STREET, BOSTON, MASSACHUSETTS
   PREPARED BY SURVEYING AND MAPPING CONSULTANTS, INC.
   SCALE: 1"=20' DATE: MAY 2, 2014
   DWG NO. Y10000FP.dwg
4. MASSACHUSETTS WATER RESOURCES AUTHORITY
   SITE UTILITY PLAN
   NORTH DORCHESTER BAY CSO STORAGE TUNNEL
   NOVEMBER 2006
5. TOPOGRAPHIC SURVEY MOAKLEY PARK
   SOUTH BOSTON, MA
   PREPARED BY SURVEYING AND MAPPING CONSULTANTS, INC.
   SCALE: 1"=40' DATE: APRIL 7, 2009
   DWG NO. R13800FP.dwg
6. DRAWING 12744D–ALTA
   PROVIDED BY TETRA TECH. INC.
7. BOS 087 SITE ASBUILT UTILITY PLAN
   NORTH DORCHESTER BAY CSO STORAGE TUNNEL
   PREPARED BY BARLETTA ENGINEERING
   SCALE: 1"=20' DATE: SEPTEMBER 1, 2009
8. BWSC SITE PLAN #10050 VENTILATION BUIDING
   NORTH DORCHESTER BAY CSO FACILITIES
   PREPARED BY FAY, SPOFFORD & THORNDIKE, LLC
   SCALE: 1"=20' DATE: AUGUST, 2009



VERTICAL DATUM RELATIONSHIP

Kevin Hanley
15th December 2014

KEVIN HANLEY, PLS
MASSACHUSETTS REG. No. 31313

0 10 20 30 METERS
0 20 40 60 80 FEET
GRAPHIC SCALE 1" = 20'

325 WOOD ROAD
SUITE 109
BRAINTREE MA 02184
(781)380–7766
FAX (781)380–7757

SMC SURVEYING AND MAPPING CONSULTANTS

EXISTING CONDITIONS SURVEY
188 MOUNT VERNON STREET
BOSTON, MASSACHUSETTS

PREPARED FOR: TETRA TECH, INC.

REVISED: NOVEMBER 12, 2014
REVISED: OCTOBER 3, 2014
REVISED: AUGUST 18, 2014
DATE: JUNE 24, 2014

SCALE: 1"=20'

SMC DWG. NO. Y13001WS.DWG

SHEET 2 OF 2

Revised:	NOVEMBER 12, 2014
Revised:	OCTOBER 3, 2014
Revised:	AUGUST 18, 2014
Date:	JUNE 24, 2014
Job No.:	Y13000
Drawn By:	SKH
Checked By:	KH
Calc'd By:	EP
Drawing No.:	Y13001WS.DWG
Sheet:	2 OF 2

APPENDIX E - EASEMENT AGREEMENT (CD)

11080 172

138

SUFFOLK REGISTRY OF DEEDS
REC'D ENTD & EXAM. ATTEST

AUG 9 11 21 AM '84

Paul R. Tierney
REGISTER

MT VERNON ST DORCHESTER

EASEMENT AGREEMENT

Agreement dated this 7th day of August, 1984, by and between BAYSIDE ASSOCIATES LIMITED PARTNERSHIP, a Massachusetts limited partnership having an address at 200 Mt. Vernon Street, Dorchester, Massachusetts, ("BAYSIDE") and BAYSIDE III LIMITED PARTNERSHIP, a Massachusetts limited partnership having an address at 200 Mt. Vernon Street, Dorchester, Massachusetts, ("BAYSIDE III"), and BTUHWF BUILDING CORPORATION, a Massachusetts corporation having an address at 180 Mt. Vernon Street, Dorchester, Massachusetts, ("BTUHWF").

BAYSIDE is the owner of a parcel of land with the buildings thereon sometimes known as the Bayside Mall shown, in part, as Lot 7 on a plan entitled "SUBDIVISION PLAN OF LAND 'BEING A SUBDIVISION OF LOT 2 ON L.C. NO. 28699C' BOSTON (DORCHESTER) MASS." dated February 16, 1984, by Harry Feldman, Inc. (the "Conveyance Plan"), filed with the Suffolk Registry District of the Land Court under Certificate of Title No. 95228.

BAYSIDE III is the owner of the land shown on a plan of land entitled "Subdivision Plan of Land, Boston (Dorchester) Mass." dated February 15, 1984, recorded with Suffolk County Registry of Deeds, that part of which is shown as Lot 8 as shown on the Conveyance Plan under Certificate of Title No. (97090), such land hereinafter referred to for all purposes as "Lot 8."

BTUHWF is the owner of a parcel of land with the building (the "Building") and improvements thereon shown as Lot 6 on the Conveyance Plan, by deed of Bayside dated August 7, 1984, to be registered herewith.

WHEREAS the parties hereto desire to grant certain rights and easements in and over their respective parcels and to evidence their agreement with respect to such rights and easements:

$1.00

NOW, THEREFORE, for value received, BAYSIDE and BTUHWF agree as follows:

A. GENERAL ACCESS

1. BAYSIDE and BAYSIDE III hereby grant to BTUHWF and its successors in title to Lot 6:

The right, for the benefit of BTUHWF, its successors in title, agents, employees and invitees, to use in common with others from time to time entitled thereto, including without limitation BAYSIDE and BAYSIDE III and their successors in title, agents, employees and invitees, the twenty five foot right of way shown as "25' WIDE R.O.W." ("Right of Way") on the Conveyance Plan but only between the southwesterly boundary of said Lot 6 and Mt. Vernon Street for pedestrian and vehicular access and egress between Lot 6 and Mt. Vernon Street, subject to the reservation of the right by BAYSIDE, BAYSIDE III and their successors to relocate said Right of Way as hereinafter provided but, except as set forth above, no other right or interest in the Right of Way over any other portion of BAYSIDE'S remaining land is hereby granted, including any right or interest in the portion of the Right of Way running clockwise from the northeasterly boundary of Lot 6 over other land of the BAYSIDE as shown on the Conveyance Plan and BTUHWF hereby disclaims and releases to

BAYSIDE any interest or right in said portion of the Right of Way, except for those rights specifically granted herein.

2. BAYSIDE grants to BTUHWF the right in common with BAYSIDE and its successors in title to Lot 7, to use the passageway lying Southwesterly and Southeasterly of the Building between it and the building of the Bayside Mall Exposition Center located on Lot 7, as shown on the Conveyance Plan, for fire access, emergency delivery and service access only, provided that said passageway shall at all times remain open and unobstructed except as the parties hereto may otherwise agree in writing.

BTUHWF hereby grants to each of BAYSIDE and BAYSIDE III respectively and their successors in title to Lots 7 and 8 or any portion thereof:

3. The right, in common with BTUHWF and others entitled thereto, to use the area shown as "Proposed 40' Wide R.O.W. (Access Road Extended)" on the Conveyance Plan for all purposes for which the Access Road (as hereinafter defined) may be used between the Right of Way, (as the same may be relocated as hereinafter provided) and the Access Road as shown on the Conveyance Plan, the Access Road being the premises demised in a certain lease dated December 30, 1964, recorded with Suffolk Registry of Deeds in Book 7917, at Page 411, as amended by agreement dated March 24, 1966, recorded with said Deeds in Book 8030, at Page 140.

4. The right, in common with BTUHWF and its successors in title to Lot 6, to use the passageway lying Southwesterly and Southeasterly of the Building between it and the building of the Bayside Mall Exposition Center located on Lot 7, as shown on the Conveyance Plan, for fire access, emergency delivery, and service access only, provided that said passageway shall at all times remain open and unobstructed except as the parties hereto may otherwise agree in writing.

BAYSIDE, BAYSIDE III and BTUHWF each grant to one another the following rights and easements and further agree as follows:

B. <u>UTILITY EASEMENTS</u>

1. BTUHWF and its successors in title to Lot 6 shall have the right and easement, in common with BAYSIDE, BAYSIDE III and their successors in title to Lots 7 and 8 and others entitled thereto to use all utility (including but not limited to gas, water, sewer, electricity and telephone), sewer and drainage lines, including all poles, wires, pipes, transformers, conduits, manholes, vaults, basins, hydrants and related structures, equipment and systems ("Utility Systems"), as they presently serve Lot 6 or any portion thereof, substantially in their present locations as shown on a plan registered with the Land Court ~~herewith~~ entitled "AS BUILT SITE PLAN BAYSIDE EXPOSITION CENTER BOSTON (DORCHESTER) MASS." dated December 9, 1982 and updated through June 26, 1984 by Harry Feldman, Inc. (the "Utility Plan"), in, over, upon, across, under and through Lots 7 and 8, subject to right of

, as shown on a plan recorded with the Suffolk Registry of Deeds Book 11040, Page 131.

BAYSIDE and BAYSIDE III to relocate same as hereinafter provided. BTUHWF shall also have the right, subject, however, to BAYSIDE's and BAYSIDE III's prior written approval which shall not be unreasonably withheld or delayed, to alter, enlarge, improve, remove, relocate, and reconstruct the portion of the Utility Systems that are located in, over, upon, across, under and through Lot 6, provided that any such alteration, enlargement, improvement, removal, relocation or reconstruction shall not interfere (other than unavoidable, minor, temporary interruptions in service while work is in progress as provided in paragraph B.3 below) with BAYSIDE'S use of Lot 7 and BAYSIDE III's use of Lot 8 and the buildings and improvements located thereon or reduce the capacity or availability of utility services thereto.

Such rights as are granted herein to BTUHWF shall be exercised in common with BAYSIDE, BAYSIDE III and others entitled thereto. Due to the manner in which the Utility Systems affect Lots 7 and 8 and the improvements thereon, BAYSIDE shall maintain the Utility Systems and, if necessary, repair and replace the same. Any cost incurred by BAYSIDE in connection with such maintenance, repair or replacement shall be shared by BTUHWF and BAYSIDE based upon the manner in which the Utility Systems serve Lots 6, 7 and 8 and the respective benefits derived therefrom. The parties agree that in the event of a dispute relating to expenses charged by BAYSIDE to BTUHWF under this paragraph, the dispute shall be submitted to a mediator who is mutually agreeable to the parties and whose determination shall be binding. The parties shall be jointly and equally responsible for any fee charged by the mediator. BTUHWF's share of the costs incurred by BAYSIDE for such maintenance, repair or replacement, which share shall be determined as aforesaid, shall be payable within thirty days of invoice therefor.

In the event BTUHWF has reason to believe that a Utility System requires maintenance, repair or replacement, it shall deliver written notice thereof to BAYSIDE and BAYSIDE shall proceed to maintain, repair or replace such Utility System within a reasonable time. In the event of exigent circumstances which affect the imminent safety of persons or improvements on Lot 6, BTUHWF shall give such notice as is reasonable under the circumstances and may take such action as is reasonably necessary to alleviate the hazard to safety.

BTUHWF and its successors in title to Lot 6 shall have (a) the right, easement and privilege, at BTUHWF's sole expense and risk, to relocate any of the Utility Systems into, or construct new utility systems within, the Right of Way, as the same may be relocated as provided herein, in such manner and to such extent as may be necessary or convenient from time to time for the full enjoyment or use of Lot 6 and the building and improvements located thereon as presently constructed and used or as such building and improvements may be hereafter used, reconstructed, altered, expanded, relocated or renovated from time to time, provided that any such alteration, enlargement, improvement, relocation or reconstruction shall not unreasonably interfere with BAYSIDE's use of Lot 7 and BAYSIDE III' s use of Lot 8 and further provided that BTUHWF gives reasonable prior written notice to BAYSIDE or to BAYSIDE III, whichever lot is affected, and (b) the right, subject, however, to the prior written approval of BAYSIDE or BAYSIDE III, whichever lot is affected, which shall not be unreasonably withheld or delayed, to alter, enlarge, improve, remove, relocate and reconstruct the Utility Systems to and within areas other than in the Right of Way provided that any such alteration, enlargement, improvement, removal, relocation or reconstruction shall not interfere (other than unavoidable, minor temporary interruption of service while work is in progress as provided in paragraph B. 3 below) with BAYSIDE's use of Lot 7 or BAYSIDE III's use of Lot 8 and the buildings and improvements located now or hereafter thereon. In the case of any such work contemplated in this paragraph, BTUHWF shall first deliver plans therefor and specifications for the proposed discontinuance of existing utilities and the addition of new utilities together with a construction schedule and completion date to BAYSIDE (and BAYSIDE III only if Lot 8 is affected), for its written approval, not to be unreasonably withheld or delayed, before any work shall commence. No such alteration or other work contemplated by this paragraph shall unreasonably adversely affect BAYSIDE's use of Lot 7 or BAYSIDE III's use of Lot 8 and the buildings and improvements now or hereafter located thereon. After BAYSIDE's or BAYSIDE III's written approval, as the case may be, and upon completion of the work contemplated thereby, BTUHWF, BAYSIDE, and BAYSIDE III shall enter into an amendment to this agreement evidencing the location of the new lines and shall forthwith register a plan showing such lines and easements covering such lines, to be prepared at the sole expense of BTUHWF and in form and substance satisfactory to BAYSIDE and BAYSIDE III. Upon the registration of such agreement and plan, the easements granted herein with respect to the lines which have been discontinued shall terminate and become of no further force or effect.

2. BAYSIDE and BAYSIDE III or either of them and their respective successors in title to Lots 7 and 8 shall have the right and easement in common with BTUHWF and its successors in title to Lot 6 to use, inspect, maintain, repair and replace all Utility Systems presently serving Lots 7 and 8 or any portion thereof substantially in their present location as shown on the Utility Plan in, over, upon and across Lot 6, subject to the right of BTUHWF to relocate same as herein provided.

BAYSIDE and BAYSIDE III or either of them and their respective successors in title to Lots 7 and 8 shall also have the right, to alter, enlarge, improve, remove, relocate and reconstruct the portions of the Utility Systems that are located in, over, across, under and through their respective lot, provided that if any such Utility System also serves Lot 6, such work shall be subject to BTUHWP's prior written approval which shall not be unreasonably withheld or delayed, and provided further that any such alteration, enlargement, improvement, removal, relocation or reconstruction shall not interfere (other than unavoidable, minor, temporary interruptions of service while work is in progress as provided in paragraph B. 3 below) with BTUHWP's use of Lot 6 and the building and improvements located thereon or reduce the capacity or availability of utility services thereto.

3. Each party and its successors in title to Lot 6 and to Lots 7 and 8 shall, upon reasonable advance notice to the other party, have the right to enter in and upon the land of the other party, when necessary, for the purpose of exercising the rights and easements granted herein, provided, however that any such entry shall not unreasonably interfere with the respective owner's use of Lots 6, 7 or 8 as shown on a plan of land recorded with Suffolk Registry of Deeds in Book 11040 Page 131 or the buildings and improvements thereon and provided further that the party exercising the rights and easements hereunder shall perform all work at mutually agreed times in a good workmanlike and expeditious manner and shall promptly restore the portion of the Lot and any building or improvement thereon disturbed thereby as nearly as possible to its condition prior to the commencement of any such work. All

such work shall be done at the sole expense of the party exercising its rights hereunder. It is further agreed that any work performed under paragraphs 1 and 2 above, and this paragraph 3 shall not cause an interruption in service without the prior consent of the party so affected, such consent not to be unreasonably withheld or delayed.

Each party performing work under this Agreement shall, prior to the commencement of such work, provide the other parties with evidence of liability insurance naming the other parties as named insureds thereunder.

Each party performing work under this Agreement hereby indemnifies the other parties against any loss or damage to person or property caused by the negligence or wilful act or omission of the party performing the work or its agents, employees and those for whom it is legally responsible. Upon completion of the work relocating any Utility Systems or portions thereof under this Agreement, but prior to relinquishment of any right in and to the Utility Systems or portions thereof being replaced thereby, the party performing such relocation shall, at its sole expense, a) provide the other parties with assurances of title which shall be satisfactory to the other parties' counsel, and b) provide plans and documents suitable for registration or recording with the Suffolk Registry/District and Registry of Deeds indicating the location of the new utility system or portion thereof.

C. <u>RELOCATION OF RIGHT OF WAY</u>

1. The parties hereto further agree that upon prior written approval of BTUHWF, which approval shall not be unreasonably

withheld or delayed, BAYSIDE or BAYSIDE and BAYSIDE III may relocate the Right of Way provided, however that (1) any new right of way shall provide adequate unobstructed access between Lot 6 and Mt. Vernon Street; (2) BAYSIDE will be responsible for all costs associated with the relocation including the costs of an easement plan, attorneys' fees incurred by the parties in connection with the preparation or review of any necessary agreements and plans, and filing fees; and (3) the relocation of the Right of Way shall not in any way prejudice BTUHWF's rights hereunder to inspect, maintain, repair and replace any and all utility lines hereafter located in the Right of Way prior to BAYSIDE or BAYSIDE and BAYSIDE III's relocation thereof as provided herein.

In the event the Right of Way is relocated as set forth herein, it is understood and agreed between the parties that the Access Road Extended shall be relocated and extended if necessary, as a matter of record so as to ensure BAYSIDE and BAYSIDE III's right of access from the Right of Way, as relocated, to the Access Road. Any and all costs associated with such relocation shall be borne by BAYSIDE.

D. <u>CROSS EASEMENTS FOR PARKING</u>

1. BTUHWF, its agents, invitees and guests, and its successors in title to Lot 6 shall have the right, in common with others entitled thereto, to use those portions of Lots 7 and 8 devoted to parking from time to time by BAYSIDE and BAYSIDE III for the temporary parking of automobiles, when necessary.

2. BAYSIDE and BAYSIDE III, their agents, invitees and guests, and their respective successors in title to Lots 7 and 8 shall have the right to use those portions of Lot 6 devoted to parking from time to time by BTUHWF for the temporary parking of automobiles, when necessary.

E. GENERAL

All rights and easements under this agreement are appurtenant to and shall run with and bind the respective parcels and shall not be exercised except as appurtenant to Lots 6, 7 and 8, as the case may be.

Wherever the words "BTUHWF", "BAYSIDE", "BAYSIDE III", "party" or "parties" are used above, such words shall include and apply to that party's successors in interest.

EXECUTED as a sealed instrument this 7th day of August, 1984.

BTUHWF BUILDING CORPORATION

By: [signature]
President

[signature]
Treasurer

BAYSIDE ASSOCIATES LIMITED PARTNERSHIP

By: O'Connell Development Co., Inc., a general partner

By: [signature]
President

[signature]
Treasurer

BAYSIDE III LIMITED
PARTNERSHIP

By: O'Connell Development
Co., Inc.,
a general partner

By: William S O'Connell
President

Peter F. O'Connell
Treasurer

COMMONWEALTH OF MASSACHUSETTS

Suffolk , SS. August 7 , 1984

Then personally appeared the above-named ARTHUR H. KROZY & DANIEL B. McDUFFEE and acknowledged that they are the President and Treasurer, respectively, of BTUHWF BUILDING CORPORATION and acknowledged the foregoing to be the free act and deed of BTUHWF BUILDING CORPORATION before me,

Karyn Faith Scheier
Notary Public KARYN FAITH SCHEIER

My commission expires: July 7, 1987

COMMONWEALTH OF MASSACHUSETTS

Suffolk , SS. August 7 , 1984

Then personally appeared the above-named William S. O'Connell & Peter F. O'Connell and acknowledged that they are the President and Treasurer, respectively, of O'Connell Development Co., Inc., a general partner of BAYSIDE ASSOCIATES LIMITED PARTNERSHIP, a Massachusetts limited partnership and acknowledged the foregoing to be their free act and deed and the free act and deed of said partnership by authority of its general partners, before me,

Linda R Golden
Notary Public
My commission expires: February 22, 1991

COMMONWEALTH OF MASSACHUSETTS

Suffolk , SS. August 7, 1984

Then personally appeared the above-named William S O'Connell and Peter F O'Connell acknowledged that they are the President and Treasurer, respectively, of O'Connell Development Co., Inc., a general partner of BAYSIDE III LIMITED PARTNERSHIP, a Massachusetts limited partnership and acknowledged the foregoing to be their free act and deed and the free act and deed of said partnership by authority of its general partners, before me,

Linda R Golden
Notary Public
My commission expires: February 22, 1991

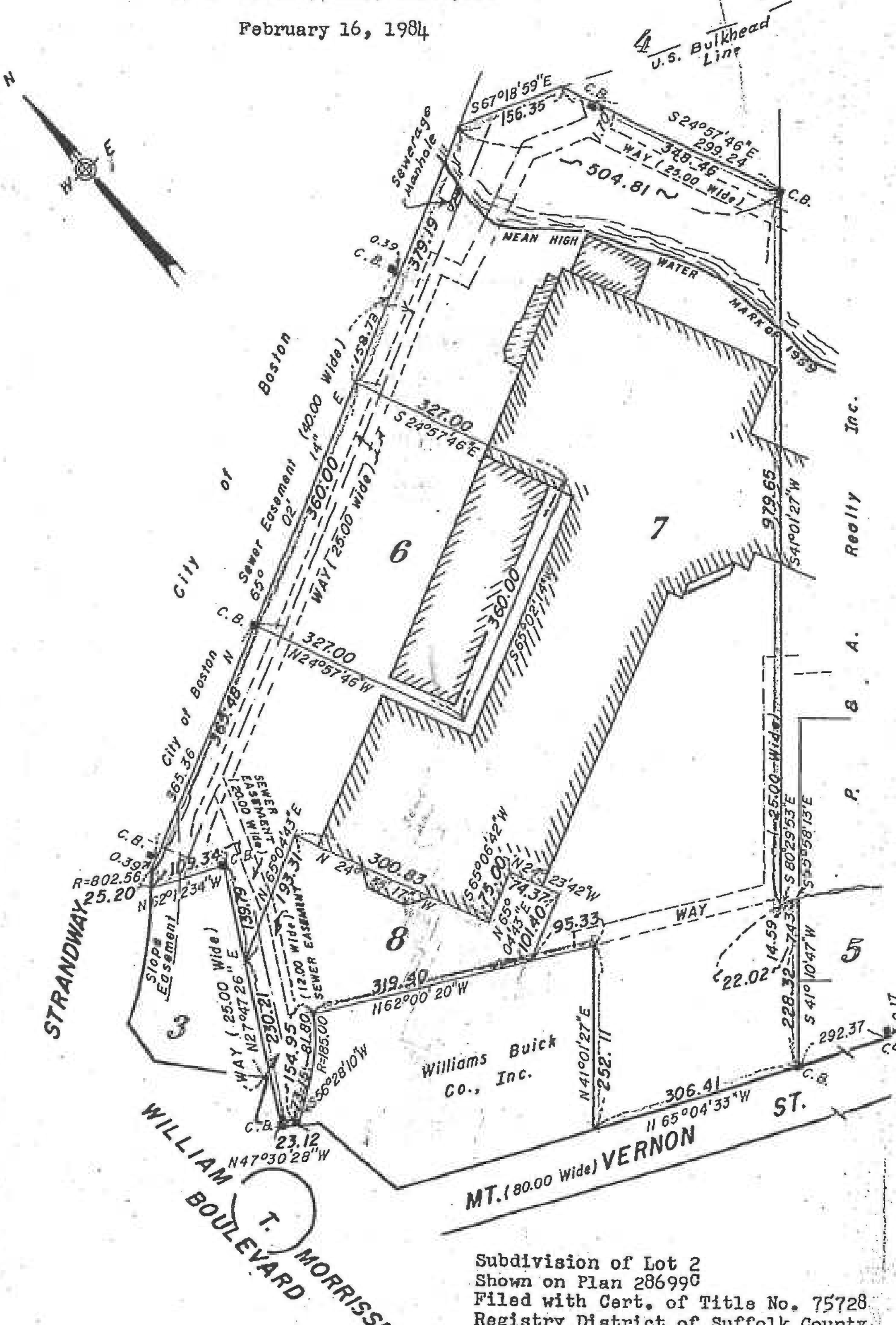
11.Cert.97090

28699D

SUBDIVISION PLAN OF LAND IN BOSTON (Dor.)

Harry R. Feldman, Inc., Surveyors

February 16, 1984



Subdivision of Lot 2
Shown on Plan 28699C
Filed with Cert. of Title No. 75728
Registry District of Suffolk County

Separate certificates of title may be issued for land shown hereon as Lots 6, 7 and 8
By the Court.

Abutters are shown as on original decree plan.

Copy of part of plan filed in
LAND REGISTRATION OFFICE
MAY 31, 1984
Scale of this plan 160 feet to an inch
Louis A. Moore, Engineer for Court

MAY 31, 1984 Jeanne M. Maloney Deputy Recorder.

FF.

Form LCE-S-3. 3500 3-84

33546 143

672957 445

12/30/2003 Doc: 0445

AMENDMENT TO EASEMENT AGREEMENT

This **Amendment to Easement Agreement** (the "Amendment") dated the 31st day of August, 2000 is made by and among **BAYSIDE ASSOCIATES LIMITED PARTNERSHIP**, a Massachusetts limited partnership having an address at 150 Mt. Vernon Street, Boston, Massachusetts ("Bayside L.P."), **BAYSIDE MERCHANDISE MART LIMITED PARTNERSHIP**, a Massachusetts limited partnership having an address at 150 Mt. Vernon Street, Boston, Massachusetts ("BMMLP"), **BAYSIDE CLUB HOTEL LLC**, a Massachusetts limited liability company having an address at 150 Mt. Vernon Street, Boston, Massachusetts ("Bayside Hotel"), **CMJ MOUNT VERNON STREET NOMINEE TRUST**, a Massachusetts nominee trust having an address at 150 Mt. Vernon Street, Boston, Massachusetts ("CMJ Trust") and **BTUHWF BUILDING CORPORATION**, a Massachusetts corporation having an address at 180 Mt. Vernon Street, Boston Massachusetts ("BTUHWF"), which defined terms shall mean and include, where the context so admits, successors in title and their respective tenants, members, officers, directors, trustees, employees, agents and invitees. This Amendment is intended to modify in certain limited respects that certain Easement Agreement executed August 7, 1984 among Bayside L.P., Bayside III Limited Partnership, a Massachusetts limited partnership ("Bayside III") and BTUHWF and recorded with the Suffolk Registry of Deeds in Book 11080, Page 172 and filed in the Suffolk Registry District of the Land Court as Document No. 382464 and noted on Certificates of Titles Numbers 95228, 97090 and 97173 (the "Easement Agreement").

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REGISTERED LAND

RECITALS

1. The Easement Agreement, among other things, established rights of access for the benefit of Lot 6 on Land Court Plan 28699D ("Lot 6"), owned by BTUHWF, over Lot 7 on

APPROVED FOR REGISTRATION BY THE COURT As a State Instrument w/ Attorney's Affidavit
Sheila R Bardall
Land Court 12/16/2003

HWD2 773916v8

Land Court Plan 28699D ("Lot 7"), and over a certain unregistered parcel of land identified on the below-referenced Conveyance Plan as "N/F BAYSIDE ASSOCIATES LIMITED PARTNERSHIP BIT. CONC. PARKING AREA" (the "Williams Buick Parcel"), then both owned by Bayside L.P., and over Lot 8 on Land Court Plan 28699D ("Lot 8"), then owned by Bayside III, and cross-easement rights for parking over Lots 6, 7 and 8, all as shown on a "Conveyance Plan" which plan is described and defined in the Easement Agreement.

2. BMMLP is now the owner of Lot 8 and a portion of the Williams Buick Parcel. Bayside LP is now the owner of the portion of former Lot 7 now shown as Lot 14 on Land Court Plan No. 28699F and a portion of the Williams Buick Parcel. Bayside Hotel is now the owner of the portion of former Lot 7 now shown as Lot 15 on Land Court Plan No. 28699G and a portion of the Williams Buick Parcel. CMJ Trust is now the owner of the portion of former Lot 7 now shown as Lot 9 on Land Court Plan No. 28699E and Lot 16 on Land Court Plan No. 28699G. For Title Ref. See Ct. 108939; ~~99064~~, 95228; 113071; 113769; and 97173

3. A dispute has arisen between BTUHWF, Bayside L.P. and BMMLP as to certain matters concerning the Easement Agreement, resulting in an action in the Land Court, Misc. No. 257960 (the "Court Case")..

4. This Amendment to Easement Agreement is being entered into pursuant to a Settlement Agreement dated as of the date hereof, entered in the Court Case.

5. Reference is made to a Plan dated August 1, 2000 and prepared by Harry R. Feldman, Inc. and captioned "Plan Showing Right of Way Relocation and Discontinuance" and filed and recorded herewith (the "Amendment Plan") and to the portions of Lots 7, 8 and the Williams Buick Parcel designated thereon as "Reserved Parking Area" which together constitute the "Restricted Parking Area" under this Agreement.

6. A portion of the Reserved Parking Area is also located on Lot 3 as shown on Land Court Plan 28699C ("Lot 3"). Lot 3 is a parcel of land which is not owned by any party to this Amendment but which lot has been functionally combined with the Reserved Parking Area. Lot 3 may or may not remain part of the Reserved Parking Area. No party to this Amendment currently has the right to enter into any agreement permitting the use of Lot 3.

7. BMMLP has agreed to install, at its sole expense, a mechanical system controlling access to and through the Reserved Parking Area whereby one seeking to travel in the most direct available route between Mt. Vernon Street and Lot 6 will retrieve a card dispensed from a machine operating gates blocking access to the right of way as relocated herein. This card will permit the user to pass through the gate and thereafter exit within approximately six minutes through a similar gate at or near the other end of the Fire Lane Route, as defined herein. Hereinafter such gate system described is referred to as the "existing gate system".

AMENDMENT

NOW THEREFORE in consideration of these premises and the mutual covenants and agreements set forth herein, Bayside L.P., BMMLP, CMJ Trust and Bayside Hotel (as successors in title to Bayside III), and BTUHWF hereby agree as follows:

1. The Parties signatory hereto hereby agree to relocate the right of way referred to in Section A, Paragraph 1 of the Easement Agreement in accordance with Paragraphs 2 and 3 below.

RELEASE OF FORMER EASEMENT

2. BTUHWF expressly releases and quitclaims to Bayside L.P., BMMLP and Bayside Hotel, to each insofar as it owns the land across which that portion of the released right of way runs, any and all rights that it may now have or have ever had to the twenty five foot

right of way shown as "25' WIDE R.O.W." on the Conveyance Plan, other than the right to maintain all existing utilities, lines, pipes, conduits and appurtenances therein or thereon, if any.

Bayside L.P., BMMLP, Bayside Hotel and CMJ Trust hereby each expressly release and quitclaim to each other, insofar as any of them owns the land upon which a portion of the "Discontinued Right of Way" runs, as described below, any and all rights that it may now have or have ever had to the Discontinued Right of Way. The "Discontinued Right of Way" shall mean that portion of the twenty five foot right of way shown as "25' WIDE R.O.W." on the Conveyance Plan which is shaded and shown as "Area of Discontinued 25' Wide Right of Way = 28,000 ± S.F." on the Amendment Plan.

GRANT OF NEW EASEMENT

3. Bayside L.P., BMMLP and CMJ Trust hereby grant BTUHWF and to each other and to Bayside Hotel the right to use, in common with others from time to time entitled thereto, the "Fire Lane Route" as defined and described below. The grant to BTUHWF shall be for the same purposes and with the same rights, standards and conditions contained in Section A, paragraph 1 of the Easement Agreement. It is the express purpose of this grant to relocate the right of way and, unless specifically hereinafter set forth, not to otherwise alter the rights of BTUHWF to use the right of way. The "Fire Lane Route" shall mean those portions of Lots 7, 8 and the Williams Buick Lot as are depicted on the Amendment Plan and designated "RELOCATED VARIABLE WIDTH RIGHT OF WAY AREA = 5,951 S.F., and as RELOCATED 24' WIDE RIGHT OF WAY AREA = 9,006 S.F. and as RELOCATED VARIABLE WIDTH RIGHT OF WAY AREA = 5,800 ± S.F.".

RESERVATIONS ON GRANT OF NEW EASEMENT

4. In connection with the Reserved Parking Area only, Bayside L.P. and BMMLP hereby reserve the right to install reasonable controls on their respective Lots (including the Fire Lane Route) which controls may include, but are not limited to the existing gate system. So long as these or future controls are in compliance with the standards set forth in Paragraph 5 below, BMMLP and Bayside L.P. may continue to control access to the Fire Lane Route in any reasonable manner including, but not limited to, the retention or installation of gates, fences or other physical barriers or the use of guards.

5. Bayside L.P.'s and BMMLP's right to control access to the Fire Lane Route as set forth herein shall not constitute an infringement upon or interference with the rights granted to BTUHWF under the Easement Agreement, as amended hereby, and the Fire Lane Route as so controlled shall be deemed to provide adequate, unobstructed access to BTUHWF *so long as* BMMLP installs devices or implements procedures, or installs and implements a combination of devices and procedures (including the existing gate system), as will permit BTUHWF at all times to access, travel across and exit the Fire Lane Route by vehicle between Lot 6 and Mt. Vernon Street without cost and without interference or delay greater than that involved in the existing gate system as described herein.

PARKING RIGHTS

6. Bayside L.P.'s and BMMLP's right to control access to the Fire Lane Route and the Reserved Parking Area as set forth herein 1) shall not constitute an infringement upon or interference with the parking rights granted to BTUHWF under Section D, paragraph 1 of the Easement Agreement, as hereby amended and 2) the Reserved Parking Area as so controlled

shall be considered consistent with all such existing parking rights of BTUHWF with respect to any portion of the land within the Reserved Parking Area so long as:

A) During "Peak Periods" and "Requested Periods," BTUHWF is afforded a system of validated parking or some other reasonable means of exercising the right to park within the Reserved Parking Area to the extent spaces are available. Such parking access shall be limited to parking for the purpose of utilizing BTUHWF's facilities located on Lot 6. BTUHWF expressly acknowledges that neither Bayside L.P. nor BMMLP is under any obligation to ensure that parking spaces are available; and Bayside L.P.'s and BMMLP's sole obligation hereunder shall be to provide such access to the Reserved Parking Area. BTUHWF further expressly acknowledges that a system of validation (or other similar system, provided each is accessible 24 hours a day) may require BTUHWF to obtain validation in the office building or elsewhere on the site (provided such other location for validation shall be not more than 100 feet from the Reserved Parking Area) and that this requirement or other potential inconveniences resulting from the system employed (expressly including the likelihood that persons will not be able to obtain validation without leaving their automobile) shall not be deemed a violation of this condition.

i) For purposes of this Section 6, "Peak Periods" shall mean any show or event, including, without limitation, set up and disassembly, scheduled for the Bayside Exposition Center, or for any successor owner or operator of all or any substantial portion of the Bayside L.P. property now known as the Bayside Exposition Center (a "Bayside Event"), that is reasonably anticipated to impact on parking in Lot 6. Peak Periods shall include, without limitation, the New England Spring Flower Show, the Boston Gift Show, the World of Wheels, the New England Boat Show, the Home Show, any computer-related show, college graduations and days when the Boston Teachers Union monthly membership meeting coincides with a Bayside Event.

ii) For purposes of this Section 6, "Requested Periods" shall mean a period of time, not to exceed twelve (12) hours, during which BTUHWF plans to have an event or meeting at which it anticipates attendance by a sufficient number of people on Lot 6 so that it is reasonably expected that it will be necessary for BTUHWF to use the Reserve Parking Area for overflow parking. BTUHWF shall so notify a designated representative of Bayside L.P. and BMMLP, either orally or in writing, at least 48 hours in advance of the event or meeting. BTUHWF shall be presumptively entitled to at least 25 such notices within a 12-month period. Access to the Reserved Parking Area for Requested Periods on weekdays shall be limited to the hours between 3 p.m. and 7 a.m. Access on weekends shall not be limited by time. During Requested Periods, in addition to the validation system in operation for Peak Periods, Bayside L.P. and BMMLP will provide BTUHWF with a reasonably convenient method of validation or egress, such as providing an agreed-upon number of pre-validated tickets, providing a validation machine at the Building, temporarily raising the gates controlling access to the Reserved Parking Area, or taking other mutually-agreed-upon measures.

B) Except as set forth below, nothing herein shall be deemed to enlarge or expand BTUHWF's rights to park on land of Bayside L.P. or BMMLP beyond the rights granted in the Easement Agreement to park on Lots 7 and 8. Notwithstanding the immediately preceding sentence, so long as that portion of the Williams Buick Parcel which is currently part of the Reserved Parking Area i) shall be used for surface parking or ii) shall be used as part of the Reserved Parking Area, then Bayside L.P. grants to BTUHWF the right to use in common with others from time to time entitled thereto that portion of the Williams Buick Parcel which is part of the Reserved Parking Area for all of the parking uses, and subject to all of the conditions, for which it may use those portions of Lots 7 and 8 within the Reserved Parking Area. Nothing herein shall diminish BTUHWF's'existing rights within the remainder of Lots 7 and 8.

7. Bayside L.P. and BMMLP represent and warrant to BTUHWF that all necessary parties to grant, preserve and alter the rights of BTUHWF as provided herein are signatories to this Agreement.

8. This Amendment shall amend the Easement Agreement only as specifically set forth herein. All other provisions of the Easement Agreement are hereby ratified and reaffirmed and shall remain in full force and effect, including without limiting the generality of the foregoing, provisions related to utilities, relocation, parking (except as specifically modified herein) application of the Easement Agreement to successors in interest, and all rights granted therein to the parties.

EXECUTED AS A SEALED INSTRUMENT this 31 day of August, 2000.

BAYSIDE ASSOCIATES LIMITED PARTNERSHIP*, a Massachusetts corporation, its sole general partner

*a Massachusetts limited partnership

By: Bayside Expo Center, Inc.,

By: [signature]
Name: Joseph J. Corcoran
Title: President

By: [signature]
Name: Christopher M. Holmquest
Title: Treasurer

BAYSIDE MERCHANDISE MART LIMITED PARTNERSHIP, a Massachusetts limited partnership

By: BAYSIDE MERCHANDISE MART, INC., a Massachusetts corporation, its sole general partner

By:____________________________
Name: Christopher M. Holmquest
Title: President and Treasurer

BAYSIDE CLUB HOTEL LLC, a Massachusetts limited liability company

By: Corcoran Jennison Hospitality Company, Inc. a Massachusetts corporation, its manager

By:____________________________
Name: Scott C. Stettner
Title: President

By:____________________________
Name: Christopher M. Holmquest
Title: Treasurer

CMJ MOUNT VERNON STREET NOMINEE TRUST

By:____________________________
Trustee Karen F. Meyer

B.T.U.H.W.F. BUILDING CORPORATION

By:____________________________
President Mary Black Walsh

By:____________________________
Treasurer Daniel B McDuffie

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss ~~August~~ October 12, 2000

Before me appeared Joseph J. Corcoran, the President of Bayside Expo Center, Inc., a Massachusetts corporation, a general partner of Bayside Associates Limited Partnership, a Massachusetts limited partnership, and acknowledged that the foregoing instrument was signed and sealed in behalf of said partnership by authority of the partnership and that said instrument was the free act and deed of said partnership.

Deborah L Beal

Notary Public Deborah L. Beal
My commission expires: August 11, 2006

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss ~~August~~ October 12,

2000

Before me appeared Christopher M. Holmquest, the Treasurer of Bayside Expo Center, Inc., a Massachusetts corporation, a general partner of Bayside Associates Limited Partnership, a Massachusetts limited partnership, and acknowledged that the foregoing instrument was signed and sealed in behalf of said partnership by authority of the partnership and that said instrument was the free act and deed of said partnership.

Deborah L. Beal
Notary Public Deborah L. Beal
My commission expires: August 11, 2006

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss ~~August~~ October 12, 2000

Before me appeared Christopher M. Holmquest, the President and Treasurer of Bayside Merchandise Mart, Inc., a Massachusetts corporation, a general partner of Bayside Merchandise Mart Limited Partnership, a Massachusetts limited partnership, and acknowledged that the foregoing instrument was signed and sealed in behalf of said partnership by authority of the partnership and that said instrument was the free act and deed of said partnership.

Deborah L. Beal
Notary Public Deborah L. Beal
My commission expires: August 11, 2006

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss ~~August~~ Oct 16, 2000

Before me appeared Scott C. Stettner, the President of Corcoran Jennison Hospitality Company, Inc., a Massachusetts corporation, the manager of Bayside Club Hotel LLC, a Massachusetts limited liability company, and acknowledged that the foregoing instrument was signed and sealed in behalf of said limited liability company by authority of the limited liability company and that said instrument was the free act and deed of said limited liability company.

Ann T. Gillespie

ANN T. GILLESPIE
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 28, 2006

HWD2 773916v8

Notary Public
My commission expires:

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss ~~August~~ October 12, 2000

Before me appeared Christopher M. Holmquest, the Treasurer of Corcoran Jennison Hospitality Company, Inc., a Massachusetts corporation, the manager of Bayside Club Hotel LLC, a Massachusetts limited liability company, and acknowledged that the foregoing instrument was signed and sealed in behalf of said limited liability company by authority of the limited liability company and that said instrument was the free act and deed of said limited liability company.

Deborah L. Beal
Notary Public Deborah L. Beal
My commission expires: August 11, 2006

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss ~~August~~ October 19, 2000

Before me appeared Karen F. Myers, the Trustee of CMJ Mount Vernon Street Nominee Trust., a Massachusetts nominee trust, and acknowledged that the foregoing instrument was signed and sealed in behalf of said limited liability company by authority of the limited liability company and that said instrument was the free act and deed of said trust.

Judith D. Bryant
Notary Public Judith D. Bryant
My commission expires:
MY COMMISSION EXPIRES
MARCH 24, 2006

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss. November 9 ~~August~~ __, 2000

Before me appeared Mary Black Walsh the President of BTUHWF BUILDING CORPORATION, a Massachusetts corporation, and acknowledged that the foregoing instrument was signed and sealed on behalf of said corporation by authority of the corporation and that said instrument was the free act and deed of said corporation.

Notary Public
My commission expires:

3/31/06

Suffolk County
Richard Stutman

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, ss. November 9, 2000

Before me appeared Daniel B. McDuffie the Treasurer of BTUHWF BUILDING CORPORATION, a Massachusetts corporation, and acknowledged that the foregoing instrument was signed and sealed on behalf of said corporation by authority of the corporation and that said instrument was the free act and deed of said corporation.

Notary Public
My commission expires:

3/31/06

Suffolk County
Richard Stutman

33546 156

ATTORNEY'S AFFIDAVIT

The undersigned represents Bayside Associates Limited Partnership, a Massachusetts limited partnership, Bayside Merchandise Mart Limited Partnership, a Massachusetts limited partnership, Bayside Club Hotel LLC, a Massachusetts limited liability company, and CMJ Mount Vernon Street Nominee Trust, a Massachusetts nominee trust, as they are parties to an Amendment to Easement Agreement by and among the above entities and BTUHWF Building Corporation, a Massachusetts corporation, which Agreement is dated August 31, 2000 (the "Agreement"). The Agreement modifies that certain Easement Agreement dated August 7, 1984 recorded with Suffolk Registry of Deeds in Book 11080, Page 172 and filed with Suffolk Registry District of the Land Court as Document No. 382464.

The parties to the Agreement intend to file the Agreement with Suffolk County Registry District of the Land Court. This affidavit is being furnished because the Agreement is to be filed more than one year after the date of its execution. The undersigned states that each party to the Agreement has legal existence in the Commonwealth of Massachusetts as of this date.

Executed under seal this twenty-fourth day of November, 2003.

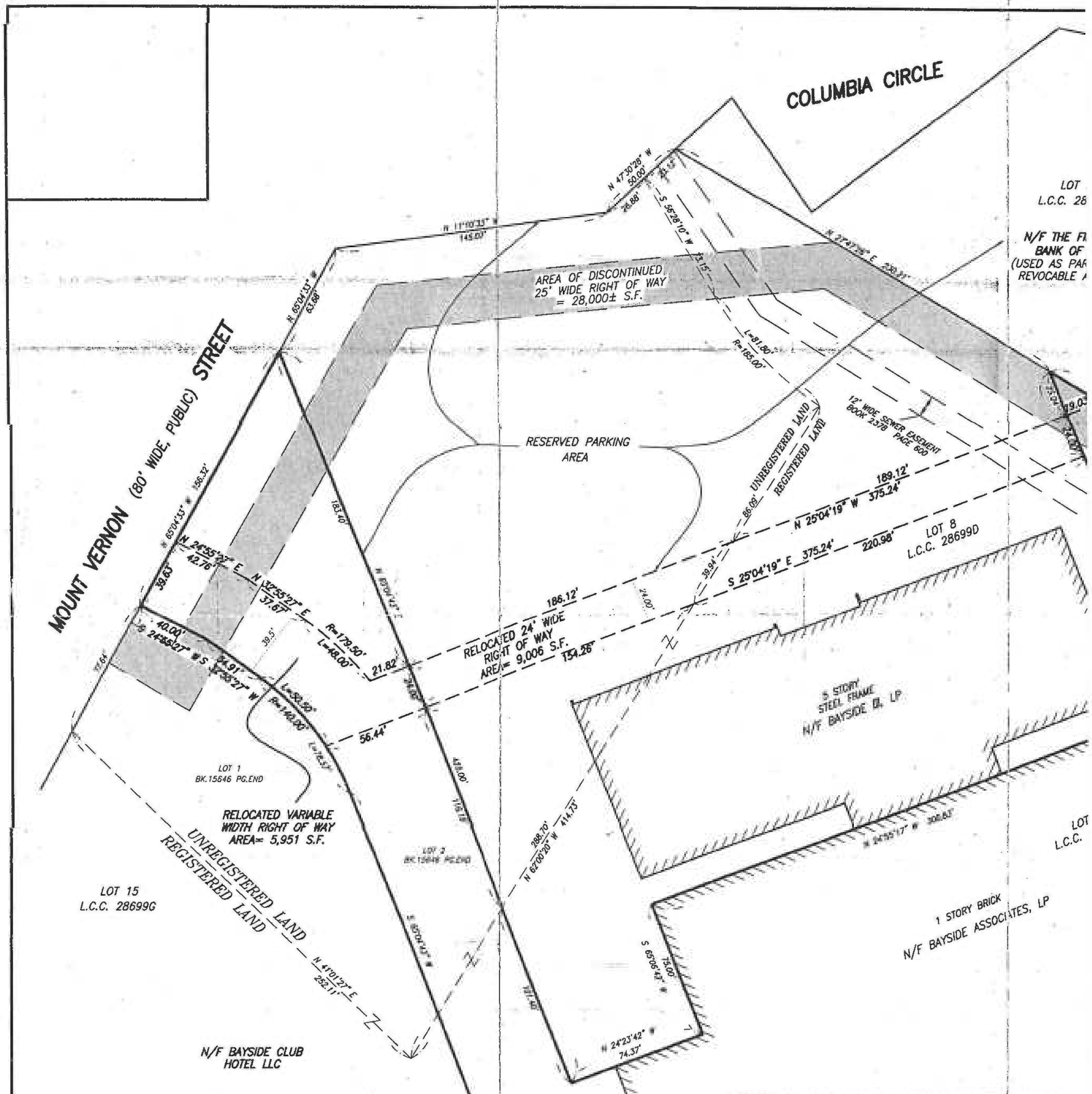
Alexander A. Randall, P.C.
BBO # 411555
Goodwin Procter LLP
Exchange Place
Boston, MA 02109
617-570-1425

APPROVED FOR ... BY THE COURT

CHIEF TITLE EXAMINER

to be attached to amendment to Easement Agmt

LIBD/1447095.1



I CERTIFY THAT THE PROPERTY LINES SHOWN HEREON ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

I FURTHER CERTIFY THAT THIS PLAN CONFORMS WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS.

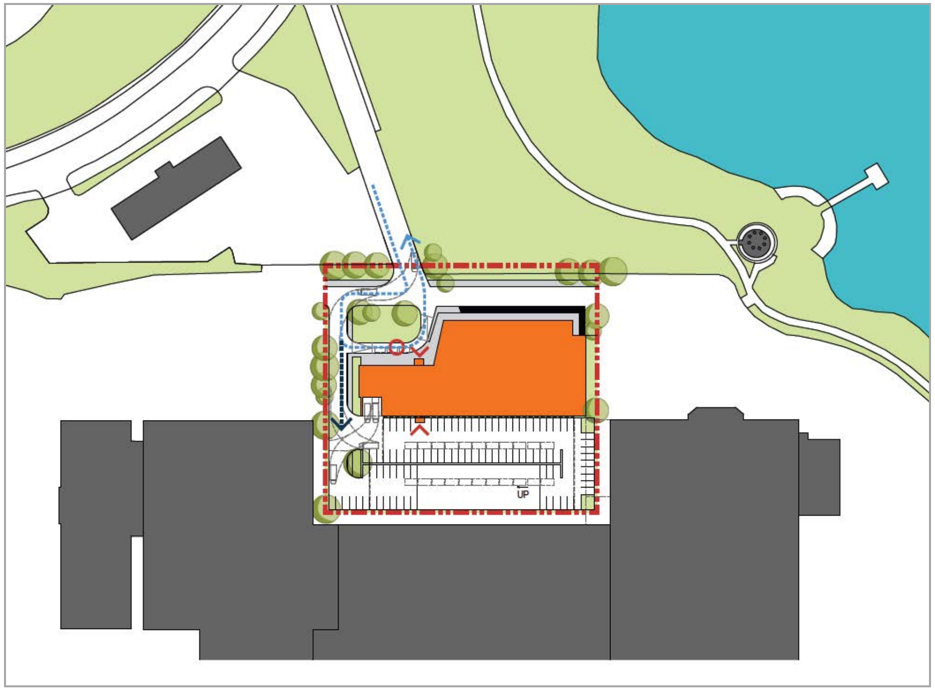
Rt. L. Applegt 8/14/00

APPENDIX F - WIND STUDY (CD)

Boston Teachers Union
Health and Welfare Fund Headquarters
Boston, MA

Pedestrian Wind Assessment

RWDI # 1500709
December 8, 2014



Site Plan

SUBMITTED TO

Sandra Smith, AIA, LEED AP
Senior Project Manager
Perkins + Will
225 Franklin Street, Suite 1100
Boston, MA 02110
Sandra.Smith@perkinswill.com

SUBMITTED BY

Rowan Williams Davies & Irwin Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada N1K 1B8
519.823.1311

Jill Bond, B.A.Sc., E.I.T.
Technical Coordinator
Jill.Bond@rwdi.com

Jordan Gilmour, P.Eng.
Associate / Senior Project Manager
Jordan.gilmour@rwdi.com

Hanqing Wu, Ph.D, P.Eng
Principal / Project Director
Hanqing.wu@rwdi.com

1. Introduction

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by BTUHWF Building Corp LLC to assess the potential wind conditions for the proposed Boston Teachers Union Health and Welfare Fund Headquarters in Boston, MA. The objective of this assessment was to provide a qualitative evaluation of wind comfort conditions on and around the development and recommend mitigation measures, if necessary.

This qualitative assessment is based on the following:

- a review of regional long-term meteorological data;
- our previous wind-tunnel tests on buildings in the Boston area;
- design drawings received by RWDI on November 3, 2014;
- our engineering judgment and expert knowledge of wind flows around buildings[1-3];
- use of software developed by RWDI (*Windestimator*[2]) for estimating the potential wind comfort conditions around generalized building forms.

This qualitative approach provides a screening-level estimation of potential wind conditions. To quantify these conditions or refine any conceptual mitigation measures, physical scale model tests would typically be required. Note that other wind issues, such as those related to door pressures, exhaust re-entrainment, snowdrifts, wind loading, etc. are not considered in the scope of this assessment.

Image 1 – Existing Site and Surroundings

1. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, vol.104-106, pp.397-407.
2. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004,* Nashville, Tennessee.
3. C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", *10th International Conference on Wind Engineering*, Copenhagen, Denmark.

2. Building and Site Information

The proposed project site is located east of Southeast Expressway, near the intersection of Mt. Vernon Street and William J Day Boulevard, as shown in Image 1. The proposed building consists of three stories plus a mechanical penthouse, totaling a height of 66 ft (see Image 2). Pedestrian areas include building entrances (Locations A and B in Image 3), the Event Plaza and Raised Patio (Location C) and sidewalks surrounding the site.

The southern half of the building will directly abut a low-rise parking garage. Joe Moakley Park is situated to the north of the proposed development and Old Harbor is to the east. Further away from the site are low-rise buildings and roadways, with the Boston downtown to the distant north and the airport to the northeast.

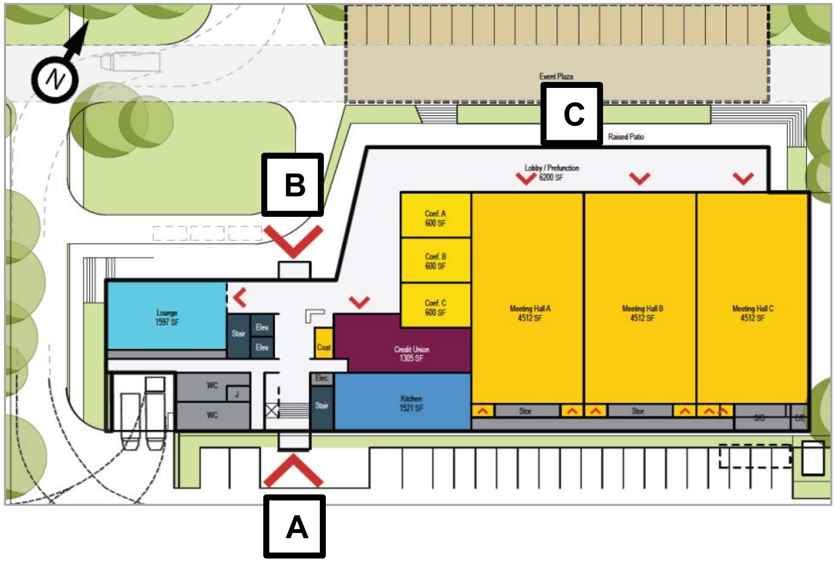


Image 3 – Ground Floor Plan and Pedestrian Locations

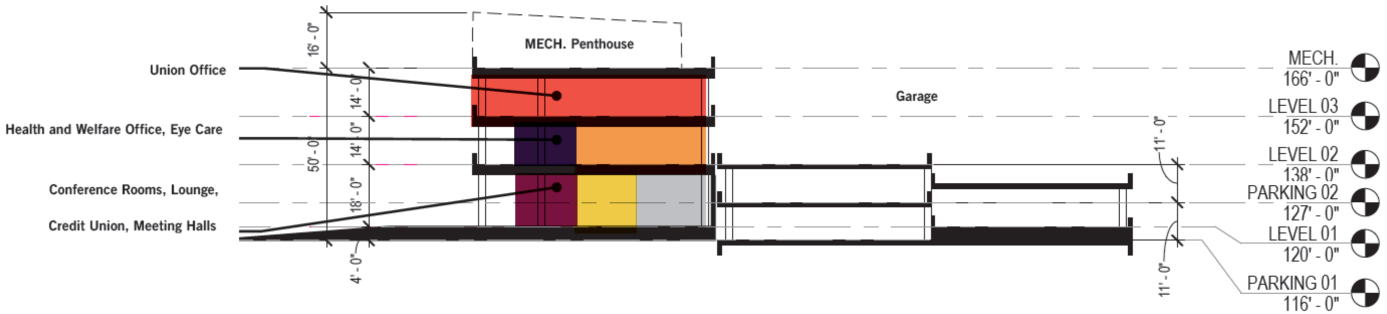


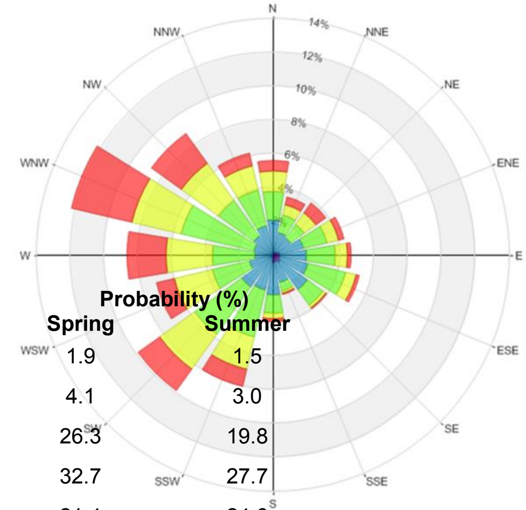
Image 2 – Building Section

3. Meteorological Data

Wind statistics at the Boston-Logan International Airport between 1981 and 2011 were analyzed for the spring (March to May), summer (June to August), fall (September to November) and winter (December to February) seasons. Image 4 graphically depicts the distributions of wind frequency and directionality for these four seasons and for the annual period. When all winds are considered, winds from the northwest and southwest quadrants are predominant. The northeasterly winds are also frequent and strong, especially in the spring.

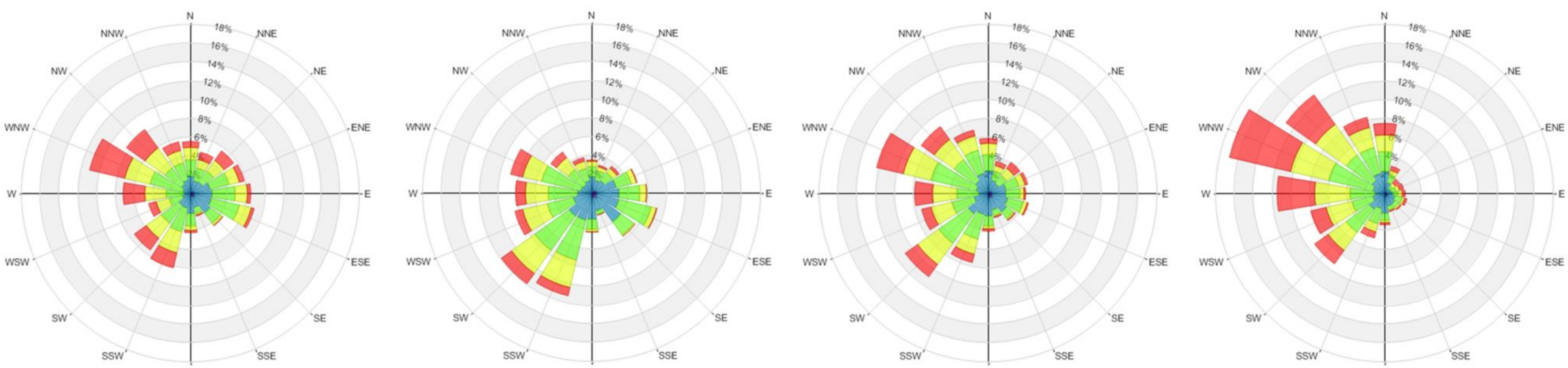
Strong winds with mean speeds greater than 20 mph (red bands) measured at the airport are prevalently from the northwesterly directions throughout the year, while the southwesterly and northeasterly winds are also frequent.

Therefore, winds from the northwest, southwest and northeast directions are considered most relevant to the current study, while winds from other directions are also considered in our analysis.



Wind Speed (mph)	Probability (%) Spring	Summer
Calm	1.9	1.5
1-5	4.1	3.0
6-10	26.3	19.8
11-15	32.7	27.7
16-20	21.4	24.6
>20	13.5	23.4

Annual Winds



Spring (March to May) **Summer (June to August)** **Fall (September to November)** **Winter (December to February)**

Image 4 - Directional Distribution (%) of Winds (Blowing From) - Boston Logan International Airport (1981 to 2011)

4. Explanation Of Criteria

The BRA has adopted two standards for assessing the relative wind comfort of pedestrians. First, the BRA wind design guidance criterion states that an effective gust velocity (hourly mean wind speed +1.5 times the root mean square wind speed) of 31 mph should not be exceeded more than one percent of the time. The second set of criteria used by the BRA to determine the acceptability of specific locations is based on the work of Melbourne[4]. This set of criteria is used to determine the relative level of pedestrian wind comfort for activities such as sitting, standing, or walking. The criteria are expressed in terms of benchmarks for the 1-hour mean wind speed exceeded 1% of the time (i.e., the 99-percentile mean wind speed). They are as follows:

Table 1: BRA Mean Wind Criteria *

Dangerous	*> 27 mph*
Uncomfortable for Walking	*> 19 and ≤ 27 mph*
Comfortable for Walking	*> 15 and ≤ 19 mph*
Comfortable for Standing	*> 12 and ≤ 15 mph*
Comfortable for Sitting	*< 12 mph*

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

Pedestrians on sidewalks and parking lots will be active and wind speeds comfortable for walking are appropriate. Lower wind speeds comfortable for standing are desired for building entrances where people are apt to linger. For outdoor decks and terraces, low wind speeds comfortable for sitting are desired during the summer. In the winter, wind conditions in these areas may not be of a serious concern due to limited usage.

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

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

5. Pedestrian Wind Conditions

5.1 Background

Predicting wind speeds and occurrence frequencies is complicated. It involves building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate. Over the years, RWDI has conducted more than 2,500 wind-tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. This knowledge has been incorporated into RWDI's proprietary software that allows, in many situations, for a qualitative, screening-level numerical estimation of pedestrian wind conditions without wind tunnel testing.

As indicated in the elevation drawing in Image 2, the proposed building consists of three stories. This is approximately the same height as surrounding buildings to the southwest. As this is not a tall building, the effect of downwashing flows will be minimal. Corner acceleration (see Image 5) may occur during particularly strong wind events, but the effect will be localized to small areas near the building corners.

In general, the wind climate near the building site is expected to be comfortable for walking or better throughout the year. The effective gust criterion is predicted to be met at all pedestrian areas on and around the development. These conditions are suitable for all sidewalks around the development; potential areas where wind mitigation may be desired are discussed in the following sections.

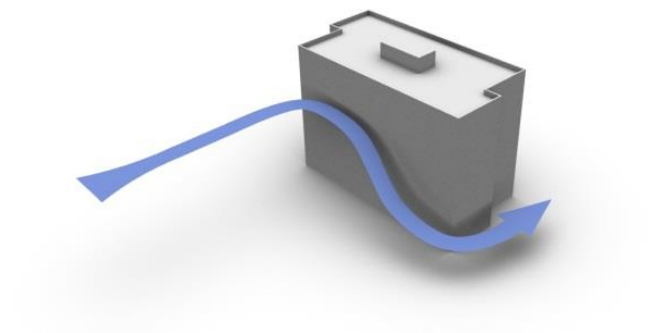


Image 5 – Corner Acceleration
When winds accelerate around a building corner and cause a localized increase in wind activity

5.2 Building Entrances

Wind conditions outside the main building entrances (Locations A and B in Image 3) are expected to be comfortable for standing or sitting throughout the year, which is considered suitable for an entrance area. The overhead canopies are a positive design feature, as they protect the entrances from any downwashing wind flows.

However, door operability may be a concern in the case where strong winds originate from the northwest. In this case, an area of high pressure would exist to the north of the building, and an area of low pressure would occur to the south of the building. When both doors are open, a passageway would be created between the two areas and a pressure-driven wind flow would result (see Image 6). This wind flow can cause difficulties in opening or closing the doors.

To reduce the force required to open or close these doors, mitigation options include creating a vestibule around one or both of the doors, or installing automatic sliding doors or balanced doors.

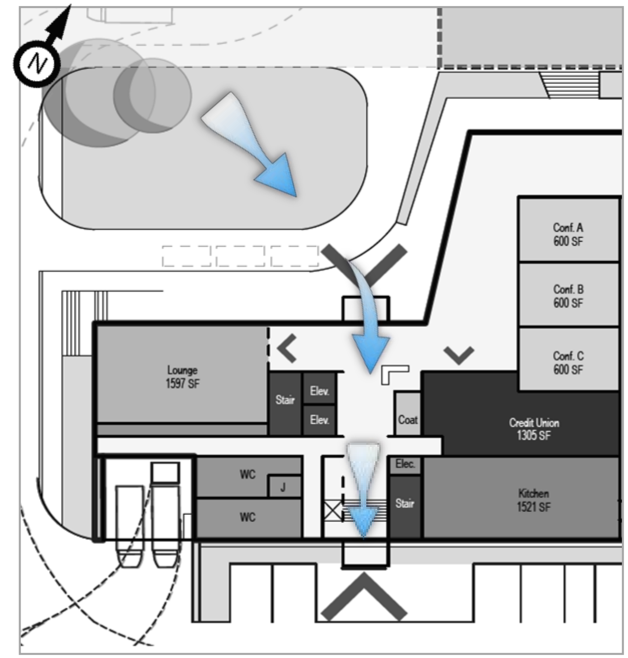


Image 6 – Pressure Driven Flow

5.3 Event Plaza and Raised Patio

Wind conditions around the Event Plaza and Raised Patio to the northeast of the proposed building (Location C in Image 7) are generally expected to be comfortable for sitting or standing in the summer, because the area is sheltered by the proposed building from the southwesterly winds. Higher wind speeds may occur in other seasons when the area is exposed to strong northeasterly and northwesterly winds. These conditions are suitable for most pedestrian activities; however, it may be desired to lower the wind speeds locally around seating areas for the shoulder seasons, if frequent use of the area is anticipated.

To locally protect seating areas from the wind, it is recommended to add wind screens or landscaping to each seating area, primarily on the north side. Any wind screen or landscaping used should be at least 6 ft high. Examples are shown in Image 8.

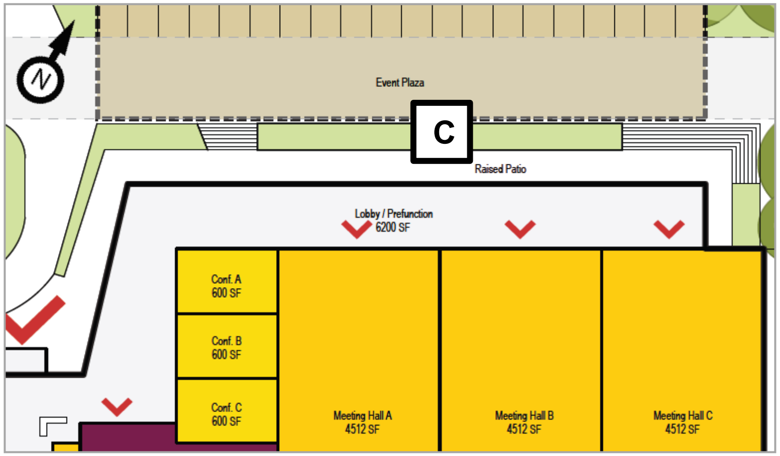


Image 7 – Event Plaza and Raised Patio

Image 8 – Examples of Wind Control for Seating Areas

5.4 Roof Terrace

The roof terrace is located at the 3rd floor and sheltered by the proposed building from the southwesterly winds in the summer, when the terrace will typically be in use. Suitable wind conditions can be achieved in the shoulder seasons by using high railings or parapets (5 ft or taller) along the perimeter of the terrace. Examples are shown in Image 10.

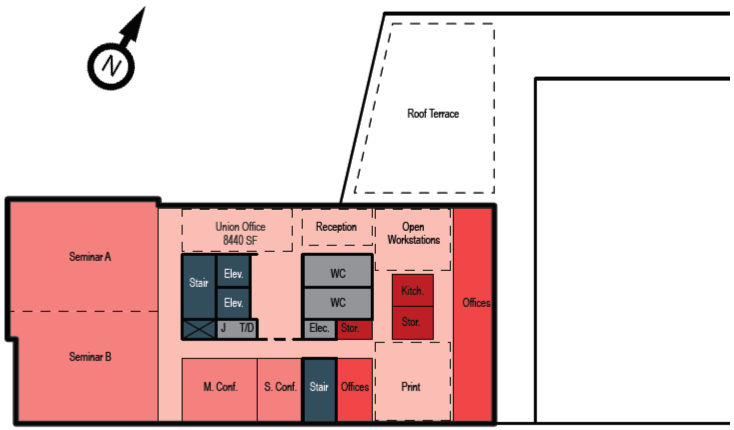


Image 9 – Roof Terrace at the 3rd Floor

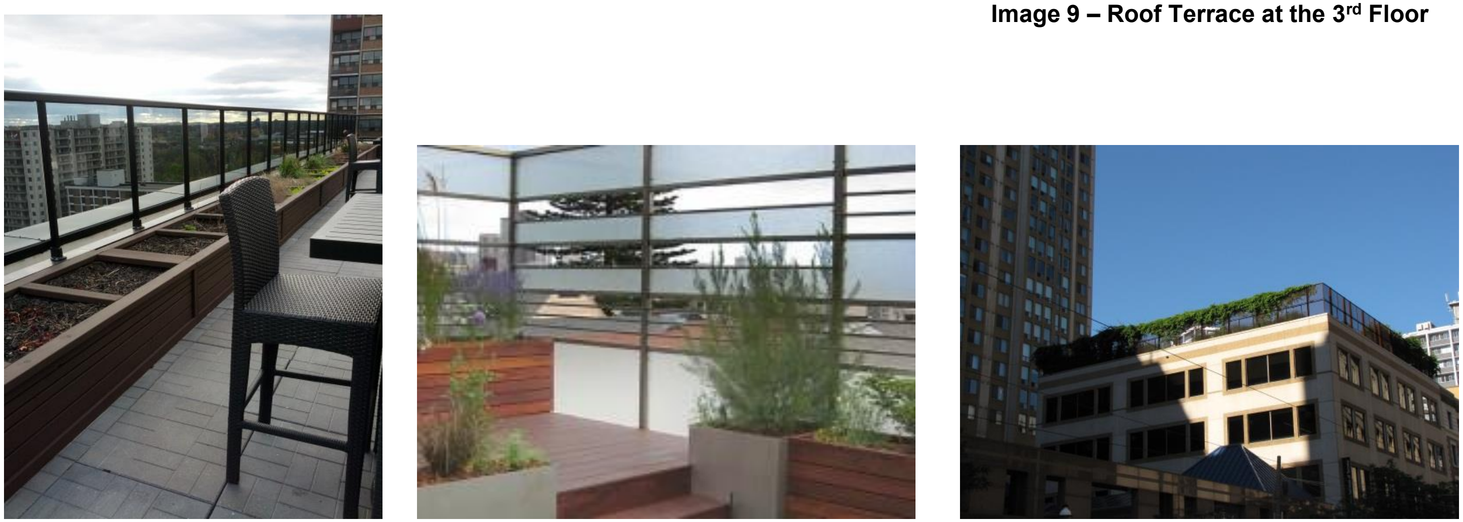


Image 10 – Examples of Wind Control for Roof Terrace

6. Summary

The wind climate around the building site is expected to be comfortable for standing or walking. The addition of the proposed building is not expected to influence the wind speeds in the area.

Suitable wind conditions are expected throughout all sidewalks, parking lots and building entrances. The effective gust criterion is predicted to be met at all pedestrian areas on and around the development. When winds are particularly strong, door operability may become a concern due to pressure-driven wind flows. In addition, wind speeds at the Event Plaza and Raised Patio and at the 3rd floor roof terrace are expected to be comfortable in the summer, but slightly higher than desired during the shoulder seasons. Wind control measures have been suggested for these areas.

It is our opinion that no further wind study is required for the proposed development.

7. Applicability Of Results

In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI could provide an assessment of their impact on the design considered in this report. It is the responsibility of others to contact RWDI to initiate this process.

APPENDIX G - GREENHOUSE GAS STUDY (CD)

GREENHOUSE GAS ANALYSIS FOR BOSTON TEACHERS UNION HEALTH AND WELFARE FUND BUILDING REPLACEMENT PROJECT

BOSTON, MASSACHUSETTS

December 2014

TECH environmental
FOCUSED KNOWLEDGE. REAL SOLUTIONS.

GREENHOUSE GAS ANALYSIS FOR BOSTON TEACHERS UNION HEALTH AND WELFARE FUND BUILDING REPLACEMENT PROJECT

BOSTON, MASSACHUSETTS

Prepared for:

Tetra Tech
Engineering and Consulting Services
One Grant Street
Framingham, MA 01701

Prepared by:

Tech Environmental, Inc.
303 Wyman Street, Suite 295
Waltham, Massachusetts 02451

December 23, 2014

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1.0 INTRODUCTION AND SUMMARY

1.1 Methodology

A greenhouse gas (GHG) emissions analysis was performed for Boston Teachers Union Health and Welfare Fund (BTUHWF) Building Replacement Project (the "Project"), located on 188 Mount Vernon Street in Boston, Massachusetts, consistent with the EOEEA "Greenhouse Gas Emissions Policy and Protocol" (May 5, 2010; the "Policy"). The Project site consists of 117,720 square feet (sf) (2.7 acres) of land and improvements. The BTUHWF proposes to replace their existing 32,500 sf building with a new three-story, 52,394 sf building that will have multifunction halls and conference rooms, offices and credit union bank, and a 59,845 sf parking garage with 172 parking spaces. As discussed in Section 3, GHG emissions for the Project are reduced by the following building design and operational energy efficiency measures (EEMs):

- Using higher efficiency windows and building envelopes;
- Providing demand control ventilation in the meeting hall space of approximately 15,000 sf;
- Providing daylighting controls;
- Specifying high-efficiency heating and cooling system;
- Using interior lighting systems with a lower light power density;
- Sealing, insulating, and testing HVAC supply ducts;
- Employing light-colored membrane roof (cool roof);
- Using LED exterior lighting;
- Designing the parking garage for natural ventilation;
- Installing Energy Star electrical appliances in kitchen and office areas;
- Using Energy Star computers and other equipment; and
- Setting aside solar-ready roof space either on the new building or the new parking garage for a possible third party photo-voltaic (PV) installation.

The GHG Policy requires a project to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect of proposed mitigation in terms of energy savings and emissions reduction. The Project's GHG emissions will include: 1) direct emissions of CO_2 from natural gas combustion for space heating and hot water; 2) indirect emissions of CO_2 from electricity generated off-site and used on-site for lighting, building cooling and ventilation, and the operation of other equipment; and 3) transportation demand management measures to reduce CO_2 emissions from Project traffic.

CO_2 emissions were quantified for: (1) the Base Case corresponding to the 9th Edition of the Massachusetts Building Code that includes the IECC 2012 code (the "Code"), and (2) the Mitigation Alternative, which includes all energy saving measures, detailed in Section 3.

The City of Boston has adopted the Massachusetts Stretch Energy Code, which requires higher levels of energy efficiency. Since the building will be smaller than 100,000 sf, the Project is only subject to Section 501.1.4 of the Stretch Code, the Prescriptive Option, and the 20% energy reduction requirement in Section 501.1.1 does not apply[1]. The GHG analysis assumes energy mitigation measures consistent with, and greater than, the Prescriptive Option of the Stretch Code.

This analysis uses the eQUEST energy design software (version 3.65), which incorporates the U.S. Department of Energy's DOE-2 building energy use model, and CO_2 emission rates of 117.1 lb/million Btu of natural gas[2] and 719 lb/MWhr.[3] The eQUEST model inputs are summarized in Tables 4 and 5. Consistent with the ASHRAE 90.1-2007 Appendix G.3 methodology, electrical loads and schedules from Tables G-B and G-L were employed in the analysis.

A formal traffic study was not completed as part of the Expanded Environmental Notification Form (EENF) document. It is anticipated that the increase in building size of the new building from the existing one will not increase the site trip generation for the new facility; thus, the number of BTUHWF employees and type of events held within the function spaces are not anticipated to change. Although there will be no change in site trip generations, BTUHWF is proposing several traffic mitigation measures to encourage alternative modes of transportation.

Energy use and CO_2 emissions are detailed for the Project buildings in Tables 1A through 1C, and the eQUEST model output is provided in Appendix A. Table 2 summarizes total CO_2 emissions for the Project, for the Base Case (buildings that comply with the Code), and the Mitigation Alternative (includes all energy saving measures). The eQUEST model input files have been provided to the Massachusetts Department of Energy Resources (DOER).

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[1] The requirement in Section 5.1.1 of the Stretch Code that building design shall achieve energy use per square foot at least 20% below the energy requirements of ASHRAE 90.1-2007 Appendix G does not apply.
[2] U.S. Department of Energy, Energy Information Administration.
[3] ISO New England Inc., 2012 New England Electric Generator Air Emissions Report, Annual Average Emission Rate, Table 5.2, December 2013.

1.2 Summary of Results

The Project's buildings have not progressed past an early conceptual level of design. For this reason, the BTUHWF commits to the overall carbon dioxide (CO_2) reduction presented below, but retains the flexibility to achieve these goals using energy efficiency measures that may be refined at the stage of detailed design. Table 1D reveals that the Mitigation Alternative will reduce overall Project energy use (stationary sources) by 23.7% and will reduce stationary source CO_2 emissions by 23.8%, compared to the Base Case.

As discussed in Section 2.0, although it is anticipated that the new building uses will not increase traffic volumes compared to the existing building uses, the BTUHWF is proposing Transportation Demand Management (TDM) measures that will reduce motor vehicle CO_2 emissions by an estimated 2.0%.

1.3 Section 61 Findings

At the completion of construction, the BTUHWF will provide a certification to the MEPA Office signed by an appropriate professional identifying either: 1) all of the energy efficiency mitigation measures adopted by the Project as part of the Mitigation Alternative have been implemented; or 2) an equivalent set of energy efficiency mitigation measures that together are designed to achieve the same percentage reduction in GHG emissions as the Mitigation Alternative, based on the same energy model and modeling assumptions used in this report, have been adopted.

TABLE 1A

ENERGY AND CO_2 MODELING FOR BOSTON TEACHERS UNION HEALTH AND WELFARE FUND HEADQUARTERS - MEETING HALL & OFFICE BUILDING

Effects of Individual Mitigation Measures

Mitigation Measures - eQUEST Model Run	Building Square Footage	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case	52,394	656.6		2,179.4		127.6	236.0	363.6	
Cool Roof		655.4	-0.2%	2,186.9	0.3%	128.0	235.6	363.6	0.0%
Daylighting		585.4	-10.8%	2,186.0	0.3%	128.0	210.5	338.4	-6.9%
Lower Window Glass U-Value		659.2	0.4%	2,094.1	-3.9%	122.6	237.0	359.6	-1.1%
Energy STAR Electric Appliances		620.8	-5.4%	2,191.2	0.5%	102.2	411.0	513.2	2.5%
Lighting Power		632.4	-3.7%	2,186.5	0.3%	100.6	411.0	511.6	2.2%
Window Area		647.6	-1.4%	1,952.5	-10.4%	114.3	232.8	347.1	-4.5%
Roof Insulation		656.5	0.0%	2,173.1	-0.3%	127.2	236.0	363.2	-0.1%
Ext. Wall Insulation		656.9	0.1%	2,166.4	-0.6%	126.8	236.2	363.0	-0.2%
Boiler Efficiency		656.6	0.0%	1,903.0	-12.7%	111.4	236.0	347.5	-4.5%
Mitigation Alternative - All Measures Listed Above		517.2	-21.2%	1,674.9	-23.1%	98.1	185.9	284.0	-21.9%

TABLE 1B

ENERGY AND CO_2 MODELING FOR BOSTON TEACHERS UNION HEALTH AND WELFARE FUND HEADQUARTERS

Outdoor Lighting for Parking Lot

Mitigation Measures		Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)
Base Case - Code		38.8		0.0		0.0	13.9	13.9	
Mitigation Alternative - LED Lights		10.4	-73.1%	0.0	0.0%	0.0	3.8	3.8	-73.1%

TABLE 1C

ENERGY AND CO_2 MODELING FOR BOSTON TEACHERS UNION HEALTH AND WELFARE FUND HEADQUARTERS

Totals for the Building, Parking Garage and Parking Lot

All Buildings - Combined Mitigation	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (MMBtu/yr)	Gas Change (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Change (%)	Energy Use Change (%)
Base Case	695.4		2,179.4		127.6	250.0	377.6		
Mitigation Case	527.7	-24.1%	1,674.9	-23.1%	98.1	189.7	287.8	-23.8%	-23.7%

TABLE 2

GREENHOUSE GAS (CO_2) EMISSIONS SUMMARY
BTUHWF BUILDING REPLACEMENT
(TONS/YEAR)

Source	Base Case	Mitigation Alternative	Change in GHG Emissions
Direct Emissions	127.6	98.1	-23.1%
Indirect Emissions	250.0	189.7	-24.1%
Total Direct and Indirect Emissions	377.6	287.8	-23.8%

2.0 TRANSPORTATION GHG EMISSIONS

A formal traffic study was not completed as part of the EENF. As stated in Section 1.0, the proposed project includes the removal of the existing 32,500 sf building and construction of a new 52,394 sf building. The additional 19,894 sf of building area is not anticipated to increase the site trip generation for the new facility; therefore, the number of BTUHWF employees and type of events held within the function spaces are not anticipated to change. Although there will be no change in site trip generations, BTUHWF is proposing several traffic mitigation measures to encourage alternative modes of transportation.

Transportation Demand Management

The Project will implement the following Transportation Demand Management (TDM) strategies, which are estimated[4] to reduce trip generation and CO_2 transportation emissions by 2%.

- ***Locate New Building Near Transit*** **–** The JFK/UMass MBTA Station is located approximately 1/4 mile from the Project site and provides service to the Red Line rapid rail transit line, bus service (Buses 5, 8, 16 and 41) as well as commuter rail service to the Greenbush, Kingston/Plymouth and Middleborough/Lakeville lines.

- ***Sidewalk Connections to Other Developments*** **–** The proposed site layout will include additional sidewalks within the project site that will be incorporated into the existing sidewalks around the site.

- ***Provide Bicycle Storage*** **–** Secure, weather-protected bicycle racks will be provided at locations within the site with signs directing bicyclists to the bike storage facilities.

- ***Preferential Parking Spaces*** **–** The BTUHWF will provide preferential parking spaces for vanpools and carpools.

- ***Employee Transportation Coordinator*** **–** A Transportation Coordinator will be assigned to promote use of public transportation, encourage employees to take public transportation, and to provide MBTA maps, schedules and fare information.

- ***Provide Lockers and Showers*** **–** The new building will include a designated area that will provide lockers and showers for the BTUHWF employees.

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[4] Ewing, R. "TDM , Growth Management, and the Other Four Out of Five Trips," Transportation Quarterly, Vol. 47, No. 3, 1993, pp. 343-366.

- ***Offer Flexible Work Schedules* –** The BTUHWF will offer flexible work schedules for its employees.

- ***Electric Vehicle Charging Station* –** The parking garage will have a dedicated electric vehicle dual charging station.

- ***Emergency Ride Home Program* –** The BTUHWF will provide an emergency ride home program for its employees.

- ***Carpool Matching Program* –** The BTUHWF will offer a carpool matching program for its employees.

3.0 GREENHOUSE GAS (GHG) MITIGATION ANALYSIS

The GHG Policy requires the Project to identify measures to avoid, minimize, or mitigate GHG emissions. The following sections discuss the measures the Project will implement.

3.1 Site Design Mitigation Measures

- ***Sustainable Development Principles*** – The Project conserves land by redeveloping an existing developed site. Of the total land area of 117,720 sf, 15,179 sf will be preserved as open space.

- ***Design Project to Support Alternative Transportation to the Site*** **–** The JFK/UMass MBTA Station is located approximately 1/4 mile from the Project site and provides service to the Red Line rapid rail transit line, bus service (Buses 5, 8, 16 and 41) as well as commuter rail service to the Greenbush, Kingston/Plymouth and Middleborough/Lakeville lines. A Transportation Coordinator will be assigned to promote use of public transportation, encourage employees to take public transportation, and to provide MBTA maps, schedules and fare information.

- ***Design Water Efficient Landscaping*** **–**Water efficient landscaping will be installed to minimize water use. Drought-resistant and native plants will be used for landscaping.

- ***Minimize Energy Use Through Building Orientation*** **–** The front of the new building will face north but 57% of this building face will be windows maximizing the amount of natural light throughout the year. The total window area for the building will be 40%.

- ***Best Practices for Stormwater Design*** **–** The stormwater management system will utilize Best Management Practices (BMP).

3.2 Building Design and Operation Mitigation Measures

The eQUEST energy model inputs are summarized in Tables 4 and 5. A comparison of the Project's Base Case Energy Use Intensity (EUI) to the U.S. Department of Energy's Commercial Buildings Energy Consumption Survey (CBECS) data is provided in Table 6 and reveals the modeled Base Case buildings are within +/- 10% of the average CBECS EUI values.

- ***Energy Efficient Windows and Building Envelope*** **–** Building envelope insulation will exceed Code. Roof insulation will be R40, wall insulation will be R31, and slab insulation will be R10 24" below grade. Window glass type will be better than Code: double-pane, low-e glass, U value = 0.35. Window glass area as a percentage of total building wall area is limited to 40%.

- ***Demand Control Ventilation*** **–** DCV controls for Outside Fresh Air used in the HVAC systems will be included in the design for the meeting hall space of approximately 15,000 sf.

- ***Higher-Efficiency Heating and Cooling System* –** The heating and cooling system will be a low temperature fan powered variable air volume (VAV) with chilled water and condensing hot water central plant. The heating plant will be based on condensing boilers with a heating efficiency of 95%.

- ***Seal, Test and Insulate HVAC Supply Ducts* –** HVAC supply ducts will be sealed, leak tested, and insulated to reduce energy losses.

- ***Cool Roofs* –** The new building will have light-colored membrane roof.

- ***Energy STAR Appliances* –** The kitchen areas and offices will use refrigerators, computers and other appliances that are Energy STAR rated for high efficiency. Consistent with DOER policy, the plug load values used in the eQUEST model are COMNET average values for the new building. The plug loads with Energy STAR appliances are assumed to be 10% lower.

- ***Energy Efficient Interior Lighting* –** Interior Light Power Density (LPD) will be 10% below Code the new building. The new building will use a combination of fluorescent and LED fixtures to reduce LPD.

- ***Energy Efficient Exterior Lighting* –**LED fixtures will be used to light the parking lots.

- ***Occupancy Controls for Lighting* –** The BTUHWF will recommend occupancy controls to tenants for restrooms and unoccupied storage rooms.

Other building design and operation mitigation measures were considered for the Project, but were rejected because they are either technically/financially infeasible or inappropriate for the Project:

- ***Reduce Energy Demand by Using Peak Shaving or Load Shifting Strategies* –** These measures are not appropriate for a mixed use office space and meeting hall building that must use power during peak periods.

- ***Combined Heat and Power (CHP) Technologies into Project* –** To be cost effective, CHP requires a 24/7 stable electrical output requirement and heat demand host. The project's thermal loads are seasonal only, making CHP economically infeasible.

- ***Construct Green Roof* --** The BTUHWF does not consider it economically feasible to construct and maintain a green roof. Green roofs, which consist of layers of gravel, soil and vegetation atop a rubberized water-proof membrane, are expensive to install and maintain. They typically require a steel-reinforced concrete roof that can support a dead weight of 35 lb/sf and the installation cost exclusive of roof redesign is $30/sf.[5] While green roof technology has the potential to improve stormwater management on the Project and reduce overall energy costs, the

[5] Oberndorfer, Erica, et al., "Green Roofs as Urban Ecosystems: Ecological Structures, Functions and Services," BioScience, Vol. 57, No. 10, November 2007.

significant additional costs (over $1.5 million for the Project) related to the required engineering, construction and installation of the green roof is not economically feasible.

3.3 Building Energy Efficiency Measures Requiring Further Study

This section identifies other efficiency measures that will be studied at the stage of detailed design.

On-Site Renewable Energy – The BTUHWF affirms its commitment to set aside space on the large flat roof of either the new building or new parking garage for a possible third-party photo-voltaic (PV) installation and to make the roof solar-ready. The revised PV cost feasibility analysis presented below estimates the cost of a 200-kW system installed in a single block on the new building roof. To obtain the most accurate installed-cost for a commercial-size PV system, data were obtained from the most recent installed-cost report on the EOEEA website for Qualified Generation Units in the 100-kW to 200-kW size range.[6] The average installed cost for installations starting commercial operation in 2013/14 is $3.50; this figure includes data posted through August 8, 2014.

For this PV cost analysis, a 200-kW system was assumed with an installed cost of $3.50/W; this is generally considered the minimum size for a financially feasible third-party vendor PPA. The following facts were assumed: (1) SRECs are market-based incentives, and while the expectation has been that they should sell between $300 and $550 per MWh, less broker fees, the recent market price has been lower in the $175 to $206 range[7]; (2) An owner can place excess SRECs into an auction account and receive $285 per MWh ($300 minus 5% fee). Since there are no firm estimates of the future value of SRECs, this analysis assumed the guaranteed floor price of $285, the most realistic assumption.

A 200-kW PV system, flat-mounted, is projected to generate 206,528 kWh per year,[8] which equates to 74.2 tons per year[9] in GHG emissions reductions. A 200 kW PV system would reduce the annual Mitigation Case CO_2 emissions (Table 2 in the EENF GHG report) by 7% = 100% * 74.2 / 1,042.1. The economics of a PV installation were calculated using the DOER Commercial Solar Financial Model updated to reflect the above assumptions. Model output is attached.
The cost calculator inputs are as follows:

- PV system size of 200 kW
- System cost of $3.50/Watt
- Annual capacity factor of 11.8% (flush mounted on roof)
- SREC value of $285 / MWh and revenue term 10 years
- An inverter replacement frequency of once every 10 years

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[6] Massachusetts EOEEA, "RPS Solar Carve-Out Qualified Renewable Generation Units – updated August 8 and March 26, 2014," http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/qualified-generation-units.html.

[7] "Solar success costing owners, Price of state bonds dips with popularity of panel systems," Boston Globe, January 17, 2013.

[8] Personal communication, Natalie Howlett, Renewable Energy Project Coordinator, Massachusetts DOER. This figure is four times 51,632 kWh/year for a 50 kW system.

[9] Annual PV system electrical generation is 206.5 MWh. Multiplying by the ISO New England emission factor of 719 lb CO_2 per MWh and dividing by 2,000 lb/ton yields an annual CO_2 emission reduction of 74.2 tons/year.

The customer discount rate is defined as the interest rate of return that could be earned in an investment in the financial markets with similar risk. At present, a 20-year U.S. Treasury bond pays slightly above 3%; that is the lowest risk investment possible and is not comparable to the risk of investing in a PV system. Corporate bond rates are 4% to 8%, depending on their investment grade. This analysis assumed a reasonable customer discount rate of 8%. The calculations assume federal tax credits, State tax deductions and SREC values.

For the 200-kW system, the calculated Net Present Value of the PV system is $26,989. The Simple Payback Period is 6 years. Based on market research, almost 90 percent of strong prospects would consider a payback of four years, but acceptance begins to drop rapidly once paybacks reach five years.[10] Net Present Value (NPV) is the standard financial method for using the time value of money to appraise long-term projects. Used for capital budgeting, and widely throughout economics, NPV measures the excess or shortfall of cash flows, in present value terms, once financing charges are met. If the NPV is positive, an investment may be accepted since it would add value to a project over the long-term.

While the NPV is slightly positive, the payback period is longer than what is normally acceptable, suggesting a PV system is not be feasible for the Project at this time. The BTUHWF will set aside space on the large flat roof area of either the new building or new parking garage as “solar ready” to accommodate flat-mounted PV systems for a possible third-party provider PV installation in the future.

[10] *Assessment of California CHP Market and Policy Options for Increased Penetration*, Final Report, Co-sponsors Public Interest Energy Research Program (PIER) and California Energy Commission, July 2005.

TABLE 4
SUMMARY OF ENERGY MODELING ASSUMPTIONS
BTUHWF BUILDING REPLACEMENT

Energy Efficiency Measure (EEM)	Base Case (Code)[1]	Mitigation Case
Building Envelope	Roof R25 Walls R13 + R13 Slab R10-24”	Roof R40 Walls R31 Slab R10-24”
Window Glass	U=0.38, DOE Type 2601	WFM: same as Base Case Other buildings: U=0.35 DOE Type 2614
Window Area	eQUEST default	Commercial buildings: 40%
DCV Controls for Outside Fresh Air in HVAC Systems (Meeting Hall Only)	No	Yes
Cool Roof	No	Yes
Heating Efficiency Heating Plant with Condensing Boilers	80%	95%
Parking Lot Lighting	Parking Lots 130 W/1,000 SF	Parking Lots LED 35 W/1,000 SF
Energy Star Appliances (kitchen and office areas)	No	Yes

[1] IECC 2012

TABLE 4 (Continued)
SUMMARY OF ENERGY MODELING ASSUMPTIONS
BTUHWF BUILDING REPLACEMENT

Energy Efficiency Measure (EEM)	Base Case (Code)[1]	Mitigation Case
Light Power Density (Whole Building Method)	Office 0.9 W/SF Conference Rooms 1.2 W/SF Meeting Hall 1.2 W/SF	Office 0.8 W/SF Conference Rooms 1.1 W/SF Meeting Hall 1.1 W/SF
Electric Plug Load (COMNET)	Office (Open) 2.53 W/SF Conference Rooms 1.19 W/SF Meeting Hall 1.2 W/SF	Office (Open) 2.28 W/SF Conference Rooms 1.07 W/SF Meeting Hall 1.08 W/SF
Occupancy Controls for Lighting	No	Yes

[1] IECC 2012

TABLE 5
SUMMARY OF ACTIVITY AREAS FOR
BTUWF BUILDING REPLACEMENT

Building Name Floor Area (sf)	eQUEST Activity Type	% Floor Area	External Electrical Load
New Building (Meeting Hall and Office Space)	Meeting Center Storage (Cond.) Kitchen Office Open Plan General Office Mechanical Lobbys/Hallways Bank/Financial	30 2 2 9 16 1 33 4	NA

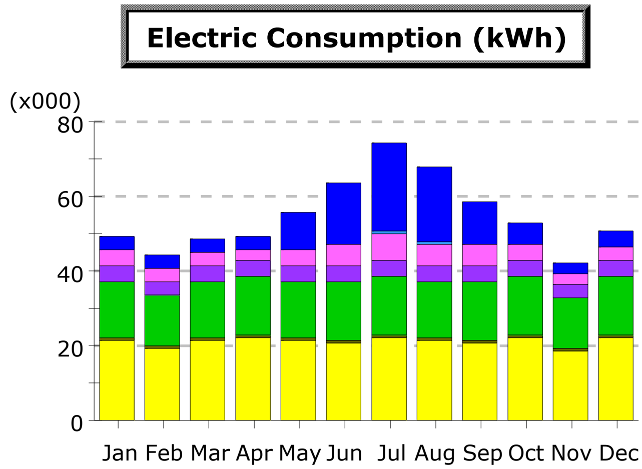
TABLE 6
COMPARISON OF eQUEST BASE CASE ENERGY USE INTENSITY
TO U.S. DEPARTMENT OF ENERGY CBECS DATA

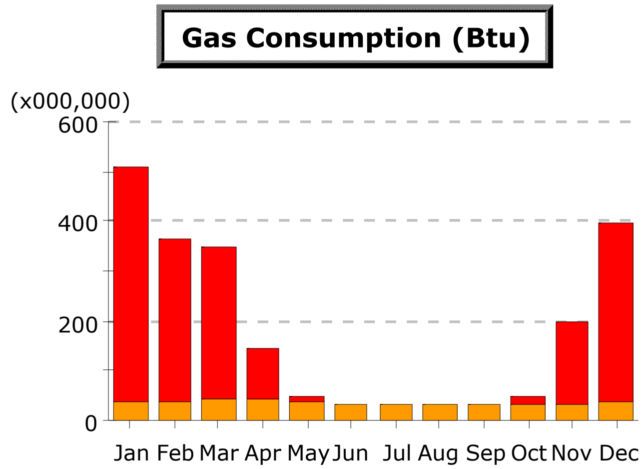
Buildings	Base Case EUI (kBtu/SF)	CBECS or RECS EUI (kBtu/SF)
New Building (Meeting Hall and Office)	84.4	93.9[1] (Public Assembly)

[1] CBECS Table 3A Public Assembly.

APPENDIX A

EQUEST MODEL OUTPUT



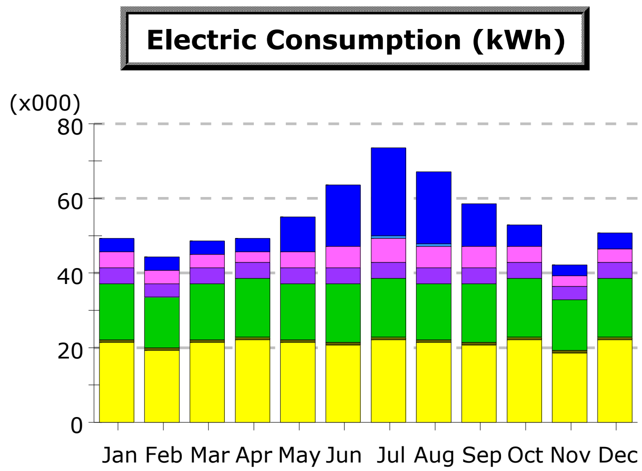


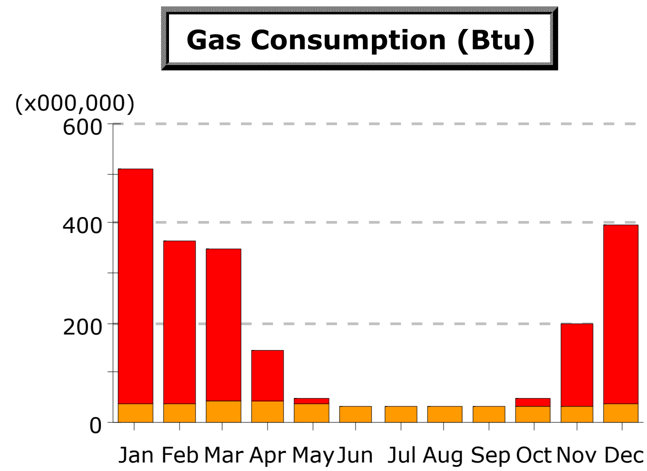
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.62	3.26	3.63	4.21	9.53	16.12	23.72	19.73	11.65	5.79	3.09	3.86	108.23
Heat Reject.	-	-	-	0.01	0.15	0.40	0.73	0.47	0.18	0.03	-	0.00	1.97
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.99	3.28	3.52	2.77	4.25	5.95	6.79	5.94	5.86	4.09	2.52	3.72	52.69
Pumps & Aux.	4.14	3.75	4.14	4.34	4.14	4.14	4.34	4.14	4.14	4.34	3.55	4.34	49.48
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	49.07	44.03	48.62	49.59	55.39	63.60	74.18	67.60	58.82	52.85	42.31	50.52	656.58

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	467.2	326.7	305.7	100.9	11.3	-	-	-	1.2	15.2	166.8	355.7	1,750.5
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.9
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	506.6	363.5	346.3	142.4	48.5	34.5	33.9	31.2	32.2	48.9	196.9	394.5	2,179.4



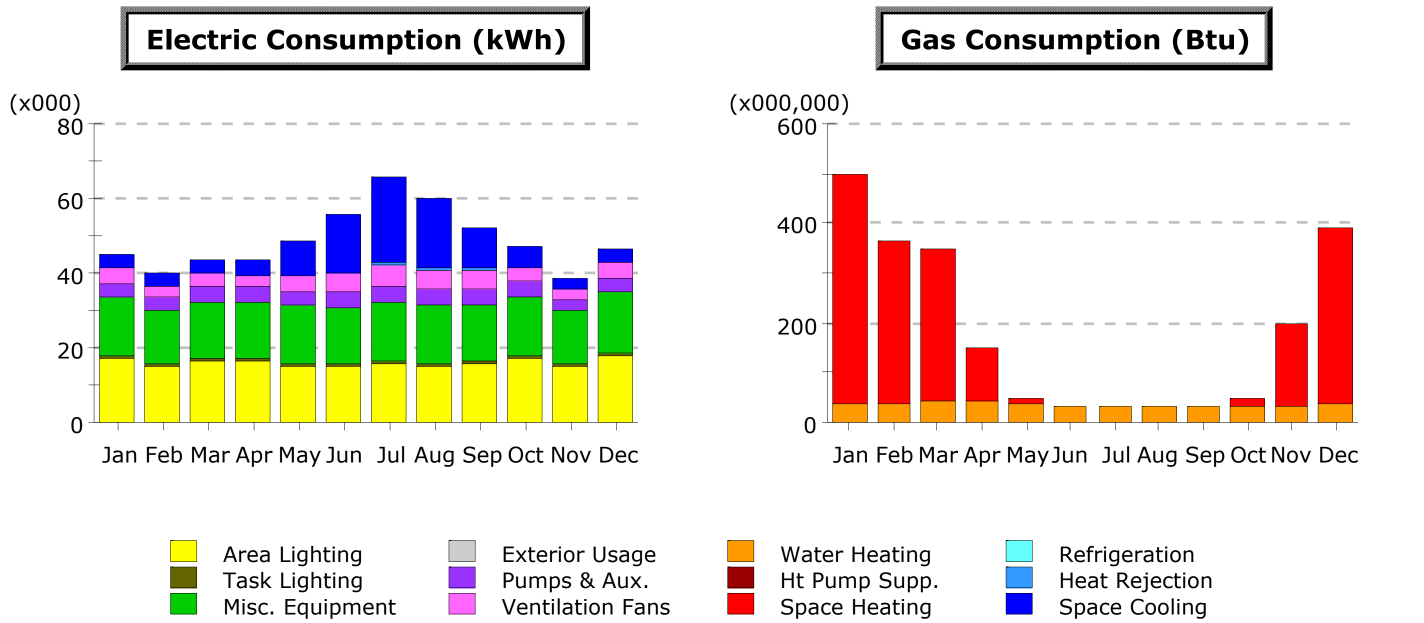


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.62	3.26	3.63	4.20	9.48	15.99	23.57	19.61	11.60	5.78	3.09	3.86	107.71
Heat Reject.	-	-	-	0.01	0.15	0.39	0.72	0.46	0.18	0.03	-	0.00	1.95
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.99	3.27	3.52	2.77	4.15	5.80	6.65	5.82	5.75	4.04	2.52	3.72	52.00
Pumps & Aux.	4.14	3.75	4.14	4.34	4.14	4.14	4.34	4.14	4.14	4.34	3.55	4.34	49.48
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	49.08	44.03	48.62	49.58	55.25	63.31	73.87	67.36	58.65	52.79	42.31	50.51	655.35

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	468.0	327.7	307.4	102.8	11.8	-	-	-	1.2	15.5	167.3	356.4	1,758.0
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.9
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	507.4	364.5	348.0	144.3	49.0	34.5	33.9	31.2	32.2	49.2	197.5	395.2	2,186.9

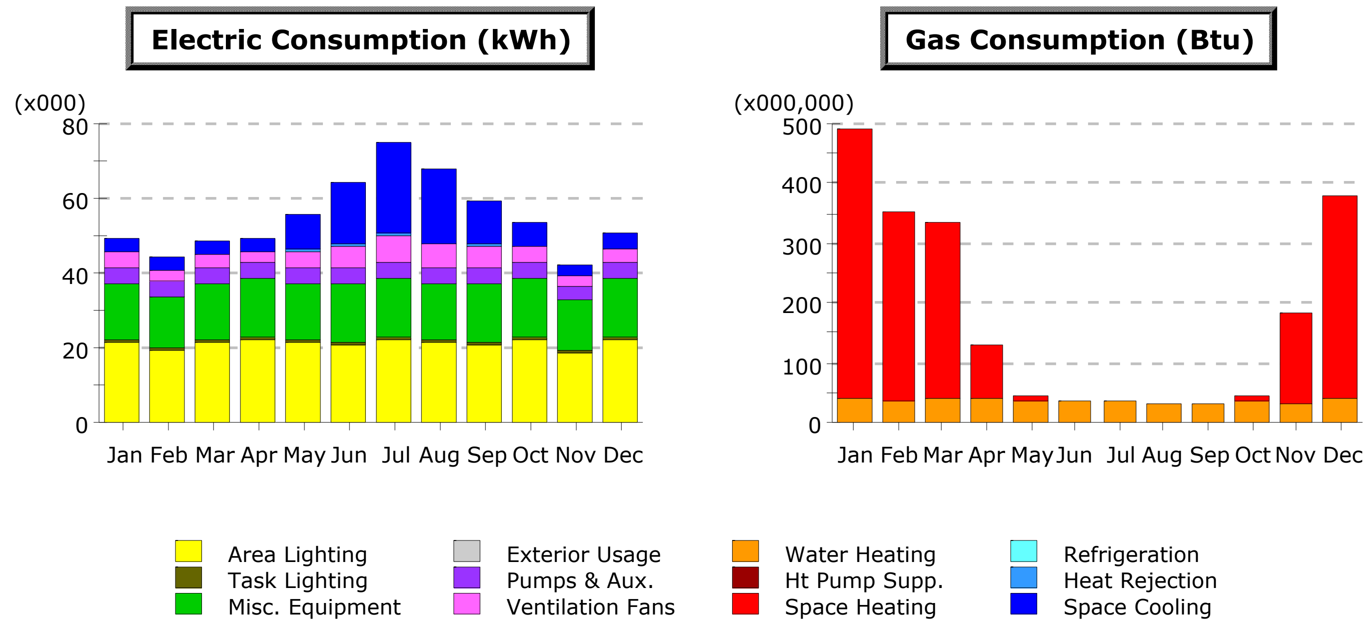


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.59	3.24	3.60	4.15	9.15	15.33	22.46	18.81	11.22	5.65	3.07	3.82	104.09
Heat Reject.	-	-	-	0.01	0.14	0.36	0.64	0.44	0.17	0.03	-	0.00	1.78
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.90	3.19	3.42	2.68	3.71	5.19	5.98	5.24	5.17	3.63	2.46	3.64	48.20
Pumps & Aux.	4.04	3.66	4.04	4.24	4.04	4.04	4.24	4.04	4.04	4.24	3.47	4.24	48.34
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	17.18	15.09	16.14	16.12	15.04	14.72	15.53	15.21	15.78	17.09	14.95	18.09	190.94
Total	44.90	39.80	43.39	43.56	48.27	55.58	65.43	59.92	52.32	47.23	38.65	46.38	585.42

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	461.2	325.4	306.5	110.1	13.4	-	-	-	1.2	15.9	169.1	354.1	1,757.0
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.7	41.5	37.2	34.6	33.9	31.2	31.0	33.7	30.2	38.8	429.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	500.6	362.3	347.2	151.6	50.7	34.6	33.9	31.2	32.2	49.6	199.3	392.9	2,186.0

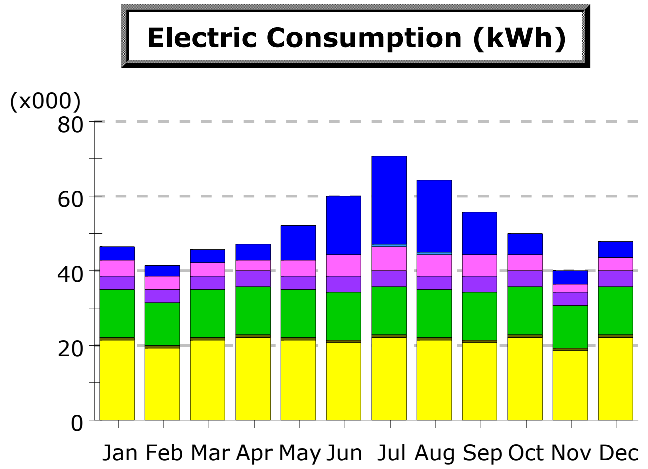


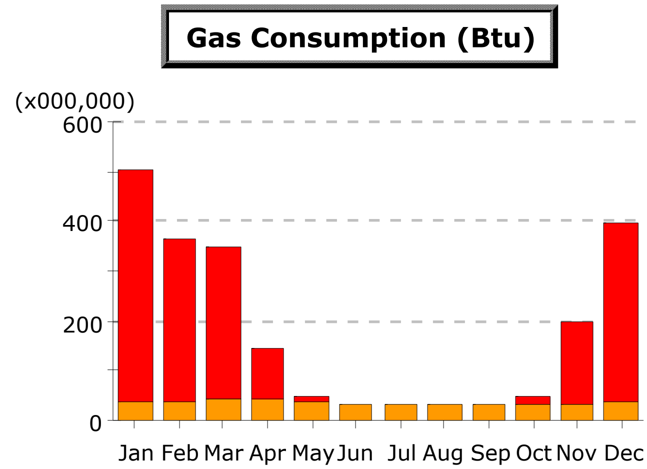
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.62	3.26	3.64	4.22	9.63	16.30	23.96	19.88	11.78	5.85	3.09	3.86	109.11
Heat Reject.	-	-	-	0.01	0.15	0.41	0.75	0.47	0.18	0.03	-	0.00	2.01
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.98	3.28	3.54	2.79	4.50	6.23	6.99	6.16	6.21	4.40	2.53	3.72	54.33
Pumps & Aux.	4.15	3.75	4.15	4.34	4.15	4.15	4.34	4.15	4.15	4.34	3.55	4.34	49.55
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	49.07	44.05	48.64	49.62	55.75	64.07	74.65	67.98	59.31	53.22	42.32	50.52	659.22

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	453.5	314.5	292.2	89.2	8.3	-	-	-	0.7	11.9	154.3	341.1	1,665.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.5
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	492.9	351.3	332.8	130.6	45.4	34.5	33.9	31.2	31.7	45.6	184.4	379.9	2,094.1



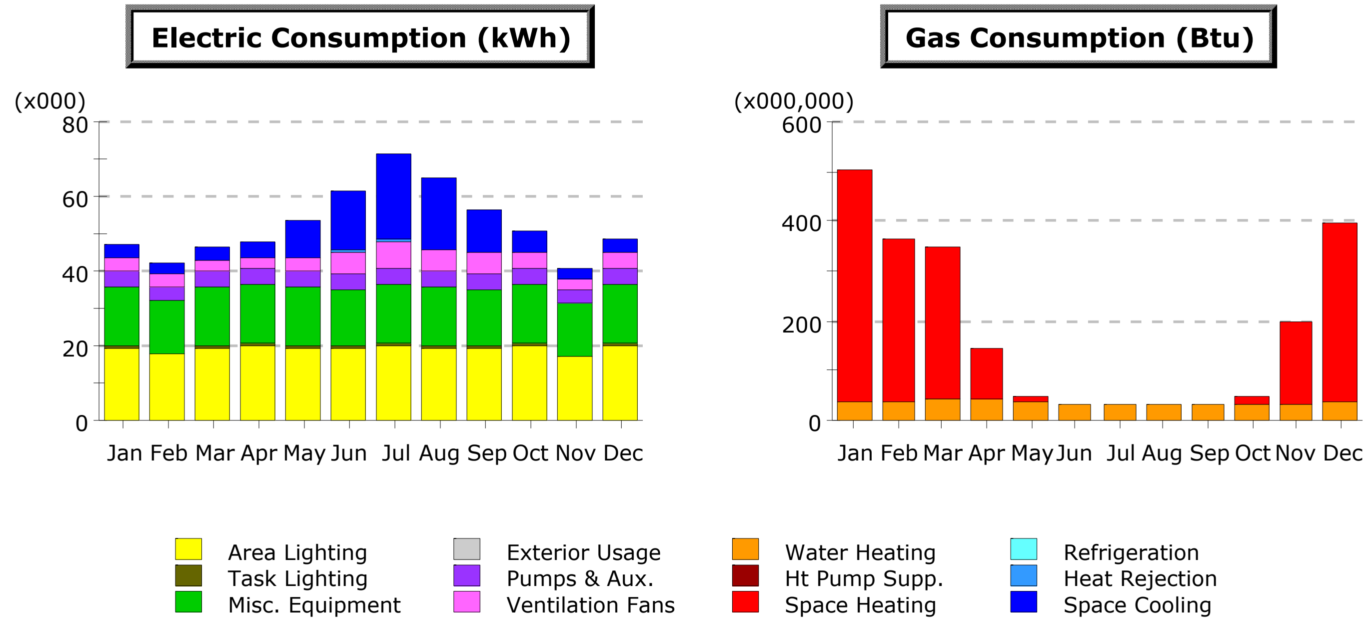


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.61	3.25	3.62	4.18	9.39	15.82	23.24	19.32	11.46	5.73	3.08	3.84	106.55
Heat Reject.	-	-	-	0.01	0.15	0.39	0.70	0.45	0.17	0.03	-	0.00	1.90
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.95	3.24	3.48	2.73	4.03	5.65	6.47	5.65	5.54	3.87	2.49	3.68	50.77
Pumps & Aux.	4.10	3.71	4.10	4.29	4.10	4.10	4.29	4.10	4.10	4.29	3.51	4.29	48.95
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	12.84	11.61	12.84	12.97	12.84	12.64	13.16	12.84	12.64	13.16	11.68	13.16	152.38
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	46.31	41.54	45.85	46.81	52.32	60.33	70.59	64.18	55.64	49.80	39.79	47.69	620.84

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	466.0	327.5	306.9	105.0	12.4	-	-	-	1.4	16.2	169.8	357.1	1,762.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.5	36.8	40.7	41.5	37.2	34.6	33.9	31.2	31.0	33.7	30.2	38.8	429.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	505.4	364.3	347.6	146.5	49.6	34.6	33.9	31.2	32.4	49.9	200.0	395.9	2,191.2

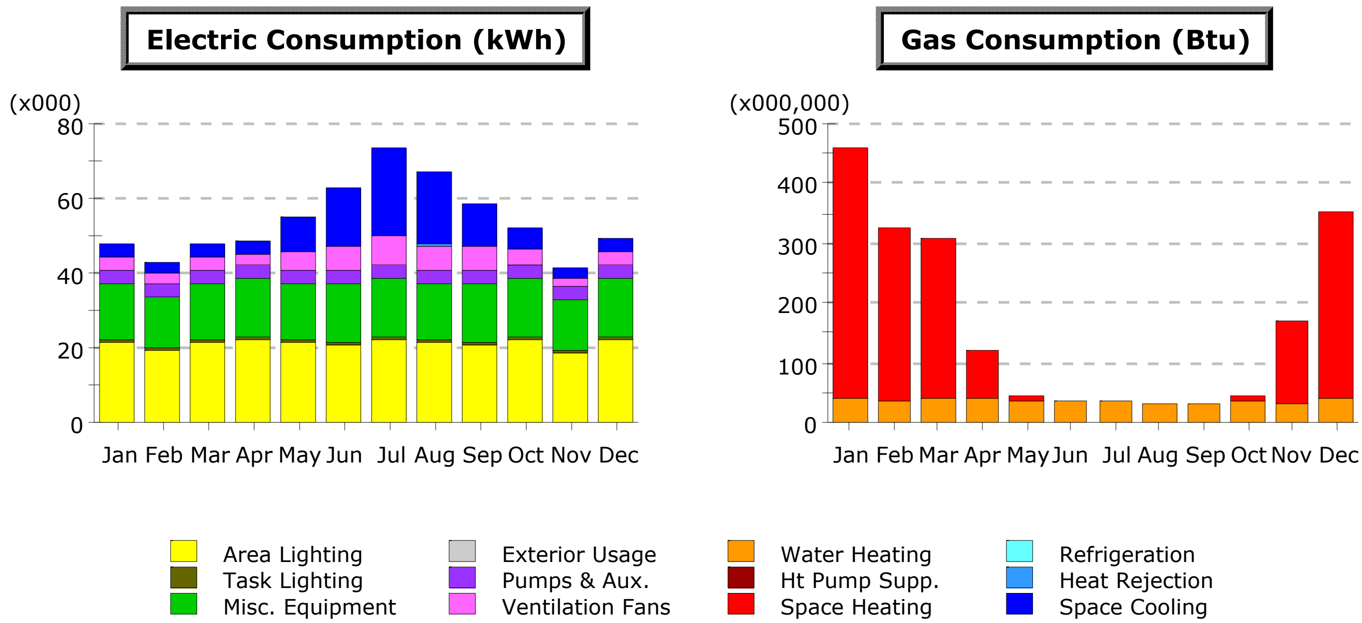


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.61	3.26	3.62	4.19	9.43	15.91	23.40	19.42	11.52	5.75	3.09	3.85	107.04
Heat Reject.	-	-	-	0.01	0.15	0.39	0.71	0.45	0.18	0.03	-	0.00	1.92
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.96	3.25	3.49	2.74	4.09	5.74	6.56	5.73	5.63	3.93	2.50	3.69	51.32
Pumps & Aux.	4.11	3.72	4.11	4.31	4.11	4.11	4.31	4.11	4.11	4.31	3.52	4.31	49.12
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	19.36	17.51	19.36	20.07	19.36	19.27	20.16	19.36	19.27	20.16	16.89	20.16	230.93
Total	47.23	42.36	46.77	47.67	53.32	61.36	71.73	65.26	56.65	50.76	40.70	48.59	632.38

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	466.3	327.5	306.6	103.5	11.8	-	-	-	1.2	15.5	168.4	356.7	1,757.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.6	33.9	31.2	31.0	33.7	30.1	38.8	428.9
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	505.8	364.3	347.3	145.0	49.0	34.6	33.9	31.2	32.2	49.3	198.6	395.5	2,186.5

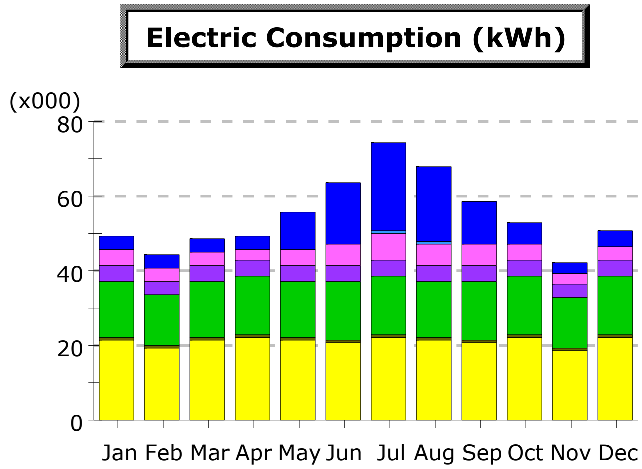


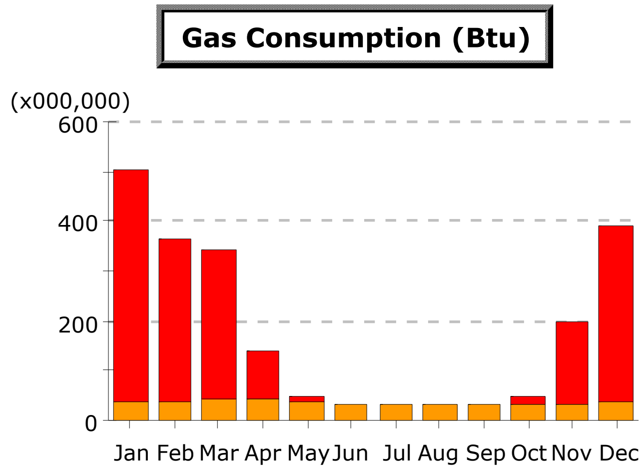
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.49	3.14	3.50	4.06	9.30	15.62	22.94	19.17	11.38	5.61	2.98	3.71	104.92
Heat Reject.	-	-	-	0.01	0.15	0.37	0.67	0.44	0.17	0.03	-	0.00	1.85
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.62	2.97	3.20	2.56	4.44	6.35	7.20	6.30	6.15	3.95	2.30	3.37	52.41
Pumps & Aux.	3.70	3.34	3.70	3.87	3.70	3.70	3.87	3.70	3.70	3.87	3.17	3.87	44.17
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	48.12	43.21	47.71	48.76	54.91	63.03	73.28	66.93	58.38	52.07	41.59	49.55	647.55

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	419.2	290.2	265.5	77.1	6.6	-	-	-	0.4	10.3	140.7	313.7	1,523.7
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.8
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	458.6	327.0	306.1	118.6	43.8	34.5	33.9	31.2	31.4	44.0	170.8	352.5	1,952.5



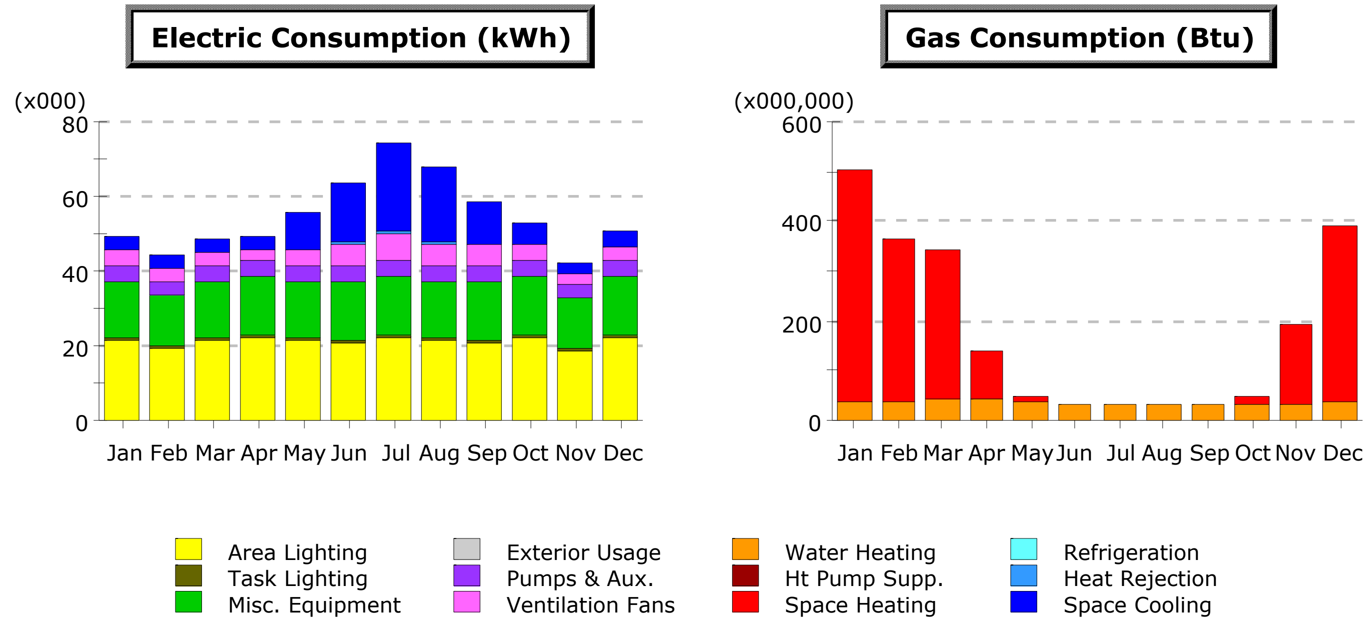


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.62	3.26	3.63	4.21	9.53	16.11	23.71	19.71	11.65	5.79	3.09	3.86	108.18
Heat Reject.	-	-	-	0.01	0.15	0.40	0.73	0.47	0.18	0.03	-	0.00	1.97
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.99	3.28	3.52	2.77	4.24	5.94	6.78	5.93	5.86	4.10	2.52	3.72	52.66
Pumps & Aux.	4.14	3.75	4.14	4.34	4.14	4.14	4.34	4.14	4.14	4.34	3.55	4.34	49.48
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	49.07	44.03	48.62	49.59	55.38	63.58	74.15	67.57	58.82	52.86	42.31	50.52	656.49

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	466.3	326.0	304.7	100.1	11.1	-	-	-	1.1	15.0	165.5	354.5	1,744.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.9
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	505.7	362.8	345.3	141.6	48.3	34.5	33.9	31.2	32.1	48.7	195.7	393.3	2,173.1

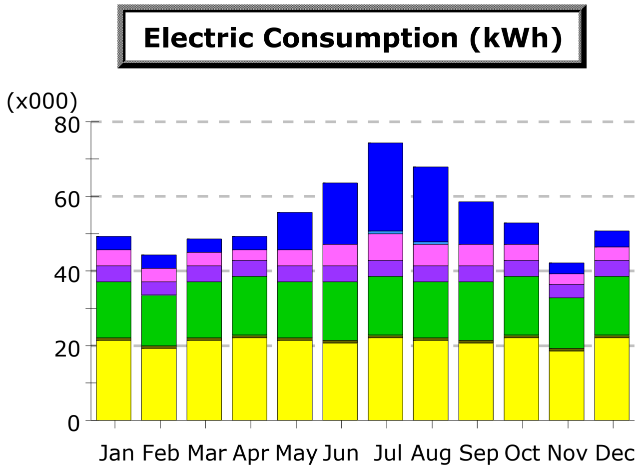


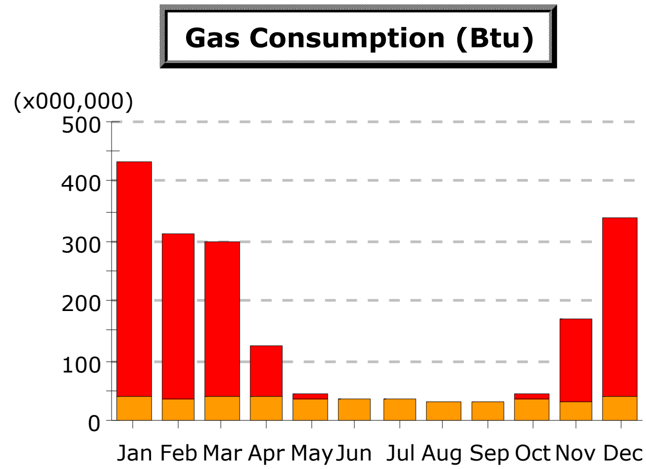
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.62	3.26	3.63	4.21	9.55	16.15	23.75	19.75	11.67	5.80	3.09	3.86	108.34
Heat Reject.	-	-	-	0.01	0.15	0.40	0.73	0.47	0.18	0.03	-	0.00	1.97
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.99	3.28	3.53	2.77	4.28	5.99	6.82	5.97	5.91	4.13	2.52	3.72	52.92
Pumps & Aux.	4.14	3.75	4.14	4.34	4.14	4.14	4.34	4.14	4.14	4.34	3.55	4.34	49.49
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	49.08	44.04	48.62	49.59	55.45	63.67	74.24	67.65	58.89	52.90	42.31	50.52	656.94

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	465.6	325.2	303.5	99.0	10.9	-	-	-	1.1	14.7	164.6	352.9	1,737.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.8
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	505.0	362.0	344.2	140.5	48.1	34.5	33.9	31.2	32.1	48.4	194.7	391.7	2,166.4



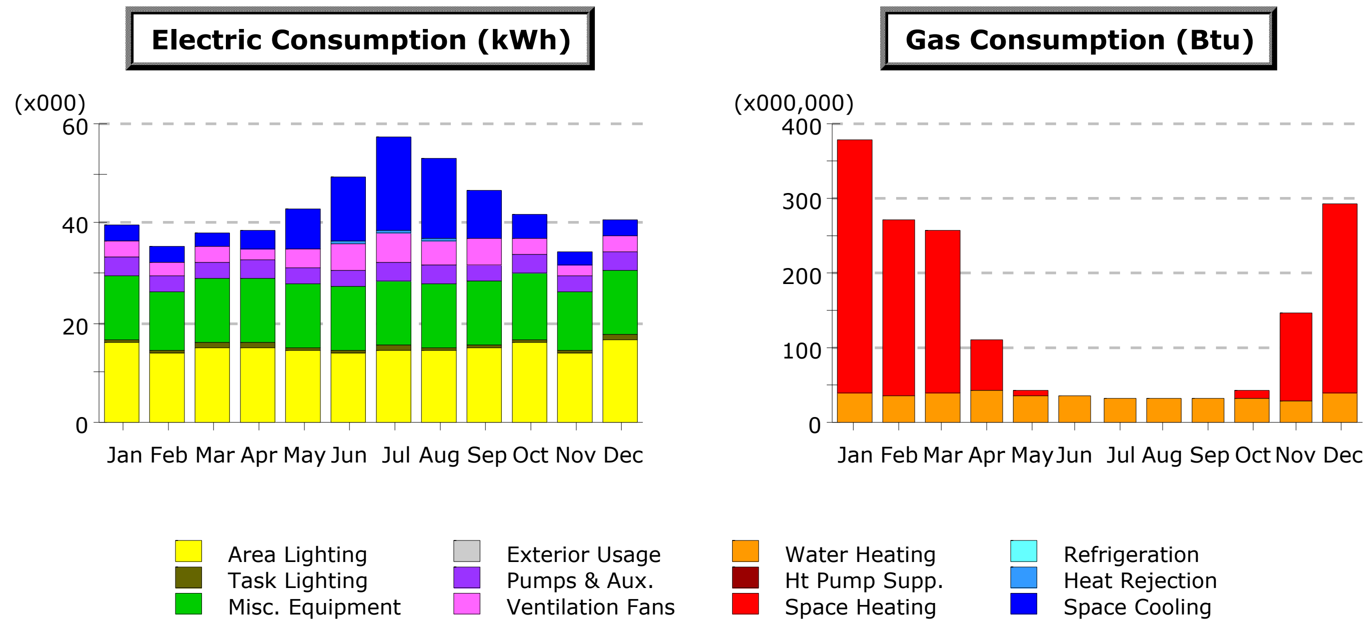


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.62	3.26	3.63	4.21	9.53	16.12	23.72	19.73	11.65	5.79	3.09	3.86	108.23
Heat Reject.	-	-	-	0.01	0.15	0.40	0.73	0.47	0.18	0.03	-	0.00	1.97
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.99	3.28	3.52	2.77	4.25	5.95	6.79	5.94	5.86	4.09	2.52	3.72	52.69
Pumps & Aux.	4.14	3.75	4.14	4.34	4.14	4.14	4.34	4.14	4.14	4.34	3.55	4.34	49.48
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	15.50	14.01	15.50	15.64	15.50	15.26	15.88	15.50	15.26	15.88	14.12	15.88	183.91
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	21.14	19.12	21.14	21.91	21.14	21.05	22.01	21.14	21.05	22.01	18.44	22.01	252.15
Total	49.07	44.03	48.62	49.59	55.39	63.60	74.18	67.60	58.82	52.85	42.31	50.52	656.58

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	393.4	275.1	257.4	85.0	9.5	-	-	-	1.0	12.8	140.5	299.5	1,474.1
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.5	33.9	31.2	31.0	33.7	30.1	38.8	428.9
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	432.8	311.9	298.0	126.5	46.7	34.5	33.9	31.2	32.0	46.5	170.6	338.3	1,903.0



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	3.09	2.78	3.10	3.57	7.84	12.93	18.79	15.93	9.63	4.87	2.64	3.28	88.47
Heat Reject.	-	-	-	0.01	0.13	0.32	0.54	0.40	0.15	0.02	-	0.00	1.56
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.43	2.82	3.01	2.39	3.60	5.12	5.87	5.15	5.08	3.37	2.18	3.20	45.24
Pumps & Aux.	3.53	3.19	3.53	3.70	3.53	3.53	3.70	3.53	3.53	3.70	3.02	3.70	42.17
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	12.84	11.61	12.84	12.97	12.84	12.64	13.16	12.84	12.64	13.16	11.68	13.16	152.38
Task Lights	0.68	0.62	0.68	0.71	0.68	0.68	0.71	0.68	0.68	0.71	0.58	0.71	8.15
Area Lights	16.03	14.10	15.14	15.18	14.20	13.92	14.69	14.34	14.81	15.99	13.96	16.87	179.25
Total	39.61	35.13	38.30	38.53	42.82	49.14	57.46	52.88	46.53	41.83	34.07	40.92	517.23

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	337.5	236.2	216.8	69.5	6.5	-	-	-	0.4	8.4	116.3	254.4	1,246.0
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	39.4	36.8	40.6	41.5	37.2	34.6	33.9	31.2	31.0	33.7	30.1	38.8	428.9
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	376.9	273.0	257.5	111.0	43.7	34.6	33.9	31.2	31.4	42.2	146.5	293.2	1,674.9

APPENDIX B

PV COST CALCULATIONS

SPREADSHEETS

Commercial Solar Photovoltaic Project Simple Financial Model (posted 4/06/09) - SREC Guaranteed Price

Commonwealth Solar Rebate Program 2008 Version 3.0

DATA ENTRY AND FINANCIAL SUMMARY - MassCEC Avg. Installed Cost for Commercial 100+MW Projects (Owner Installed)

Key

Entry Cells →	
Cells Draw Data from Another Worksheet	
Calculation Cells (Not for Entry)	

Select Taxable or Non-Taxable Entity	Taxable	
Project and Customer Cost Assumptions		
Solar Photovoltaic System Size	200,000	Watts (DC STC)
Total System Cost/Watt	$ 3.500	$/Watt (DC STC)
Total System Cost →	$ 700,000.00	
MTC Rebate Assumptions		
Rebate$ per/Watt	$ -	$/Watt (DC STC)
Total Rebate	$ -	
Project Performance and Savings/ Cost Assumptions		
Annual Net Capacity Factor	11.8%	kW (DC STC) to kWh AC
Annual Production Degradation	0.50%	%
Project Life	25	Years
Depreciation Life	20	Years
Electricity Revenue (Avoided Costs)	$ 0.14	$/kWh
Electricity Revenue (Avoided Costs) Annual Adjustor	3.0%	%
Renewable Energy Certificate (REC) Revenue	$ 0.206	$/kWh
REC Revenue Annual Adjustor	0.0%	%
REC Revenue Term	10	Years (must be equal to or less than project life)
Annual Operations and Maintenance Cost Factor	$ 17.59	$/kW/Year
Annual Operations and Maintenance Cost	$ 3,518	$/Year
Annual Operations and Maintenance Adjustor	3.0%	%
Future Inverter Replacement Cost	$ 0.75	$/Watt (DC STC)
Inverter Life, Replace Every X Years	10	Year (must be equal to or less than project life)

Tax Assumptions

Federal Tax Rate	35%																		
State Tax Rate	10%																		
Effective Tax Rate	42%																		
Federal Tax Credit	30%																		
State Tax Deduction	100%																		
5 Year Accelerated Depreciation Schedule (MACRS)	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%													
Depreciation	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Asset Basis																			
Gross Cost	$ 700,000																		
Rebate	$ -																		
Less 50% of Federal Tax Credit	$ (105,000)																		
Asset Basis	$ 595,000																		

Financing Assumptions

% Financed w/ Cash	100%	
% Financed w/ Loan	0%	
Loan Interest Rate	9.20%	
Loan Period	20	Years (must be equal to or less than project life)
Net Cost	$ 700,000	
Loan	$ -	
Customer Discount Rate	8.00%	

Solar Project Financial Analysis Summary	
Net Present Value	$ 26,989
Simple Payback (100% Cash only)	Year 6
Estimated Return on Equity	9.3%

Disclaimer: This Unofficial Cash Flow Model is intended to provide non-residential entities that are considering the purchase and installation of solar energy equipment with a general understanding of possible financial implications of such purchase and installation. Those entities interested in learning more about the financial implications of the purchase and installation of solar energy equipment are urged to consult their own tax and financial experts. The information contained in the Unofficial Cash Flow Model may not be relied on by anyone for any purposes. Furthermore, the information contained in this model does not necessarily reflect the views of the Massachusetts Technology Collaborative or the Commonwealth of Massachusetts, and reference to any specific method does not constitute an implied or expressed recommendation or endorsement of it. Neither the Massachusetts Technology Collaborative nor the Commonwealth of Massachusetts make any warranties or representations, expressed or implied, as to the usefulness, completeness, or accuracy of any processes, methods or other information contained, described, disclosed, or referred to in this model. Finally, neither the
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PRO FORMA AND PRODUCTION

Project Output	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Annual Generation (kWh)		206,736	205,702	204,674	203,650	202,632	201,619	200,611	199,608	198,610	197,617	196,629	195,646
FINANCIAL SCHEDULES													
INCOME STATEMENT													
Electricity Revenue (Avoided Cost)		$ 28,530	$ 29,239	$ 29,965	$ 30,710	$ 31,473	$ 32,255	$ 33,057	$ 33,878	$ 34,720	$ 35,583	$ 36,467	$ 37,373
MTC Rebate	$ -												
REC Revenue		$ 42,588	$ 42,375	$ 42,163	$ 41,952	$ 41,742	$ 41,534	$ 41,326	$ 41,119	$ 40,914	$ 40,709	$ -	$ -
Total Revenue (Avoided Costs)	$ -	$ 71,117	$ 71,613	$ 72,128	$ 72,662	$ 73,215	$ 73,788	$ 74,382	$ 74,997	$ 75,633	$ 76,292	$ 36,467	$ 37,373
Replace Inverter?	No	No	No	No	No	No	No	No	No	No	Yes	No	No
Operations & Maintenance Costs		$ (3,518)	$ (3,624)	$ (3,732)	$ (3,844)	$ (3,960)	$ (4,078)	$ (4,201)	$ (4,327)	$ (4,456)	$ (4,590)	$ (4,728)	$ (4,870)
Inverter Replacement Cost		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (150,000)	$ -	$ -
Total Operating Expenses	$ -	$ (3,518)	$ (3,624)	$ (3,732)	$ (3,844)	$ (3,960)	$ (4,078)	$ (4,201)	$ (4,327)	$ (4,456)	$ (154,590)	$ (4,728)	$ (4,870)
EBITDA	$ -	$ 67,599	$ 67,990	$ 68,396	$ 68,818	$ 69,256	$ 69,710	$ 70,182	$ 70,670	$ 71,177	$ (78,299)	$ 31,739	$ 32,503
Federal Depreciation Expense		$ (119,000)	$ (190,400)	$ (114,240)	$ (68,544)	$ (68,544)	$ (34,272)	$ -	$ -	$ -	$ -	$ -	$ -
EBIT	$ -	$ (51,401)	$ (122,410)	$ (45,844)	$ 274	$ 712	$ 35,438	$ 70,182	$ 70,670	$ 71,177	$ (78,299)	$ 31,739	$ 32,503
Interest Expense		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBT	$ -	$ (51,401)	$ (122,410)	$ (45,844)	$ 274	$ 712	$ 35,438	$ 70,182	$ 70,670	$ 71,177	$ (78,299)	$ 31,739	$ 32,503
Federal taxes saved/(paid)	$ -	$ 20,356	$ 45,223	$ 18,439	$ 2,313	$ 2,175	$ (9,964)	$ (22,107)	$ (22,261)	$ (22,421)	$ 27,404	$ (9,998)	$ (10,239)
State taxes saved/(paid) [can not deduct federal depreciation expense]	$ -	$ (6,760)	$ (6,799)	$ (6,840)	$ (6,882)	$ (6,926)	$ (6,971)	$ (7,018)	$ (7,067)	$ (7,118)	$ 7,830	$ (3,174)	$ (3,250)
Net Income	**$ -**	**$ (37,804)**	**$ (83,986)**	**$ (34,245)**	**$ (4,295)**	**$ (4,039)**	**$ 18,504**	**$ 41,056**	**$ 41,342**	**$ 41,639**	**$ (43,064)**	**$ 18,567**	**$ 19,014**
CASH FLOW STATEMENT													
Cash From Operations													
Net Income	$ -	$ (37,804)	$ (83,986)	$ (34,245)	$ (4,295)	$ (4,039)	$ 18,504	$ 41,056	$ 41,342	$ 41,639	$ (43,064)	$ 18,567	$ 19,014
Federal Depreciation Expense	$ -	$ 119,000	$ 190,400	$ 114,240	$ 68,544	$ 68,544	$ 34,272	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Operations	$ -	$ 81,196	$ 106,414	$ 79,995	$ 64,249	$ 64,505	$ 52,776	$ 41,056	$ 41,342	$ 41,639	$ (43,064)	$ 18,567	$ 19,014
Cash From Investing													
Installed PV Cost	$ (700,000)												
One Time State Solar Investment Tax Deduction (Actual Cash Value)	$ 49,000												
One Time Federal Solar Investment Tax Credit	$ 210,000												
Cash Flow From Investing	$ (441,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash From Financing													
Loan Disbursement	$ -												
Loan Repayment (Principle)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash Flow	**$ (441,000)**	**$ 81,196**	**$ 106,414**	**$ 79,995**	**$ 64,249**	**$ 64,505**	**$ 52,776**	**$ 41,056**	**$ 41,342**	**$ 41,639**	**$ (43,064)**	**$ 18,567**	**$ 19,014**
Cumulative Cash Flow	**$ (441,000)**	**$ (359,804)**	**$ (253,391)**	**$ (173,395)**	**$ (109,146)**	**$ (44,642)**	**$ 8,134**	**$ 49,190**	**$ 90,533**	**$ 132,171**	**$ 89,107**	**$ 107,674**	**$ 126,689**
Simple Payback		$ 1	$ 2	$ 3	$ 4	$ 5	$ 6	$ 7	$ 8	$ 9	$ 10	$ 11	$ 12
Net Investment	$ (441,000)	$ (359,804)	$ (253,391)	$ (173,395)	$ (109,146)	$ (44,642)	$ 8,134	$ 49,190	$ 90,533	$ 132,171	$ 89,107	$ 107,674	$ 126,689
Simple Payback Year	6						6						

Project Output	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Annual Generation (kWh)	194,667	193,694	192,726	191,762	190,803	189,849	188,900	187,955	187,016	186,080	185,150	184,224	183,303
FINANCIAL SCHEDULES													
INCOME STATEMENT													
Electricity Revenue (Avoided Cost)	$ 38,302	$ 39,254	$ 40,229	$ 41,229	$ 42,253	$ 43,303	$ 44,379	$ 45,482	$ 46,612	$ 47,771	$ 48,958	$ 50,174	$ 51,421
MTC Rebate													
REC Revenue	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenue (Avoided Costs)	$ 38,302	$ 39,254	$ 40,229	$ 41,229	$ 42,253	$ 43,303	$ 44,379	$ 45,482	$ 46,612	$ 47,771	$ 48,958	$ 50,174	$ 51,421
Replace Inverter?	No	No	No	No	No	No	No	Yes	No	No	No	No	No
Operations & Maintenance Costs	$ (5,016)	$ (5,166)	$ (5,321)	$ (5,481)	$ (5,645)	$ (5,815)	$ (5,989)	$ (6,169)	$ (6,354)	$ (6,545)	$ (6,741)	$ (6,943)	$ (7,151)
Inverter Replacement Cost	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (150,000)	$ -	$ -	$ -	$ -	$ -
Total Operating Expenses	$ (5,016)	$ (5,166)	$ (5,321)	$ (5,481)	$ (5,645)	$ (5,815)	$ (5,989)	$ (156,169)	$ (6,354)	$ (6,545)	$ (6,741)	$ (6,943)	$ (7,151)
EBITDA	$ 33,286	$ 34,087	$ 34,908	$ 35,748	$ 36,608	$ 37,489	$ 38,390	$ (110,687)	$ 40,258	$ 41,226	$ 42,217	$ 43,231	$ 44,270
Federal Depreciation Expense	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBIT	$ 33,286	$ 34,087	$ 34,908	$ 35,748	$ 36,608	$ 37,489	$ 38,390	$ (110,687)	$ 40,258	$ 41,226	$ 42,217	$ 43,231	$ 44,270
Interest Expense	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBT	$ 33,286	$ 34,087	$ 34,908	$ 35,748	$ 36,608	$ 37,489	$ 38,390	$ (110,687)	$ 40,258	$ 41,226	$ 42,217	$ 43,231	$ 44,270
Federal taxes saved/(paid)	$ (10,485)	$ (10,737)	$ (10,996)	$ (11,261)	$ (11,531)	$ (11,809)	$ (12,093)	$ 38,740	$ (12,681)	$ (12,986)	$ (13,298)	$ (13,618)	$ (13,945)
State taxes saved/(paid) [can not deduct federal depreciation expense]	$ (3,329)	$ (3,409)	$ (3,491)	$ (3,575)	$ (3,661)	$ (3,749)	$ (3,839)	$ 11,069	$ (4,026)	$ (4,123)	$ (4,222)	$ (4,323)	$ (4,427)
Net Income	**$ 19,472**	**$ 19,941**	**$ 20,421**	**$ 20,912**	**$ 21,416**	**$ 21,931**	**$ 22,458**	**$ (60,878)**	**$ 23,551**	**$ 24,117**	**$ 24,697**	**$ 25,290**	**$ 25,898**
CASH FLOW STATEMENT													
Cash From Operations													
Net Income	$ 19,472	$ 19,941	$ 20,421	$ 20,912	$ 21,416	$ 21,931	$ 22,458	$ (60,878)	$ 23,551	$ 24,117	$ 24,697	$ 25,290	$ 25,898
Federal Depreciation Expense	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Operations	$ 19,472	$ 19,941	$ 20,421	$ 20,912	$ 21,416	$ 21,931	$ 22,458	$ (60,878)	$ 23,551	$ 24,117	$ 24,697	$ 25,290	$ 25,898
Cash From Investing													
Cash Flow From Investing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash From Financing													
Loan Repayment (Principle)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Cash Flow	**$ 19,472**	**$ 19,941**	**$ 20,421**	**$ 20,912**	**$ 21,416**	**$ 21,931**	**$ 22,458**	**$ (60,878)**	**$ 23,551**	**$ 24,117**	**$ 24,697**	**$ 25,290**	**$ 25,898**
Cumulative Cash Flow	**$ 146,161**	**$ 166,102**	**$ 186,523**	**$ 207,436**	**$ 228,851**	**$ 250,782**	**$ 273,240**	**$ 212,363**	**$ 235,914**	**$ 260,031**	**$ 284,728**	**$ 310,018**	**$ 335,916**
Simple Payback	$ 13	$ 14	$ 15	$ 16	$ 17	$ 18	$ 19	$ 20	$ 21	$ 22	$ 23	$ 24	25
Net Investment	$ 146,161	$ 166,102	$ 186,523	$ 207,436	$ 228,851	$ 250,782	$ 273,240	$ 212,363	$ 235,914	$ 260,031	$ 284,728	$ 310,018	$ 335,916

DEBT SCHEDULES

Scenario A Loan: Debt Schedule	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principle	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ending Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year

Scenario A Loan: Debt Schedule	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principle	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ending Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year

Disclaimer: This Unofficial Cash Flow Model is intended to provide non-residential entities that are considering the purchase and installation of solar energy equipment with a general understanding of possible financial implications of such purchase and installation. Those entities interested in learning more about the financial implications of the purchase and installation of solar energy equipment are urged to consult their own tax and financial experts. The information contained in the Unofficial Cash Flow Model may not be relied on by anyone for any purposes. Furthermore, the information contained in this model does not necessarily reflect the views of the Massachusetts Technology Collaborative or the Commonwealth of Massachusetts, and reference to any specific method does not constitute an implied or expressed recommendation or endorsement of it. Neither the Massachusetts Technology Collaborative nor the Commonwealth of Massachusetts make any warranties or representations, expressed or implied, as to the usefulness, completeness, or accuracy of any processes, methods or other information contained, described, disclosed, or referred to in this model.

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APPENDIX H - STORMWATER MANAGEMENT REPORT (CD)

Stormwater Management Report and Calculations
BTUHWF Building Replacement Project

BTUHWF Building Corporation
188 Mount Vernon Street
Boston, Massachusetts 02125

Submitted to:
City of Boston
January 12, 2015

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1.0 Introduction

This Stormwater Management Plan, prepared in accordance with DEP Stormwater Management Standards, is submitted to the City of Boston on behalf of the applicant, BTUHWF Building Corporation, with a mailing address of 180 Mount Vernon Street, Boston, Massachusetts, 02125 for their proposed Building Replacement and Site Redevelopment Project at 188 Mount Vernon Street in Dorchester. Refer to Figure 1, *Aerial Map*. The 2.70-acre property is home to the Boston Teachers Union (BTU) and the Boston Teachers Union Health and Welfare Fund (BTUHWF). The facility consists of the BTU and BTUHWF offices; an Eye Care Center; a Credit Union; conference rooms; function halls; and a lounge. This report supplements the set of plans prepared by this office and submitted to the City of Boston entitled, "Site Development Plans, Building Replacement Project, Boston Teachers Union Health and Welfare Fund, Project Location: 188 Mount Vernon Street, Boston (Dorchester), MA 02125, Date Issued January 5, 2015.

The project site is identified on City of Boston Assessors Map No. 4C/4D as Parcel ID No. 03448-300 and is located within Sub-District Zone B-1-55 of the Harborpark District: Dorchester Bay/Neponset River Waterfront, in the Boston Zoning Code under Article 42A. The property owner is "BTUHWF Building Corporation". The Project consists of demolition of the existing building, existing parking areas, drainage and utility infrastructure; and construction of a new three-story, 52,394-square foot gross floor area building with the same functions and uses as existing, i.e., offices, services and function space. Parking for the new facility is proposed in two phases: the first project phase proposes at-grade surface parking only, totaling 135 parking spaces; the second phase proposes construction of a structured parking garage behind the new building, resulting in an overall site parking count of 308 spaces.

Other site features of the redevelopment project include a one-way vehicle loop drive to a passenger drop-off area located at the main building entrance; an eight-foot wide pedestrian sidewalk along the entire northerly properly line in the direction towards Carson Beach for future connection to the Boston Harbor Walk; and a 6,500-square foot event plaza area (located within the site's front parking area) designed for planned outdoor functions. Both the building entrance passenger drop-off area and the event plaza are designed using permeable paver blocks, rather than standard asphalt pavement, to provide aesthetic appeal and infiltration of stormwater to reduce runoff. The site design also includes a loading dock and waste/recycle enclosure area, handicapped parking spaces and accessible routes in conformance with ADA and AAB Regulations, electric vehicle charging station, new site lighting, landscaping and utility infrastructure.

The redevelopment project design proposes saving several existing mature trees located in a row along the northerly property line, and also adding large areas of new landscape trees, shrubs and ground cover that do not currently exist. As shown on the Site Planting Plan, this significant increase in landscape area not only serves to beautify the site, but also results in a significant reduction in impervious area and corresponding decrease in the rate and volume of stormwater runoff. The use of permeable pavers at the drop-off area and in the front parking area (also the event plaza area) allows rainfall to permeate through the pavement, essentially eliminating puddles from the surface and promoting direct infiltration into the ground, significantly reducing stormwater runoff volume, peak discharge rates and pollutant transport.

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TETRA TECH

One Grant Street
Framingham, MA 01701

Aerial Map

188 Mt Vernon Street
Boston (Dorchester), Massachusetts

12/30/14

Source: MassGIS

Figure 1

Created by: JLP

P:\109553\143-109553-14001\GIS\2 AERIAL.mxd

Standard bituminous concrete pavement is proposed for site access drives and parking spaces elsewhere through the site, with a conventional closed drainage collection system of deep sump hooded catch basins, drain manholes, HDPE pipe, and two Contech CDS water quality units to provide treatment. The stormwater design approach, in conformance with DEP Stormwater Standards, is to reduce runoff and improve water quality compared to today's conditions.

1.1 Existing Conditions

The main access to the site is from William J. Day Boulevard to the north; site access also exists from Mount Vernon Street via parking lots and access drives owned by UMass Boston to the east and west. The majority of the 2.70-acre site is developed with impervious surfaces: building roof, bituminous concrete access drives and parking areas, concrete sidewalks and concrete utility pads. Ninety-one percent (91%) of the total existing property area is impervious. The site is almost level in topography, with elevations ranging between approximately 15 feet and 16.5 feet based on Boston City Base Vertical Datum. There are currently 140 parking spaces on the property. There are no wetlands or other natural resources located within the site, however the site is located within the 100-year flood zone. The only significant vegetation on the site is the row of mature trees located along the northerly property line.

The existing drainage system consists of three catch basins in the main parking area and a fourth catch basin located in the site access drive. The catch basins connect to a series of drain manholes that flow in a westerly direction through the site and discharges off-site, eventually reaching Dorchester Bay. The existing drainage system is old and pre-dates DEP Stormwater Standards. Existing catch basins are not equipped with four-foot deep sumps or hooded outlets and runoff generated on-site receives no treatment prior to discharging from the site.

The building is serviced by municipal water, sewer, natural gas, and underground electric, telephone and cable. On-site soil test evaluations revealed no naturally-occurring parent geologic soil material; only construction fill material was discovered in the ten-foot deep pit excavations. The project proposes to demolish the existing building, parking areas, drainage system and utility infrastructure.

1.2 Proposed Conditions

The site redevelopment project proposes the construction of a new three-story building with 52,394-square foot gross floor area; new parking areas to be constructed in two phases: 135 spaces in Phase I and 308 total spaces after Phase II; new stormwater management system; new utility infrastructure and service connections; landscape areas and site parking area lights utilizing energy-saving LED fixtures. The proposed increased landscape areas and permeable pavers (7,000 square feet in area) result in a significant 15.5% reduction in impervious surface areas, from an existing impervious area of 107,300 square feet (91.1% of total site area) to 90,600 square feet (77% of total site area) in the proposed post-development condition. Because the project results in no net increase in impervious area on a previously developed site, it meets the criteria to qualify as a "redevelopment project" under the definition of Standard 7 in the Massachusetts DEP Stormwater Handbook.

On-site soil test evaluations, conducted by a DEP Certified Soil Evaluator from Tetra Tech, revealed fill material in the full depth of the ten-foot deep excavations. The fill material is deemed unsuitable for providing subsurface recharge to groundwater. Four feet of naturally occurring pervious material must be present to utilize a subsurface system providing groundwater recharge. Therefore, the proposed stormwater management system design does not include a subsurface infiltration/recharge system or other means of storing and infiltrating large volumes of runoff for recharge. However, it does include use of porous pavement in the form of the "Pave Drain" permeable paver system to provide infiltration above the fill material and reduce stormwater runoff. Given the status as a Redevelopment Project under the criteria of DEP Stormwater Policy (Standard Number 7 of the Handbook), in which certain standards are required to be met "only to the maximum extent practicable", the increase in landscaped/open space area and the use of permeable pavers provide volume towards meeting the Recharge Requirement, Standard Number 3, to the maximum extent practicable.

The 12"x12" square permeable paver units are designed with ¼" gaps between the units to meet the requirements of ADA and the Massachusetts Architectural Access Board. Beneath the units, a 4" thick layer of ¾" clean angular stone and 12" thick bed of 2" to 3" double-washed stone base will provide filtering treatment and storage of stormwater prior to infiltration. On the underside of each paver unit, an arch design creates an internal reservoir chamber providing additional stormwater runoff storage above the stone base, while providing strength for H-20 heavy duty vehicular loads. 6" diameter perforated HDPE pipe sub-drains are installed at the bottom of the 12" thick stone base course to properly drain and prevent extreme saturation of the permeable paver pavement section during the largest storm events. The drains discharge to the closed drainage collection system.

In addition to the permeable pavers, a new closed drainage system is proposed, consisting of a network of catch basins, manholes, drain pipe and water quality units to collect, convey and treat runoff in post-development conditions. Both conventional and proprietary best management practices will be used to manage runoff and provide water quality improvements. The system includes catch basins with 4-foot sumps below the outlet invert to allow settling of sediments and equipped with hooded outlets to trap floatables, such as oil and debris, inside the structure; as well as hydrodynamic separators, utilizing two (2) Contech CDS stormwater quality treatment devices.

The CDS water quality treatment system uses continuous deflective separation to create a non-turbulent environment that effectively screens, separates and traps debris, sediment and oil from stormwater runoff. The indirect screening capability of the system captures and retains 100% of floatables, even at high flows. The oil baffle provides effective hydrocarbon removal and the isolated storage sump eliminates sediment washout potential. The continuous deflective separation technology maintains continuous positive treatment of total suspended solids (TSS), regardless of flow rate, treating a wide range of particle sizes, and ensures that pollutants, such as free oils, heavy metals and nutrients attached to fine sediment, are captured and contained during all rainfall events.

The proposed drainage network of pipes will tie into the existing site manhole and 24-inch diameter pipe that currently discharges off-site towards the Boston Water and Sewer Commission (BWSC) system. Since the project results in a reduction in reduced impervious surface area and associated runoff, stormwater volumes and flow rates discharging from the site's drainage system to the BWSC system are reduced and therefore, no upgrades, in terms of increased capacity, are necessary to the BWSC drain pipe network.

The stormwater management system design has been calculated conservatively using the second phase of the Site Plan that includes construction of the parking garage. Because of the structured parking decks, the second phase impervious area is slightly greater (by 183 square feet) than the first phase without it, therefore, it has been chosen to conservatively calculate the existing versus proposed conditions in the hydrologic model.

The proposed redevelopment site will be serviced by a solid waste disposal and recycling area with enclosed bins; underground electric, telephone, cable, internet and fire alarm; natural gas; City of Boston water and sewer; new fire hydrants in two locations; and energy-saving LED parking area lights.

1.3 Ground Cover

The total property area is 2.70 acres. The overall hydrologic study area for the proposed redevelopment is 3.08 acres. Table 1 summarizes the ground cover distribution for the hydrologic study area for existing and proposed conditions.

Table 1 Ground Cover - Hydrologic Area

Area	Existing (ac)	Proposed (ac)
Impervious Pavement	2.11	1.81
Permeable Pavers	0.00	0.15
Roofs	0.76	0.74
Pervious Grass/Plantings	0.21	0.38
Total	**3.08**	**3.08**

2.0 Stormwater Management

2.1 Method of Calculations

The hydrologic model created to analyze the hydrology of the site was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (SCS unit hydrograph procedures), SCS Technical Release No. 55 (for Times of Concentration and Runoff Curve Numbers), and City of Boston (for Rainfall Depths).

The hydrologic model was created and calculated with HydroCAD, Version 9.0 software, developed by Applied Microcomputer Systems. The runoff from the sub-drainage areas (HydroCAD subcatchment areas) is calculated based on rainfall and the watershed characteristics, and a runoff hydrograph (a runoff rate versus time curve) is developed. The stage-storage-discharge curve for a specific detention area (i.e., a vegetated basin) is used to compute an outflow hydrograph by hydraulically routing an inflow hydrograph through the detention facilities. This procedure calculates the relationship of the inflow hydrograph with the characteristics of the detention basin systems to determine the outflow, stage, and storage capacity of the detention systems for a given time during the specified storm event.

Permeable paver areas are modeled conservatively as though they are standard impervious pavement using a conservative Curve Number (CN) of 98.

Pipe sizing calculations for the drainage collection system and roof drain system were performed with StormCAD, a computer program by Haestad Methods, Inc., utilizing the Rational Method to determine the runoff. The Intensity Duration Frequency (IDF) Curves for the Boston area were used to obtain the rainfall intensity data for the hydraulic design standard 25-year storm event. See Appendix B for HydroCAD Input/Output; and StormCAD Calculations.

2.2 Sources of Data

- SCS Technical Release No. 20 (TR-20)
- SCS Technical Release No. 55 (TR-55)
- U.S. Department of Commerce, Technical Paper No. 40 (TP-40), Rainfall Frequency Atlas of the United States.
- Soil Survey for Norfolk and Suffolk Counties, Massachusetts (Natural Resources Conservation Service)
- Intensity Duration Frequency (IDF) Curves for the Boston, Massachusetts Area

2.3 Rainfall Depths

In accordance with the Massachusetts Department of Environmental Protection Stormwater Management Guidelines, the 2, 10, 25, and 100-year storm events were analyzed. Type III-24 Hour storms were used for the stormwater runoff calculations. The following are the rainfall depths used for each storm event for the City of Boston.

Table 2 Rainfall Depths

Storm Event	24 hour Rainfall
2-year	3.2 inches
10-year	4.6 inches
25-year	5.5 inches
100-year	6.6 inches

2.4 Soil Conditions

Natural Resources Conservation Service (NRCS) Web Soil Survey Soil Map for Norfolk and Suffolk Counties indicate that soils onsite consist of the following (Refer to the County Soils Map in Appendix C):

- Uw - Urban land (Fill), wet substratum, 0 to 3 percent slopes, Hydrologic Soil Group D, Map Unit Symbol 603

On November 11, 2014 Tetra Tech evaluated four (4) soil evaluation test pits at the Site. The test pits were excavated in the paved parking lot for the purpose of determining the suitability of the soil to provide effective stormwater infiltration and recharge to groundwater. Each test pit was excavated to a minimum depth of 10 feet; one test pit depth was 15 feet in depth.

In all four test pits, the bituminous concrete pavement is underlain by 8" layer of clean sand (installed years ago at the time of pavement construction), underlain by urban fill material for the remaining full depth of each of the excavations. The fill is a mix of varying soil texture, structure and color; it can be characterized as "ash and cinder", with debris mixed in consisting of some brick and asphalt chunks, bottles and jars, and scrap metal.

Four feet of naturally occurring pervious material is not present and therefore, a subsurface infiltration/recharge system should not and cannot be designed or constructed within the existing fill material at this site.

Refer to Figure 2, *NRCS Soils Map* and Appendix C for the Soil Evaluation Test Logs.

2.5 Existing Stormwater Management

2.5.1 Existing Watershed

Under existing conditions, the site is divided into three (3) drainage subcatchment areas. Characteristics of each subcatchment area is noted below and shown on Figure 3, *Existing Conditions Watershed Map.*

There are two (2) Design Points for the site:

- Design Point 1 (DP-1) – existing 24" RCP outlet from an existing drain manhole located on the westerly side of the site which ultimately discharges into the existing BWSC system.

- Design point 2 (DP-2) – existing 10" PVC pipe outlet from an existing catch basin just beyond the property boundary located on the easterly side of the site which ultimately discharges into the existing BWSC system.

Below is a description of each subcatchment:

- Subcatchment S1 consists of pervious and impervious surfaces and discharges into existing catch basins and the existing drainage system on-site and flows towards DP-1.

- Subcatchment S2 consists of pervious and impervious surfaces and discharges into an existing catch basin and flows towards DP-2.

- Subcatchment R1 consists of roof area and discharges from existing roof leaders/downspouts into the existing drainage system on-site towards DP-1.

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One Grant Street
Framingham, MA 01701

NRCS Soils Map

188 Mt. Vernon Street
Boston (Dorchester), Massachusetts

12/30/14

Source: MassGIS

Figure
2

Created by: JLP

P:\109553\143-109553-14001\GIS\2 NRCS SOILS MAP.mxd

2.5.2 Existing Runoff Calculations

In order to determine the peak rate of discharge for existing conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 Method (refer to Appendix B, HydroCAD® Input/Output). The existing stormwater discharge rates are shown in Table 3.

Table 3 Existing Peak Runoff Rates

Point of Analysis	2-Year Storm (cfs)	10-Year Storm (cfs)	25-Year Storm (cfs)	100-Year Storm (cfs)
1 (DP1)	9.23	13.52	16.26	19.59
2 (DP2)	0.08	0.12	0.15	0.19

*cfs = cubic feet per second

2.6 Proposed Stormwater Management

2.6.1 Proposed Drainage System

The proposed drainage system consists of catch basins, manholes, roof drains and area drains, HDPE high density polyethylene pipe (sized for a 25 year storm), permeable pavers and water quality treatment devices. Water quality treatment includes catch basins equipped with 4-foot sumps and hooded outlets, permeable pavers set on a 12" thick bed of stone and two (2) Contech CDS water quality treatment units. All runoff from the site will be treated prior to discharging offsite.

2.6.2 Proposed Watershed

For the analysis of proposed storm water conditions the project area is divided into eight (8) subcatchment areas. Characteristics of each subcatchment area are noted below and shown on Figure 4, *Proposed Conditions Watershed Map.*

- Subcatchment S1a consists of pervious and impervious surfaces and discharges into proposed catch basins and the proposed drainage system on-site and flows towards DP-1.
- Subcatchments R1 and R2 consists of roof surface area and discharges via roof leaders/downspouts to the proposed drainage system and flows towards DP-1.
- Subcatchments PP1, PP2, PP3 and PP4 consists of the permeable paver areas which have been conservatively modeled with a CN value of 98 (same as standard impervious pavement). All stormwater will infiltrate through the pavers and receive filtering treatment through the 12" thick stone layer prior to percolating further through the soil or during extreme rain events discharging via 6" diameter perforated overflow pipe to the proposed site drainage system towards DP-1.
- Subcatchment S2 consists of pervious and impervious surfaces and discharges into an existing catch basin and flows towards DP-2.

2.6.3 Proposed Runoff Calculations

In order to determine the peak rate of discharge for proposed conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 Method (refer to Appendix B, HydroCAD® Input/Output). Under the proposed conditions, runoff hydrographs were routed through the existing stormwater management facilities. The proposed stormwater discharge rates are shown in Table 4.

Table 4 Proposed Peak Runoff Rates

Point of Analysis	2-Year Storm (cfs)	10-Year Storm (cfs)	25-Year Storm (cfs)	100-Year Storm (cfs)
1 (DP1)	8.73	12.77	15.33	18.44
2 (DP2)	0.05	0.08	0.10	0.12

*cfs = cubic feet per second

2.6.4 Storm Drainage Pipe System

The proposed closed drainage system was sized for the 25-year storm using the Rational Method and Manning's Equation. Stormwater runoff from standard pavement impervious areas, permeable paver areas, landscape areas and the building roof drains is conveyed by high-density polyethylene (HDPE) pipe and discharges into an existing manhole on the westerly side of the site, through an existing 24" RCP which ultimately discharges into the BWSC system. See Appendix B for supporting calculations and refer to the Figure 5, *Proposed Catch Basin Area Plan* for the layout of the drainage system.

3.0 DEP Stormwater Management Standards

The proposed stormwater management system complies with the Massachusetts Department of Environmental Protection (MADEP) Stormwater Management Standards. The proposed project meets the criteria of Standard Number 7 as a Redevelopment Project; that is, the site in its existing condition is fully developed and the proposed redevelopment of the site results in no net increase in impervious area. Projects that fall under the Redevelopment Standard can meet certain Stormwater Standards only to the maximum extent feasible, such as Recharge Standard Number 3, which meets the requirement only to the maximum extent practicable, based on the poorly-draining fill material found during on-site soil testing excavations. This project has been designed so that the stormwater management system conforms to all of the other applicable Standards. The Standards are described below.

3.1 Standard No. 1 - Untreated Stormwater

No direct point discharges of untreated stormwater from the site are proposed. The existing drainage system in the parking area and access drives consists of catch basins connected to a series of drain manholes that flow in a westerly direction through the site and discharges off-site into the BWSC system, eventually reaching Dorchester Bay. The existing drainage system is old and pre-dates DEP Stormwater Standards. Existing catch basins are not equipped with four-foot deep sumps or hooded outlets and runoff generated on-site receives no treatment prior to discharging from the site.

A new stormwater management system with Best Management Practices (BMPs) is proposed, consisting of regularly scheduled street sweeping, water filtering permeable pavers, deep sump hooded catch basins and water quality units, designed to collect and treat runoff in post-development conditions. All site runoff goes through this treatment train of water quality devices prior to connecting into the existing site manhole and 24-inch diameter pipe that currently discharges off-site to the BWSC system. Therefore, no direct point discharges of untreated stormwater from the site are proposed.

3.2 Standard No. 2 - Post-Development Peak Discharge Rates

Stormwater management controls were developed for the 2-, 10-, 25-, and 100-year 24-hour storm events. Under existing and proposed conditions, hydrologic analyses were performed utilizing the computer program, HydroCAD®. In order to determine the peak rate of discharge for existing and proposed conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 Method (refer to Appendix B for HydroCAD® Input/Output). Under the proposed conditions, the post-development runoff hydrographs were routed through the proposed drainage system.

The following table summarizes the pre- and post-development peak runoff discharge rates determined in the hydrologic/hydraulic analyses performed for the project site.

Table 5 Comparison of Peak Runoff Rates

Point of Analysis	2-Year Storm (cfs)			10-Year Storm (cfs)			25-Year Storm (cfs)			100-Year Storm (cfs)		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
1 (DP1)	9.23	8.73	-0.50	13.52	12.77	-0.75	16.26	15.33	-0.93	19.59	18.44	-1.15
2 (DP2)	0.08	0.05	-0.03	0.12	0.08	-0.04	0.15	0.10	-0.05	0.19	0.12	-0.07

*cfs = cubic feet per second

As shown in Table 5, proposed peak runoff rates for the project are less than existing conditions for each storm event. The proposed site redevelopment will not increase the runoff to the two Design Points of Analyses, both of which ultimately discharge into the BWSC system.

3.3 Standard No. 3 - Recharge to Groundwater

As previously described, soil conditions at the site are not suitable to provide effective groundwater recharge. The soils encountered during the on-site soil test evaluations indicate the presence of fill material, containing debris and of varying soil texture, consistency and structure and not suitable for providing effective subsurface recharge of stormwater runoff to groundwater.

Given the status as a Redevelopment Project under the criteria of DEP Stormwater Policy, in which certain standards are required to be met "only to the maximum extent practicable", the proposed increase in landscaped/open space area and the use of permeable pavers provide volume towards meeting this standard to the maximum extent practicable.

3.4 Standard No. 4 - TSS Removal

Best Management Practices (BMPs) will be used to provide water quality treatment and removal of Total Suspended Solids (TSS). The following BMPs will be provided on-site: street sweeping, deep sump hooded catch basins, CDS water quality units, and permeable paver filtration systems. These BMPs in total will provide for greater than the required 80% TSS removal. Water Quality Calculations and TSS Removal Worksheet Table are found under Appendix D.

3.4.1 Street Sweeping

A comprehensive source reduction program of regular pavement sweeping, litter removal, and maintenance of trash areas will be implemented at the site to protect water quality by reducing the amount of sediment and pollutants entering the stormwater management system. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilized during rain events and transported to the drainage system. Paved areas will be cleaned and maintained at least twice per year, typically in April and October and possibly more often as needed. In accordance with MADEP standards, a 10% TSS removal rate is credited for this BMP.

3.4.2 Deep Sump Catch Basins

All proposed catch basins on site will include four-foot deep sumps and provided with hooded outlets, which will serve to trap sediment and floatables before entering the drainage system. Catch basins will be inspected quarterly and sumps cleaned when sediment reaches ½ full-depth to ensure that they are working and free of debris. Sediments and hydrocarbons shall be properly handled and disposed of in accordance with local, state, and federal requirements. A TSS removal rate of 25% is credited for this BMP.

3.4.3 Water Quality Units

The proposed design of the on-site drainage system will incorporate two (2) Contech CDS water quality units to provide treatment of runoff from pavement areas prior to discharging to the BWSC system. In accordance with MADEP standards and proven in full scale testing under the NJ Corporation for Advance Technology Program, (NJCAT) 75% TSS removal rate is credited for the CDS units.

3.4.4 Porous Pavement

Porous pavement, consisting of permeable pavers, are proposed in some of the vehicular pavement areas on the site. The paver system includes a water quality filter course to provide water quality treatment by filtering out suspended solids prior to infiltration. The porous pavement bed has been designed to treat more than the minimum requirement of ½" water quality volume and drain within 72 hours. A TSS removal rate of 80% is recommended for porous pavement.

In summary, the incorporation of these BMP's will achieve a cumulative TSS removal rate of greater than 80% for the treatment train. Refer to Appendix E, Water Quality Calculations.

3.5 Standard No. 5 - Higher Potential Pollutant Loads

The proposed site redevelopment project for Boston Teachers Union Health and Welfare Fund is not considered as a use with higher potential pollutant loads. We have reviewed the Massachusetts Stormwater Handbook, Volume 1, Chapter 1, pages 12-13 and have determined that no land uses described in said Handbook will occur with this proposed redevelopment, nor will this project meet the definition of a high-intensity use of 1000 vehicle trips per day or more (both the existing conditions and the proposed project result in total trip generation of approximately 400 trips per day).

3.6 Standard No. 6 - Protection of Critical Areas

Critical areas are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries, and recharge areas for public drinking water supplies. No critical areas are located within the project area; the project site is located outside of any critical area.

3.7 Standard No. 7 - Redevelopment Projects

The proposed project is considered a redevelopment of an existing developed site. The site is previously developed and the proposed redevelopment results in no net increase in impervious area. Projects that fall under Standard #7 as a Redevelopment Project can meet certain Standards only to the maximum extent practicable, such as the Recharge Standard, which is described under Standard Number 3.

3.8 Standard No. 8 – Erosion and Sediment Control

The project will result in the disturbance of greater than one acre of land and therefore requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. The Construction General Permit (CGP) authorizes the discharge of storm water from construction activities.

The SWPPP Plan includes site specific temporary and permanent erosion and sedimentation control practices, including the following:

- Installation and maintenance of stabilized crushed stone construction entrances to prevent sediment tracking on the public ways.
- Installation and maintenance of fiber roll/silt fence barriers and catch basin protection with temporary filter sacks and fiber roll barriers.

- Temporary and permanent stabilization of all slopes by hydro-seed, loam and seed, or erosion control blankets within 14 days of when construction activity in that portion of the site has temporarily or permanently ceased.

- Site specific construction sequencing plans in order to minimize the extent of the disturbance at any given time.

- Construction of temporary diversion swales, as necessary, prior to disturbance to ensure all sediment laden runoff is captured on-site.

The above serves as only the general framework for the SWPPP Plan. The contractor will be responsible for implementing and maintaining each of these controls as shown in the SWPPP and Erosion & Sediment Control Plan.

3.9 Standard No. 9 – Operation & Maintenance Plan

A post-construction Operation and Maintenance (O&M) Plan for the project site has been prepared. The Stormwater Management System will be the overall responsibility of the Property Owner. The Owner will be responsible for post-construction Operation and Maintenance. The O&M Plan with schedule for inspection and maintenance after construction is found in Appendix E.

3.10 Standard No. 10 – Prohibition of Illicit Discharge

Illicit discharges to the on-site stormwater management system and to the off-site existing BWSC system are prohibited. The project does not include any new points of connections to the system. No illicit discharges/connections to the drainage system or discharges to or from the on-site system will be made.

4.0 Conclusion

The Stormwater Management System addresses both the quantity and quality of stormwater runoff from the site and conforms to the applicable standards outlined by the Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook.

The existing drainage system is old and pre-dates DEP Stormwater Standards. Existing catch basins are not equipped with four-foot deep sumps or hooded outlets and runoff generated on-site receives no treatment prior to discharging from the site. Because the project results in no net increase in impervious area on a previously developed site, it meets criteria to qualify as a "redevelopment project" under the definition of Standard 7 in the Massachusetts DEP Stormwater Handbook.

Soil conditions at the site are not suitable to provide effective groundwater recharge. The soils encountered during the on-site soil test evaluations indicate the presence of fill material containing debris and of varying soil texture, consistency and structure; not suitable for providing effective subsurface recharge of stormwater runoff to groundwater. Four feet of naturally occurring pervious material is not present and therefore, a subsurface infiltration/recharge system should not and cannot be designed or constructed within the existing fill material at this site. Given the status as a Redevelopment Project under the criteria of DEP Stormwater Policy, in which certain standards are required to be met "only to the maximum extent practicable", the proposed increase in landscaped/open space area and the use of permeable pavers provide volume towards meeting the recharge standard to the maximum extent practicable.

The proposed drainage system consists of catch basins, manholes, roof drains and area drains, HDPE high density polyethylene pipe (sized for a 25 year storm), permeable pavers and water quality treatment devices. Water quality treatment includes catch basins equipped with 4-foot sumps and hooded outlets, permeable pavers set on a 12" thick bed of stone and two (2) CDS water quality treatment units. All runoff from the site will be treated prior to discharging offsite.

The proposed drainage network of pipes will tie into the existing site manhole and 24-inch diameter pipe that currently discharges off-site towards the Boston Water and Sewer Commission (BWSC) system. Hydrologic analyses were performed and stormwater management controls, under existing and proposed conditions, were analyzed for the 2-, 10-, 25-, and 100-year 24-hour storm events utilizing the computer program, HydroCAD®. The design analyses for each storm event results in proposed peak runoff rates that are less than rates for existing conditions; i.e., the project results in a reduction in impervious surface area and therefore, a reduction in associated runoff.

The proposed site redevelopment will not increase runoff to the BWSC system, development impacts have been limited and stormwater runoff controlled and treated.

Appendix A

MADEP Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
GLENN K. DOUGHERTY
CIVIL
NO. 37924
REGISTERED
PROFESSIONAL ENGINEER

1/5/2015
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☐ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☒ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

  ☐ is within the Zone II or Interim Wellhead Protection Area

  ☐ is near or to other critical areas

  ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

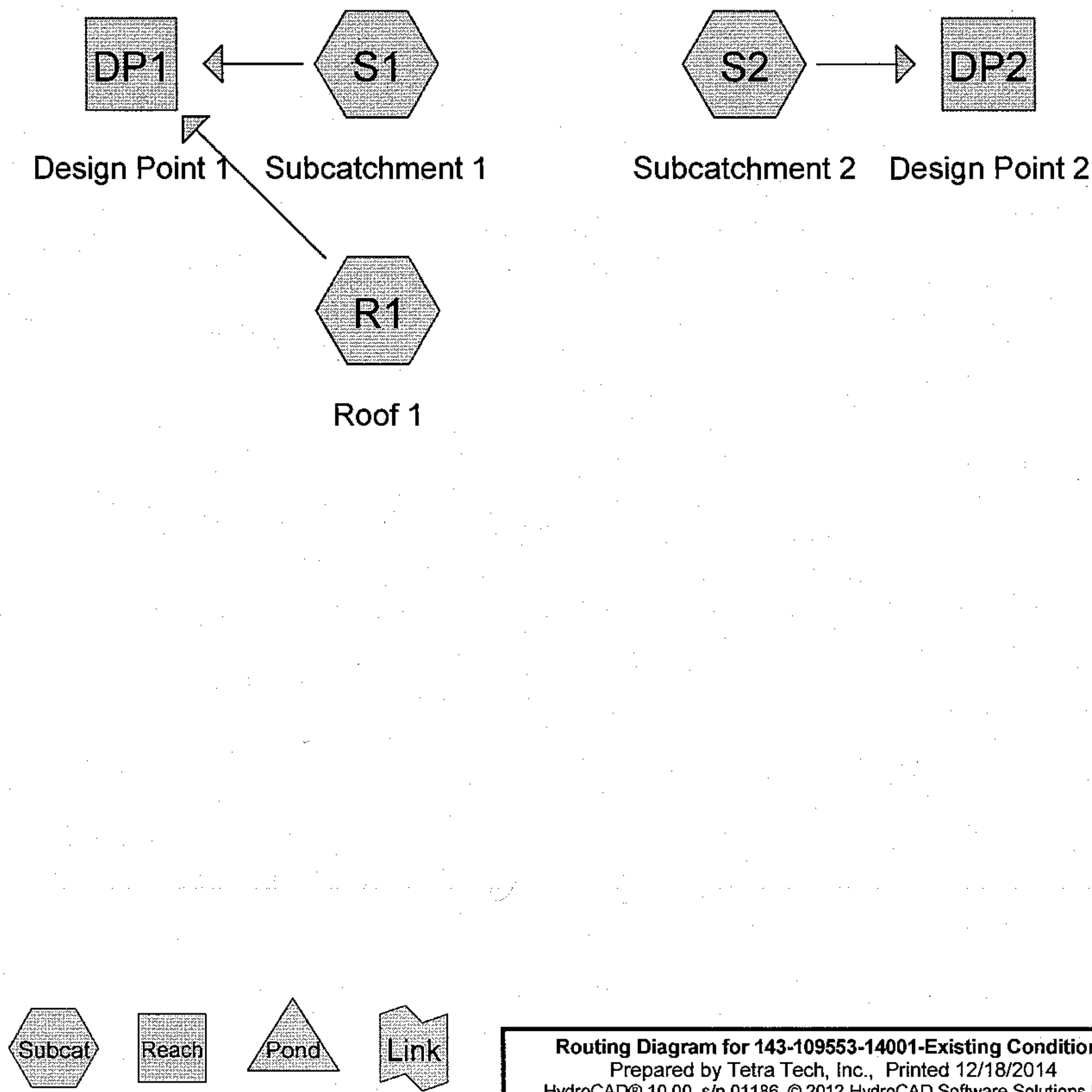
☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Appendix B

HydroCAD® Input/Output & StormCAD Calculations



Routing Diagram for 143-109553-14001-Existing Conditions
Prepared by Tetra Tech, Inc., Printed 12/18/2014
HydroCAD® 10.00 s/n 01186 © 2012 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.210	80	>75% Grass cover, Good, HSG D (S1, S2)
2.110	98	Pavement (S1, S2)
0.760	98	Roof (R1)
3.080	**97**	**TOTAL AREA**

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment R1: Roof 1 Runoff Area=0.760 ac 100.00% Impervious Runoff Depth>2.83"
Tc=6.0 min CN=98 Runoff=2.36 cfs 0.179 af

Subcatchment S1: Subcatchment 1 Runoff Area=2.290 ac 91.27% Impervious Runoff Depth>2.61"
Flow Length=619' Tc=6.0 min CN=96 Runoff=6.87 cfs 0.498 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.030 ac 66.67% Impervious Runoff Depth>2.22"
Flow Length=105' Tc=6.0 min CN=92 Runoff=0.08 cfs 0.006 af

Reach DP1: Design Point 1 Inflow=9.23 cfs 0.677 af
Outflow=9.23 cfs 0.677 af

Reach DP2: Design Point 2 Inflow=0.08 cfs 0.006 af
Outflow=0.08 cfs 0.006 af

Total Runoff Area = 3.080 ac Runoff Volume = 0.683 af Average Runoff Depth = 2.66"
6.82% Pervious = 0.210 ac 93.18% Impervious = 2.870 ac

Summary for Subcatchment R1: Roof 1

Runoff = 2.36 cfs @ 12.08 hrs, Volume= 0.179 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.760	98	Roof
	0.760		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1: Subcatchment 1

Runoff = 6.87 cfs @ 12.08 hrs, Volume= 0.498 af, Depth> 2.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	2.090	98	Pavement
	0.200	80	>75% Grass cover, Good, HSG D
	2.290	96	Weighted Average
	0.200		8.73% Pervious Area
	2.090		91.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0300	1.27		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.20"
2.5	190	0.0040	1.28		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	70	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.0	27	0.0410	10.57	5.77	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
0.6	50	0.0010	1.43	1.13	**Pipe Channel, 12" RCP** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.0	142	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections

5.9 619 Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.020	98	Pavement
	0.030	92	Weighted Average
	0.010		33.33% Pervious Area
	0.020		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.050 ac, 93.44% Impervious, Inflow Depth > 2.66" for 2-Year event
Inflow = 9.23 cfs @ 12.08 hrs, Volume= 0.677 af
Outflow = 9.23 cfs @ 12.08 hrs, Volume= 0.677 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.030 ac, 66.67% Impervious, Inflow Depth > 2.22" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment R1: Roof 1 Runoff Area=0.760 ac 100.00% Impervious Runoff Depth>4.16"
Tc=6.0 min CN=98 Runoff=3.42 cfs 0.264 af

Subcatchment S1: Subcatchment 1 Runoff Area=2.290 ac 91.27% Impervious Runoff Depth>3.93"
Flow Length=619' Tc=6.0 min CN=96 Runoff=10.10 cfs 0.751 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.030 ac 66.67% Impervious Runoff Depth>3.50"
Flow Length=105' Tc=6.0 min CN=92 Runoff=0.12 cfs 0.009 af

Reach DP1: Design Point 1 Inflow=13.52 cfs 1.014 af
Outflow=13.52 cfs 1.014 af

Reach DP2: Design Point 2 Inflow=0.12 cfs 0.009 af
Outflow=0.12 cfs 0.009 af

Total Runoff Area = 3.080 ac Runoff Volume = 1.023 af Average Runoff Depth = 3.99"
6.82% Pervious = 0.210 ac 93.18% Impervious = 2.870 ac

Summary for Subcatchment R1: Roof 1

Runoff = 3.42 cfs @ 12.08 hrs, Volume= 0.264 af, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	0.760	98	Roof
	0.760		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1: Subcatchment 1

Runoff = 10.10 cfs @ 12.08 hrs, Volume= 0.751 af, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	2.090	98	Pavement
	0.200	80	>75% Grass cover, Good, HSG D
	2.290	96	Weighted Average
	0.200		8.73% Pervious Area
	2.090		91.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0300	1.27		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.20"
2.5	190	0.0040	1.28		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	70	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.0	27	0.0410	10.57	5.77	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
0.6	50	0.0010	1.43	1.13	**Pipe Channel, 12" RCP** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.0	142	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections

5.9 619 Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.020	98	Pavement
	0.030	92	Weighted Average
	0.010		33.33% Pervious Area
	0.020		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.050 ac, 93.44% Impervious, Inflow Depth > 3.99" for 10-Year event
Inflow = 13.52 cfs @ 12.08 hrs, Volume= 1.014 af
Outflow = 13.52 cfs @ 12.08 hrs, Volume= 1.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.030 ac, 66.67% Impervious, Inflow Depth > 3.50" for 10-Year event
Inflow = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af
Outflow = 0.12 cfs @ 12.08 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment R1: Roof 1 Runoff Area=0.760 ac 100.00% Impervious Runoff Depth>5.02"
Tc=6.0 min CN=98 Runoff=4.09 cfs 0.318 af

Subcatchment S1: Subcatchment 1 Runoff Area=2.290 ac 91.27% Impervious Runoff Depth>4.79"
Flow Length=619' Tc=6.0 min CN=96 Runoff=12.16 cfs 0.914 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.030 ac 66.67% Impervious Runoff Depth>4.34"
Flow Length=105' Tc=6.0 min CN=92 Runoff=0.15 cfs 0.011 af

Reach DP1: Design Point 1 Inflow=16.26 cfs 1.232 af
Outflow=16.26 cfs 1.232 af

Reach DP2: Design Point 2 Inflow=0.15 cfs 0.011 af
Outflow=0.15 cfs 0.011 af

Total Runoff Area = 3.080 ac Runoff Volume = 1.243 af Average Runoff Depth = 4.84"
6.82% Pervious = 0.210 ac 93.18% Impervious = 2.870 ac

Summary for Subcatchment R1: Roof 1

Runoff = 4.09 cfs @ 12.08 hrs, Volume= 0.318 af, Depth> 5.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	0.760	98	Roof
	0.760		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1: Subcatchment 1

Runoff = 12.16 cfs @ 12.08 hrs, Volume= 0.914 af, Depth> 4.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	2.090	98	Pavement
	0.200	80	>75% Grass cover, Good, HSG D
	2.290	96	Weighted Average
	0.200		8.73% Pervious Area
	2.090		91.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0300	1.27		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.20"
2.5	190	0.0040	1.28		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	70	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.0	27	0.0410	10.57	5.77	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
0.6	50	0.0010	1.43	1.13	**Pipe Channel, 12" RCP** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.0	142	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections

5.9 619 Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.15 cfs @ 12.08 hrs, Volume= 0.011 af, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.020	98	Pavement
	0.030	92	Weighted Average
	0.010		33.33% Pervious Area
	0.020		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.050 ac, 93.44% Impervious, Inflow Depth > 4.85" for 25-Year event
Inflow = 16.26 cfs @ 12.08 hrs, Volume= 1.232 af
Outflow = 16.26 cfs @ 12.08 hrs, Volume= 1.232 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.030 ac, 66.67% Impervious, Inflow Depth > 4.34" for 25-Year event
Inflow = 0.15 cfs @ 12.08 hrs, Volume= 0.011 af
Outflow = 0.15 cfs @ 12.08 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment R1: Roof 1 Runoff Area=0.760 ac 100.00% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=98 Runoff=4.92 cfs 0.384 af

Subcatchment S1: Subcatchment 1 Runoff Area=2.290 ac 91.27% Impervious Runoff Depth>5.83"
Flow Length=619' Tc=6.0 min CN=96 Runoff=14.68 cfs 1.113 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.030 ac 66.67% Impervious Runoff Depth>5.37"
Flow Length=105' Tc=6.0 min CN=92 Runoff=0.19 cfs 0.013 af

Reach DP1: Design Point 1 Inflow=19.59 cfs 1.498 af
Outflow=19.59 cfs 1.498 af

Reach DP2: Design Point 2 Inflow=0.19 cfs 0.013 af
Outflow=0.19 cfs 0.013 af

Total Runoff Area = 3.080 ac Runoff Volume = 1.511 af Average Runoff Depth = 5.89"
6.82% Pervious = 0.210 ac 93.18% Impervious = 2.870 ac

Summary for Subcatchment R1: Roof 1

Runoff = 4.92 cfs @ 12.08 hrs, Volume= 0.384 af, Depth> 6.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	0.760	98	Roof
	0.760		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1: Subcatchment 1

Runoff = 14.68 cfs @ 12.08 hrs, Volume= 1.113 af, Depth> 5.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	2.090	98	Pavement
	0.200	80	>75% Grass cover, Good, HSG D
	2.290	96	Weighted Average
	0.200		8.73% Pervious Area
	2.090		91.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	30	0.0300	1.27		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.20"
2.5	190	0.0040	1.28		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.6	70	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.0	27	0.0410	10.57	5.77	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
0.6	50	0.0010	1.43	1.13	**Pipe Channel, 12" RCP** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.0	142	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections

5.9 619 Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.19 cfs @ 12.08 hrs, Volume= 0.013 af, Depth> 5.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.020	98	Pavement
	0.030	92	Weighted Average
	0.010		33.33% Pervious Area
	0.020		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

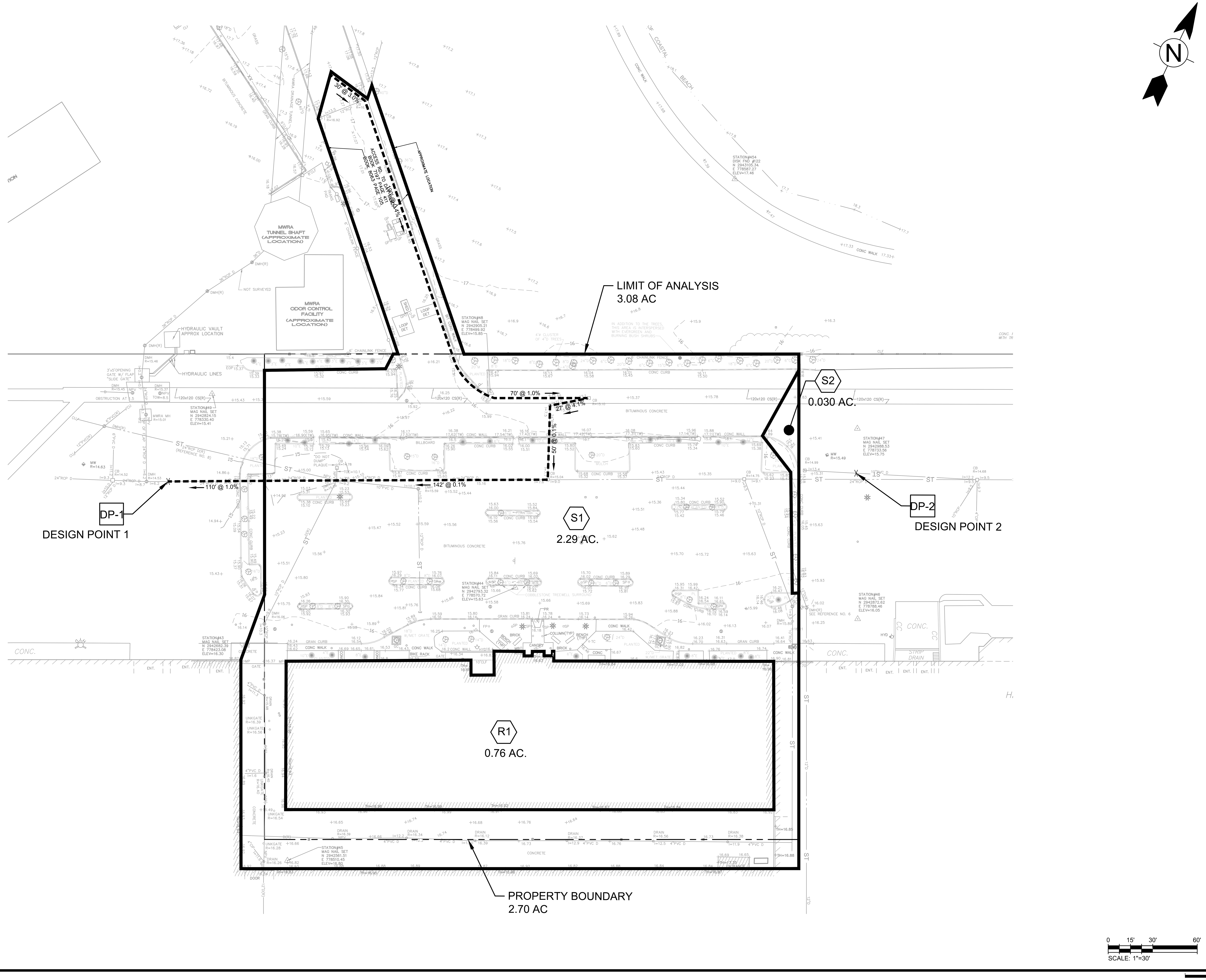
Inflow Area = 3.050 ac, 93.44% Impervious, Inflow Depth > 5.89" for 100-Year event
Inflow = 19.59 cfs @ 12.08 hrs, Volume= 1.498 af
Outflow = 19.59 cfs @ 12.08 hrs, Volume= 1.498 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.030 ac, 66.67% Impervious, Inflow Depth > 5.37" for 100-Year event
Inflow = 0.19 cfs @ 12.08 hrs, Volume= 0.013 af
Outflow = 0.19 cfs @ 12.08 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs



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MARK	DATE	DESCRIPTION	BY
1	1-12-15	INITIAL SUBMISSION	

Client: BTU/HWF Building Corporation
Proj. Loc.: 188 Mount Vernon Street, Boston (Dorchester) MA 02125
Site Development Plans - Building Replacement Project

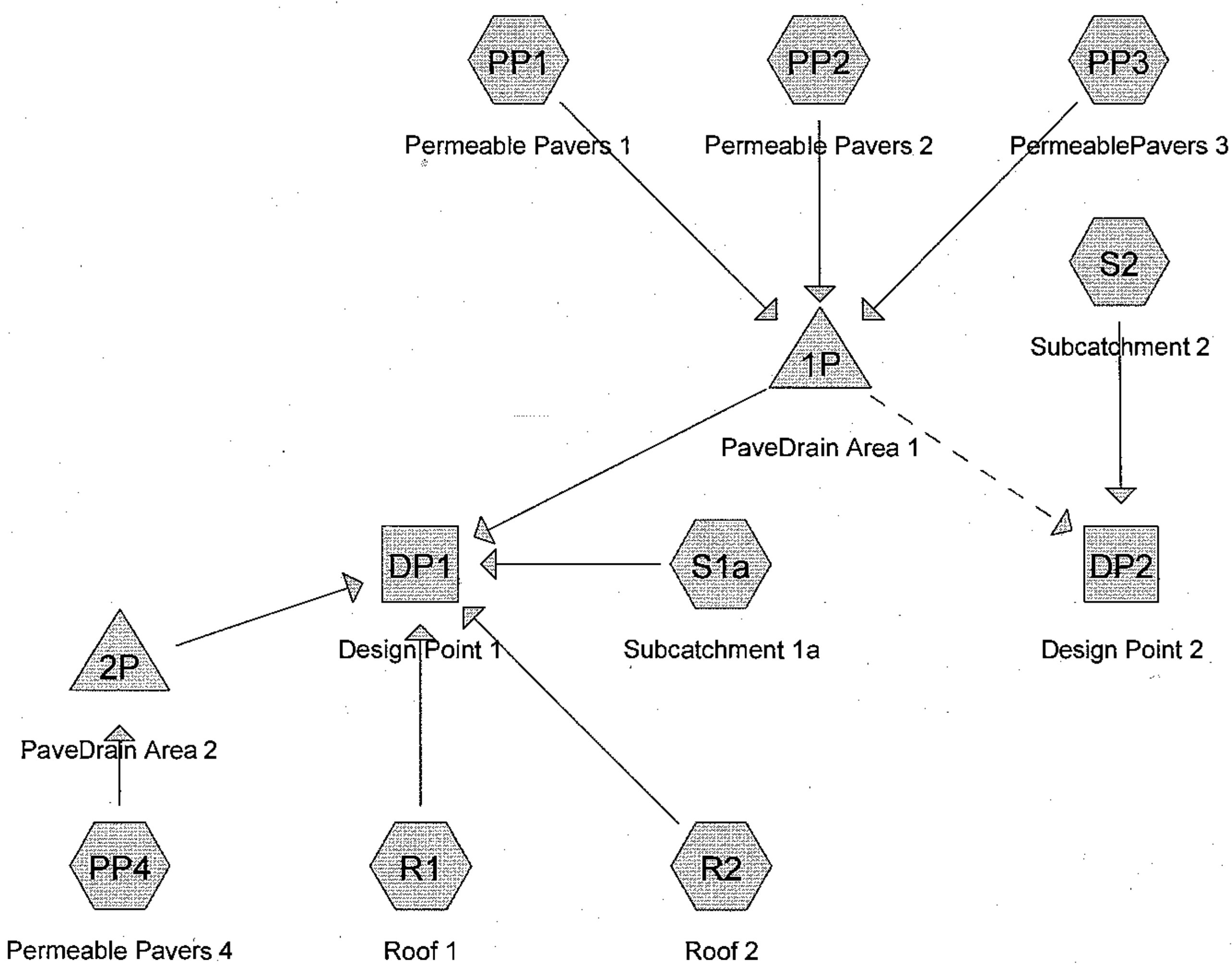
Existing Conditions Watershed Plan

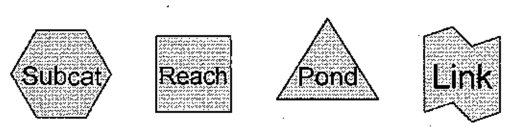
Project No.:	143-109553-14001
Designed By:	R.D.A.
Drawn By:	J.L.P.
Checked By:	

Figure 3

Bar Measures 1 inch

1/8/2015 12:01:40 PM - P:\109553\143-109553-14001\CAD\SUPPORTFILES\143-109553-14001-E-SUBCATCHMENT-AREAS.DWG - PAPPAS, JUD





Routing Diagram for 143-109553-14001-Proposed Conditions
Prepared by Tetra Tech, Inc., Printed 12/29/2014
HydroCAD® 10.00 s/n 01603 © 2012 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.370	80	>75% Grass cover, Good, HSG D (PP1, PP2, PP3, S1a, S2)
1.820	98	Pavement (PP1, PP2, PP3, PP4, S1a, S2)
0.150	98	Permeable Pavers (PP1, PP2, PP3, PP4)
0.740	98	Roof (R1, R2)
3.080	**96**	**TOTAL AREA**

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PP1: Permeable Pavers 1 Runoff Area=0.060 ac 66.67% Impervious Runoff Depth>2.22"
Tc=6.0 min CN=92 Runoff=0.16 cfs 0.011 af

Subcatchment PP2: Permeable Pavers 2 Runoff Area=0.130 ac 69.23% Impervious Runoff Depth>2.22"
Tc=6.0 min CN=92 Runoff=0.35 cfs 0.024 af

Subcatchment PP3: PermeablePavers 3 Runoff Area=0.120 ac 66.67% Impervious Runoff Depth>2.22"
Tc=6.0 min CN=92 Runoff=0.32 cfs 0.022 af

Subcatchment PP4: Permeable Pavers 4 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>2.83"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment R1: Roof 1 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>2.83"
Tc=6.0 min CN=98 Runoff=1.15 cfs 0.087 af

Subcatchment R2: Roof 2 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>2.83"
Tc=6.0 min CN=98 Runoff=1.15 cfs 0.087 af

Subcatchment S1a: Subcatchment 1a Runoff Area=1.990 ac 86.93% Impervious Runoff Depth>2.61"
Flow Length=671' Tc=6.0 min CN=96 Runoff=5.97 cfs 0.433 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.020 ac 50.00% Impervious Runoff Depth>1.95"
Flow Length=105' Tc=6.0 min CN=89 Runoff=0.05 cfs 0.003 af

Reach DP1: Design Point 1 Inflow=8.73 cfs 0.668 af
Outflow=8.73 cfs 0.668 af

Reach DP2: Design Point 2 Inflow=0.05 cfs 0.003 af
Outflow=0.05 cfs 0.003 af

Pond 1P: PaveDrain Area 1 Peak Elev=14.53' Storage=0.011 af Inflow=0.83 cfs 0.057 af
Primary=0.50 cfs 0.056 af Secondary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.056 af

Pond 2P: PaveDrain Area 2 Peak Elev=17.64' Storage=0.000 af Inflow=0.06 cfs 0.005 af
6.0" Round Culvert n=0.010 L=20.0' S=0.0200 '/' Outflow=0.06 cfs 0.005 af

Total Runoff Area = 3.080 ac Runoff Volume = 0.672 af Average Runoff Depth = 2.62"
12.01% Pervious = 0.370 ac 87.99% Impervious = 2.710 ac

Summary for Subcatchment PP1: Permeable Pavers 1

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.020	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
*	0.030	98	Permeable Pavers
	0.060	92	Weighted Average
	0.020		33.33% Pervious Area
	0.040		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP2: Permeable Pavers 2

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.060	98	Permeable Pavers
	0.130	92	Weighted Average
	0.040		30.77% Pervious Area
	0.090		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP3: PermeablePavers 3

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.022 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.050	98	Permeable Pavers
	0.120	92	Weighted Average
	0.040		33.33% Pervious Area
	0.080		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP4: Permeable Pavers 4

Runoff = 0.06 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.010	98	Pavement
*	0.010	98	Permeable Pavers
	0.020	98	Weighted Average
	0.020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment R1: Roof 1

Runoff = 1.15 cfs @ 12.08 hrs, Volume= 0.087 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment R2: Roof 2

Runoff = 1.15 cfs @ 12.08 hrs, Volume= 0.087 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1a: Subcatchment 1a

Runoff = 5.97 cfs @ 12.08 hrs, Volume= 0.433 af, Depth> 2.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
*	1.730	98	Pavement
	0.260	80	>75% Grass cover, Good, HSG D
	1.990	96	Weighted Average
	0.260		13.07% Pervious Area
	1.730		86.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	37	0.0050	0.65		**Sheet Flow, Landscape** Smooth surfaces n= 0.011 P2= 3.20"
0.3	50	0.0230	3.08		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.2	70	0.0120	6.46	5.07	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	88	0.0050	4.17	3.28	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	117	0.0050	4.84	5.94	**Pipe Channel, 15" HDPE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010 PVC, smooth interior
0.1	46	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.3	100	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.1	35	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	14	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	4	0.0380	18.25	57.33	**Pipe Channel, 24" HDPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.010 PVC, smooth interior
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
3.6	671	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.003 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
	0.020	89	Weighted Average
	0.010		50.00% Pervious Area
	0.010		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.060 ac, 88.24% Impervious, Inflow Depth > 2.62" for 2-Year event
Inflow = 8.73 cfs @ 12.09 hrs, Volume= 0.668 af
Outflow = 8.73 cfs @ 12.09 hrs, Volume= 0.668 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.020 ac, 50.00% Impervious, Inflow Depth > 1.95" for 2-Year event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.003 af
Outflow = 0.05 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: PaveDrain Area 1

Inflow Area = 0.310 ac, 67.74% Impervious, Inflow Depth > 2.22" for 2-Year event
Inflow = 0.83 cfs @ 12.09 hrs, Volume= 0.057 af
Outflow = 0.50 cfs @ 12.19 hrs, Volume= 0.056 af, Atten= 40%, Lag= 6.4 min
Primary = 0.50 cfs @ 12.19 hrs, Volume= 0.056 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 14.53' @ 12.19 hrs Surf.Area= 0.072 ac Storage= 0.011 af

Plug-Flow detention time= 33.1 min calculated for 0.056 af (98% of inflow)
Center-of-Mass det. time= 23.1 min (789.6 - 766.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.014 af	**32.00'W x 198.00'L x 0.47'H PaveDrain** 0.068 af Overall x 20.0% Voids
#2	14.00'	0.022 af	**32.00'W x 98.00'L x 1.00'H Stone Base** 0.072 af Overall x 30.0% Voids
		0.035 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	14.00'	**6.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.80' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Secondary	15.60'	**32.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.50 cfs @ 12.19 hrs HW=14.53' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.50 cfs @ 2.54 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: PaveDrain Area 2

Inflow Area = 0.020 ac,100.00% Impervious, Inflow Depth > 2.83" for 2-Year event
Inflow = 0.06 cfs @ 12.08 hrs, Volume= 0.005 af
Outflow = 0.06 cfs @ 12.12 hrs, Volume= 0.005 af, Atten= 11%, Lag= 2.5 min
Primary = 0.06 cfs @ 12.12 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 17.64' @ 12.12 hrs Surf.Area= 0.010 ac Storage= 0.000 af

Plug-Flow detention time= 16.9 min calculated for 0.005 af (99% of inflow)
Center-of-Mass det. time= 12.2 min (740.9 - 728.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.50'	0.001 af	**8.00'W x 55.00'L x 0.47'H PaveDrain** 0.005 af Overall x 20.0% Voids
#2	17.50'	0.003 af	**8.00'W x 55.00'L x 1.00'H Stone Base** 0.010 af Overall x 30.0% Voids
		0.004 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Round Culvert** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 17.50' / 17.10' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.06 cfs @ 12.12 hrs HW=17.64' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.06 cfs @ 1.26 fps)

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PP1: Permeable Pavers 1 Runoff Area=0.060 ac 66.67% Impervious Runoff Depth>3.50"
Tc=6.0 min CN=92 Runoff=0.25 cfs 0.018 af

Subcatchment PP2: Permeable Pavers 2 Runoff Area=0.130 ac 69.23% Impervious Runoff Depth>3.50"
Tc=6.0 min CN=92 Runoff=0.54 cfs 0.038 af

Subcatchment PP3: PermeablePavers 3 Runoff Area=0.120 ac 66.67% Impervious Runoff Depth>3.50"
Tc=6.0 min CN=92 Runoff=0.50 cfs 0.035 af

Subcatchment PP4: Permeable Pavers 4 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>4.16"
Tc=6.0 min CN=98 Runoff=0.09 cfs 0.007 af

Subcatchment R1: Roof 1 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>4.16"
Tc=6.0 min CN=98 Runoff=1.66 cfs 0.128 af

Subcatchment R2: Roof 2 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>4.16"
Tc=6.0 min CN=98 Runoff=1.66 cfs 0.128 af

Subcatchment S1a: Subcatchment 1a Runoff Area=1.990 ac 86.93% Impervious Runoff Depth>3.93"
Flow Length=671' Tc=6.0 min CN=96 Runoff=8.78 cfs 0.652 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.020 ac 50.00% Impervious Runoff Depth>3.20"
Flow Length=105' Tc=6.0 min CN=89 Runoff=0.08 cfs 0.005 af

Reach DP1: Design Point 1 Inflow=12.77 cfs 1.005 af
Outflow=12.77 cfs 1.005 af

Reach DP2: Design Point 2 Inflow=0.08 cfs 0.005 af
Outflow=0.08 cfs 0.005 af

Pond 1P: PaveDrain Area 1 Peak Elev=14.80' Storage=0.017 af Inflow=1.28 cfs 0.090 af
Primary=0.70 cfs 0.089 af Secondary=0.00 cfs 0.000 af Outflow=0.70 cfs 0.089 af

Pond 2P: PaveDrain Area 2 Peak Elev=17.67' Storage=0.001 af Inflow=0.09 cfs 0.007 af
6.0" Round Culvert n=0.010 L=20.0' S=0.0200 '/' Outflow=0.08 cfs 0.007 af

Total Runoff Area = 3.080 ac Runoff Volume = 1.012 af Average Runoff Depth = 3.94"
12.01% Pervious = 0.370 ac 87.99% Impervious = 2.710 ac

Summary for Subcatchment PP1: Permeable Pavers 1

Runoff = 0.25 cfs @ 12.08 hrs, Volume= 0.018 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	0.020	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
*	0.030	98	Permeable Pavers
	0.060	92	Weighted Average
	0.020		33.33% Pervious Area
	0.040		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP2: Permeable Pavers 2

Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.038 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.060	98	Permeable Pavers
	0.130	92	Weighted Average
	0.040		30.77% Pervious Area
	0.090		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP3: PermeablePavers 3

Runoff = 0.50 cfs @ 12.08 hrs, Volume= 0.035 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.050	98	Permeable Pavers
	0.120	92	Weighted Average
	0.040		33.33% Pervious Area
	0.080		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP4: Permeable Pavers 4

Runoff = 0.09 cfs @ 12.08 hrs, Volume= 0.007 af, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	0.010	98	Pavement
*	0.010	98	Permeable Pavers
	0.020	98	Weighted Average
	0.020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment R1: Roof 1

Runoff = 1.66 cfs @ 12.08 hrs, Volume= 0.128 af, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment R2: Roof 2

Runoff = 1.66 cfs @ 12.08 hrs, Volume= 0.128 af, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1a: Subcatchment 1a

Runoff = 8.78 cfs @ 12.08 hrs, Volume= 0.652 af, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
*	1.730	98	Pavement
	0.260	80	>75% Grass cover, Good, HSG D
	1.990	96	Weighted Average
	0.260		13.07% Pervious Area
	1.730		86.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	37	0.0050	0.65		**Sheet Flow, Landscape** Smooth surfaces n= 0.011 P2= 3.20"
0.3	50	0.0230	3.08		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.2	70	0.0120	6.46	5.07	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	88	0.0050	4.17	3.28	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	117	0.0050	4.84	5.94	**Pipe Channel, 15" HDPE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010 PVC, smooth interior
0.1	46	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.3	100	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.1	35	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	14	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	4	0.0380	18.25	57.33	**Pipe Channel, 24" HDPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.010 PVC, smooth interior
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
3.6	671	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.005 af, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.60"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
	0.020	89	Weighted Average
	0.010		50.00% Pervious Area
	0.010		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.060 ac, 88.24% Impervious, Inflow Depth > 3.94" for 10-Year event
Inflow = 12.77 cfs @ 12.08 hrs, Volume= 1.005 af
Outflow = 12.77 cfs @ 12.08 hrs, Volume= 1.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.020 ac, 50.00% Impervious, Inflow Depth > 3.20" for 10-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.005 af
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: PaveDrain Area 1

Inflow Area = 0.310 ac, 67.74% Impervious, Inflow Depth > 3.50" for 10-Year event
Inflow = 1.28 cfs @ 12.08 hrs, Volume= 0.090 af
Outflow = 0.70 cfs @ 12.21 hrs, Volume= 0.089 af, Atten= 46%, Lag= 7.4 min
Primary = 0.70 cfs @ 12.21 hrs, Volume= 0.089 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 14.80' @ 12.21 hrs Surf.Area= 0.072 ac Storage= 0.017 af

Plug-Flow detention time= 29.0 min calculated for 0.089 af (98% of inflow)
Center-of-Mass det. time= 21.0 min (776.6 - 755.6)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.014 af	**32.00'W x 198.00'L x 0.47'H PaveDrain** 0.068 af Overall x 20.0% Voids
#2	14.00'	0.022 af	**32.00'W x 98.00'L x 1.00'H Stone Base** 0.072 af Overall x 30.0% Voids
		0.035 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	14.00'	**6.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.80' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Secondary	15.60'	**32.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.70 cfs @ 12.21 hrs HW=14.80' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.70 cfs @ 3.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: PaveDrain Area 2

Inflow Area =	0.020 ac,100.00% Impervious,	Inflow Depth > 4.16"	for 10-Year event	
Inflow =	0.09 cfs @	12.08 hrs, Volume=	0.007 af	
Outflow =	0.08 cfs @	12.12 hrs, Volume=	0.007 af,	Atten= 9%, Lag= 2.2 min
Primary =	0.08 cfs @	12.12 hrs, Volume=	0.007 af	

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 17.67' @ 12.12 hrs Surf.Area= 0.010 ac Storage= 0.001 af

Plug-Flow detention time= 14.5 min calculated for 0.007 af (99% of inflow)
Center-of-Mass det. time= 10.7 min (732.6 - 721.9)

Volume	Invert	Avail.Storage	Storage Description
#1	18.50'	0.001 af	**8.00'W x 55.00'L x 0.47'H PaveDrain** 0.005 af Overall x 20.0% Voids
#2	17.50'	0.003 af	**8.00'W x 55.00'L x 1.00'H Stone Base** 0.010 af Overall x 30.0% Voids
		0.004 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Round Culvert** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 17.50' / 17.10' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.08 cfs @ 12.12 hrs HW=17.67' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.08 cfs @ 1.40 fps)

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PP1: Permeable Pavers 1 Runoff Area=0.060 ac 66.67% Impervious Runoff Depth>4.34"
Tc=6.0 min CN=92 Runoff=0.30 cfs 0.022 af

Subcatchment PP2: Permeable Pavers 2 Runoff Area=0.130 ac 69.23% Impervious Runoff Depth>4.34"
Tc=6.0 min CN=92 Runoff=0.66 cfs 0.047 af

Subcatchment PP3: PermeablePavers 3 Runoff Area=0.120 ac 66.67% Impervious Runoff Depth>4.34"
Tc=6.0 min CN=92 Runoff=0.61 cfs 0.043 af

Subcatchment PP4: Permeable Pavers 4 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>5.02"
Tc=6.0 min CN=98 Runoff=0.11 cfs 0.008 af

Subcatchment R1: Roof 1 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>5.02"
Tc=6.0 min CN=98 Runoff=1.99 cfs 0.155 af

Subcatchment R2: Roof 2 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>5.02"
Tc=6.0 min CN=98 Runoff=1.99 cfs 0.155 af

Subcatchment S1a: Subcatchment 1a Runoff Area=1.990 ac 86.93% Impervious Runoff Depth>4.79"
Flow Length=671' Tc=6.0 min CN=96 Runoff=10.57 cfs 0.794 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.020 ac 50.00% Impervious Runoff Depth>4.02"
Flow Length=105' Tc=6.0 min CN=89 Runoff=0.10 cfs 0.007 af

Reach DP1: Design Point 1 Inflow=15.33 cfs 1.222 af
Outflow=15.33 cfs 1.222 af

Reach DP2: Design Point 2 Inflow=0.10 cfs 0.007 af
Outflow=0.10 cfs 0.007 af

Pond 1P: PaveDrain Area 1 Peak Elev=14.98' Storage=0.021 af Inflow=1.57 cfs 0.112 af
Primary=0.81 cfs 0.110 af Secondary=0.00 cfs 0.000 af Outflow=0.81 cfs 0.110 af

Pond 2P: PaveDrain Area 2 Peak Elev=17.69' Storage=0.001 af Inflow=0.11 cfs 0.008 af
6.0" Round Culvert n=0.010 L=20.0' S=0.0200 '/' Outflow=0.10 cfs 0.008 af

Total Runoff Area = 3.080 ac Runoff Volume = 1.231 af Average Runoff Depth = 4.80"
12.01% Pervious = 0.370 ac 87.99% Impervious = 2.710 ac

Summary for Subcatchment PP1: Permeable Pavers 1

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.022 af, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	0.020	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
*	0.030	98	Permeable Pavers
	0.060	92	Weighted Average
	0.020		33.33% Pervious Area
	0.040		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP2: Permeable Pavers 2

Runoff = 0.66 cfs @ 12.08 hrs, Volume= 0.047 af, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.060	98	Permeable Pavers
	0.130	92	Weighted Average
	0.040		30.77% Pervious Area
	0.090		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP3: PermeablePavers 3

Runoff = 0.61 cfs @ 12.08 hrs, Volume= 0.043 af, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.050	98	Permeable Pavers
	0.120	92	Weighted Average
	0.040		33.33% Pervious Area
	0.080		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP4: Permeable Pavers 4

Runoff = 0.11 cfs @ 12.08 hrs, Volume= 0.008 af, Depth> 5.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	0.010	98	Pavement
*	0.010	98	Permeable Pavers
	0.020	98	Weighted Average
	0.020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment R1: Roof 1

Runoff = 1.99 cfs @ 12.08 hrs, Volume= 0.155 af, Depth> 5.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment R2: Roof 2

Runoff = 1.99 cfs @ 12.08 hrs, Volume= 0.155 af, Depth> 5.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1a: Subcatchment 1a

Runoff = 10.57 cfs @ 12.08 hrs, Volume= 0.794 af, Depth> 4.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
*	1.730	98	Pavement
	0.260	80	>75% Grass cover, Good, HSG D
	1.990	96	Weighted Average
	0.260		13.07% Pervious Area
	1.730		86.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	37	0.0050	0.65		**Sheet Flow, Landscape** Smooth surfaces n= 0.011 P2= 3.20"
0.3	50	0.0230	3.08		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.2	70	0.0120	6.46	5.07	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	88	0.0050	4.17	3.28	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	117	0.0050	4.84	5.94	**Pipe Channel, 15" HDPE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010 PVC, smooth interior
0.1	46	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.3	100	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.1	35	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	14	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	4	0.0380	18.25	57.33	**Pipe Channel, 24" HDPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.010 PVC, smooth interior
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
3.6	671	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 0.007 af, Depth> 4.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
	0.020	89	Weighted Average
	0.010		50.00% Pervious Area
	0.010		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.060 ac, 88.24% Impervious, Inflow Depth > 4.79" for 25-Year event
Inflow = 15.33 cfs @ 12.08 hrs, Volume= 1.222 af
Outflow = 15.33 cfs @ 12.08 hrs, Volume= 1.222 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.020 ac, 50.00% Impervious, Inflow Depth > 4.02" for 25-Year event
Inflow = 0.10 cfs @ 12.09 hrs, Volume= 0.007 af
Outflow = 0.10 cfs @ 12.09 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: PaveDrain Area 1

Inflow Area = 0.310 ac, 67.74% Impervious, Inflow Depth > 4.34" for 25-Year event
Inflow = 1.57 cfs @ 12.08 hrs, Volume= 0.112 af
Outflow = 0.81 cfs @ 12.22 hrs, Volume= 0.110 af, Atten= 48%, Lag= 8.1 min
Primary = 0.81 cfs @ 12.22 hrs, Volume= 0.110 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 14.98' @ 12.22 hrs Surf.Area= 0.072 ac Storage= 0.021 af

Plug-Flow detention time= 27.6 min calculated for 0.110 af (98% of inflow)
Center-of-Mass det. time= 20.4 min (770.9 - 750.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.014 af	**32.00'W x 198.00'L x 0.47'H PaveDrain** 0.068 af Overall x 20.0% Voids
#2	14.00'	0.022 af	**32.00'W x 98.00'L x 1.00'H Stone Base** 0.072 af Overall x 30.0% Voids
		0.035 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	14.00'	**6.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.80' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Secondary	15.60'	**32.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.81 cfs @ 12.22 hrs HW=14.98' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.81 cfs @ 4.13 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: PaveDrain Area 2

Inflow Area = 0.020 ac,100.00% Impervious, Inflow Depth > 5.02" for 25-Year event
Inflow = 0.11 cfs @ 12.08 hrs, Volume= 0.008 af
Outflow = 0.10 cfs @ 12.12 hrs, Volume= 0.008 af, Atten= 8%, Lag= 2.0 min
Primary = 0.10 cfs @ 12.12 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 17.69' @ 12.12 hrs Surf.Area= 0.010 ac Storage= 0.001 af

Plug-Flow detention time= 13.4 min calculated for 0.008 af (99% of inflow)
Center-of-Mass det. time= 9.9 min (729.0 - 719.1)

Volume	Invert	Avail.Storage	Storage Description
#1	18.50'	0.001 af	**8.00'W x 55.00'L x 0.47'H PaveDrain** 0.005 af Overall x 20.0% Voids
#2	17.50'	0.003 af	**8.00'W x 55.00'L x 1.00'H Stone Base** 0.010 af Overall x 30.0% Voids
		0.004 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Round Culvert** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 17.50' / 17.10' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.10 cfs @ 12.12 hrs HW=17.69' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.10 cfs @ 1.47 fps)

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PP1: Permeable Pavers 1 Runoff Area=0.060 ac 66.67% Impervious Runoff Depth>5.37"
Tc=6.0 min CN=92 Runoff=0.37 cfs 0.027 af

Subcatchment PP2: Permeable Pavers 2 Runoff Area=0.130 ac 69.23% Impervious Runoff Depth>5.37"
Tc=6.0 min CN=92 Runoff=0.80 cfs 0.058 af

Subcatchment PP3: PermeablePavers 3 Runoff Area=0.120 ac 66.67% Impervious Runoff Depth>5.37"
Tc=6.0 min CN=92 Runoff=0.74 cfs 0.054 af

Subcatchment PP4: Permeable Pavers 4 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.010 af

Subcatchment R1: Roof 1 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=98 Runoff=2.39 cfs 0.187 af

Subcatchment R2: Roof 2 Runoff Area=0.370 ac 100.00% Impervious Runoff Depth>6.07"
Tc=6.0 min CN=98 Runoff=2.39 cfs 0.187 af

Subcatchment S1a: Subcatchment 1a Runoff Area=1.990 ac 86.93% Impervious Runoff Depth>5.83"
Flow Length=671' Tc=6.0 min CN=96 Runoff=12.75 cfs 0.968 af

Subcatchment S2: Subcatchment 2 Runoff Area=0.020 ac 50.00% Impervious Runoff Depth>5.03"
Flow Length=105' Tc=6.0 min CN=89 Runoff=0.12 cfs 0.008 af

Reach DP1: Design Point 1 Inflow=18.44 cfs 1.489 af
Outflow=18.44 cfs 1.489 af

Reach DP2: Design Point 2 Inflow=0.12 cfs 0.008 af
Outflow=0.12 cfs 0.008 af

Pond 1P: PaveDrain Area 1 Peak Elev=15.18' Storage=0.027 af Inflow=1.92 cfs 0.139 af
Primary=0.91 cfs 0.137 af Secondary=0.00 cfs 0.000 af Outflow=0.91 cfs 0.137 af

Pond 2P: PaveDrain Area 2 Peak Elev=17.71' Storage=0.001 af Inflow=0.13 cfs 0.010 af
6.0" Round Culvert n=0.010 L=20.0' S=0.0200 '/' Outflow=0.12 cfs 0.010 af

Total Runoff Area = 3.080 ac Runoff Volume = 1.499 af Average Runoff Depth = 5.84"
12.01% Pervious = 0.370 ac 87.99% Impervious = 2.710 ac

Summary for Subcatchment PP1: Permeable Pavers 1

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 0.027 af, Depth> 5.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	0.020	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
*	0.030	98	Permeable Pavers
	0.060	92	Weighted Average
	0.020		33.33% Pervious Area
	0.040		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP2: Permeable Pavers 2

Runoff = 0.80 cfs @ 12.08 hrs, Volume= 0.058 af, Depth> 5.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.060	98	Permeable Pavers
	0.130	92	Weighted Average
	0.040		30.77% Pervious Area
	0.090		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP3: PermeablePavers 3

Runoff = 0.74 cfs @ 12.08 hrs, Volume= 0.054 af, Depth> 5.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	0.040	80	>75% Grass cover, Good, HSG D
*	0.030	98	Pavement
*	0.050	98	Permeable Pavers
	0.120	92	Weighted Average
	0.040		33.33% Pervious Area
	0.080		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment PP4: Permeable Pavers 4

Runoff = 0.13 cfs @ 12.08 hrs, Volume= 0.010 af, Depth> 6.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	0.010	98	Pavement
*	0.010	98	Permeable Pavers
	0.020	98	Weighted Average
	0.020		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Permeable Pavers**

Summary for Subcatchment R1: Roof 1

Runoff = 2.39 cfs @ 12.08 hrs, Volume= 0.187 af, Depth> 6.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment R2: Roof 2

Runoff = 2.39 cfs @ 12.08 hrs, Volume= 0.187 af, Depth> 6.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	0.370	98	Roof
	0.370		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Roof Runoff**

Summary for Subcatchment S1a: Subcatchment 1a

Runoff = 12.75 cfs @ 12.08 hrs, Volume= 0.968 af, Depth> 5.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
*	1.730	98	Pavement
	0.260	80	>75% Grass cover, Good, HSG D
	1.990	96	Weighted Average
	0.260		13.07% Pervious Area
	1.730		86.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	37	0.0050	0.65		**Sheet Flow, Landscape** Smooth surfaces n= 0.011 P2= 3.20"
0.3	50	0.0230	3.08		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.2	70	0.0120	6.46	5.07	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	88	0.0050	4.17	3.28	**Pipe Channel, 12" HDPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
0.4	117	0.0050	4.84	5.94	**Pipe Channel, 15" HDPE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010 PVC, smooth interior
0.1	46	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.3	100	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.1	35	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	14	0.0050	5.46	9.66	**Pipe Channel, 18" HDPE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010 PVC, smooth interior
0.0	4	0.0380	18.25	57.33	**Pipe Channel, 24" HDPE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.010 PVC, smooth interior
0.8	110	0.0010	2.28	7.15	**Pipe Channel, 24" RCP** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Concrete pipe, bends & connections
3.6	671	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment S2: Subcatchment 2

Runoff = 0.12 cfs @ 12.08 hrs, Volume= 0.008 af, Depth> 5.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=6.60"

	Area (ac)	CN	Description
	0.010	80	>75% Grass cover, Good, HSG D
*	0.010	98	Pavement
	0.020	89	Weighted Average
	0.010		50.00% Pervious Area
	0.010		50.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	20	0.0050	0.07		**Sheet Flow, Landscaping** Grass: Short n= 0.150 P2= 3.20"
0.5	63	0.0130	2.31		**Shallow Concentrated Flow, Gutter** Paved Kv= 20.3 fps
0.1	22	0.0100	5.22	2.85	**Pipe Channel, 10" PVC** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.010 PVC, smooth interior
5.3	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach DP1: Design Point 1

Inflow Area = 3.060 ac, 88.24% Impervious, Inflow Depth > 5.84" for 100-Year event
Inflow = 18.44 cfs @ 12.08 hrs, Volume= 1.489 af
Outflow = 18.44 cfs @ 12.08 hrs, Volume= 1.489 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Design Point 2

Inflow Area = 0.020 ac, 50.00% Impervious, Inflow Depth > 5.03" for 100-Year event
Inflow = 0.12 cfs @ 12.08 hrs, Volume= 0.008 af
Outflow = 0.12 cfs @ 12.08 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: PaveDrain Area 1

Inflow Area = 0.310 ac, 67.74% Impervious, Inflow Depth > 5.37" for 100-Year event
Inflow = 1.92 cfs @ 12.08 hrs, Volume= 0.139 af
Outflow = 0.91 cfs @ 12.24 hrs, Volume= 0.137 af, Atten= 52%, Lag= 9.4 min
Primary = 0.91 cfs @ 12.24 hrs, Volume= 0.137 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 15.18' @ 12.24 hrs Surf.Area= 0.217 ac Storage= 0.027 af

Plug-Flow detention time= 26.6 min calculated for 0.137 af (98% of inflow)
Center-of-Mass det. time= 20.1 min (765.7 - 745.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.014 af	**32.00'W x 198.00'L x 0.47'H PaveDrain** 0.068 af Overall x 20.0% Voids
#2	14.00'	0.022 af	**32.00'W x 98.00'L x 1.00'H Stone Base** 0.072 af Overall x 30.0% Voids
		0.035 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	14.00'	**6.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.80' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Secondary	15.60'	**32.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.91 cfs @ 12.24 hrs HW=15.18' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.91 cfs @ 4.64 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=14.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (**Controls** 0.00 cfs)

Summary for Pond 2P: PaveDrain Area 2

Inflow Area =	0.020 ac,100.00% Impervious,	Inflow Depth > 6.07"	for 100-Year event	
Inflow =	0.13 cfs @	12.08 hrs, Volume=	0.010 af	
Outflow =	0.12 cfs @	12.12 hrs, Volume=	0.010 af,	Atten= 7%, Lag= 1.9 min
Primary =	0.12 cfs @	12.12 hrs, Volume=	0.010 af	

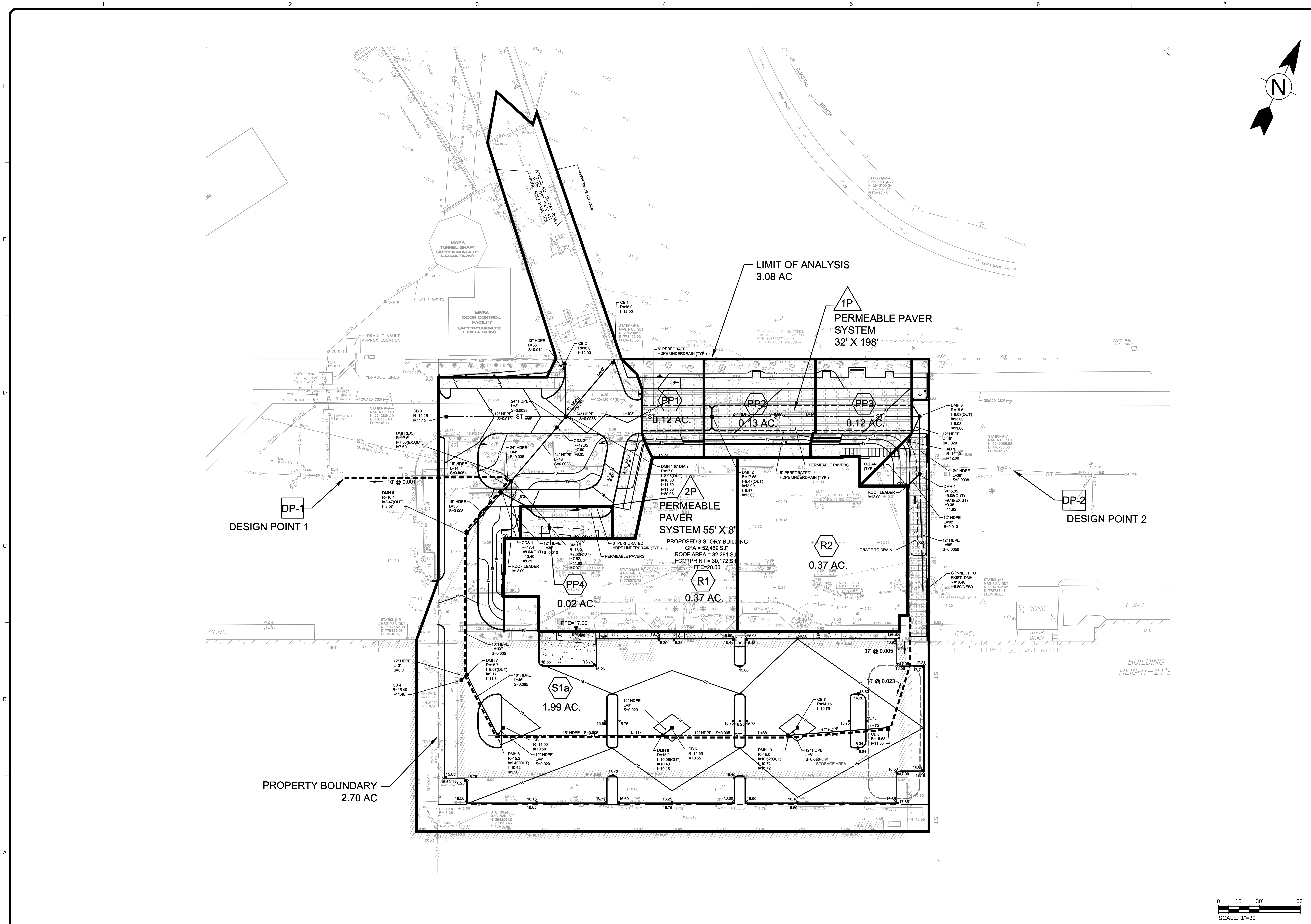
Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Peak Elev= 17.71' @ 12.12 hrs Surf.Area= 0.010 ac Storage= 0.001 af

Plug-Flow detention time= 12.4 min calculated for 0.010 af (99% of inflow)
Center-of-Mass det. time= 9.2 min (725.6 - 716.4)

Volume	Invert	Avail.Storage	Storage Description
#1	18.50'	0.001 af	**8.00'W x 55.00'L x 0.47'H PaveDrain** 0.005 af Overall x 20.0% Voids
#2	17.50'	0.003 af	**8.00'W x 55.00'L x 1.00'H Stone Base** 0.010 af Overall x 30.0% Voids
		0.004 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Round Culvert** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 17.50' / 17.10' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.12 cfs @ 12.12 hrs HW=17.71' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.12 cfs @ 1.55 fps)



TETRA TECH	
www.tetratech.com	
One Grant Street	
Framingham, MA 01701	
PHONE: (508) 903-2000 FAX: (508) 903-2001	

MARK	DATE	DESCRIPTION	BY
1	1-12-15	INITIAL SUBMISSION	

Client: BTUHWF Building Corporation
Proj. Loc.: 188 Mount Vernon Street, Boston (Dorchester) MA 02125

Site Development Plans - Building Replacement Project

Proposed Watershed Plan

Project No.:	143-109553-14001
Designed By:	R.D.A.
Drawn By:	J.L.P.
Checked By:	

Figure 4

Bar Measures 1 inch

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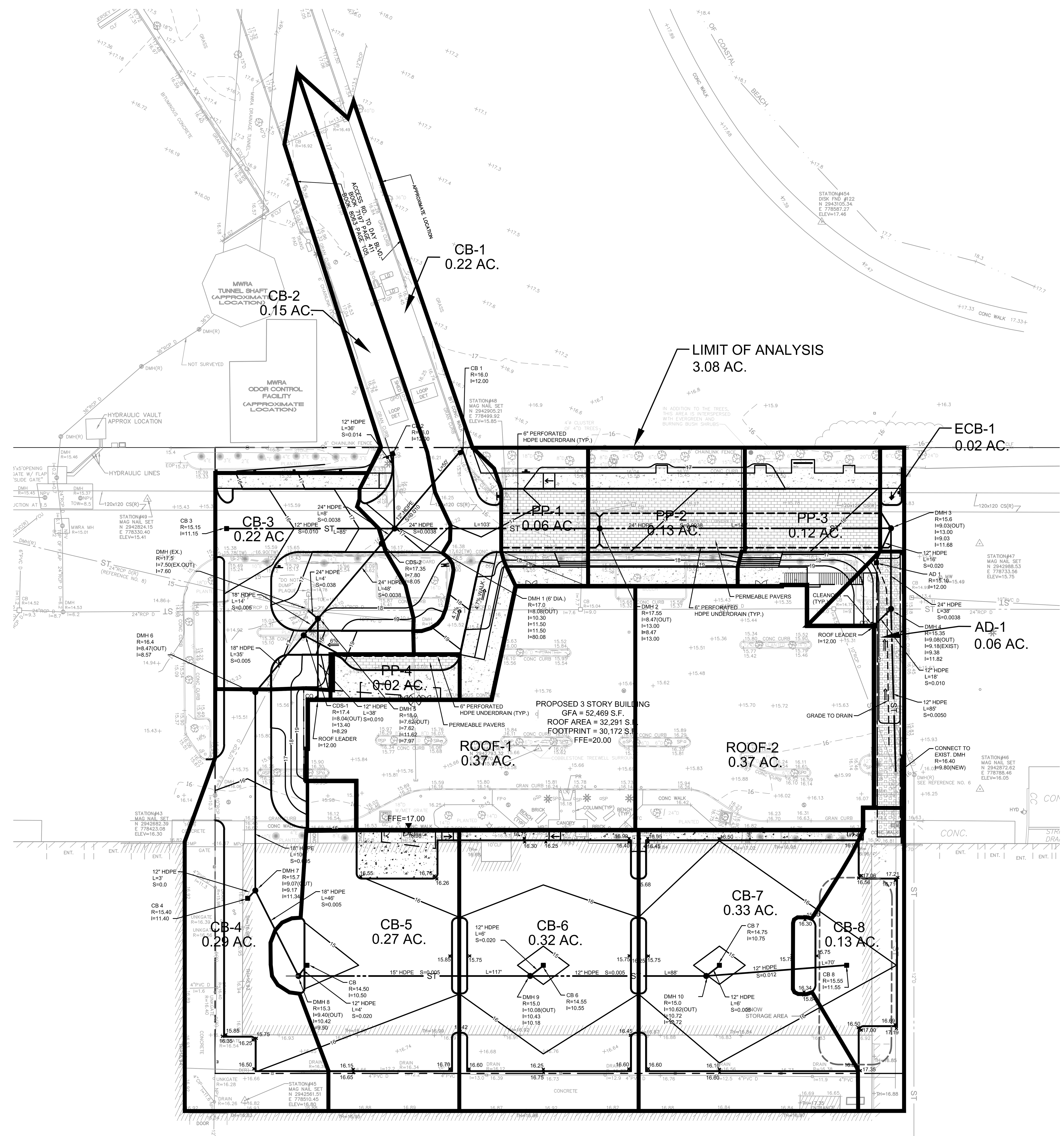

NOTE:
LANDSCAPE DIVIDER ISLANDS (AREA=183 SF) SHOWN IN REAR PARKING LOT ASSUMED TO BE IMPERVIOUS IN PROPOSED HYDROCAD AND STORMCAD ANALYSES TO CONSERVATIVELY SIMULATE FUTURE PHASE II PARKING GARAGE ROOF AREA.

0 15' 30' 60'
SCALE: 1"=30'

TETRA TECH
www.tetratech.com
One Grant Street
Framingham, MA 01701
PHONE: (508) 903-2000 FAX: (508) 903-2001

MARK	DATE	DESCRIPTION	BY
1	1-12-15	INITIAL SUBMISSION	

Client: BTU/HWF Building Corporation
Proj. Loc.: 188 Mount Vernon Street, Boston (Dorchester) MA 02125
Site Development Plans - Building Replacement Project

Proposed Catch Basin Area Plan

Project No.:	143-109553-14001
Designed By:	R.D.A.
Drawn By:	J.L.P.
Checked By:	

Figure 5

Bar Measures 1 inch

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TETRA TECH
25 Year Storm

Project: 188 Mount Vernon Street
City: Boston
State: MA

Proj. No: 143-109553-14001
Date: 13-Dec-14
Comp: CDH
Check :

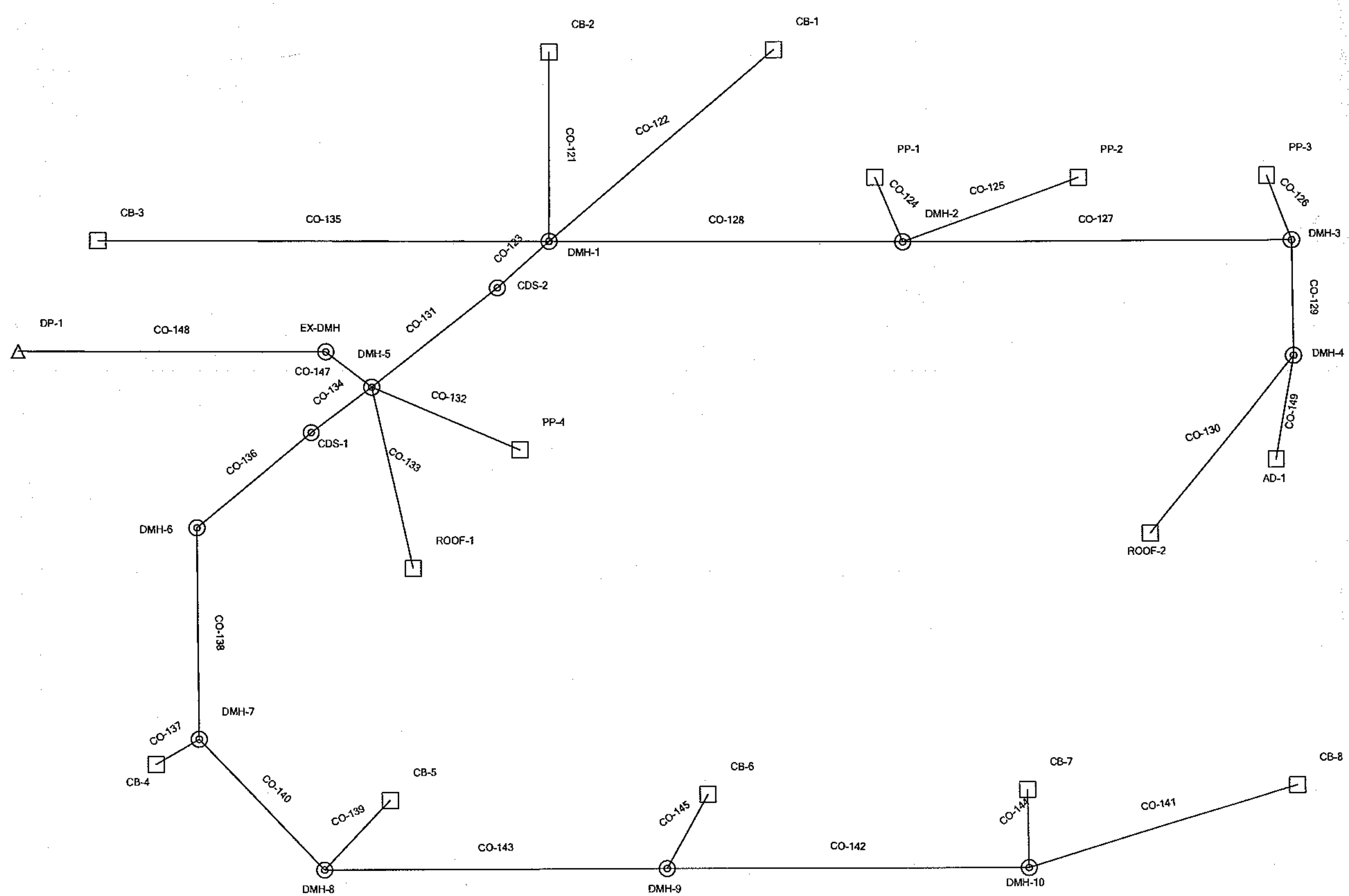
Structure	Pavement / Roof Area (acres)	Pavement / Roof C Factor	Grass / Pervious Area (acres)	Grass / Pervious C Factor	Pervious Pavers Area (acres)	Pervious Pavers C Factor	Total Area (acres)	Composite C	Q (cfs)
CB-1	0.20	0.98	0.02	0.50	0.00	0.40	0.22	0.94	1.24
CB-2	0.13	0.98	0.02	0.50	0.00	0.40	0.15	0.92	0.82
CB-3	0.14	0.98	0.08	0.50	0.00	0.40	0.22	0.81	1.06
CB-4	0.26	0.98	0.03	0.50	0.00	0.40	0.29	0.93	1.62
CB-5	0.27	0.98	0.00	0.50	0.00	0.40	0.27	0.98	1.59
CB-6	0.32	0.98	0.00	0.50	0.00	0.40	0.32	0.98	1.88
CB-7	0.33	0.98	0.00	0.50	0.00	0.40	0.33	0.98	1.94
CB-8	0.08	0.98	0.05	0.50	0.00	0.40	0.13	0.80	0.62
ECB-1	0.01	0.98	0.01	0.50	0.00	0.40	0.02	0.74	0.09
PP-1	0.01	0.98	0.02	0.50	0.03	0.40	0.06	0.53	0.19
PP-2	0.03	0.98	0.04	0.50	0.06	0.40	0.13	0.56	0.44
PP-3	0.03	0.98	0.04	0.50	0.05	0.40	0.12	0.58	0.42
PP-4	0.01	0.98	0.00	0.50	0.01	0.40	0.02	0.69	0.08
ROOF-1	0.37	0.98	0.00	0.50	0.00	0.40	0.37	0.98	2.18
ROOF-2	0.37	0.98	0.00	0.50	0.00	0.40	0.37	0.98	2.18
AD-1	0.00	0.98	0.06	0.50	0.00	0.40	0.06	0.50	0.18
TOTAL	**2.56**		**0.37**		**0.15**		**3.08**		

Notes:
1.) Shaded columns indicate input values.
2.) Storm Event = 25 Year.
3.) Q = Flow = C x I x Area,
where I = 6.0 inches/hour (5 min. duration) for the 25 year storm event.

188 Mount Vernon Street - Boston, MA

Label	Upstream Structure	Upstream Structure Rim Elevation (ft)	Downstream Structure	Downstream Structure Rim Elevation (ft)	Length (ft)	Diameter (in)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Slope (ft/ft)	Flow (ft³/s)	Capacity (Full Flow) (ft³/s)	Velocity (Average) (ft/s)	Upstream Cover (ft)	Downstream Cover (ft)
CO-121	CB-2	16.00	DMH-1	17.00	36.0	12.0	12.00	11.50	0.014	0.82	5.46	5.00	3.00	4.50
CO-122	CB-1	16.00	DMH-1	17.00	50.0	12.0	12.00	11.50	0.010	1.24	4.63	5.00	3.00	4.50
CO-123	DMH-1	17.00	CDS-2	17.35	8.0	24.0	8.08	8.01	0.009	6.53	27.51	7.17	6.92	7.34
CO-124	PP-1	17.00	DMH-2	17.55	10.0	12.0	13.50	13.00	0.050	0.19	10.36	5.11	2.50	3.55
CO-125	PP-2	17.00	DMH-2	17.55	10.0	12.0	13.50	13.00	0.050	0.44	10.36	6.54	2.50	3.55
CO-126	PP-3	16.00	DMH-3	15.60	8.0	12.0	13.50	13.00	0.063	0.42	11.58	6.99	1.50	1.60
CO-127	DMH-3	15.60	DMH-2	17.55	148.0	24.0	9.03	8.47	0.004	2.78	18.09	4.17	4.57	7.08
CO-128	DMH-2	17.55	DMH-1	17.00	103.0	24.0	8.47	8.08	0.004	3.41	18.10	4.42	7.08	6.92
CO-129	DMH-4	15.85	DMH-3	15.60	38.0	24.0	9.18	9.03	0.004	2.36	18.48	4.04	4.67	4.57
CO-130	ROOF-2	16.50	DMH-4	15.85	18.0	12.0	12.00	11.82	0.010	2.18	4.63	5.81	3.50	3.03
CO-131	CD5-2	17.35	DMH-5	18.00	48.0	24.0	8.01	7.62	0.008	6.53	26.51	6.99	7.34	8.38
CO-132	PP-4	19.50	DMH-5	18.00	22.0	12.0	16.00	13.40	0.118	0.08	15.92	5.27	2.50	3.60
CO-133	ROOF-1	18.50	DMH-5	18.00	38.0	12.0	12.00	11.62	0.010	2.18	4.63	5.81	5.50	5.38
CO-134	CDS-1	17.40	DMH-5	18.00	14.0	18.0	8.11	7.97	0.010	7.62	13.65	7.94	7.79	8.53
CO-135	CB-3	15.15	DMH-1	17.00	85.0	12.0	11.15	10.30	0.010	1.06	4.63	4.79	3.00	5.70
CO-136	DMH-6	16.40	CDS-1	17.40	35.0	18.0	8.47	8.11	0.010	7.62	13.85	8.02	6.43	7.79
CO-137	CB-4	15.40	DMH-7	15.70	3.0	12.0	11.40	11.34	0.020	1.62	6.55	6.91	3.00	3.36
CO-138	DMH-7	15.70	DMH-6	16.40	100.0	18.0	9.07	8.57	0.005	7.62	9.66	6.06	5.13	6.33
CO-139	CB-5	14.50	DMH-8	15.30	4.0	12.0	10.50	10.42	0.020	1.56	6.55	6.84	3.00	3.88
CO-140	DMH-8	15.30	DMH-7	15.70	46.0	18.0	9.40	9.17	0.005	6.00	9.66	5.76	4.40	5.03
CO-141	CB-8	15.55	DMH-10	15.00	70.0	12.0	11.55	10.72	0.012	0.62	5.04	4.36	3.00	3.28
CO-142	DMH-10	15.00	DMH-9	15.00	88.0	12.0	10.62	10.18	0.005	2.56	3.27	4.61	3.38	3.82
CO-143	DMH-9	15.00	DMH-8	15.30	117.0	15.0	10.08	9.50	0.005	4.44	5.91	5.29	3.67	4.55
CO-144	CB-7	14.75	DMH-10	15.00	6.0	12.0	10.75	10.72	0.005	1.94	3.27	4.35	3.00	3.28
CO-145	CB-6	14.55	DMH-9	15.00	6.0	12.0	10.55	10.43	0.020	1.88	6.55	7.20	3.00	3.57
CO-147	DMH-5	18.00	EX-DMH	17.50	4.0	24.0	7.62	7.60	0.005	16.41	20.79	7.34	8.38	7.90
CO-148	EX-DMH	17.50	DP-1	14.53	127.0	24.0	7.50	6.20	0.010	16.41	22.89	7.92	8.00	6.33
CO-149	AD-1	16.00	DMH-4	15.85	16.0	12.0	12.00	11.68	0.020	0.18	6.55	3.63	3.00	3.17

188 Mount Vernon Street - Boston, MA



Appendix C

Soil Logs

Commonwealth of Massachusetts
City/Town of Boston

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

BTUHWF Building Corporation
Owner Name

188 Mount Vernon Street
Street Address

4C-4D/03448-300
Map/Lot #

Dorchester
City

MA
State

02125
Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☒ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: Soil Web Survey (Source) Ur (Soil Map Unit)

   Urban (Fill)
   Soil Name

   poor draining, not suitable for infiltration/filtration
   Soil Limitations

   N/A
   Geologic/Parent Material

   N/A
   Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: ____ Year Published/Source ____ Publication ____ Map Unit

4. Flood Rate Insurance Map

   Above the 500-year flood boundary? ☒ Yes ☐ No
   If Yes, continue to #5.

   Within the 500-year flood boundary? ☐ Yes ☒ No

   Within the 100-year flood boundary? ☒ Yes ☐ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No MassGIS Wetland Data Layer: ____ Wetland Type

7. Current Water Resource Conditions (USGS): 11/14 (Month/Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed: ____

Commonwealth of Massachusetts
City/Town of Boston
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1,2,3,4 — Date: 11/11/2014 — Time: 9:00 AM-1:00PM — Weather: Sunny 55-65 degrees

1. Location
   Ground Elevation at Surface of Hole: ______ feet — Latitude/Longitude: ______ / ______
   Description of Location: paved parking area

2. Land Use: paved parking area (e.g., woodland, agricultural field, vacant lot, etc.)
   Surface Stones (e.g., cobbles, stones, boulders, etc.): ______ — Slope (%): ______
   Vegetation: ______ — Landform: ______ — Position on Landscape (SU, SH, BS, FS, TS): ______

3. Distances from: Open Water Body ______ feet — Drainage Way ______ feet — Wetlands ______ feet
   Property Line ______ feet — Drinking Water Well ______ feet — Other ______ feet

4. Parent Material: N/A — Unsuitable Materials Present: ☒ Yes ☐ No
   If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No — If yes: ______ Depth Weeping from Pit — 11' to 14' down Depth Standing Water in Hole
   Estimated Depth to High Groundwater: ______ inches — ______ elevation

Commonwealth of Massachusetts
City/Town of Boston
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-16	Bit Conc Pavement										
16-24	Sand Fill										
24-120	Fill & Debris										

Additional Notes:

Commonwealth of Massachusetts
City/Town of Boston
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	Bit Conc Pavement										
6-10	Sand Fill										
10-180	Fill & Debris										

Additional Notes:

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-5	Bit Conc Pavement										
5-10	Sand Fill										
10-144	Fill & Debris										

Additional Notes:

Commonwealth of Massachusetts
City/Town of Boston
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-5	Bit Conc Pavement										
5-10	Sand Fill										
10-132	Fill & Debris										

Additional Notes:

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:	Obs. Hole # ______	Obs. Hole # ______
☐ Depth observed standing water in observation hole	______ inches	______ inches
☐ Depth weeping from side of observation hole	______ inches	______ inches
☐ Depth to soil redoximorphic features (mottles)	______ inches	______ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	______ inches	______ inches

______ Index Well Number   ______ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ____	S_c ____	S_r ____	OW_c ____	OW_{max} ____	OW_r ____	S_h ____
Obs. Hole # ____	S_c ____	S_r ____	OW_c ____	OW_{max} ____	OW_r ____	S_h ____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☐ No

b. If yes, at what depth was it observed? Upper boundary: ______ inches Lower boundary: ______ inches

c. If no, at what depth was impervious material observed? Upper boundary: ______ inches Lower boundary: ______ inches

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 1 & 2	Obs. Hole # 3 & 4
☒ Depth observed standing water in observation hole	TP-1: No Water TP-2: 168" inches	TP-3: 132" TP-4: 120" inches
☐ Depth weeping from side of observation hole	inches	inches
☐ Depth to soil redoximorphic features (mottles)	inches	inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	inches	inches

Index Well Number ______ Reading Date ______

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole # ____ S_c ____ S_r ____ OW_c ____ OW_{max} ____ OW_r ____ S_h ____

Obs. Hole # ____ S_c ____ S_r ____ OW_c ____ OW_{max} ____ OW_r ____ S_h ____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed? Upper boundary: ____ inches Lower boundary: ____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: ____ inches Lower boundary: ____ inches

Commonwealth of Massachusetts
City/Town of Boston
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	11/11/2014 Date
Glenn K. Dougherty, P.E. / SE-607 Typed or Printed Name of Soil Evaluator / License #	6/30/2016 Expiration Date of License
N/A Name of Board of Health Witness	N/A Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Appendix D

Water Quality Calculations

Calc. By: CDH Date: 19-Dec-14
Chk. By: ________ Date: ________

188 Mount Vernon Street
Boston, MA

Water Quality Volume Calculations

PaveDrain System	A_{IMP} (acres)	D_{WQ} (inches)	V_{WQ} (cubic feet)	Provided Volume (cubic feet)
1P	0.21	0.50	381	1,525
2P	0.02	0.50	36	174
Total	**0.23**		**417**	**1,699**

$V_{WQ} = (D_{WQ}$ / 12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

Where: V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth (in inches)
A_{IMP} = Impervious Area (in acres)

Notes:
1.) Refer to Massachusetts Stormwater Handbook Volume 3, Chapter 1, page 32 dated February 2008.

Tetra Tech

Project: **188 Mount Vernon Street** By: **CDH** Date: **12/22/2014**

Location: **Boston, MA** Chkd: Date:

Watershed Area: **S1a**

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Street Sweeping	0.10	1.00	0.100	0.90
Deep Sump/Hooded Catchbasins	0.25	0.90	0.225	0.68
Water Quality Structures	0.75	0.68	0.506	0.17

* Equals remaining load from previous BMP

Total TSS Removal = 83.1%

Source: Volume Two: Massachusetts Stormwater Handbook, Dated January 2009
prepared by MADEP, Section VI Case studies.

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Tetra Tech

Project: **188 Mount Vernon Street** By: **CDH** Date: **12/22/2014**

Location: **Boston, MA** Chkd: Date:

TSS Removal Calculation Worksheet

Watershed Area: **S2**

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Street Sweeping	0.10	1.00	0.100	0.90
Deep Sump/Hooded Catchbasins	0.25	0.90	0.225	0.68

* Equals remaining load from previous BMP

Total TSS Removal = 32.5%

Source: Volume Two: Massachusetts Stormwater Handbook, Dated January 2009
prepared by MADEP, Section VI Case studies.

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Tetra Tech

Project: **188 Mount Vernon Street** By: **CDH** Date: **12/22/2014**

Location: **Boston, MA** Chkd: Date:

TSS Removal Calculation Worksheet

Watershed Area: **PP1-PP4**

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Permeable Pavers	0.80	1.00	0.800	0.20

* Equals remaining load from previous BMP

Total TSS Removal = 80.0%

Source: Volume Two: Massachusetts Stormwater Handbook, Dated January 2009
prepared by MADEP, Section VI Case studies.

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Tetra Tech

Project: **188 Mount Vernon Street**
Location: **Boston, MA**

By: **CDH**
Chkd:

Date: **12/22/2014**
Date:

Cumulative TSS Removal Rate

Watershed ID	Area (AC)	TSS Removal Rate	Weighted Removal Rate
S1a	1.99	0.83	1.65
S2	0.02	0.33	0.01
PP	0.33	0.80	0.26
Totals	**2.34**		**1.92**

$$\text{Cumulative Rate} = \frac{1.92}{2.34} = 0.821$$

Cumulative Rate = 82%

Project: Boston Teachers Union Health and Welfare Fund
Location: Boston, MA
Prepared for: Glenn Dougherty - Tetra Tech

CONTECH
ENGINEERED SOLUTIONS

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1.0" of runoff.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Given:

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)
CDS-1	1.27	0.0019766	10.0	0.167	1.00
CDS-2	1.06	0.0016625	10.0	0.167	1.00

Procedure:

Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Structure Name	qu (csm/in.)
CDS-1	700.00
CDS-2	700.00

1. Compute Q Rate using the following equation:

$$Q_1 = (qu)\ (A)\ (WQV)$$

where:

Q_1 = flow fate associated with first 1.0" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1.0" in this case)

Structure Name	Q_1 (cfs)
CDS-1	1.38
CDS-2	1.16

CDS ESTIMATED NET ANNUAL TSS REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

CDS

BOSTON TEACHERS UNION HEALTH AND WELFARE FUND
BOSTON, MA
for SYSTEM: CDS-1

CONTECH ENGINEERED SOLUTIONS

Total Area = 1.36 Ac.
Impervious % = 93%
Area = 1.27 Ac.

Area	1.27	acres	CDS Model	2015-4
Weighted C	0.90			
Tc	10	minutes	CDS Treatment Capacity	1.4 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Removal Efficiency (%)	Incremental Removal (%)
0.02	10.2%	10.2%	0.02	0.02	99.5	10.1
0.04	9.6%	19.8%	0.05	0.05	98.4	9.5
0.06	9.4%	29.3%	0.07	0.07	97.3	9.2
0.08	7.7%	37.0%	0.09	0.09	96.2	7.4
0.10	8.6%	45.6%	0.11	0.11	95.1	8.2
0.12	6.3%	51.9%	0.14	0.14	94.0	5.9
0.14	4.7%	56.5%	0.16	0.16	92.9	4.3
0.16	4.6%	61.2%	0.18	0.18	91.8	4.3
0.18	3.5%	64.7%	0.21	0.21	90.7	3.2
0.20	4.3%	69.1%	0.23	0.23	89.6	3.9
0.25	8.0%	77.1%	0.29	0.29	86.9	6.9
0.30	5.6%	82.7%	0.34	0.34	84.1	4.7
0.35	4.4%	87.0%	0.40	0.40	81.4	3.6
0.40	2.5%	89.5%	0.46	0.46	78.6	2.0
0.45	2.5%	92.1%	0.51	0.51	75.9	1.9
0.50	1.4%	93.5%	0.57	0.57	73.1	1.0
0.75	5.0%	98.5%	0.86	0.86	59.4	3.0
1.00	1.0%	99.5%	1.14	1.14	45.6	0.5
1.50	0.0%	99.5%	1.71	1.40	27.1	0.0
2.00	0.0%	99.5%	2.29	1.40	20.4	0.0
3.00	0.5%	100.0%	3.43	1.40	13.6	0.1
						89.7

Removal Efficiency Adjustment[2] = 6.5%

Predicted % Annual Rainfall Treated = 93.3%

Predicted Net Annual Load Removal Efficiency = 83.2%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CDS ESTIMATED NET ANNUAL TSS REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

BOSTON TEACHERS UNION HEALTH AND WELFARE FUND
BOSTON, MA
for SYSTEM: CDS-2

CONTECH ENGINEERED SOLUTIONS

Total Area = 1.33
Impervious % = 80%
Area = 1.06 Ac.

Area	1.06	acres	CDS Model	2015-4
Weighted C	0.90		CDS Treatment Capacity	1.4 cfs
Tc	10	minutes		

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Removal Efficiency (%)	Incremental Removal (%)
0.02	10.2%	10.2%	0.02	0.02	99.7	10.1
0.04	9.6%	19.8%	0.04	0.04	98.8	9.5
0.06	9.4%	29.3%	0.06	0.06	97.9	9.2
0.08	7.7%	37.0%	0.08	0.08	96.9	7.5
0.10	8.6%	45.6%	0.10	0.10	96.0	8.2
0.12	6.3%	51.9%	0.11	0.11	95.1	6.0
0.14	4.7%	56.5%	0.13	0.13	94.2	4.4
0.16	4.6%	61.2%	0.15	0.15	93.3	4.3
0.18	3.5%	64.7%	0.17	0.17	92.3	3.3
0.20	4.3%	69.1%	0.19	0.19	91.4	4.0
0.25	8.0%	77.1%	0.24	0.24	89.1	7.1
0.30	5.6%	82.7%	0.29	0.29	86.8	4.9
0.35	4.4%	87.0%	0.33	0.33	84.5	3.7
0.40	2.5%	89.5%	0.38	0.38	82.2	2.1
0.45	2.5%	92.1%	0.43	0.43	80.0	2.0
0.50	1.4%	93.5%	0.48	0.48	77.7	1.1
0.75	5.0%	98.5%	0.72	0.72	66.2	3.3
1.00	1.0%	99.5%	0.95	0.95	54.7	0.6
1.50	0.0%	99.5%	1.43	1.40	32.5	0.0
2.00	0.0%	99.5%	1.91	1.40	24.4	0.0
3.00	0.5%	100.0%	2.86	1.40	16.3	0.1
						91.4

Removal Efficiency Adjustment[2] = 6.5%
Predicted % Annual Rainfall Treated = 93.3%
Predicted Net Annual Load Removal Efficiency = 85.0%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Appendix E

Operation & Maintenance Plan

Operation & Maintenance Plan
BTUHWF Building Replacement Project

BTUHWF Building Corporation
188 Mount Vernon Street
Boston, Massachusetts 02125

Submitted to:
City of Boston
January 12, 2015

Table of Contents

1.0 Introduction

This long-term Stormwater Management System Operation and Maintenance (O&M) Plan, filed with the City of Boston, shall be implemented at the proposed redevelopment at 188 Mount Vernon Street to ensure that the stormwater management system functions as designed. The Owner possesses the primary responsibility for overseeing and implementing the O&M Plan and assigning a Property Manager who will be responsible for the proper operation and maintenance of the stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M Plan. Included in the manual is a log for tracking inspections and maintenance of key components of the stormwater management system.

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular pavement sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of designated waste and recycling areas.

1.1 Responsibility

The purpose of the Stormwater Operation and Maintenance (O&M) plan is to ensure inspections of the system, removal of accumulated sediments, oils, and debris, and implementation of corrective action and record keeping activities. The ongoing responsibility is the Owner, its successors and assigns. Adequate maintenance is defined in this document as good working condition.

Owner contact information is provided below:

Responsibility for Operation and Maintenance

Name:	BTUHWF Building Corporation
Address:	180 Mount Vernon Street
City, State:	Boston, Massachusetts 02125
Contact:	Eugene McGlynn
Email:	EMcGlynn@btuhwf.org

1.2 Documentation

An Inspection and Maintenance Record Log and Schedule will be kept by the Owner or Property Manager summarizing inspections, maintenance, repairs and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. Inspection & Maintenance Logs will be kept on file at the on-site Property Management office.

The City of Boston has the right to enter the property at reasonable times and in a reasonable manner for the purpose of inspecting the stormwater management components and to review the Inspection and Maintenance Log.

2.0 Maintenance Program

The Owner, Property Manager and maintenance staff will conduct the Operation and Maintenance program set forth in this document. The Owner or Property Manager will ensure that inspections and record keeping are timely and accurate and that cleaning and maintenance are performed in accordance with the recommended frequency for each stormwater component. The Owner or Property Manager will also maintain all drainage components to function as they were designed to. Inspection & Maintenance Log Forms (provided herein) shall include the date and the amount of the last significant storm event in excess of 1" of rain in a 24-hour period, physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Estimated annual cost of the Maintenance Program is $1,000 to $3,000.

2.1 Inspection and Maintenance Frequency

The following areas, facilities and measures will be inspected by the Owner or Property Manager and maintained as specified below. Identified deficiencies will be corrected. Accumulated sediments and debris will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations.

2.1.1 Catch Basins

Catch basins with 4-foot deep sumps and hooded outlets will be inspected and cleaned twice per year (April and October), or when sediment reaches ½ full depth from the invert of the pipe to ensure that the catch basins are working in their intended fashion and are free of debris. The basin outlet equipped with a hood/tee to trap floatable materials should be checked to ensure that the watertight seal is working. Sediments and hydrocarbons will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations. The method of sediment removal will be by vacuum and disposal must be documented. Any structural damage to catch basins or to castings must be repaired upon discovery.

2.1.2 Drain Manholes

Drain manholes shall be inspected twice per year (April and October). Collection of accumulated sediment and hydrocarbons will be accomplished by means of vacuum pumping. Disposal of accumulated sediment and hydrocarbons will be performed in accordance with applicable local, state and federal regulations. Any structural damage to drain manholes or to castings must be repaired upon discovery.

2.1.3 Contech CDS Water Quality Structures

CDS units will be inspected and cleaned twice per year (April and October), or when the sediment depth reaches 15% of storage capacity. Sediments and hydrocarbons will be properly handled and disposed of off-site in accordance with local, state and federal guidelines and regulations. In addition, inspections must be made immediately after an oil, fuel or chemical spill. A licensed waste management company must remove captured petroleum waste products and dispose responsibly in accordance with local, state and federal guidelines and regulations.

2.1.4 Standard Pavement Driveways and Parking Areas

Accumulations of sand and debris will be cleared from the standard pavement portions of the site through mechanical sweeping. The sweeping program is a highly effective source control measure to reduce pollutant loading in stormwater by removing sand and contaminants directly from paved surfaces before they become mobilized during rain events and transported to the drainage system. Pavement sweeping will be conducted twice per year (April and October) or more often as necessary. Sweeping is most important in Spring after winter snowmelt when road sand and other sediments have accumulated. Important Note: Sweeping is prohibited in the portions of the site covered with porous pavement; see following section.

2.1.5 Porous Pavement (Permeable Pavers)

Maintenance and cleaning of the permeable paver areas must be conducted utilizing pavement vacuuming and angular power-washing of the porous paved surfaces. <u>Important: Pavement sweeping, which is suitable for maintaining standard impervious bituminous pavement, is not a suitable method for cleaning any porous pavement surface. Winter sanding and construction material stockpiles are prohibited on the porous pavement surface area.</u>

Power-washing of porous pavement must be used for unclogging plugged areas in conjunction with a high velocity vacuum head so that debris is removed and not just displaced. Power-washing should occur at mid-pressure typically less than 500 psi, and at a low angle less than 45 degrees, to drive sediment and material out of the void spaces, instead of deeper clogging. A powerful vacuum, such as Elgin Whirlwind or Tymco 500X, is required. All permeable paver areas will be cleaned and maintained twice per year (April and October), and more often if conditions warrant.

Routine preventative cleaning of the porous pavement is more effective than corrective cleaning. Controlling run-on and debris tracking is the key to extending the life of porous pavement surfaces. Materials such as sand, salt, mulch, soil, yard waste and other stockpile materials should not be stored on porous pavement. Signage installation is required to identify areas of porous pavement and to prohibit winter sanding. All accumulated vacuum sweepings must be disposed of in a legal manner.

It is recommended that BTUHWF Building Corporation hire a Contract Operator such as Stormwater Compliance, LLC to manage the maintenance of porous pavement areas, including operation of the regenerative air vacuum truck and power washing implement. The contact at Stormwater Compliance, LLC is Gregg Novick, phone (877) 271-9055.

2.2 Winter Maintenance Program

Ensure structures are not blocked by ice, snow, debris or trash during winter months. Sand is prohibited from use on the permeable paver/porous pavement areas because it will clog the voids and render the infiltrative abilities ineffective. Signage must be installed at the site to identify the use of porous pavement and to prevent sand use by snowplow operators. Reduced use of road salt (sodium chloride use is prohibited; only calcium chloride use is permitted) to the extent feasible helps limit the amount of dissolved pollutants in runoff and minimizes the potential impact of deicing chemicals on wetland resources.

2.3 Fertilizer Use

Only slow-release organic low-phosphorous fertilizers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system and Dorchester Bay.

3.0 Sample Inspection Forms

Inspection and Maintenance Log

INSPECTOR: ______________________________ YEAR: ______________________

RAINFALL INSPECTION DATE: _______________ RAINFALL AMOUNT: __________

Component to be inspected	Frequency	Date Performed	Action to be Taken	Comments
Catch Basins	Cleaned Twice per Year	April and October	Remove sediment and debris	
Drain Manholes	Inspections Twice per Year	April and October	Remove sediment and debris	
CDS Water Quality Units	Cleaned Twice per Year	April and October	Remove sediment and hydrocarbons	
Porous Pavement (Permeable Paver) Areas	Cleaned Twice per Year	April and October	Vacuum and power wash	
Standard Pavement (Bituminous Asphalt) Areas	Cleaned Twice per Year	April and October	Street Sweeping	

CATCH BASIN INSPECTION FORM

188 Mount Vernon Street
Boston, Massachusetts

Owner: ____________________

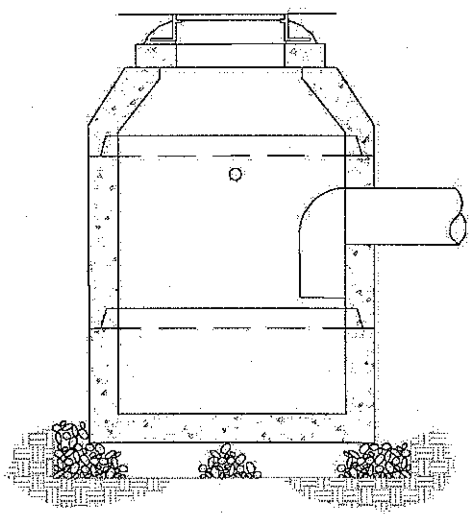
Property Manager: ____________________

Inspected By: ____________________

Date of Inspection: ____________________

Catch Basin Inspected: ____________________

	Acceptable	Needs Work	Notes



Date of Cleaning: ______________ By Whom: ______________

Date of Repair: ______________ By Whom: ______________

Note any discrepancies and suggested corrective actions:

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DRAIN MANHOLE INSPECTION FORM

188 Mount Vernon Street
Boston, Massachusetts

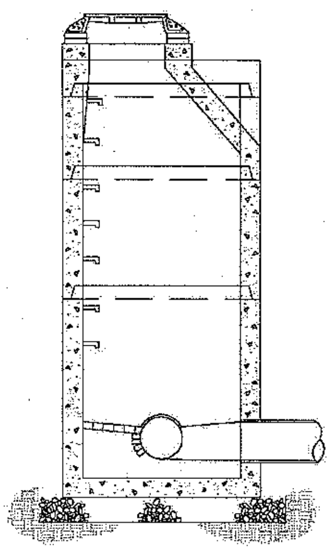
Owner: ______________________________

Property Manager: ______________________________

Inspected By: ______________________________

Date of Inspection: ______________________________

Drain Manhole Inspected: ______________________________

	Acceptable	Needs Work	Notes
			

Date of Cleaning: ______________ By Whom: ______________

Date of Repair: ______________ By Whom: ______________

Note any discrepancies and suggested corrective actions:

____
____
____
____
____
____

CDS2015-4-C WATER QUALITY UNIT INSPECTION FORM

188 Mount Vernon Street
Boston, Massachusetts

Owner: ____________________

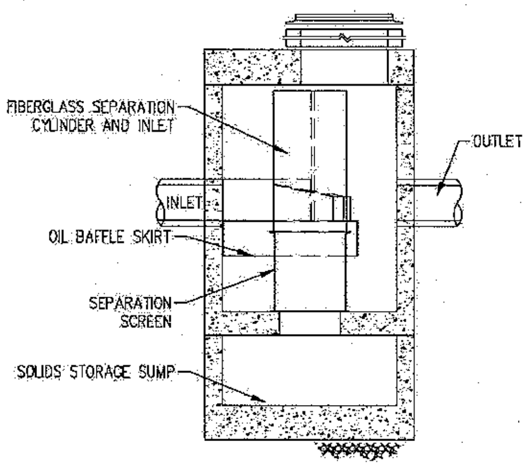
Property Manager: ____________________

Inspected By: ____________________

Date of Inspection: ____________________

Stormceptor Inspected: ____________________

	Acceptable	Needs Work	Notes



Date of Cleaning: ____________ By Whom: ____________

Date of Repair: ____________ By Whom: ____________

Note any discrepancies and suggested corrective actions:

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APPENDIX I - NOISE ANALYSIS (CD)

Boston Teacher's Union
Cadna Results

Name	M.	ID	Level Lr Day (dBA)	Level Lr Night (dBA)	Limit. Value Day (dBA)	Limit. Value Night (dBA)	Land Use Type	Land Use Auto	Noise Type	Height (m)		Coordinates X (m)	Coordinates Y (m)	Coordinates Z (m)
Harbor Point Apartments			41.6	41.6	0	0			Total	10.67	r	237468	896708	14.09
Harbor Point Apartments			42.2	42.2	0	0			Total	10.67	r	237531	896808	14.27
Harbor Point Apartments			41.1	41.1	0	0			Total	10.67	r	237582	896851	14.72
10 Kemp Street Housing			37.6	37.6	0	0			Total	4.57	r	236867	897130	8.27
DoubleTree Hotel			47.3	47.3	0	0			Total	13.72	r	237259	896777	16.99

Harbor Point Apartments									
Typ	31.5	63	125	250	500	1000	2000	4000	8000
Day	39.3	41.4	43.6	39.9	40.4	38.1	33.1	22.6	-7.8
Night	39.3	41.4	43.6	39.9	40.4	38.1	33.1	22.6	-7.8
10 Kemp Street Housing									
Typ	31.5	63	125	250	500	1000	2000	4000	8000
Day	35.4	37.6	39.8	34.9	36.3	33.6	27.6	13.3	-30.9
Night	35.4	37.6	39.8	34.9	36.3	33.6	27.6	13.3	-30.9
DoubleTree Hotel									
Typ	31.5	63	125	250	500	1000	2000	4000	8000
Day	44.6	47.4	51.7	46.2	44.9	42.7	38.4	30.5	9.5
Night	44.6	47.4	51.7	46.2	44.9	42.7	38.4	30.5	9.5

Boston Teacher's Union
Cadna Results

	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A-wtd**	**Existing**	**Future**	**Increase**
Boston Res Nighttime	68	67	61	52	46	40	33	28	26	50			
Harbor Point Apartments	39	41	44	40	40	38	33	23	-8	42	45	47	2
10 Kemp Street Housing	35	38	40	35	36	34	28	13	-31	38	44	45	1
Boston Res/Ind Nighttime	72	71	65	57	51	45	39	34	32	55			
DoubleTree Hotel	45	47	52	46	45	43	38	31	10	47	45	49	4

Figure 1

Sound Monitoring Locations & Modeling Receptors

BTUHWF, Boston, MA

TECH environmental
FOCUSED KNOWLEDGE. REAL SOLUTIONS.

APPENDIX J – TRAFFIC (CD)

Trip Generation - Typical Day Morning (11/19)

	D - Westerly Entrance to BTU Lot						E - Easterly Entrance to BTU Lot		Total		
	From the East (BTU Lot)		From the South (Alley)		From the West (Corcoran Side)		East (Umass	West (BTU Lot)			
	TH	LT	RT	LT	RT	Th	TH	TH	IN	OUT	TOTAL
7:00	1						1		1	1	2
7:15						1	1		2	0	2
7:30						5	0		5	0	5
7:45						3	1		4	0	4
8:00						3	2		5	0	5
8:15						1			1	0	1
8:30						4			4	0	4
8:45	1					7		1	7	2	9

Morning Peak Hour

	In	Out	Total
8:00 a.m.	17	2	19

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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

File Name : 144197 D (Wed 7-9am)
Site Code : TBA
Start Date : 11/19/2014
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Groups Printed- Cars - Heavy Vehicles

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	1	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	0	1	0	1
07:30 AM	0	0	0	0	0	0	0	5	0	5
07:45 AM	0	0	0	0	0	0	0	3	0	3
Total	1	0	0	0	0	0	0	9	0	10
08:00 AM	0	0	0	0	0	0	0	3	0	3
08:15 AM	0	0	0	0	0	0	0	1	0	1
08:30 AM	0	0	0	0	0	0	0	4	0	4
08:45 AM	1	0	0	0	0	0	0	7	0	8
Total	1	0	0	0	0	0	0	15	0	16
Grand Total	2	0	0	0	0	0	0	24	0	26
Apprch %	100	0	0	0	0	0	0	100	0	
Total %	7.7	0	0	0	0	0	0	92.3	0	
Cars	2	0	0	0	0	0	0	24	0	26
% Cars	100	0	0	0	0	0	0	100	0	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:30 AM	0	0	0	0	0	0	0	0	0	4	0	4	4
08:45 AM	**1**	0	0	**1**	0	0	0	0	0	**7**	0	**7**	**8**
Total Volume	1	0	0	1	0	0	0	0	0	15	0	15	16
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.000	.000	.000	.000	.536	.000	.536	.500
Cars	1	0	0	1	0	0	0	0	0	15	0	15	16
% Cars	100	0	0	100	0	0	0	0	0	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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Start Date : 11/19/2014
Page No : 1

Groups Printed- Cars

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	1	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	0	1	0	1
07:30 AM	0	0	0	0	0	0	0	5	0	5
07:45 AM	0	0	0	0	0	0	0	3	0	3
Total	1	0	0	0	0	0	0	9	0	10
08:00 AM	0	0	0	0	0	0	0	3	0	3
08:15 AM	0	0	0	0	0	0	0	1	0	1
08:30 AM	0	0	0	0	0	0	0	4	0	4
08:45 AM	1	0	0	0	0	0	0	7	0	8
Total	1	0	0	0	0	0	0	15	0	16
Grand Total	2	0	0	0	0	0	0	24	0	26
Apprch %	100	0	0	0	0	0	0	100	0	
Total %	7.7	0	0	0	0	0	0	92.3	0	

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:30 AM	0	0	0	0	0	0	0	0	0	4	0	4	4
08:45 AM	**1**	0	0	**1**	0	0	0	0	0	**7**	0	**7**	**8**
Total Volume	1	0	0	1	0	0	0	0	0	15	0	15	16
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.000	.000	.000	.000	.536	.000	.536	.500

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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Start Date : 11/19/2014

Groups Printed- Heavy Vehicles

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	0	0	0	
Total %										

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
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Groups Printed- Peds and Bicycles

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	Peds WB	Right	Left	U-Turn	Right	Thru	Peds EB	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	1	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	0	0	0	0	1
Grand Total	0	0	1	0	0	0	0	0	0	1
Apprch %	0	0	100	0	0	0	0	0	0	
Total %	0	0	100	0	0	0	0	0	0	

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	Peds WB	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	Peds EB	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	**1**	**1**	0	0	0	0	0	0	0	0	**1**
Total Volume	0	0	1	1	0	0	0	0	0	0	0	0	1
% App. Total	0	0	100		0	0	0		0	0	0		
PHF	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.250

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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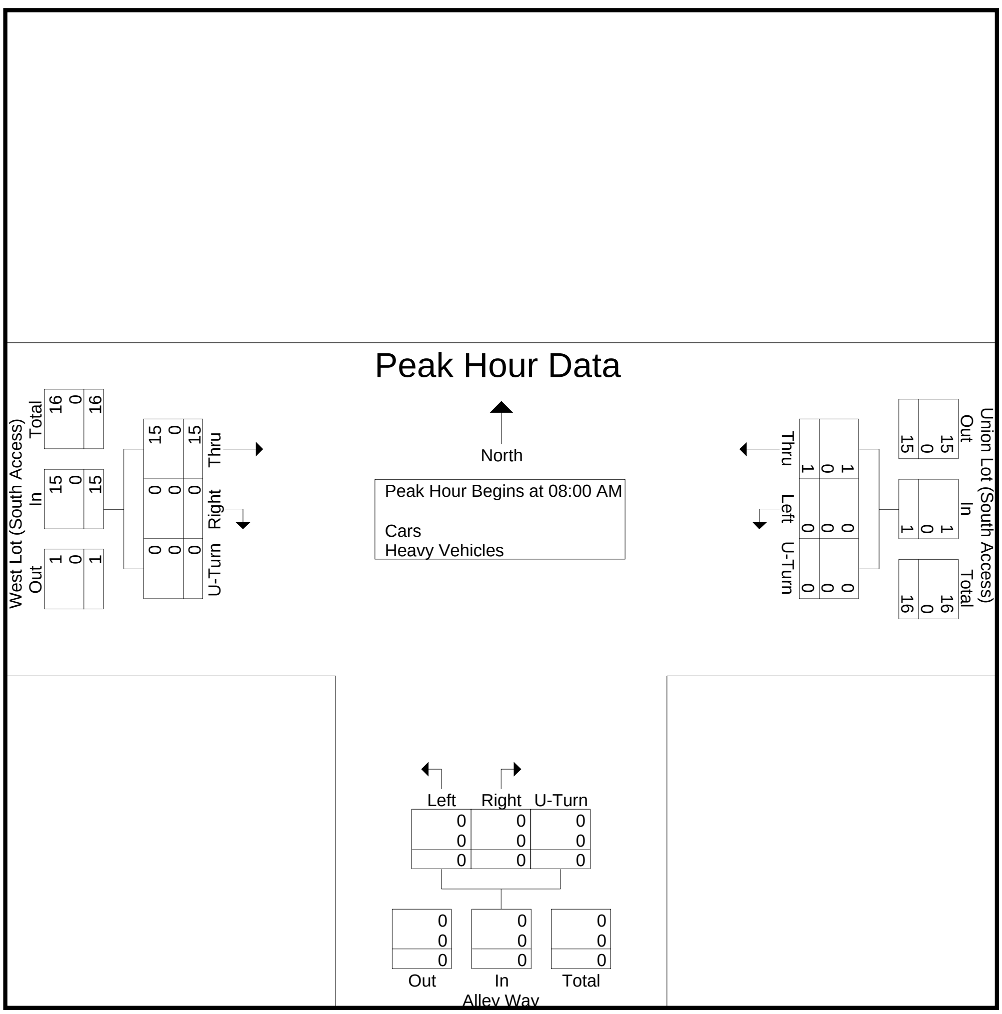
Site Code : TBA
Start Date : 11/19/2014

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 08:00 AM													
08:00 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
08:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:30 AM	0	0	0	0	0	0	0	0	0	4	0	4	4
08:45 AM	**1**	0	0	**1**	0	0	0	0	0	**7**	0	**7**	**8**
Total Volume	1	0	0	1	0	0	0	0	0	15	0	15	16
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.000	.000	.000	.000	.536	.000	.536	.500
Cars	1	0	0	1	0	0	0	0	0	15	0	15	16
% Cars	100	0	0	100	0	0	0	0	0	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0



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E: East Lot (South Access)
W: Union Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo / N. Doherty

File Name : 144197 E (Wed 7-9am)
Site Code : TBA
Start Date : 11/19/2014
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
07:00 AM	1	0	0	0	1
07:15 AM	1	0	0	0	1
07:30 AM	0	0	0	0	0
07:45 AM	1	0	0	0	1
Total	3	0	0	0	3
08:00 AM	2	0	0	0	2
08:15 AM	0	0	0	0	0
08:30 AM	0	0	0	0	0
08:45 AM	0	0	1	0	1
Total	2	0	1	0	3
Grand Total	5	0	1	0	6
Apprch %	100	0	100	0	
Total %	83.3	0	16.7	0	
Cars	5	0	1	0	6
% Cars	100	0	100	0	100
Heavy Vehicles	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 07:15 AM							
07:15 AM	1	0	1	0	0	0	1
07:30 AM	0	0	0	0	0	0	0
07:45 AM	1	0	1	0	0	0	1
08:00 AM	**2**	0	**2**	0	0	0	**2**
Total Volume	4	0	4	0	0	0	4
% App. Total	100	0		0	0		
PHF	.500	.000	.500	.000	.000	.000	.500
Cars	4	0	4	0	0	0	4
% Cars	100	0	100	0	0	0	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0

E: East Lot (South Access)
W: Union Lot (South Access)
City, State: Boston, MA
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Groups Printed- Cars

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
07:00 AM	1	0	0	0	1
07:15 AM	1	0	0	0	1
07:30 AM	0	0	0	0	0
07:45 AM	1	0	0	0	1
Total	3	0	0	0	3
08:00 AM	2	0	0	0	2
08:15 AM	0	0	0	0	0
08:30 AM	0	0	0	0	0
08:45 AM	0	0	1	0	1
Total	2	0	1	0	3
Grand Total	5	0	1	0	6
Apprch %	100	0	100	0	
Total %	83.3	0	16.7	0	

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 07:15 AM							
07:15 AM	1	0	1	0	0	0	1
07:30 AM	0	0	0	0	0	0	0
07:45 AM	1	0	1	0	0	0	1
08:00 AM	**2**	0	**2**	0	0	0	**2**
Total Volume	4	0	4	0	0	0	4
% App. Total	100	0		0	0		
PHF	.500	.000	.500	.000	.000	.000	.500

E: East Lot (South Access)
W: Union Lot (South Access)
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File Name : 144197 E (Wed 7-9am)
Site Code : TBA
Start Date : 11/19/2014

Groups Printed- Heavy Vehicles

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
07:00 AM	0	0	0	0	0
07:15 AM	0	0	0	0	0
07:30 AM	0	0	0	0	0
07:45 AM	0	0	0	0	0
Total	0	0	0	0	0
08:00 AM	0	0	0	0	0
08:15 AM	0	0	0	0	0
08:30 AM	0	0	0	0	0
08:45 AM	0	0	0	0	0
Total	0	0	0	0	0
Grand Total	0	0	0	0	0
Apprch %	0	0	0	0	
Total %					

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 07:00 AM							
07:00 AM	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0
% App. Total	0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000

E: East Lot (South Access)
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File Name : 144197 E (Wed 7-9am)
Site Code : TBA
Start Date : 11/19/2014

Groups Printed- Peds and Bicycles

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	Peds WB	Thru	Peds EB	Int. Total
07:00 AM	0	0	0	0	0
07:15 AM	0	0	0	0	0
07:30 AM	0	0	0	0	0
07:45 AM	0	0	0	0	0
Total	0	0	0	0	0
08:00 AM	0	0	0	0	0
08:15 AM	0	0	0	0	0
08:30 AM	0	0	0	0	0
08:45 AM	0	0	0	0	0
Total	0	0	0	0	0
Grand Total	0	0	0	0	0
Apprch %	0	0	0	0	
Total %					

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	Peds WB	App. Total	Thru	Peds EB	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 07:00 AM							
07:00 AM	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0
% App. Total	0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000

E: East Lot (South Access)
W: Union Lot (South Access)
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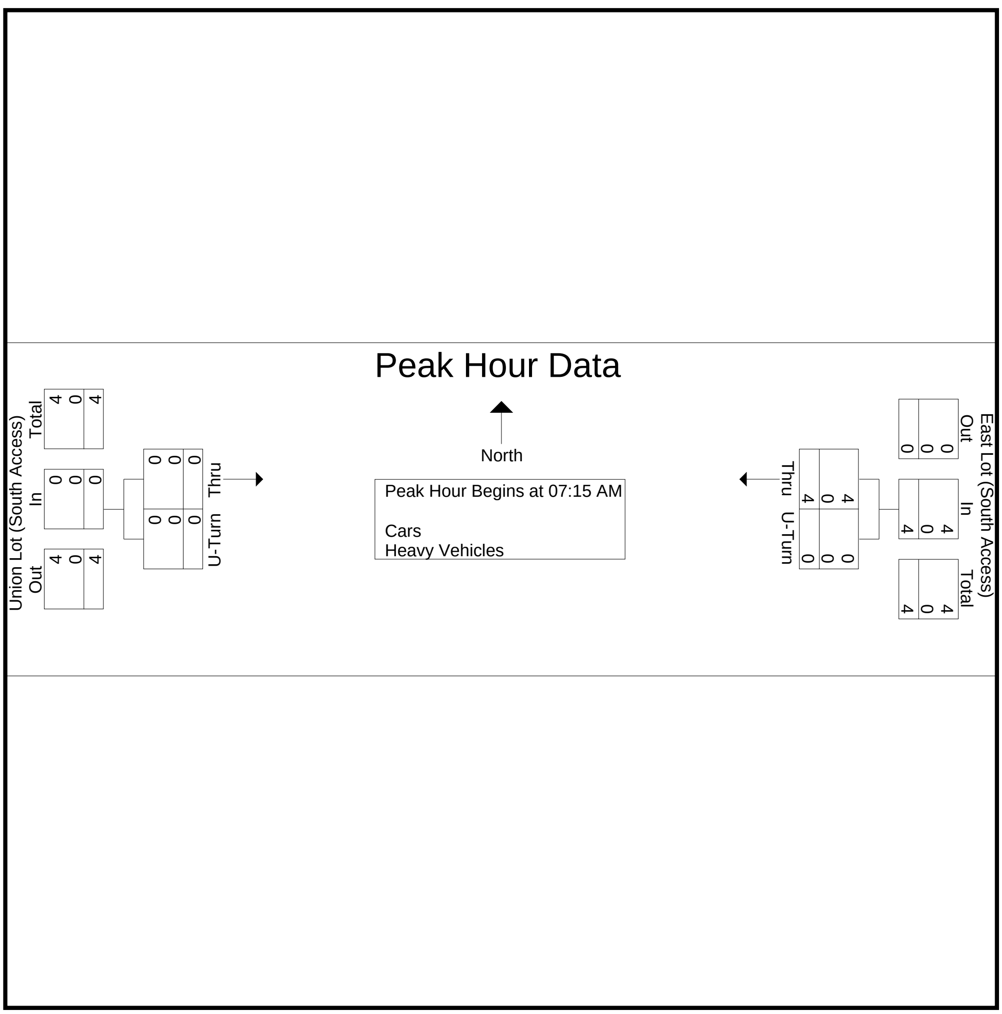
	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 07:15 AM							
07:15 AM	1	0	1	0	0	0	1
07:30 AM	0	0	0	0	0	0	0
07:45 AM	1	0	1	0	0	0	1
08:00 AM	**2**	0	**2**	0	0	0	**2**
Total Volume	4	0	4	0	0	0	4
% App. Total	100	0		0	0		
PHF	.500	.000	.500	.000	.000	.000	.500
Cars	4	0	4	0	0	0	4
% Cars	100	0	100	0	0	0	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0



Trip Generation - Typical Day Afternoon (11/19)

	D - Westerly Entrance to BTU Lot						**E - Easterly Entrance to BTU Lot**		**Total**		
	From the East (BTU Lot)		From the South (Alley)		From the West (Corcoran Side)		East (Umass	West (BTU Lot)			
	TH	LT	RT	LT	RT	Th	TH	TH	IN	OUT	TOTAL
4:00	5					10		2	10	7	17
4:15	7					1		2	1	9	10
4:30	4					5	1	1	6	5	11
4:45	1					1			1	1	2
5:00	7					1		1	1	8	9
5:15	5					1		1	1	6	7
5:30	1	1				1	1	1	2	2	4
5:45	2			1		1			1	2	3

Afternoon Peak Hour

	In	Out	Total
4:00 p.m.	18	22	40

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
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Client: Tetra Tech Rizzo/ N. Doherty

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Office: 508.481.3999 Fax: 508.545.1234
Email: datarequests@pdillc.com

File Name : 144197 D (Wed 4-6pm)
Site Code : TBA
Start Date : 11/19/2014
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	5	0	0	0	0	0	0	10	0	15
04:15 PM	7	0	0	0	0	0	0	1	0	8
04:30 PM	4	0	0	0	0	0	0	5	0	9
04:45 PM	1	0	0	0	0	0	0	1	0	2
Total	17	0	0	0	0	0	0	17	0	34
05:00 PM	7	0	0	0	0	0	0	1	0	8
05:15 PM	5	0	0	0	0	0	0	1	0	6
05:30 PM	1	1	0	0	0	0	0	1	0	3
05:45 PM	2	0	0	0	1	0	0	1	0	4
Total	15	1	0	0	1	0	0	4	0	21
Grand Total	32	1	0	0	1	0	0	21	0	55
Apprch %	97	3	0	0	100	0	0	100	0	
Total %	58.2	1.8	0	0	1.8	0	0	38.2	0	
Cars	32	1	0	0	1	0	0	21	0	55
% Cars	100	100	0	0	100	0	0	100	0	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	5	0	0	5	0	0	0	0	0	**10**	0	**10**	**15**
04:15 PM	**7**	0	0	**7**	0	0	0	0	0	1	0	1	8
04:30 PM	4	0	0	4	0	0	0	0	0	5	0	5	9
04:45 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
Total Volume	17	0	0	17	0	0	0	0	0	17	0	17	34
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.607	.000	.000	.607	.000	.000	.000	.000	.000	.425	.000	.425	.567
Cars	17	0	0	17	0	0	0	0	0	17	0	17	34
% Cars	100	0	0	100	0	0	0	0	0	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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Groups Printed- Cars

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	5	0	0	0	0	0	0	10	0	15
04:15 PM	7	0	0	0	0	0	0	1	0	8
04:30 PM	4	0	0	0	0	0	0	5	0	9
04:45 PM	1	0	0	0	0	0	0	1	0	2
Total	17	0	0	0	0	0	0	17	0	34
05:00 PM	7	0	0	0	0	0	0	1	0	8
05:15 PM	5	0	0	0	0	0	0	1	0	6
05:30 PM	1	1	0	0	0	0	0	1	0	3
05:45 PM	2	0	0	0	1	0	0	1	0	4
Total	15	1	0	0	1	0	0	4	0	21
Grand Total	32	1	0	0	1	0	0	21	0	55
Apprch %	97	3	0	0	100	0	0	100	0	
Total %	58.2	1.8	0	0	1.8	0	0	38.2	0	

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	5	0	0	5	0	0	0	0	0	**10**	0	**10**	**15**
04:15 PM	**7**	0	0	**7**	0	0	0	0	0	1	0	1	8
04:30 PM	4	0	0	4	0	0	0	0	0	5	0	5	9
04:45 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
Total Volume	17	0	0	17	0	0	0	0	0	17	0	17	34
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.607	.000	.000	.607	.000	.000	.000	.000	.000	.425	.000	.425	.567

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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Site Code : TBA
Start Date : 11/19/2014

Groups Printed- Heavy Vehicles

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	U-Turn	Right	Left	U-Turn	Right	Thru	U-Turn	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	0	0	0	
Total %										

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
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File Name : 144197 D (Wed 4-6pm)
Site Code : TBA
Start Date : 11/19/2014

Groups Printed- Peds and Bicycles

	Union Lot (South Access) From East			Alley Way From South			West Lot (South Access) From West			
Start Time	Thru	Left	Peds WB	Right	Left	U-Turn	Right	Thru	Peds EB	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	1	0	0	0	0	0	1	2
04:30 PM	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	0	0	0	1	2
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	1	1
Grand Total	0	0	1	0	0	0	0	0	2	3
Apprch %	0	0	100	0	0	0	0	0	100	
Total %	0	0	33.3	0	0	0	0	0	66.7	

	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	Peds WB	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	Peds EB	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	**1**	**1**	0	0	0	0	0	0	**1**	**1**	**2**
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	1	1	0	0	0	0	0	0	1	1	2
% App. Total	0	0	100		0	0	0		0	0	100		
PHF	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.250	.250	.250

E/S: Union Lot (South Access)/ Alley Way
W: West Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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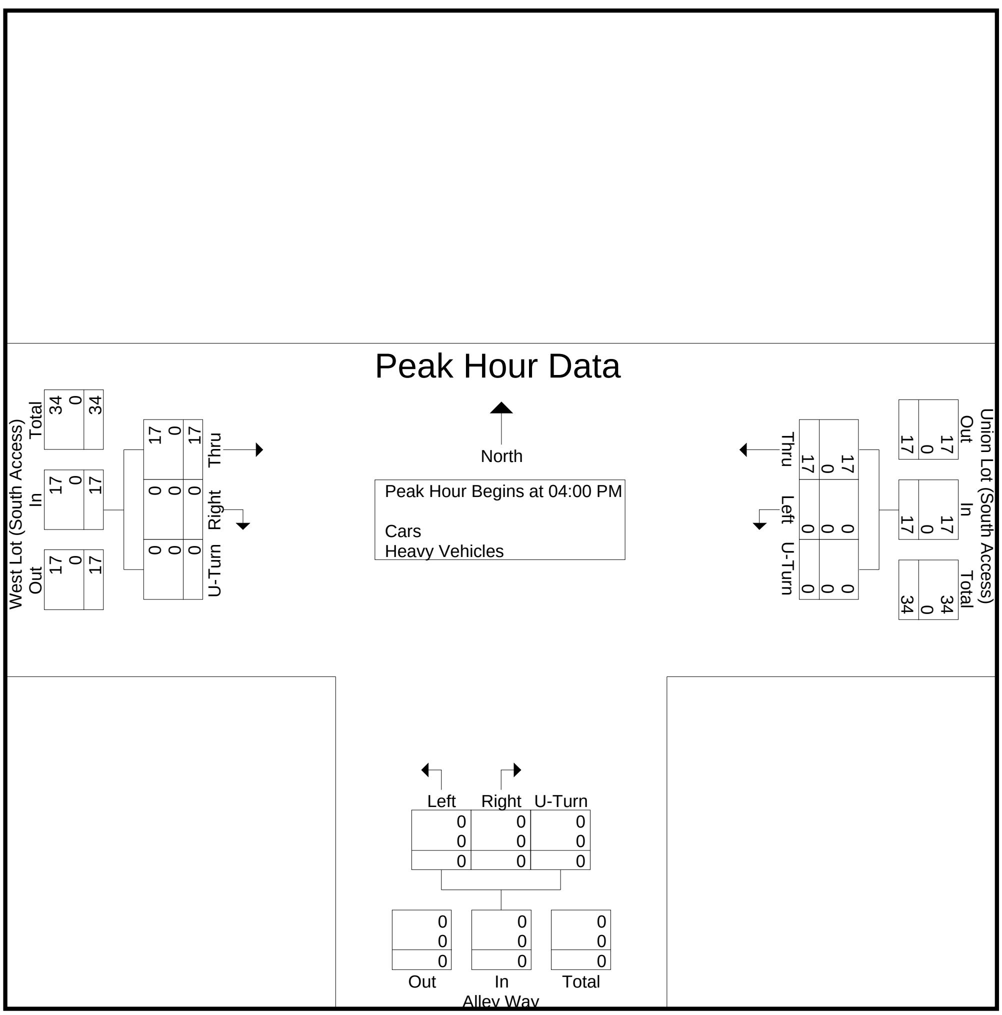
	Union Lot (South Access) From East				Alley Way From South				West Lot (South Access) From West				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	5	0	0	5	0	0	0	0	0	**10**	0	**10**	**15**
04:15 PM	**7**	0	0	**7**	0	0	0	0	0	1	0	1	8
04:30 PM	4	0	0	4	0	0	0	0	0	5	0	5	9
04:45 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
Total Volume	17	0	0	17	0	0	0	0	0	17	0	17	34
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.607	.000	.000	.607	.000	.000	.000	.000	.000	.425	.000	.425	.567
Cars	17	0	0	17	0	0	0	0	0	17	0	17	34
% Cars	100	0	0	100	0	0	0	0	0	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0



E: East Lot (South Access)
W: Union Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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File Name : 144197 E (Wed 4-6pm)
Site Code : TBA
Start Date : 11/19/2014
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
04:00 PM	0	0	2	0	2
04:15 PM	0	0	2	0	2
04:30 PM	1	0	1	0	2
04:45 PM	0	0	0	0	0
Total	1	0	5	0	6
05:00 PM	0	0	1	0	1
05:15 PM	0	0	1	0	1
05:30 PM	1	0	1	0	2
05:45 PM	0	0	0	0	0
Total	1	0	3	0	4
Grand Total	2	0	8	0	10
Apprch %	100	0	100	0	
Total %	20	0	80	0	
Cars	2	0	8	0	10
% Cars	100	0	100	0	100
Heavy Vehicles	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:00 PM							
04:00 PM	0	0	0	**2**	0	**2**	**2**
04:15 PM	0	0	0	2	0	2	2
04:30 PM	**1**	0	**1**	1	0	1	2
04:45 PM	0	0	0	0	0	0	0
Total Volume	1	0	1	5	0	5	6
% App. Total	100	0		100	0		
PHF	.250	.000	.250	.625	.000	.625	.750
Cars	1	0	1	5	0	5	6
% Cars	100	0	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0

E: East Lot (South Access)
W: Union Lot (South Access)
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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Page No : 1

Groups Printed- Cars

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
04:00 PM	0	0	2	0	2
04:15 PM	0	0	2	0	2
04:30 PM	1	0	1	0	2
04:45 PM	0	0	0	0	0
Total	1	0	5	0	6
05:00 PM	0	0	1	0	1
05:15 PM	0	0	1	0	1
05:30 PM	1	0	1	0	2
05:45 PM	0	0	0	0	0
Total	1	0	3	0	4
Grand Total	2	0	8	0	10
Apprch %	100	0	100	0	
Total %	20	0	80	0	

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:00 PM							
04:00 PM	0	0	0	**2**	0	**2**	**2**
04:15 PM	0	0	0	2	0	2	2
04:30 PM	**1**	0	**1**	1	0	1	2
04:45 PM	0	0	0	0	0	0	0
Total Volume	1	0	1	5	0	5	6
% App. Total	100	0		100	0		
PHF	.250	.000	.250	.625	.000	.625	.750

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City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144197 E (Wed 4-6pm)
Site Code : TBA
Start Date : 11/19/2014
Page No : 1

Groups Printed- Heavy Vehicles

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
04:00 PM	0	0	0	0	0
04:15 PM	0	0	0	0	0
04:30 PM	0	0	0	0	0
04:45 PM	0	0	0	0	0
Total	0	0	0	0	0
05:00 PM	0	0	0	0	0
05:15 PM	0	0	0	0	0
05:30 PM	0	0	0	0	0
05:45 PM	0	0	0	0	0
Total	0	0	0	0	0
Grand Total	0	0	0	0	0
Apprch %	0	0	0	0	
Total %					

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:00 PM							
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0
% App. Total	0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000

E: East Lot (South Access)
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Start Date : 11/19/2014

Groups Printed- Peds and Bicycles

	East Lot (South Access) From East		Union Lot (South Access) From West		
Start Time	Thru	Peds WB	Thru	Peds EB	Int. Total
04:00 PM	0	0	0	0	0
04:15 PM	0	0	0	0	0
04:30 PM	0	0	0	0	0
04:45 PM	0	0	0	0	0
Total	0	0	0	0	0
05:00 PM	0	0	0	0	0
05:15 PM	0	0	0	0	0
05:30 PM	0	0	0	0	0
05:45 PM	0	0	0	0	0
Total	0	0	0	0	0
Grand Total	0	0	0	0	0
Apprch %	0	0	0	0	
Total %					

	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	Peds WB	App. Total	Thru	Peds EB	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:00 PM							
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0
% App. Total	0	0		0	0		
PHF	.000	.000	.000	.000	.000	.000	.000

E: East Lot (South Access)
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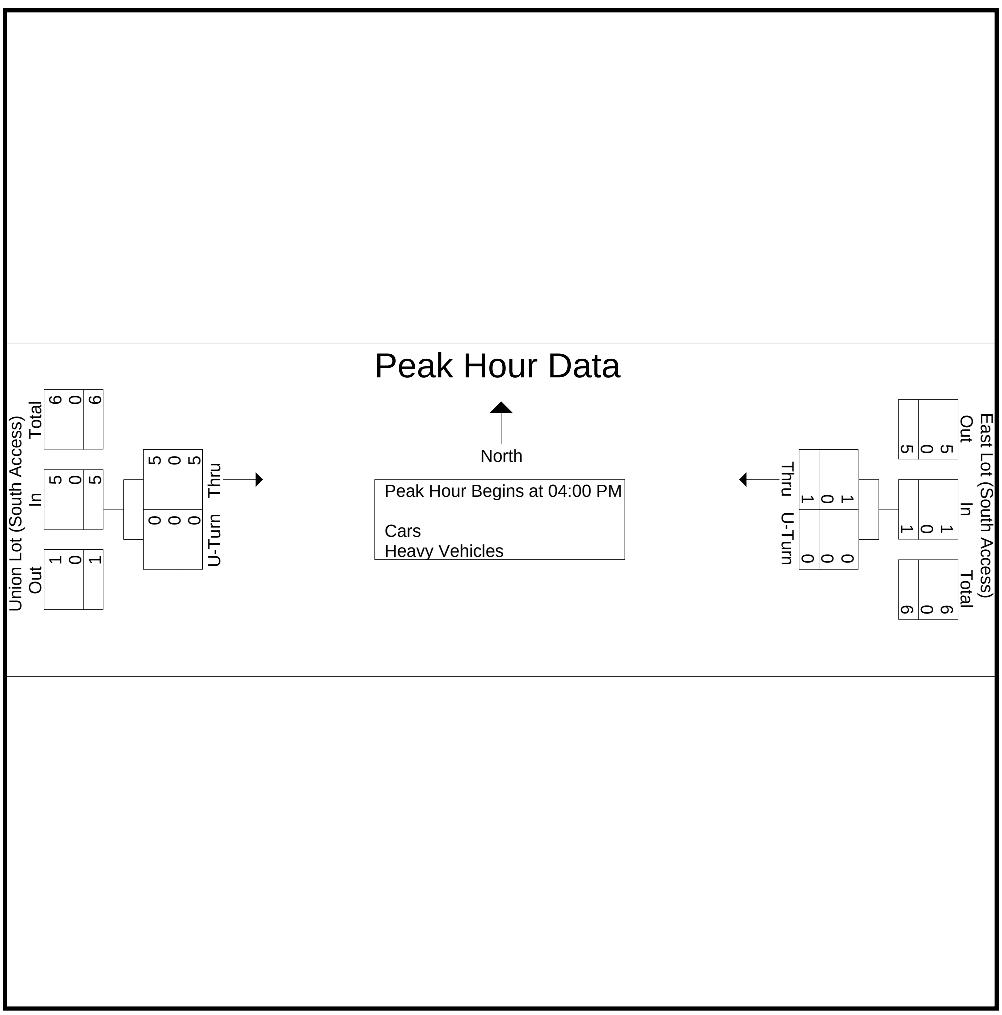
	East Lot (South Access) From East			Union Lot (South Access) From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:00 PM							
04:00 PM	0	0	0	**2**	0	**2**	**2**
04:15 PM	0	0	0	2	0	2	2
04:30 PM	**1**	0	**1**	1	0	1	2
04:45 PM	0	0	0	0	0	0	0
Total Volume	1	0	1	5	0	5	6
% App. Total	100	0		100	0		
PHF	.250	.000	.250	.625	.000	.625	.750
Cars	1	0	1	5	0	5	6
% Cars	100	0	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0



Trip Generation - Typical Event (BTUHWF Monthly Meeting)

	A - Main Entrance from Day Blvd.						F - Gate in Westerly Lot		Total		
	North		East		West		From the East	From the West			
	RT	LT	RT	TH	TH	LT	TH	TH	IN	OUT	TOTAL
3:00	11	4	10	1	0	10	5	5	20	25	45
3:15	15	7	4	0	0	9	0	3	25	13	38
3:30	24	5	6	0	0	7	2	4	33	15	48
3:45	36	18	7	0	2	6	1	6	60	14	74
4:00	39	17	7	0	0	9	3	4	60	19	79
4:15	22	12	9	0	0	8	4	3	37	21	58
4:30	16	2	5	1	0	8	4	6	24	17	41
4:45	9	3	12	3	0	24	3	10	22	39	61
5:00	7	3	10	4	0	49	8	10	20	67	87
5:15	3	0	5	2	0	11	4	3	6	20	26
5:30	4	1	7	1	0	16	1	6	11	24	35
5:45	5	1	11	0	1	14	2	7	13	27	40
6:00	2	0	16	0	0	28	5	3	5	49	54
6:15	3	2	3	0	0	9	4	0	5	16	21
6:30	0	0	1	0	0	6	0	3	3	7	10
6:45	0	0	3	0	1	2	0	3	3	5	8
7:00	2	0	1	0	0	5	5	3	5	11	16
7:15	0	0	2	0	0	11	0	4	4	13	17
7:30	1	0	2	0	1	4	0	3	4	6	10
7:45	1	0	0	0	0	6	0	3	4	6	10
	200	75	121	12	5	242	51	89	364	414	778

Arrival Peak Hour

	In	Out	Total
3:30 p.m.	190	69	259
Attendees		180	
Trip Rate	1.06	0.38	1.44

Departure Peak Hour

	In	Out	Total
4:45 p.m.	59	150	209
Attendees		180	
Trip Rate	0.33	0.83	1.16

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144200 A
Site Code : TBA
Start Date : 12/10/2014

Groups Printed- Cars - Heavy Vehicles

	Access Road to/from Day Boulevard From North			Access to East Lot From East			Access to West Lot From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	Int. Total
03:00 PM	11	4	0	10	1	1	0	10	0	37
03:15 PM	15	7	0	4	0	0	0	9	0	35
03:30 PM	24	5	0	6	0	0	0	7	0	42
03:45 PM	36	18	0	7	0	0	2	6	0	69
Total	86	34	0	27	1	1	2	32	0	183
04:00 PM	39	17	0	7	0	0	0	9	0	72
04:15 PM	22	12	0	9	0	0	0	8	0	51
04:30 PM	16	2	0	5	1	0	0	8	0	32
04:45 PM	9	3	0	12	3	0	0	24	0	51
Total	86	34	0	33	4	0	0	49	0	206
05:00 PM	7	3	0	10	4	0	0	49	0	73
05:15 PM	3	0	0	5	2	0	0	11	0	21
05:30 PM	4	1	0	7	1	0	0	16	0	29
05:45 PM	5	1	0	11	0	0	1	14	0	32
Total	19	5	0	33	7	0	1	90	0	155
06:00 PM	2	0	0	16	0	0	0	28	0	46
06:15 PM	3	2	0	3	0	0	0	9	0	17
06:30 PM	0	0	0	1	0	0	0	6	0	7
06:45 PM	0	0	0	3	0	0	1	2	0	6
Total	5	2	0	23	0	0	1	45	0	76
07:00 PM	2	0	0	1	0	0	0	5	0	8
07:15 PM	0	0	0	2	0	0	0	11	0	13
07:30 PM	1	0	0	2	0	0	1	4	0	8
07:45 PM	1	0	0	0	0	0	0	6	0	7
Total	4	0	0	5	0	0	1	26	0	36
Grand Total	200	75	0	121	12	1	5	242	0	656
Apprch %	72.7	27.3	0	90.3	9	0.7	2	98	0	
Total %	30.5	11.4	0	18.4	1.8	0.2	0.8	36.9	0	
Cars	199	74	0	120	12	1	4	242	0	652
% Cars	99.5	98.7	0	99.2	100	100	80	100	0	99.4
Heavy Vehicles	1	1	0	1	0	0	1	0	0	4
% Heavy Vehicles	0.5	1.3	0	0.8	0	0	20	0	0	0.6

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	24	5	0	29	6	0	0	6	0	7	0	7	42
03:45 PM	36	**18**	0	54	7	0	0	7	**2**	6	0	8	69
04:00 PM	**39**	17	0	**56**	7	0	0	7	0	**9**	0	**9**	**72**
04:15 PM	22	12	0	34	**9**	0	0	**9**	0	8	0	8	51
Total Volume	121	52	0	173	29	0	0	29	2	30	0	32	234
% App. Total	69.9	30.1	0		100	0	0		6.2	93.8	0		
PHF	.776	.722	.000	.772	.806	.000	.000	.806	.250	.833	.000	.889	.813
Cars	121	52	0	173	29	0	0	29	2	30	0	32	234
% Cars	100	100	0	100	100	0	0	100	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144200 A
Site Code : TBA
Start Date : 12/10/2014
Page No : 1

Groups Printed- Cars

	Access Road to/from Day Boulevard From North			Access to East Lot From East			Access to West Lot From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	Int. Total
03:00 PM	11	4	0	10	1	1	0	10	0	37
03:15 PM	15	7	0	4	0	0	0	9	0	35
03:30 PM	24	5	0	6	0	0	0	7	0	42
03:45 PM	36	18	0	7	0	0	2	6	0	69
Total	86	34	0	27	1	1	2	32	0	183
04:00 PM	39	17	0	7	0	0	0	9	0	72
04:15 PM	22	12	0	9	0	0	0	8	0	51
04:30 PM	16	1	0	5	1	0	0	8	0	31
04:45 PM	9	3	0	12	3	0	0	24	0	51
Total	86	33	0	33	4	0	0	49	0	205
05:00 PM	7	3	0	10	4	0	0	49	0	73
05:15 PM	3	0	0	4	2	0	0	11	0	20
05:30 PM	4	1	0	7	1	0	0	16	0	29
05:45 PM	5	1	0	11	0	0	1	14	0	32
Total	19	5	0	32	7	0	1	90	0	154
06:00 PM	2	0	0	16	0	0	0	28	0	46
06:15 PM	3	2	0	3	0	0	0	9	0	17
06:30 PM	0	0	0	1	0	0	0	6	0	7
06:45 PM	0	0	0	3	0	0	1	2	0	6
Total	5	2	0	23	0	0	1	45	0	76
07:00 PM	2	0	0	1	0	0	0	5	0	8
07:15 PM	0	0	0	2	0	0	0	11	0	13
07:30 PM	0	0	0	2	0	0	0	4	0	6
07:45 PM	1	0	0	0	0	0	0	6	0	7
Total	3	0	0	5	0	0	0	26	0	34
Grand Total	199	74	0	120	12	1	4	242	0	652
Apprch %	72.9	27.1	0	90.2	9	0.8	1.6	98.4	0	
Total %	30.5	11.3	0	18.4	1.8	0.2	0.6	37.1	0	

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	24	5	0	29	6	0	0	6	0	7	0	7	42
03:45 PM	36	**18**	0	54	7	0	0	7	**2**	6	0	8	69
04:00 PM	**39**	17	0	**56**	7	0	0	7	0	**9**	0	**9**	**72**
04:15 PM	22	12	0	34	**9**	0	0	**9**	0	8	0	8	51
Total Volume	121	52	0	173	29	0	0	29	2	30	0	32	234
% App. Total	69.9	30.1	0		100	0	0		6.2	93.8	0		
PHF	.776	.722	.000	.772	.806	.000	.000	.806	.250	.833	.000	.889	.813

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144200 A
Site Code : TBA
Start Date : 12/10/2014
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Groups Printed- Heavy Vehicles

	Access Road to/from Day Boulevard From North			Access to East Lot From East			Access to West Lot From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	1	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	0	0	0	1
05:00 PM	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	1	0	0	0	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	0	0	1
06:00 PM	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
07:00 PM	0	0	0	0	0	0	0	0	0	0
07:15 PM	0	0	0	0	0	0	0	0	0	0
07:30 PM	1	0	0	0	0	0	1	0	0	2
07:45 PM	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	0	0	1	0	0	2
Grand Total	1	1	0	1	0	0	1	0	0	4
Apprch %	50	50	0	100	0	0	100	0	0	
Total %	25	25	0	25	0	0	25	0	0	

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	0	**1**	0	**1**	0	0	0	0	0	0	0	0	**1**
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	**1**	0	0	**1**	0	0	0	0	1
Total Volume	0	1	0	1	1	0	0	1	0	0	0	0	2
% App. Total	0	100	0		100	0	0		0	0	0		
PHF	.000	.250	.000	.250	.250	.000	.000	.250	.000	.000	.000	.000	.500

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144200 A
Site Code : TBA
Start Date : 12/10/2014
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Groups Printed- Peds and Bicycles

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	CW EB	CW WB	Right	Thru	CW SB	CW NB	Thru	Left	CW NB	CW SB	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
03:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	3	3
Total	0	0	0	0	0	0	0	0	0	0	1	4	5
04:00 PM	0	0	1	0	0	0	0	0	0	0	0	1	2
04:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	3	0	3
Total	1	0	1	0	0	0	0	0	0	0	3	1	6
05:00 PM	0	0	0	1	0	0	0	0	0	0	2	0	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	1	1	2
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	0	0	0	3	1	5
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
06:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1	0	0	0	0	1
07:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
07:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	1	0	1
Grand Total	1	0	1	1	0	0	0	1	0	0	8	6	18
Apprch %	33.3	0	33.3	33.3	0	0	0	100	0	0	57.1	42.9	
Total %	5.6	0	5.6	5.6	0	0	0	5.6	0	0	44.4	33.3	

	Access Road to/from Day Boulevard From North					Access to East Lot From East					Access to West Lot From West					
Start Time	Right	Left	CW EB	CW WB	App. Total	Right	Thru	CW SB	CW NB	App. Total	Thru	Left	CW NB	CW SB	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 04:45 PM																
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	**3**	**3**
05:00 PM	0	0	0	**1**	**1**	0	0	0	0	0	0	0	2	0	2	3
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	2	2
Total Volume	0	0	0	1	1	0	0	0	0	0	0	0	6	1	7	8
% App. Total	0	0	0	100		0	0	0	0		0	0	85.7	14.3		
PHF	.000	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.500	.250	.583	.667

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144200 A
Site Code : TBA
Start Date : 12/10/2014
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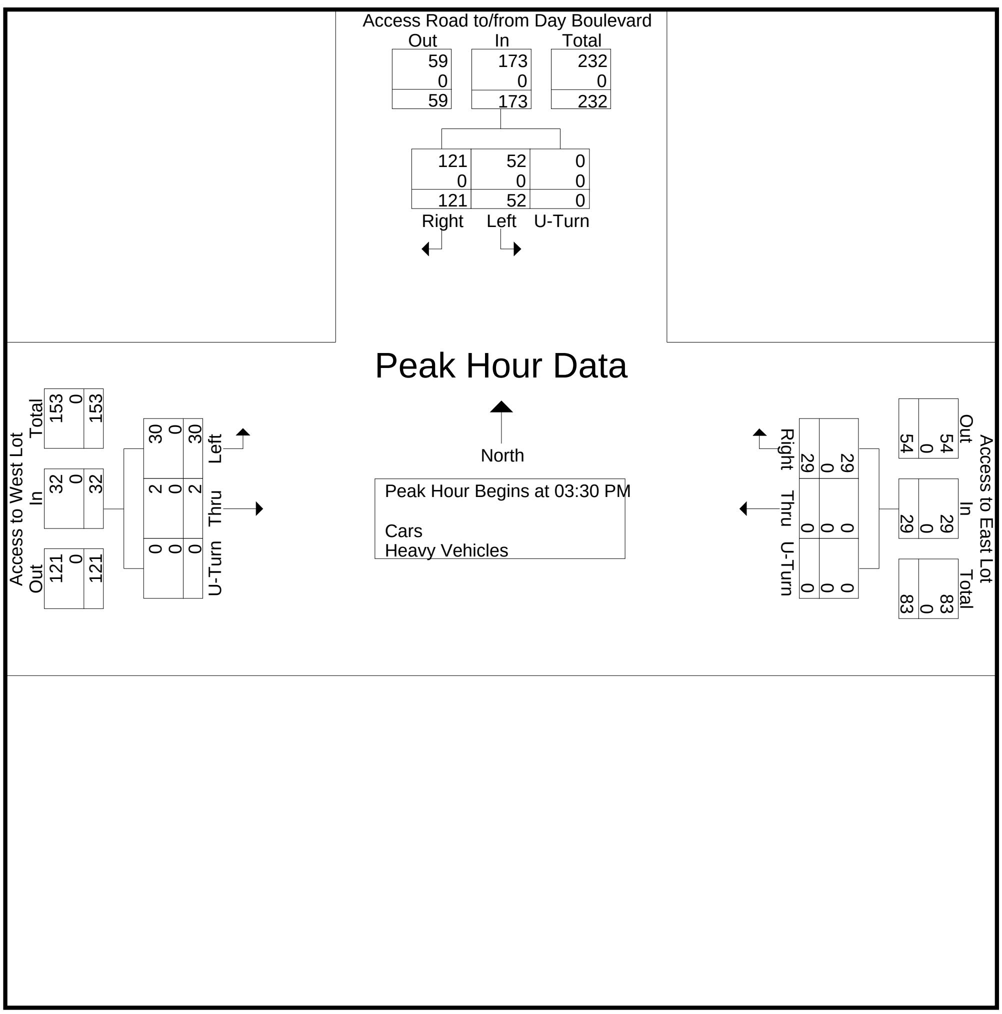
	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 03:30 PM													
03:30 PM	24	5	0	29	6	0	0	6	0	7	0	7	42
03:45 PM	36	**18**	0	54	7	0	0	7	**2**	6	0	8	69
04:00 PM	**39**	17	0	**56**	7	0	0	7	0	**9**	0	**9**	**72**
04:15 PM	22	12	0	34	**9**	0	0	**9**	0	8	0	8	51
Total Volume	121	52	0	173	29	0	0	29	2	30	0	32	234
% App. Total	69.9	30.1	0		100	0	0		6.2	93.8	0		
PHF	.776	.722	.000	.772	.806	.000	.000	.806	.250	.833	.000	.889	.813
Cars	121	52	0	173	29	0	0	29	2	30	0	32	234
% Cars	100	100	0	100	100	0	0	100	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0



E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo / N. Doherty

File Name : 144200 F
Site Code : TBA
Start Date : 12/10/2014
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	West Lot From East		Gated Far West Lot From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
03:00 PM	5	0	5	0	10
03:15 PM	0	0	3	0	3
03:30 PM	2	0	4	0	6
03:45 PM	1	0	6	0	7
Total	8	0	18	0	26
04:00 PM	3	0	4	0	7
04:15 PM	4	0	3	0	7
04:30 PM	4	0	6	0	10
04:45 PM	3	0	10	0	13
Total	14	0	23	0	37
05:00 PM	8	0	10	0	18
05:15 PM	4	0	3	0	7
05:30 PM	1	0	6	0	7
05:45 PM	2	0	7	0	9
Total	15	0	26	0	41
06:00 PM	5	0	3	0	8
06:15 PM	4	0	0	0	4
06:30 PM	0	0	3	0	3
06:45 PM	0	0	3	0	3
Total	9	0	9	0	18
07:00 PM	5	0	3	0	8
07:15 PM	0	0	4	0	4
07:30 PM	0	0	3	0	3
07:45 PM	0	0	3	0	3
Total	5	0	13	0	18
Grand Total	51	0	89	0	140
Apprch %	100	0	100	0	
Total %	36.4	0	63.6	0	
Cars	51	0	88	0	139
% Cars	100	0	98.9	0	99.3
Heavy Vehicles	0	0	1	0	1
% Heavy Vehicles	0	0	1.1	0	0.7

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:15 PM							
04:15 PM	4	0	4	3	0	3	7
04:30 PM	4	0	4	6	0	6	10
04:45 PM	3	0	3	**10**	0	**10**	13
05:00 PM	**8**	0	**8**	10	0	10	**18**
Total Volume	19	0	19	29	0	29	48
% App. Total	100	0		100	0		
PHF	.594	.000	.594	.725	.000	.725	.667
Cars	19	0	19	29	0	29	48
% Cars	100	0	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo / N. Doherty

File Name : 144200 F
Site Code : TBA
Start Date : 12/10/2014
Page No : 1

Groups Printed- Cars

	West Lot From East		Gated Far West Lot From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
03:00 PM	5	0	5	0	10
03:15 PM	0	0	3	0	3
03:30 PM	2	0	4	0	6
03:45 PM	1	0	5	0	6
Total	8	0	17	0	25
04:00 PM	3	0	4	0	7
04:15 PM	4	0	3	0	7
04:30 PM	4	0	6	0	10
04:45 PM	3	0	10	0	13
Total	14	0	23	0	37
05:00 PM	8	0	10	0	18
05:15 PM	4	0	3	0	7
05:30 PM	1	0	6	0	7
05:45 PM	2	0	7	0	9
Total	15	0	26	0	41
06:00 PM	5	0	3	0	8
06:15 PM	4	0	0	0	4
06:30 PM	0	0	3	0	3
06:45 PM	0	0	3	0	3
Total	9	0	9	0	18
07:00 PM	5	0	3	0	8
07:15 PM	0	0	4	0	4
07:30 PM	0	0	3	0	3
07:45 PM	0	0	3	0	3
Total	5	0	13	0	18
Grand Total	51	0	88	0	139
Apprch %	100	0	100	0	
Total %	36.7	0	63.3	0	

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:15 PM							
04:15 PM	4	0	4	3	0	3	7
04:30 PM	4	0	4	6	0	6	10
04:45 PM	3	0	3	**10**	0	**10**	13
05:00 PM	**8**	0	**8**	10	0	10	**18**
Total Volume	19	0	19	29	0	29	48
% App. Total	100	0		100	0		
PHF	.594	.000	.594	.725	.000	.725	.667

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo / N. Doherty

File Name : 144200 F
Site Code : TBA
Start Date : 12/10/2014
Page No : 1

Groups Printed- Heavy Vehicles

	West Lot From East		Gated Far West Lot From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
03:00 PM	0	0	0	0	0
03:15 PM	0	0	0	0	0
03:30 PM	0	0	0	0	0
03:45 PM	0	0	1	0	1
Total	0	0	1	0	1
04:00 PM	0	0	0	0	0
04:15 PM	0	0	0	0	0
04:30 PM	0	0	0	0	0
04:45 PM	0	0	0	0	0
Total	0	0	0	0	0
05:00 PM	0	0	0	0	0
05:15 PM	0	0	0	0	0
05:30 PM	0	0	0	0	0
05:45 PM	0	0	0	0	0
Total	0	0	0	0	0
06:00 PM	0	0	0	0	0
06:15 PM	0	0	0	0	0
06:30 PM	0	0	0	0	0
06:45 PM	0	0	0	0	0
Total	0	0	0	0	0
07:00 PM	0	0	0	0	0
07:15 PM	0	0	0	0	0
07:30 PM	0	0	0	0	0
07:45 PM	0	0	0	0	0
Total	0	0	0	0	0
Grand Total	0	0	1	0	1
Apprch %	0	0	100	0	
Total %	0	0	100	0	

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 03:00 PM							
03:00 PM	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0
03:45 PM	0	0	0	**1**	0	**1**	**1**
Total Volume	0	0	0	1	0	1	1
% App. Total	0	0		100	0		
PHF	.000	.000	.000	.250	.000	.250	.250

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo / N. Doherty

File Name : 144200 F
Site Code : TBA
Start Date : 12/10/2014
Page No : 1

Groups Printed- Peds and Bicycles

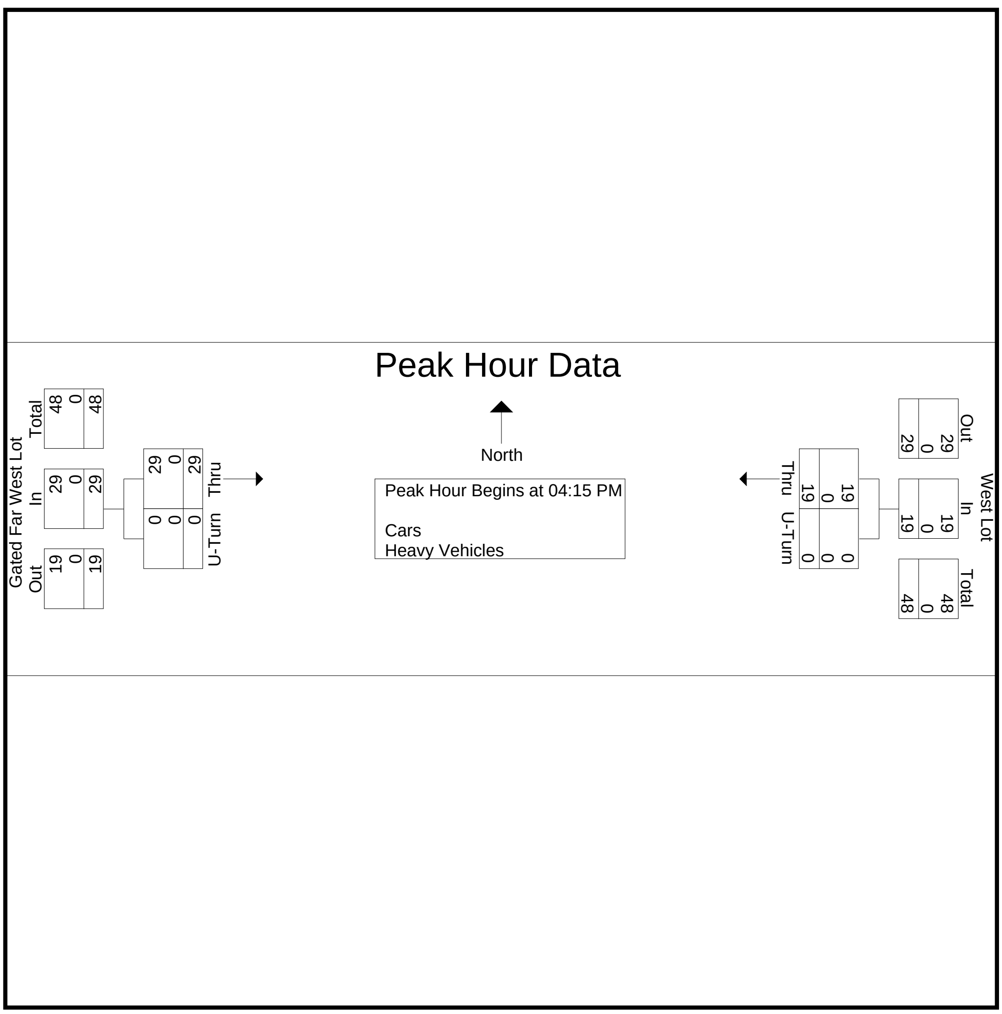
	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	CW SB	CW NB	Thru	CW NB	CW SB	Int. Total
03:00 PM	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
06:00 PM	0	0	0	0	0	0	0
06:15 PM	0	0	0	0	0	0	0
06:30 PM	0	0	0	0	0	0	0
06:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
07:00 PM	0	0	0	0	0	0	0
07:15 PM	0	0	0	0	0	0	0
07:30 PM	0	0	0	0	0	0	0
07:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	
Total %							

	West Lot From East				Gated Far West Lot From West				
Start Time	Thru	CW SB	CW NB	App. Total	Thru	CW NB	CW SB	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1									
Peak Hour for Entire Intersection Begins at 03:00 PM									
03:00 PM	0	0	0	0	0	0	0	0	0
03:15 PM	0	0	0	0	0	0	0	0	0
03:30 PM	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144200 F
Site Code : TBA
Start Date : 12/10/2014
Page No : 1

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 07:45 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 04:15 PM							
04:15 PM	4	0	4	3	0	3	7
04:30 PM	4	0	4	6	0	6	10
04:45 PM	3	0	3	**10**	0	**10**	13
05:00 PM	**8**	0	**8**	10	0	10	**18**
Total Volume	19	0	19	29	0	29	48
% App. Total	100	0		100	0		
PHF	.594	.000	.594	.725	.000	.725	.667
Cars	19	0	19	29	0	29	48
% Cars	100	0	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0



Trip Generation - Large Event (Annual Retirees Luncheon)

	A - Main Entrance from Day Blvd.						F - Gate in Westerly Lot		Total		
	From North		From East		From West		From East	From West			
Time	RT	LT	RT	TH	TH	LT	TH	TH	IN	OUT	TOTAL
10:00	23	12	8	0	1	8	7	2	37	16	53
10:15	35	20	3	1	0	5	4	4	59	8	67
10:30	88	10	6	0	0	8	2	3	101	14	115
10:45	96	0	1	1	2	10	25	0	96	11	107
11:00	94	1	6	0	1	7	71	1	96	13	109
11:15	46	0	3	0	0	7	22	4	50	10	60
11:30	25	7	2	2	1	8	14	4	36	10	46
11:45	8	5	0	0	0	6	2	6	19	6	25

Arrival Peak Hour

	In	Out	Total
10:15 a.m.	352	46	398
Attendees	600		
Trip Rate	0.59	0.08	0.67

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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

File Name : 144197 A (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014

Groups Printed- Cars - Heavy Vehicles

	Access Road to/from Day Boulevard From North			Access to East Lot From East			Access to West Lot From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	Int. Total
10:00 AM	23	12	0	8	0	0	1	8	0	52
10:15 AM	35	20	0	3	1	0	0	5	0	64
10:30 AM	88	10	0	6	0	0	0	8	0	112
10:45 AM	96	0	0	1	1	1	2	10	1	112
Total	242	42	0	18	2	1	3	31	1	340
11:00 AM	94	1	1	6	0	0	1	7	0	110
11:15 AM	46	0	0	3	0	0	0	7	1	57
11:30 AM	25	7	0	2	2	1	1	8	0	46
11:45 AM	8	5	0	0	0	0	0	6	0	19
Total	173	13	1	11	2	1	2	28	1	232
12:00 PM	12	5	0	4	2	0	3	9	0	35
12:15 PM	9	4	0	3	0	0	2	3	0	21
12:30 PM	8	0	0	4	0	0	0	7	0	19
12:45 PM	5	1	0	5	0	0	0	5	0	16
Total	34	10	0	16	2	0	5	24	0	91
01:00 PM	4	3	0	0	1	0	0	11	0	19
01:15 PM	7	3	0	6	1	0	0	11	0	28
01:30 PM	7	3	0	7	4	0	1	11	0	33
01:45 PM	12	1	0	8	2	0	0	30	0	53
Total	30	10	0	21	8	0	1	63	0	133
02:00 PM	9	0	1	34	2	0	0	77	0	123
02:15 PM	4	2	0	36	0	0	0	79	0	121
Grand Total	492	77	2	136	16	2	11	302	2	1040
Apprch %	86.2	13.5	0.4	88.3	10.4	1.3	3.5	95.9	0.6	
Total %	47.3	7.4	0.2	13.1	1.5	0.2	1.1	29	0.2	
Cars	487	75	2	130	14	2	11	297	2	1020
% Cars	99	97.4	100	95.6	87.5	100	100	98.3	100	98.1
Heavy Vehicles	5	2	0	6	2	0	0	5	0	20
% Heavy Vehicles	1	2.6	0	4.4	12.5	0	0	1.7	0	1.9

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:15 AM													
10:15 AM	35	**20**	0	55	3	**1**	0	4	0	5	0	5	64
10:30 AM	88	10	0	**98**	**6**	0	0	**6**	0	8	0	8	**112**
10:45 AM	**96**	0	0	96	1	1	**1**	3	**2**	**10**	**1**	**13**	112
11:00 AM	94	1	**1**	96	6	0	0	6	1	7	0	8	110
Total Volume	313	31	1	345	16	2	1	19	3	30	1	34	398
% App. Total	90.7	9	0.3		84.2	10.5	5.3		8.8	88.2	2.9		
PHF	.815	.388	.250	.880	.667	.500	.250	.792	.375	.750	.250	.654	.888
Cars	311	29	1	341	12	1	1	14	3	28	1	32	387
% Cars	99.4	93.5	100	98.8	75.0	50.0	100	73.7	100	93.3	100	94.1	97.2
Heavy Vehicles	2	2	0	4	4	1	0	5	0	2	0	2	11
% Heavy Vehicles	0.6	6.5	0	1.2	25.0	50.0	0	26.3	0	6.7	0	5.9	2.8

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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

File Name : 144197 A (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014

Groups Printed- Cars

	Access Road to/from Day Boulevard From North			Access to East Lot From East			Access to West Lot From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	Int. Total
10:00 AM	23	12	0	8	0	0	1	7	0	51
10:15 AM	34	20	0	2	0	0	0	4	0	60
10:30 AM	87	9	0	4	0	0	0	7	0	107
10:45 AM	96	0	0	1	1	1	2	10	1	112
Total	240	41	0	15	1	1	3	28	1	330
11:00 AM	94	0	1	5	0	0	1	7	0	108
11:15 AM	46	0	0	3	0	0	0	7	1	57
11:30 AM	25	7	0	2	2	1	1	8	0	46
11:45 AM	7	5	0	0	0	0	0	6	0	18
Total	172	12	1	10	2	1	2	28	1	229
12:00 PM	11	5	0	3	2	0	3	9	0	33
12:15 PM	9	4	0	3	0	0	2	3	0	21
12:30 PM	8	0	0	3	0	0	0	6	0	17
12:45 PM	5	1	0	5	0	0	0	5	0	16
Total	33	10	0	14	2	0	5	23	0	87
01:00 PM	4	3	0	0	1	0	0	11	0	19
01:15 PM	7	3	0	6	1	0	0	11	0	28
01:30 PM	7	3	0	7	4	0	1	11	0	33
01:45 PM	11	1	0	8	1	0	0	30	0	51
Total	29	10	0	21	7	0	1	63	0	131
02:00 PM	9	0	1	34	2	0	0	76	0	122
02:15 PM	4	2	0	36	0	0	0	79	0	121
Grand Total	487	75	2	130	14	2	11	297	2	1020
Apprch %	86.3	13.3	0.4	89	9.6	1.4	3.5	95.8	0.6	
Total %	47.7	7.4	0.2	12.7	1.4	0.2	1.1	29.1	0.2	

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:15 AM													
10:15 AM	34	**20**	0	54	2	0	0	2	0	4	0	4	60
10:30 AM	87	9	0	**96**	4	0	0	4	0	7	0	7	107
10:45 AM	**96**	0	0	96	1	**1**	**1**	3	**2**	**10**	**1**	**13**	**112**
11:00 AM	94	0	**1**	95	**5**	0	0	**5**	1	7	0	8	108
Total Volume	311	29	1	341	12	1	1	14	3	28	1	32	387
% App. Total	91.2	8.5	0.3		85.7	7.1	7.1		9.4	87.5	3.1		
PHF	.810	.363	.250	.888	.600	.250	.250	.700	.375	.700	.250	.615	.864

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N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144197 A (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014
Page No : 1

Groups Printed- Heavy Vehicles

	Access Road to/from Day Boulevard From North			Access to East Lot From East			Access to West Lot From West			
Start Time	Right	Left	U-Turn	Right	Thru	U-Turn	Thru	Left	U-Turn	Int. Total
10:00 AM	0	0	0	0	0	0	0	1	0	1
10:15 AM	1	0	0	1	1	0	0	1	0	4
10:30 AM	1	1	0	2	0	0	0	1	0	5
10:45 AM	0	0	0	0	0	0	0	0	0	0
Total	2	1	0	3	1	0	0	3	0	10
11:00 AM	0	1	0	1	0	0	0	0	0	2
11:15 AM	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0
11:45 AM	1	0	0	0	0	0	0	0	0	1
Total	1	1	0	1	0	0	0	0	0	3
12:00 PM	1	0	0	1	0	0	0	0	0	2
12:15 PM	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	1	0	0	0	1	0	2
12:45 PM	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	2	0	0	0	1	0	4
01:00 PM	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0
01:45 PM	1	0	0	0	1	0	0	0	0	2
Total	1	0	0	0	1	0	0	0	0	2
02:00 PM	0	0	0	0	0	0	0	1	0	1
02:15 PM	0	0	0	0	0	0	0	0	0	0
Grand Total	5	2	0	6	2	0	0	5	0	20
Apprch %	71.4	28.6	0	75	25	0	0	100	0	
Total %	25	10	0	30	10	0	0	25	0	

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:15 AM													
10:15 AM	**1**	0	0	1	1	**1**	0	**2**	0	**1**	0	**1**	4
10:30 AM	1	**1**	0	**2**	**2**	0	0	2	0	1	0	1	**5**
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	1	0	1	1	0	0	1	0	0	0	0	2
Total Volume	2	2	0	4	4	1	0	5	0	2	0	2	11
% App. Total	50	50	0		80	20	0		0	100	0		
PHF	.500	.500	.000	.500	.500	.250	.000	.625	.000	.500	.000	.500	.550

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
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Client: Tetra Tech Rizzo/ N. Doherty

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File Name : 144197 A (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014

Groups Printed- Peds and Bicycles

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	CW EB	CW WB	Right	Thru	CW SB	CW NB	Thru	Left	CW NB	CW SB	Int. Total
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	2	2
10:30 AM	1	0	0	0	0	0	0	0	0	0	0	3	4
10:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	2
Total	2	0	0	1	0	0	0	0	0	0	0	5	8
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1
11:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	2
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	1	1	3
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	1
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	2	0	0	0	0	0	0	0	3	0	5
Total	0	0	2	0	0	0	0	0	0	0	3	0	5
02:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
02:15 PM	0	0	0	0	0	0	0	0	0	0	2	1	3
Grand Total	2	0	2	1	0	0	0	0	0	1	7	8	21
Apprch %	40	0	40	20	0	0	0	0	0	6.2	43.8	50	
Total %	9.5	0	9.5	4.8	0	0	0	0	0	4.8	33.3	38.1	

	Access Road to/from Day Boulevard From North					Access to East Lot From East					Access to West Lot From West					
Start Time	Right	Left	CW EB	CW WB	App. Total	Right	Thru	CW SB	CW NB	App. Total	Thru	Left	CW NB	CW SB	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1																
Peak Hour for Entire Intersection Begins at 01:30 PM																
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	**2**	0	**2**	0	0	0	0	0	0	0	**3**	0	**3**	**5**
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	**1**	3	3
Total Volume	0	0	2	0	2	0	0	0	0	0	0	0	6	1	7	9
% App. Total	0	0	100	0		0	0	0	0		0	0	85.7	14.3		
PHF	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.000	.500	.250	.583	.450

N: Access to/from Day Boulevard
E/W: East Lot and West Lot Access
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

PRECISION
D A T A
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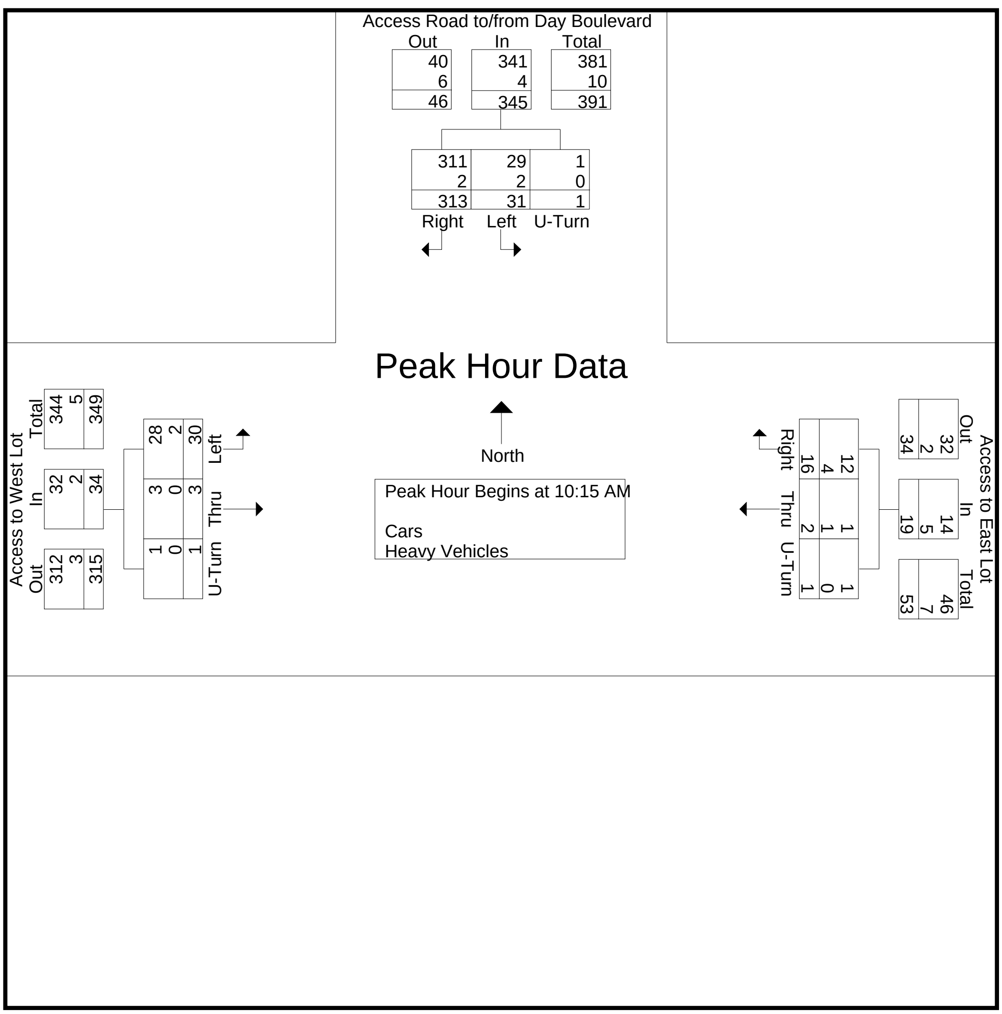
File Name : 144197 A (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014

	Access Road to/from Day Boulevard From North				Access to East Lot From East				Access to West Lot From West				
Start Time	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 10:15 AM													
10:15 AM	35	**20**	0	55	3	**1**	0	4	0	5	0	5	64
10:30 AM	88	10	0	**98**	**6**	0	0	**6**	0	8	0	8	**112**
10:45 AM	**96**	0	0	96	1	1	**1**	3	**2**	**10**	**1**	**13**	112
11:00 AM	94	1	**1**	96	6	0	0	6	1	7	0	8	110
Total Volume	313	31	1	345	16	2	1	19	3	30	1	34	398
% App. Total	90.7	9	0.3		84.2	10.5	5.3		8.8	88.2	2.9		
PHF	.815	.388	.250	.880	.667	.500	.250	.792	.375	.750	.250	.654	.888
Cars	311	29	1	341	12	1	1	14	3	28	1	32	387
% Cars	99.4	93.5	100	98.8	75.0	50.0	100	73.7	100	93.3	100	94.1	97.2
Heavy Vehicles	2	2	0	4	4	1	0	5	0	2	0	2	11
% Heavy Vehicles	0.6	6.5	0	1.2	25.0	50.0	0	26.3	0	6.7	0	5.9	2.8



E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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

File Name : 144197 F (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	West Lot From East		Gated Far West Lot From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
10:00 AM	7	0	2	0	9
10:15 AM	4	0	4	0	8
10:30 AM	2	0	3	0	5
10:45 AM	25	0	0	0	25
Total	38	0	9	0	47
11:00 AM	71	0	1	0	72
11:15 AM	22	0	4	0	26
11:30 AM	14	0	4	0	18
11:45 AM	2	0	6	0	8
Total	109	0	15	0	124
12:00 PM	4	0	5	0	9
12:15 PM	6	0	5	0	11
12:30 PM	2	0	6	0	8
12:45 PM	1	0	1	0	2
Total	13	0	17	0	30
01:00 PM	2	0	8	0	10
01:15 PM	2	0	5	0	7
01:30 PM	5	0	4	0	9
01:45 PM	8	0	10	0	18
Total	17	0	27	0	44
02:00 PM	3	0	38	0	41
02:15 PM	2	0	41	0	43
Grand Total	182	0	147	0	329
Apprch %	100	0	100	0	
Total %	55.3	0	44.7	0	
Cars	179	0	145	0	324
% Cars	98.4	0	98.6	0	98.5
Heavy Vehicles	3	0	2	0	5
% Heavy Vehicles	1.6	0	1.4	0	1.5

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 10:45 AM							
10:45 AM	25	0	25	0	0	0	25
11:00 AM	**71**	0	**71**	1	0	1	**72**
11:15 AM	22	0	22	**4**	0	**4**	26
11:30 AM	14	0	14	4	0	4	18
Total Volume	132	0	132	9	0	9	141
% App. Total	100	0		100	0		
PHF	.465	.000	.465	.563	.000	.563	.490
Cars	132	0	132	9	0	9	141
% Cars	100	0	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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

File Name : 144197 F (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014
Page No : 1

Groups Printed- Cars

	West Lot From East		Gated Far West Lot From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
10:00 AM	7	0	1	0	8
10:15 AM	3	0	4	0	7
10:30 AM	2	0	3	0	5
10:45 AM	25	0	0	0	25
Total	37	0	8	0	45
11:00 AM	71	0	1	0	72
11:15 AM	22	0	4	0	26
11:30 AM	14	0	4	0	18
11:45 AM	2	0	6	0	8
Total	109	0	15	0	124
12:00 PM	4	0	5	0	9
12:15 PM	6	0	5	0	11
12:30 PM	2	0	5	0	7
12:45 PM	1	0	1	0	2
Total	13	0	16	0	29
01:00 PM	2	0	8	0	10
01:15 PM	2	0	5	0	7
01:30 PM	5	0	4	0	9
01:45 PM	6	0	10	0	16
Total	15	0	27	0	42
02:00 PM	3	0	38	0	41
02:15 PM	2	0	41	0	43
Grand Total	179	0	145	0	324
Apprch %	100	0	100	0	
Total %	55.2	0	44.8	0	

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 10:45 AM							
10:45 AM	25	0	25	0	0	0	25
11:00 AM	**71**	0	**71**	1	0	1	**72**
11:15 AM	22	0	22	**4**	0	**4**	26
11:30 AM	14	0	14	4	0	4	18
Total Volume	132	0	132	9	0	9	141
% App. Total	100	0		100	0		
PHF	.465	.000	.465	.563	.000	.563	.490

PRECISION DATA INDUSTRIES, LLC
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E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

File Name : 144197 F (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014
Page No : 1

Groups Printed- Heavy Vehicles

	West Lot From East		Gated Far West Lot From West		
Start Time	Thru	U-Turn	Thru	U-Turn	Int. Total
10:00 AM	0	0	1	0	1
10:15 AM	1	0	0	0	1
10:30 AM	0	0	0	0	0
10:45 AM	0	0	0	0	0
Total	1	0	1	0	2
11:00 AM	0	0	0	0	0
11:15 AM	0	0	0	0	0
11:30 AM	0	0	0	0	0
11:45 AM	0	0	0	0	0
Total	0	0	0	0	0
12:00 PM	0	0	0	0	0
12:15 PM	0	0	0	0	0
12:30 PM	0	0	1	0	1
12:45 PM	0	0	0	0	0
Total	0	0	1	0	1
01:00 PM	0	0	0	0	0
01:15 PM	0	0	0	0	0
01:30 PM	0	0	0	0	0
01:45 PM	2	0	0	0	2
Total	2	0	0	0	2
02:00 PM	0	0	0	0	0
02:15 PM	0	0	0	0	0
Grand Total	3	0	2	0	5
Apprch %	100	0	100	0	
Total %	60	0	40	0	

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 10:00 AM							
10:00 AM	0	0	0	**1**	0	**1**	**1**
10:15 AM	**1**	0	**1**	0	0	0	1
10:30 AM	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0
Total Volume	1	0	1	1	0	1	2
% App. Total	100	0		100	0		
PHF	.250	.000	.250	.250	.000	.250	.500

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

PRECISION
DATA
INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
Office: 508.481.3999 Fax: 508.545.1234
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File Name : 144197 F (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014
Page No : 1

Groups Printed- Peds and Bicycles

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	CW SB	CW NB	Thru	CW NB	CW SB	Int. Total
10:00 AM	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0
Apprch %	0	0	0	0	0	0	
Total %							

	West Lot From East				Gated Far West Lot From West				
Start Time	Thru	CW SB	CW NB	App. Total	Thru	CW NB	CW SB	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1									
Peak Hour for Entire Intersection Begins at 10:00 AM									
10:00 AM	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000

E: West Lot
W: Gated Far West Lot
City, State: Boston, MA
Client: Tetra Tech Rizzo/ N. Doherty

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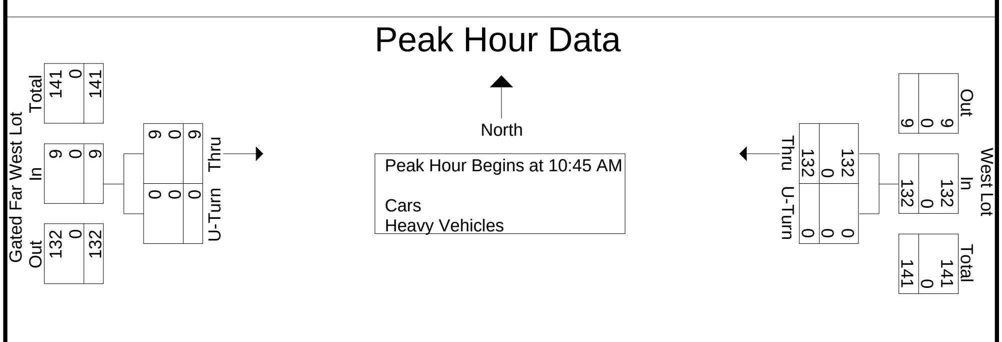
File Name : 144197 F (Thurs 10am-230pm)
Site Code : TBA
Start Date : 11/20/2014

	West Lot From East			Gated Far West Lot From West			
Start Time	Thru	U-Turn	App. Total	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:15 PM - Peak 1 of 1							
Peak Hour for Entire Intersection Begins at 10:45 AM							
10:45 AM	25	0	25	0	0	0	25
11:00 AM	**71**	0	**71**	1	0	1	**72**
11:15 AM	22	0	22	**4**	0	**4**	26
11:30 AM	14	0	14	4	0	4	18
Total Volume	132	0	132	9	0	9	141
% App. Total	100	0		100	0		
PHF	.465	.000	.465	.563	.000	.563	.490
Cars	132	0	132	9	0	9	141
% Cars	100	0	100	100	0	100	100
Heavy Vehicles	0	0	0	0	0	0	0
% Heavy Vehicles	0	0	0	0	0	0	0



APPENDIX K - CHAPTER 91 LICENSES (CD)

LIBERTY TRUST CO

DISCHARGE

KNOW ALL MEN BY THESE PRESENTS THAT THE LIBERTY TRUST COMPANY, a Corporation established under the Laws of the Commonwealth of Massachusetts and having its usual place of business in Boston, in the County of Suffolk, and said Commonwealth, Holder of a certain mortgage given by Clement D'Andria to itself dated October 31st, A. D. 1921, and recorded with Suffolk Deeds, Libro 4325, folio 632, hereby acknowledges that it has received full payment and satisfaction of the same; and in consideration thereof hereby cancels and Discharges said mortgage, and releases and quitclaims forever, the premises thereby conveyed. IN WITNESS WHEREOF, the said Liberty Trust Company has caused its corporate seal to be hereunto affixed and these presents to be signed in its name and behalf by George B. Wason, its President and William H. Sturges, its Ass't. Treas. this 3rd day of December, 1925. LIBERTY TRUST COMPANY By George B. Wason, President Wm. H. Sturgis, Asst. Treasurer. and the Corporate Seal. COMMONWEALTH OF MASSACHUSETTS. Suffolk ss. December 3rd, 1925. Then personally appeared the above named George B. Wason, and acknowledged the foregoing instrument to be the free act and deed of the LIBERTY TRUST COMPANY. Before me, - Leon G. Shattuck, Notary Public. My commission expires May 25, 1928.-------------------------December 4, 1925. At one o'clock and sixteen minutes P. M. Received, Entered, and Examined. ✓--

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COMMONWEALTH OF MASSACHUSETTS

to

WILLARD WELSH REALTY CO. INC.

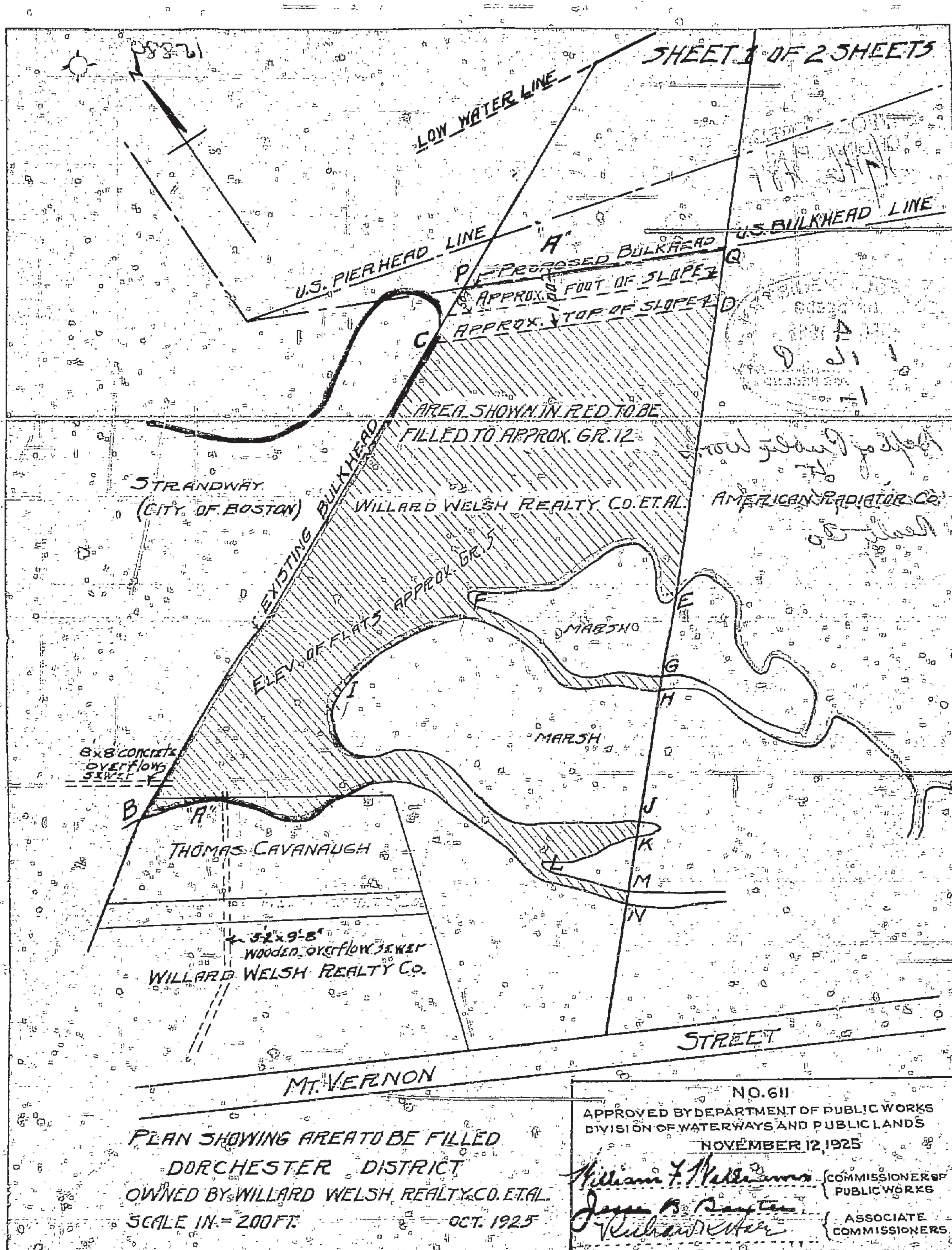
THE COMMONWEALTH OF MASSACHUSETTS MASSACHUSETTS COAT OF ARMS No. 611. WHEREAS, the Willard Welsh Realty Co., Inc., of Boston, in the County of Suffolk and Commonwealth aforesaid, has applied to the Department of Public Works, Division of Waterways and Public Lands, for license to construct bulkheads and fill solid in Old Harbor in the Dorchester District of the city of Boston, and has submitted plans of the same; and whereas due notice of said application, and of the time and place fixed for a hearing thereon, has been given, as required by law, to the Mayor and City Council of the city of Boston, NOW, said Department, Division of Waterways and Public Lands, having heard all parties desiring to be heard, and having fully considered said application, hereby, authorizes and licenses the said Willard Welsh Realty Co., Inc., subject to the provisions of the ninety-first chapter of the General Laws, and of all laws which are or may be in force applicable thereto, to construct bulkheads and fill solid in Old Harbor at its property in the Dorchester District of the city of Boston, Subject to the consent of the owners of any lands and flats on which bulkheads are to be built or filling done, in conformity with the accompanying plan No. 611, which shows in red thereon the location of the bulkhead to be constructed on the United States Bulkhead Line and the area to be filled within lines B-C-D-E-F-G-H-I-J-K-L-M-N-B. The slope of said filling may extend northeasterly of and parallel with said line C-D before the construction of said bulkhead on line P-Q, the top of slope to be on a line 100 feet south-westerly from and parallel with said United States Bulkhead Line, and the foot of slope to be fifty feet southwesterly of and parallel with said United States Bulkhead Line. In case filling is to be placed between said slope and said United States Bulkhead Line, a bulkhead shall be constructed on said Bulkhead line, and also on lines C-P and Q-D if deemed necessary by said Division. Provision shall also be made by the licensee, its successors and assigns for the extension of the two overflow sewers shown on said plan on and through the area to be filled under this license. If required by the Division bulkheads or other sufficient barriers shall be constructed to retain said filling within the area authorized to be filled. The amount of tide water which will be displaced by the work authorized as aforesaid is estimated to be 70,670 cubic yards. The recording of this license shall constitute an admission by the licensee that the foregoing estimate of displacement is correct. The plan of said work, numbered 611 is on file in the office of said Department, Division of Waterways and Public Lands, and a duplicate of said plan accompanies this License, and is to be referred to as a part hereof. Compensation for the amount of tide-water displaced by the work hereby authorized shall be made by the said Willard Welsh Realty Co., Inc., its successors, and assigns by paying into the treasury of the Commonwealth seven (7) cents for each cubic yard so displaced, being the amount hereby assessed by said Department, Division of Waterways and Public Lands. Nothing in this License shall be so construed as to impair the legal rights of any person. This license shall be void unless the same and the accompanying plan are recorded within one year from the date hereof, in the Registry of Deeds for the County of Suffolk. IN WITNESS WHEREOF, said Department of Public Works, Division of Waterways and Public Lands have hereunto set thei hands this twelfth day of November, in the year nineteen hundred and twenty-five. William F. Williams, Jesse B. Baxter, Richard K. Hale, Department of Public Works, Division of Waterways and Public Lands. Approved, William F. Williams, Commissioner of Public. Works. THE COMMONWEALTH OF MASSACHUSETTS Boston, " Approved by the Governor and Council " Executive Secretary. ----------------------December 4, 483

1925. At one o'clock and sixteen minutes P. M. Received, Entered, and Examined.

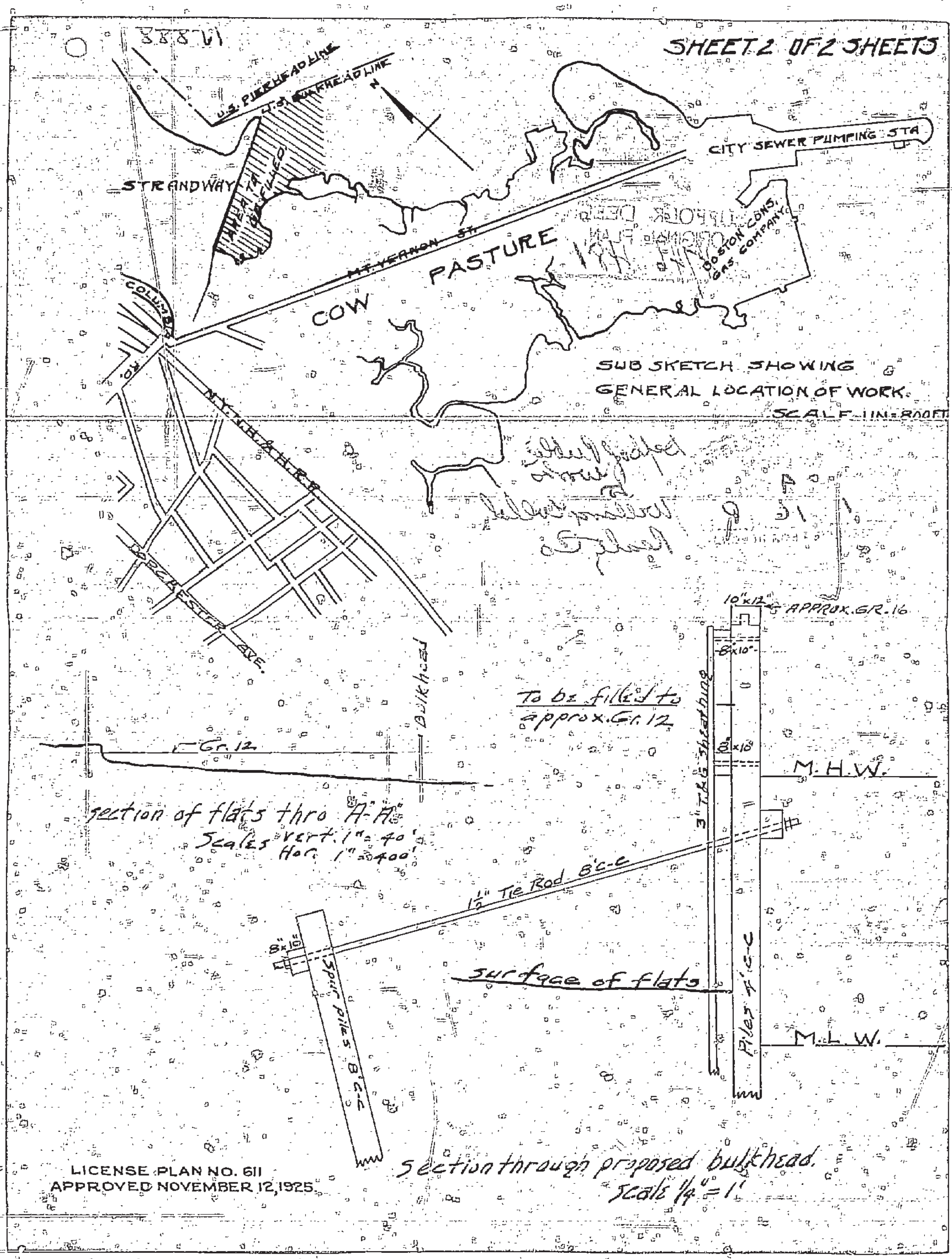
WILLARD WELSH REALTY CO to WALSH

WILLARD WELSH REALTY COMPANY, a corporation duly organized under the Laws of the Commonwealth of Massachusetts, for consideration paid, grants to RICHARD P. WALSH, of Medford, Middlesex County, Massachusetts, with Quitclaim Covenants, the following described parcels of land situated on or near Mount Vernon Street in that part of the City of Boston, Suffolk County, Massachusetts, formerly called Dorchester, viz:- First Parcel: A certain parcel of flats situated in the rear of and northeasterly of said Mount Vernon Street, being a part of the flats shown as contiguous or appurtenant to lot six (6) on plan showing the lines and boundaries of ownership in the flats of Old Harbor Bay, as determined by Darwin E. Ware and Henry L. Whiting, Commissioners appointed by the Supreme Judicial Court of Massachusetts, December 1, 1875, from surveys by Henry W. Wilson, Civil Engineer, dated February 1, 1878, on file at the Clerk's office of said Supreme Judicial Court in Boston, said flats are bounded and described as follows, viz: Beginning at the southeasterly corner thereof at land now or formerly of Cavanagh and running northwesterly on said land now or formerly of Cavanagh by a line parallel with and two hundred (200) feet distant northeasterly from the northeasterly line of a proposed street, about three hundred and ninety-five (395) feet, more or less; thence turning and running northeasterly on land of the City of Boston on the line between lots six (6) and seven (7) on said plan of the Old Harbor Division about fifteen hundred and ninety (1590) feet, more or less to Old Harbor and the line of private ownership; thence turning and running easterly on Old Harbor and line of private ownership to flats formerly of George H. Cavanagh; thence turning and running southwesterly on said flats, formerly of George H. Cavanagh on the line between lots five (5) and six (6) on said plan of the Old Harbor Division, about sixteen hundred and fifty (1650) feet, more or less; thence turning at about right angles and running southeasterly one hundred and twenty (120) feet to the point of beginning Excepting therefrom a small portion at the westerly corner thereof taken by the City of Boston under a taking recorded with Suffolk Deeds, Book 2069, page 17, and conveyed to said City of Boston by deed of Joseph Ham dated May 29, 1894, recorded with Suffolk Deeds, Book 2201, page 497. The premises are shown on a plan by Whitman & Howard dated September 1918, and recorded with Suffolk Deeds, Book 4181, page 461, and comprise the second parcel de-

U.S. Revenue stamps of the amount of $33.00 were affixed to this instrument and were canceled



SHEET 1 OF 2 SHEETS
LOW WATER LINE
U.S. PIERHEAD LINE
U.S. BULKHEAD LINE
"A"
PROPOSED BULKHEAD
APPROX. FOOT OF SLOPE
APPROX. TOP OF SLOPE
P
Q
D
C
AREA SHOWN IN RED TO BE
FILLED TO APPROX. GR. 12
EXISTING BULKHEAD
STRANDWAY
(CITY OF BOSTON)
WILLARD WELSH REALTY CO. ET. AL.
AMERICAN RADIATOR CO.
ELEV. OF FLATS APPROX. GR. 5
MARSH
E
F
G
H
I
J
K
L
M
N
8x8 concrete overflow sewer
B
"A"
THOMAS CAVANAUGH
3'-2" x 9'-8" wooden overflow sewer
WILLARD WELSH REALTY CO.
MT. VERNON
STREET
PLAN SHOWING AREA TO BE FILLED
DORCHESTER DISTRICT
OWNED BY WILLARD WELSH REALTY CO. ET. AL.
SCALE IN. = 200 FT.
OCT. 1925
NO. 611
APPROVED BY DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATERWAYS AND PUBLIC LANDS
NOVEMBER 12, 1925
William F. Williams
COMMISSIONER OF PUBLIC WORKS
ASSOCIATE COMMISSIONERS


SHEET 2 OF 2 SHEETS
U.S. PIERHEAD LINE
U.S. BULKHEAD LINE
STRANDWAY
AREA TO BE FILLED
MT. VERNON ST.
COW PASTURE
CITY SEWER PUMPING STA.
BOSTON CONS. GAS COMPANY
COLUMBIA RD.
N.Y.N.H.&H.R.R.
DORCHESTER AVE.
SUB SKETCH SHOWING GENERAL LOCATION OF WORK.
Gr. 12
Bulkhead
section of flats thro "A"-"A"
Scales Vert. 1" = 40' Hor. 1" = 400'
To be filled to approx. Gr. 12
10"x12"
APPROX. GR. 16
8"x10"
3" T.&G. Sheathing
M.H.W.
1½" Tie Rod 8' c-c
8"x10"
Spur piles 8' c-c
surface of flats
Piles 4' c-c
M.L.W.
LICENSE PLAN NO. 611
APPROVED NOVEMBER 12, 1925
Section through proposed bulkhead.
Scale ¼" = 1'

5387
268

COMMONWEALTH OF MASSACHUSETTS
to
CITY OF BOSTON

THE COMMONWEALTH OF MASSACHUSETTS No. 1483 Massachusetts Coat of Arms. WHEREAS, the City of Boston, by its Commissioner of Public Works in the County of Suffolk and Commonwealth aforesaid has applied to the Department of Public Works for license to construct and maintain a concrete conduit and to dredge in Old Harbor in the city of Boston, and has submitted plans of the same; and whereas due notice of said application, and of the time and place fixed for a hearing thereon has been given as required by law, to the Mayor and City Council of the city of Boston. NOW said Department having heard all parties desiring to be heard, and having fully considered said application, hereby authorizes and licenses the said City of Boston subject to the provisions of the ninety-first chapter of the General Laws, and of all laws which are or may be in force applicabe thereto, to construct and maintain a concrete conduit and to dredge in Old Harbor in the city of Boston, in conformity with the accompanying plan No. 1483. A reinforced concrete conduit, connecting with existing conduits, may be built in the location shown on said plan and in accordance with the details of construction there indicated. At the outer end of said conduit an area approximately 150 feet long by 40 feet wide may be dredged to a depth of 11 feet at mean low water, as shown on said plan. This license is granted subject to the laws of the United States, and to the provisions of Sections 52 to 56, inclusive, of Chapter 91 of the General Laws, which provide in part, that the transportation and dumping of the dredged material shall be done under the supervision of the Department of Public Works, and that the licensee shall be held liable to pay the cost of said supervision whenever the owner of the dredge or excavating machine fails to pay for the same within ten days after notification in writing from the Treasurer of the Commonwealth that the same is due. The plan of said work, numbered 1483 is on file in the office of said Department, and duplicate of said plan accompanies this License, and is to be referred to as a part hereof. Nothing in this License shall be so construed as to impair the legal rights of any person. This License shall be void unless the same and the accompanying plan are recorded within one year from the date hereof, in the Registry of Deeds for the County of Suffolk. IN WITNESS WHEREOF said Department of Public Works have hereunto set their hands this twenty third day of May in the year nineteen hundred and thirty three. F. E. Lyman, Richard K. Hale, Department of Public Works.-------------- June 12, 1933 At one o'clock and fifty minutes P. M. Received, Entered, and Examined ✓--

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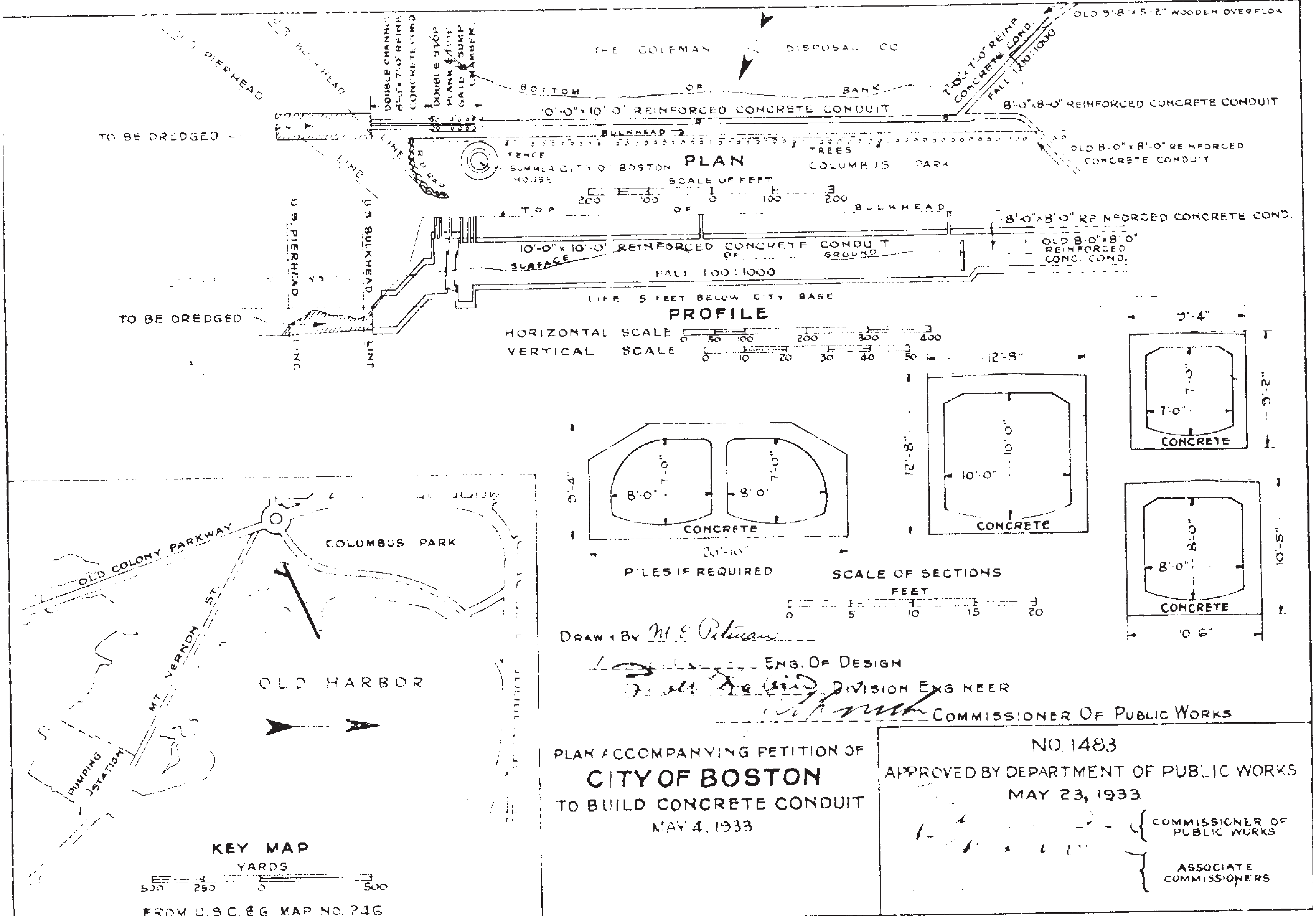


THE COLEMAN DISPOSAL CO.
BOTTOM OF BANK
U.S. PIERHEAD
U.S. BULKHEAD LINE
DOUBLE CHANNEL 8'-0" x 7'-0" REINF. CONCRETE COND.
DOUBLE STOP PLANK & TIDE GATE & SUMP CHAMBER
10'-0" x 10'-0" REINFORCED CONCRETE CONDUIT
BULKHEAD
TO BE DREDGED
FENCE
SUMMER HOUSE
CITY OF BOSTON
PLAN
SCALE OF FEET
200 100 0 100 200
TREES
COLUMBUS PARK
7'-0" x 7'-0" REINF. CONCRETE COND.
FALL 1.00 : 1000
OLD 5'-8" x 5'-2" WOODEN OVERFLOW
8'-0" x 8'-0" REINFORCED CONCRETE CONDUIT
OLD 8'-0" x 8'-0" REINFORCED CONCRETE CONDUIT
TOP OF BULKHEAD
8'-0" x 8'-0" REINFORCED CONCRETE COND.
10'-0" x 10'-0" REINFORCED CONCRETE CONDUIT
SURFACE OF GROUND
OLD 8'-0" x 8'-0" REINFORCED CONC. COND.
FALL 1.00 : 1000
LINE 5 FEET BELOW CITY BASE
U.S. PIERHEAD LINE
U.S. BULKHEAD LINE
TO BE DREDGED
PROFILE
HORIZONTAL SCALE 0 50 100 200 300 400
VERTICAL SCALE 0 10 20 30 40 50
9'-4"
7'-0"
8'-0"
7'-0"
8'-0"
CONCRETE
20'-10"
PILES IF REQUIRED
12'-8"
12'-8"
10'-0"
10'-0"
CONCRETE
9'-4"
9'-2"
7'-0"
7'-0"
CONCRETE
10'-5"
8'-0"
8'-0"
CONCRETE
10'-6"
SCALE OF SECTIONS
FEET
0 5 10 15 20
KEY MAP
OLD COLONY PARKWAY
COLUMBUS PARK
MT. VERNON ST.
OLD HARBOR
PUMPING STATION
YARDS
500 250 0 500
FROM U.S.C. & G. MAP NO. 246
DRAWN BY M. E. Pitman
ENG. OF DESIGN
DIVISION ENGINEER
COMMISSIONER OF PUBLIC WORKS
PLAN ACCOMPANYING PETITION OF
CITY OF BOSTON
TO BUILD CONCRETE CONDUIT
MAY 4, 1933
NO. 1483
APPROVED BY DEPARTMENT OF PUBLIC WORKS
MAY 23, 1933
COMMISSIONER OF PUBLIC WORKS
ASSOCIATE COMMISSIONERS

APPENDIX L - CLIMATE CHANGE PREPAREDNESS AND RESILIENCY CHECKLIST FOR NEW CONSTRUCTION (CD)

Climate Change Preparedness and Resiliency Checklist for New Construction

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

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

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

Climate Change Analysis and Information Sources:

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

Checklist

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

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

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

A.1 - Project Information

Project Name:	Building Replacement Project
Project Address Primary:	188 Mount Vernon Street Boston, MA 02125
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	David Brunelle, Jones Lang LaSalle david.brunelle@am.jll.com 617-459-6973

A.2 - Team Description

Owner / Developer:	B.T.U.H.W.F. Building Corporation
Architect:	Perkins + Will
Engineer (building systems):	Cosentini Associates
Sustainability / LEED:	Perkins + Will
Permitting:	Tetra Tech
Construction Management:	Jones Lang LaSalle
Climate Change Expert:	Tetra Tech

A.3 - Project Permitting and Phase

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

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

A.4 - Building Classification and Description

List the principal Building Uses:	Assembly Union Halls, Office
List the First Floor Uses:	Meeting Halls, Lobby, Prefunction, Credit Union, Conference Rooms, Lounge

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

☐ Wood Frame	☐ Masonry	☑ **Steel Frame**	☐ Concrete

Describe the building?

Site Area:	117,720 sf	Building Area:	*30,172 sf/52,469 gsf*
Building Height:	*50 ft.*	Number of Stories:	*3*
First Floor Elevation (reference Boston City Base):	20 ft	Are there below grade spaces/levels, if yes how many:	☑ *No / Number of Levels*

A.5 - Green Building

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

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

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

Registered:	**Not determined**	Certified:	

A.6 - Building Energy-

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

Electric:	*750 (kW)*	Heating:	*1,700 (MMBtu/hr)*
What is the planned building Energy Use Intensity:	*TBD from Energy Model (kWh/SF)*	Cooling:	*200 (Tons/hr)*

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

Electric:	*0 (kW)*	Heating:	*1,700 (MMBtu/hr)*
		Cooling:	*0 (Tons/hr)*

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

Electrical Generation:	*75 (kW)*		Life Safety Only Fuel Source:	*Diesel*
System Type and Number of Units:	☑ **Combustion Engine**	☐ Gas Turbine	☐ Combine Heat and Power	*(Units)*

B - Extreme Weather and Heat Events

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

B.1 – Analysis

What is the full expected life of the project?

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

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

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

What time span of future Climate Conditions was considered?

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

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

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

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

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

What Drought characteristics will be used for project planning – Duration and Frequency?

30-90 Days	*0.2 Events / yr.*

What Extreme Rain Event characteristics will be used for project planning – Seasonal Rain Fall, Peak Rain Fall, and Frequency of Events per year?

45 Inches / yr.	*4 Inches*	*0.5 Events / yr.*

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

130 Peak Wind	*10 Hours*	*0.25 Events / yr.*

B.2 - Mitigation Strategies

What will be the overall energy performance, based on use, of the project and how will performance be determined?

Building energy use below code:	*20 %*
How is performance determined:	**Energy Model**

What specific measures will the project employ to reduce building energy consumption?

Select all appropriate:	☑ **High performance building envelop**	☑ **High performance lighting & controls**	☑ **Building day lighting**	☑ **Energy Star equip. / appliances**
	☑ **High performance HVAC equipment**	☑ **Energy recovery ventilation**	☐ No active cooling	☐ No active heating
Describe any added measures:				

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

Roof:	*R = 25*	Walls / Curtain Wall Assembly:	*R = 13BATTS + R8 continuous insulation*
Foundation:	*R = 15*	Basement / Slab:	*R =10*
Windows:	*R = / U =0.4*	Doors:	*R = / U =0.7*

What specific measures will the project employ to reduce building energy demands on the utilities and infrastructure?

☐ On-site clean energy / CHP system(s)	☐ Building-wide power dimming	☐ Thermal energy storage systems	☐ Ground source heat pump
☑ **On-site Solar PV Provisions for only**	☐ On-site Solar Thermal	☐ Wind power	☐ None

Describe any added measures:	

Will the project employ Distributed Energy / Smart Grid Infrastructure and /or Systems?

Select all appropriate:				
	☐ Connected to local distributed electrical	☐ Building will be Smart Grid ready	☐ Connected to distributed steam, hot, chilled water	☐ Distributed thermal energy ready

Will the building remain operable without utility power for an extended period?

	Yes / No	If yes, for how long:	***1-2 Days***
If Yes, is building "Islandable?	No		
If Yes, describe strategies:			

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

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

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

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

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

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

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

Select all appropriate:				
	☐ Hardened building structure & elements	☐ Buried utilities & hardened infrastructure	☐ Hazard removal & protective landscapes	☐ Soft & permeable surfaces (water infiltration)
Describe other strategies:	**No basement, Transformers, switchgear, located on first floor above the flood plain.**			

C - Sea-Level Rise and Storms

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

C.1 - Location Description and Classification:

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

	Yes / No

Describe site conditions?

Site Elevation – Low/High Points:	*Boston City Base* 14.75' to *16.9' Elev.(Ft.)*
Building Proximity to Water:	*240 Ft.*

Is the site or building located in any of the following?

Coastal Zone:	*Yes* / No	Velocity Zone:	Yes / ***No***
Flood Zone:	*Yes* / No	Area Prone to Flooding:	***Yes*** / No

Will the 2013 Preliminary FEMA Flood Insurance Rate Maps or future floodplain delineation updates due to Climate Change result in a change of the classification of the site or building location?

2013 FEMA Prelim. FIRMs:	Yes / ***No***	Future floodplain delineation updates:	Yes / ***No***

What is the project or building proximity to nearest Coastal, Velocity or Flood Zone or Area Prone to Flooding?

	Site is entirely within the AE flood zone.

If you answered YES to any of the above Location Description and Classification questions, please complete the following questions. ***Otherwise you have completed the questionnaire; thank you!***

C - Sea-Level Rise and Storms

This section explores how a project responds to Sea-Level Rise and / or increase in storm frequency or severity.

C.2 – Analysis

How were impacts from higher sea levels and more frequent and extreme storm events analyzed: **TBHA (+2 feet); and range of CZM Intermediate Low (+1.6) and Intermediate High (+3.9')**

Sea Level Rise:	.	Frequency of storms:	*1 per 100 year*

C.3 - Building Flood Proofing

Describe any strategies to limit storm and flood damage and to maintain functionality during an extended periods of disruption.

What will be the Building Flood Proof Elevation and First Floor Elevation:

Flood Proof Elevation:	*Boston City Base 20.0 Elev.(Ft.)*	First Floor Elevation:	*Boston City Base 20.0 Elev. (Ft.)*

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

	Yes / ***No***	If Yes, to what elevation	Boston City Base Elev. (Ft.)
If Yes, describe:			

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

☑ **Systems located above flood plain**	☑ **Water tight utility conduits**	☐ Waste water back flow prevention	☐ Storm water back flow prevention

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

*Yes / **No***

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

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

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

*Yes / **No***

If Yes, describe:	

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

Building will have an emergency generator and is also located above the flood plain.	*Yes / **No***	If Yes, for how long:	*days*

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

See Section 7.5 of EENF/EPNF

C.4 - Building Resilience and Adaptability

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

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

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

Can the site and building be reasonably modified to increase Building Flood Proof Elevation?

Select appropriate:	*Yes / **No***	☐ Surrounding site elevation can be raised	☐ Building ground floor can be raised	☐ Construction been engineered
Describe additional strategies:	**The major portion of the first floor is already raised to be above the flood plain.**			

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	***Yes*** */ No*	☑ **Solar PV Provisions for**	☐ Solar Thermal	☐ Clean Energy / CHP System(s)
		☐ Potable water storage	☐ Wastewater storage	☐ Back up energy systems & fuel
Describe any specific or additional strategies:				

Thank you for completing the Boston Climate Change Resilience and Preparedness Checklist!

For questions or comments about this checklist or Climate Change Resiliency and Preparedness best practices, please contact: John.Dalzell.BRA@cityofboston.gov

APPENDIX M - LEED CHECKLIST (CD)

LEED 2009 for New Construction and Major Renovations

Project Checklist

Boston Teachers Union Health and Welfare Fund December 15, 2014

Y	?	N				
19	1	5	**Sustainable Sites**		Possible Points:	**26**
Y			Prereq 1	Construction Activity Pollution Prevention		
1			Credit 1	Site Selection	1	
5			Credit 2	Development Density and Community Connectivity	5	
		1	Credit 3	Brownfield Redevelopment	1	
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6	
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1	
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3	
		1	Credit 4.4	Alternative Transportation—Parking Capacity	2	
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1	
		1	Credit 5.2	Site Development—Maximize Open Space	1	
		1	Credit 6.1	Stormwater Design—Quantity Control	1	
1			Credit 6.2	Stormwater Design—Quality Control	1	
1			Credit 7.1	Heat Island Effect—Non-roof	1	
1			Credit 7.2	Heat Island Effect—Roof	1	
	1		Credit 8	Light Pollution Reduction	1	
8	2		**Water Efficiency**		Possible Points:	**10**
Y			Prereq 1	Water Use Reduction—20% Reduction		
4			Credit 1	Water Efficient Landscaping	2 to 4	
	2		Credit 2	Innovative Wastewater Technologies	2	
4			Credit 3	Water Use Reduction	2 to 4	
9	16	10	**Energy and Atmosphere**		Possible Points:	**35**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems		
Y			Prereq 2	Minimum Energy Performance		
Y			Prereq 3	Fundamental Refrigerant Management		
3	6	10	Credit 1	Optimize Energy Performance	1 to 19	
	7		Credit 2	On-Site Renewable Energy	1 to 7	
2			Credit 3	Enhanced Commissioning	2	
2			Credit 4	Enhanced Refrigerant Management	2	
	3		Credit 5	Measurement and Verification	3	
2			Credit 6	Green Power	2	
7	1	6	**Materials and Resources**		Possible Points:	**14**
Y			Prereq 1	Storage and Collection of Recyclables		
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3	
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1	
2			Credit 2	Construction Waste Management	1 to 2	
	1	1	Credit 3	Materials Reuse	1 to 2	

Y	?	N				
			Materials and Resources, Continued			
2			Credit 4	Recycled Content	1 to 2	
2			Credit 5	Regional Materials	1 to 2	
		1	Credit 6	Rapidly Renewable Materials	1	
1			Credit 7	Certified Wood	1	
11	2	2	**Indoor Environmental Quality**		Possible Points:	**15**
Y			Prereq 1	Minimum Indoor Air Quality Performance		
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control		
1			Credit 1	Outdoor Air Delivery Monitoring	1	
	1		Credit 2	Increased Ventilation	1	
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1	
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1	
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1	
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1	
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1	
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1	
1			Credit 5	Indoor Chemical and Pollutant Source Control	1	
1			Credit 6.1	Controllability of Systems—Lighting	1	
		1	Credit 6.2	Controllability of Systems—Thermal Comfort	1	
1			Credit 7.1	Thermal Comfort—Design	1	
	1		Credit 7.2	Thermal Comfort—Verification	1	
		1	Credit 8.1	Daylight and Views—Daylight	1	
1			Credit 8.2	Daylight and Views—Views	1	
5			**Innovation and Design Process**		Possible Points:	**6**
1			Credit 1.1	Innovation in Design: Green Housekeeping	1	
1			Credit 1.2	Innovation in Design: Sustainable Education	1	
1			Credit 1.3	Innovation in Designing for Resiliency and Sea Level Rise	1	
1			Credit 1.4		1	
			Credit 1.5		1	
1			Credit 2	LEED Accredited Professional	1	
3			**Regional Priority Credits**		Possible Points:	**4**
1			Credit 1.1	Heat Island Effect Roof	1	
1			Credit 1.2	Heat Island Non Roof	1	
1			Credit 1.3	Regional Priority: Storm Water Design Quality Control	1	
			Credit 1.4	Regional Priority: Specific Credit	1	
62	22	23	**Total**		Possible Points:	**110**

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

APPENDIX N - ACCESSIBILITY CHECKLIST (CD)

Accessibility Checklist

(to be added to the BRA Development Review Guidelines)

In 2009, a nine-member Advisory Board was appointed to the Commission for Persons with Disabilities in an effort to reduce architectural, procedural, attitudinal, and communication barriers affecting persons with disabilities in the City of Boston. These efforts were instituted to work toward creating universal access in the built environment.

In line with these priorities, the Accessibility Checklist aims to support the inclusion of people with disabilities. In order to complete the Checklist, you must provide specific detail, including descriptions, diagrams and data, of the universal access elements that will ensure all individuals have an equal experience that includes full participation in the built environment throughout the proposed buildings and open space.

In conformance with this directive, all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding the following:

- improvements for pedestrian and vehicular circulation and access;
- encourage new buildings and public spaces to be designed to enhance and preserve Boston's system of parks, squares, walkways, and active shopping streets;
- ensure that persons with disabilities have full access to buildings open to the public;
- afford such persons the educational, employment, and recreational opportunities available to all citizens; and
- preserve and increase the supply of living space accessible to persons with disabilities.

We would like to thank you in advance for your time and effort in advancing best practices and progressive approaches to expand accessibility throughout Boston's built environment.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
    a. http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
    a. http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Boston Complete Street Guidelines
    a. http://bostoncompletestreets.org/
4. City of Boston Mayors Commission for Persons with Disabilities Advisory Board
    a. http://www.cityofboston.gov/Disability
5. City of Boston – Public Works Sidewalk Reconstruction Policy
    a. http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
6. Massachusetts Office On Disability Accessible Parking Requirements
    a. www.mass.gov/anf/docs/mod/hp-parking-regulations-mod.doc
7. MBTA Fixed Route Accessible Transit Stations
    a. http://www.mbta.com/about_the_mbta/accessibility/

Project Information

Project Name:	**Building Replacement Project**
Project Address Primary:	**188 Mount Vernon Street**
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	**David Brunelle, Jones Lang LaSalle** david.brunelle@am.jll.com **617-459-6973**

Team Description

Owner / Developer:	**B.T.U.H.W.F Building Corporation**
Architect:	**Perkins + Will**
Engineer (building systems):	**Cosentini Associates**
Sustainability / LEED:	**Perkins + Will**
Permitting:	**Tetra Tech**
Construction Management:	**Jones Lang LaSalle**

Project Permitting and Phase

At what phase is the project – at time of this questionnaire?

☑ PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BRA Board Approved
BRA Design Approved	Under Construction	Construction just completed:

Building Classification and Description

What are the principal Building Uses - select all appropriate uses?

Residential – One to Three Unit	Residential - Multi-unit, Four +	Institutional	Education
Commercial	**Office**	**Retail**	**Assembly**
Laboratory / Medical	Manufacturing / Industrial	Mercantile	Storage, Utility and Other

First Floor Uses (List)	*Conference Center, Lounge, Credit Union*

What is the Construction Type – select most appropriate type?

Wood Frame	Masonry	**Steel Frame**	Concrete

Describe the building?

Site Area:	*117, 718 SF*	Building Area:	*30,172 sf / 52,469 GSF Bldg*
Building Height:	*50 Ft.*	Number of Stories:	*3 Flrs.*
First Floor Elevation:	*BCB 20.00' Elev.*	Are there below grade spaces:	Yes / ***No***

Assessment of Existing Infrastructure for Accessibility:

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

Provide a description of the development neighborhood and identifying characteristics.	**The Project site is located in the Columbia Point Section of Dorchester in a prominent location adjacent to the DCR parkland fronting Carson Beach. It is surrounded by the former Bayside Expo center on three sides currently owned by UMass Boston and used for student parking. The surrounding neighborhood**

	consists of existing housing stock toward Columbia Point
List the surrounding ADA compliant MBTA transit lines and the proximity to the development site: Commuter rail, subway, bus, etc.	The project is less than ¼ miles to the UMass/JFK MBTA station which is ADA compliant. This station is part of the MBTA Red Line transit system. Bus service is also available at this station.
List the surrounding institutions: hospitals, public housing and elderly and disabled housing developments, educational facilities, etc.	The largest institution close to the project (3/4 mile) is UMASS Boston.
Is the proposed development on a priority accessible route to a key public use facility? List the surrounding: government buildings, libraries, community centers and recreational facilities and other related facilities.	The closest recreational facility is the DCR owned Carson Beach located immediately to the north/northeast of the site.

Surrounding Site Conditions – Existing:

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

Are there sidewalks and pedestrian ramps existing at the development site?	Yes
If yes above, list the existing sidewalk and pedestrian ramp materials and physical condition at the development site.	The sidewalk, owned by DCR, from Day Boulevard to the project site is in poor condition.
Are the sidewalks and pedestrian ramps existing-to-remain? If yes, have the sidewalks and pedestrian ramps been verified as compliant? If yes, please provide surveyors report.	The sidewalks within the project site will all be replaced.
Is the development site within a historic district? If yes, please identify.	No

Proposed Accessible Parking:

See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability Handicap Parking Regulations.

What is the total number of parking spaces provided at the development site parking lot or garage?	Phase I: all grade parking 135 cars Phase II: parking garage for total of 308 cars
What is the total number of accessible spaces provided at the development site?	Phase I = 6 spaces Phase II = 10 spaces
Will any on street accessible parking spaces be required? If yes, has the proponent contacted the Commission for Persons with Disabilities and City of Boston Transportation Department regarding this need?	N/A
Where is accessible visitor parking located?	Parking in front of the building.
Has a drop-off area been identified? If yes, will it be accessible?	Yes, it will be accessible.
Include a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations. Please include route distances.	See attached Diagram.

Circulation and Accessible Routes:

The primary objective in designing smooth and continuous paths of travel is to accommodate persons of all abilities that allow for universal access to entryways, common spaces and the visit-ability* of neighbors.

**Visit-ability – Neighbors ability to access and visit with neighbors without architectural barrier limitations*

Provide a diagram of the accessible route connections through the site.	See attached Diagram.
Describe accessibility at each entryway: Flush Condition, Stairs, Ramp Elevator.	The front entrance of the building is accessible with a flush curb and will lead to the elevator bank for access to the second and third floors. The rear entrance of the building, which is at a lower elevation, is accessible and will lead to a set of stairs and lift to the elevator bank.
Are the accessible entrance and the standard entrance integrated?	Yes
If no above, what is the reason?	
Will there be a roof deck or outdoor courtyard space? If yes, include diagram of the accessible route.	Yes, see exhibit.
Has an accessible routes way-finding and signage package been developed? If yes, please describe.	The signage package has not been developed at this time.

Accessible Units: (If applicable)

In order to facilitate access to housing opportunities this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing choice.

What is the total number of proposed units for the development?	N/A
How many units are for sale; how many are for rent? What is the market value vs. affordable breakdown?	N/A

Article 80 | ACCESSIBILTY CHECKLIST

How many accessible units are being proposed?	N/A
Please provide plan and diagram of the accessible units.	N/A
How many accessible units will also be affordable? If none, please describe reason.	N/A
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs at entry or step to balcony. If yes, please provide reason.	N/A
Has the proponent reviewed or presented the proposed plan to the City of Boston Mayor's Commission for Persons with Disabilities Advisory Board?	N/A
Did the Advisory Board vote to support this project? If no, what recommendations did the Advisory Board give to make this project more accessible?	N/A

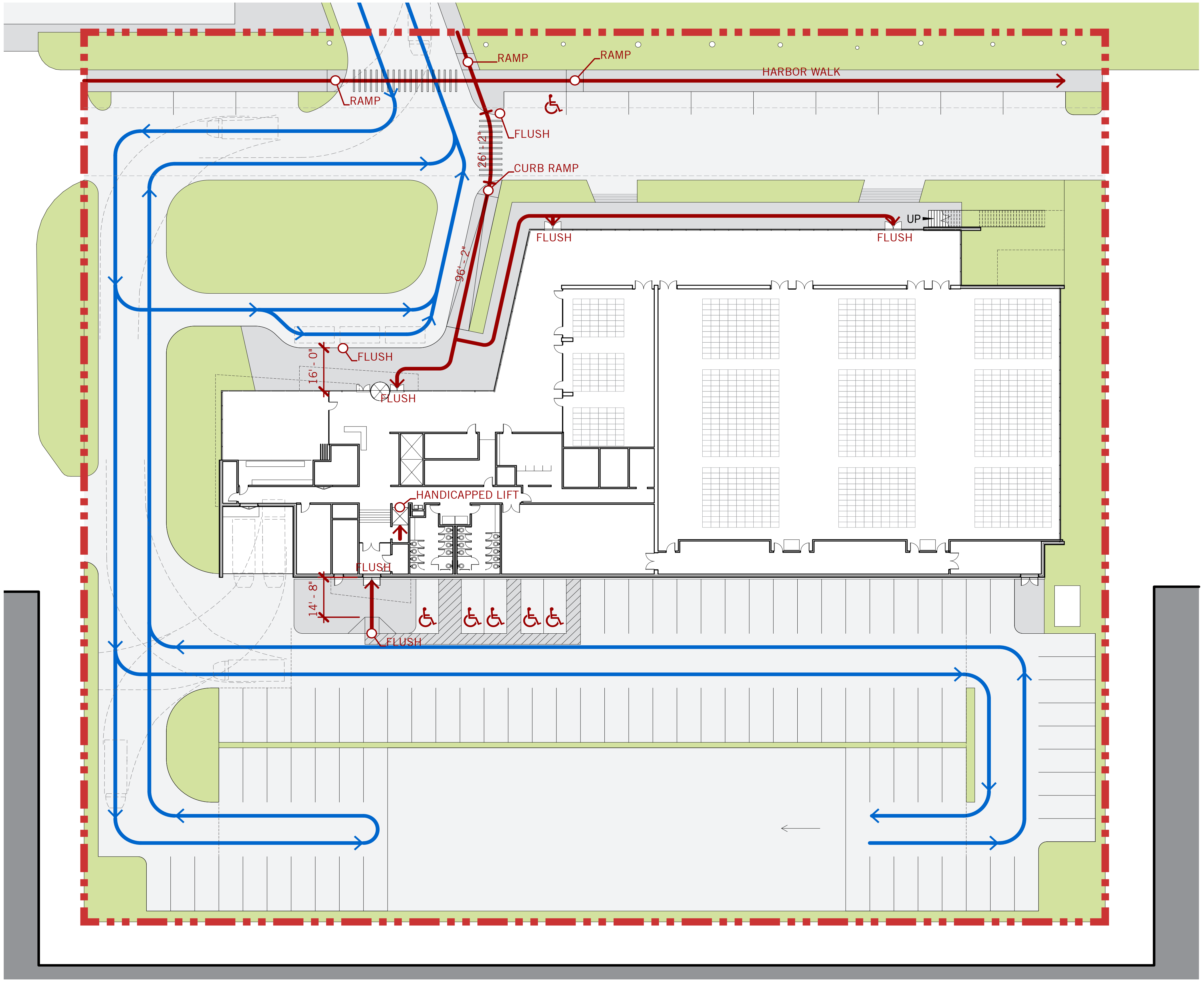
Thank you for completing the Accessibility Checklist!

For questions or comments about this checklist or accessibility practices, please contact:

kathryn.quigley@boston.gov | Mayors Commission for Persons with Disabilities

Accessibility Diagram

PEDESTRIAN ACCESS
VEHICLE ACCESS / DROP-OFF



APPENDIX O - DISTRIBUTION LIST AND PUBLIC NOTICES

EENF/EPNF Circulation List

Massachusetts Department of
Environmental Protection
Commissioner's Office
One Winter Street
Boston, MA 02108

Boston Public Library
South Boston Branch
646 East Broadway
South Boston, MA 02127

Massachusetts Department of
Environmental Protection
Division of Wetlands and Waterways
One Winter Street
Boston, MA 02108

Massachusetts Department of
Environmental Protection
Northeast Regional Office
Attn: MEPA Coordinator
205B Lowell Street
Wilmington, MA 01887

Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, MA 02116

Massachusetts Department of Transportation
Highway Division
District 6 Office
Attn: MEPA Coordinator
185 Kneeland Street
Boston, MA 02111

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

Metropolitan Area Planning Council
60 Temple Place/6th Floor
Boston, MA 02111

Massachusetts Water Resources Authority
Attn: MEPA Coordinator
100 First Avenue
Charlestown Navy Yard
Charlestown, MA 02129

Boston City Council
1 City Hall Square, Suite 550
Boston, MA 02201-2043

Boston Redevelopment Authority
One City Hall Square, Ninth Floor
Boston, Massachusetts 02201

City of Boston
Conservation Commission
1 City Hall Square
Room 709
Boston, MA 02201

Boston Public Health Commission
1010 Massachusetts Ave, 6th Floor
Boston, MA 02118

Coastal Zone Management
Attn: Project Review Coordinator
251 Causeway Street, Suite 800
Boston, MA 02114

Division of Marine Fisheries
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930

Department of Conservation and Recreation
Attn: MEPA Coordinator
251 Causeway Street, Suite 600
Boston, MA 02114-2104

Department of Energy Resources
Attn: MEPA Coordinator
100 Cambridge Street, 10th Floor
Boston, MA 02114

Massachusetts Bay Transportation Authority
Attn: MEPA Coordinator
10 Park Plaza, 6th Floor
Boston, MA 02116

Impact Advisory Group (IAG) Distribution List:

To be provided by Boston Redevelopment Authority

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs

MEPA Office

100 Cambridge Street, Suite 900
Boston, MA 02114
Telephone: 617-626-1020

PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

PROJECT: BTUHWF Building Replacement Project

LOCATION: 188 Mount Vernon Street, Boston (Dorchester), MA 02125

PROPONENT: B.T.U.H.W.F Building Corporation

The undersigned is submitting an Expanded Environmental Notification Form ("EENF") to the Secretary of Energy & Environmental Affairs on or before January 15, 2015.

This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA", M.G.L. c. 30, s.s. 61-62I). Copies of the EENF may be obtained from:

Mark Fobert
Tetra Tech
1 Grant Street
Framingham, MA 01701
Mark.Fobert@tetratech.com
(508) 903-2306

Copies of the EENF are also being sent to the Boston Conservation Commission and the Boston Redevelopment Authority where they may be inspected.

The Secretary of Energy & Environmental Affairs will publish notice of the EENF in the Environmental Monitor, will receive public comments on the project for 30 days, and will then decide, within ten days, whether or not an Environmental Impact Report is required and, if so, what to require in the Scope in accordance with the MEPA regulations (310 CMR 11.06 (9)). A site visit and consultation session on the project may also be scheduled. All persons wishing to comment on the project, or to be notified of a site visit or consultation session, should write to the Secretary of Energy & Environmental Affairs, 100 Cambridge St., Suite 900, Boston, Massachusetts 02114, Attention: MEPA Office, referencing the above project.

By: B.T.U.H.W.F Building Corporation

PUBLIC NOTICE

The Boston Redevelopment Authority (BRA), pursuant to Article 80 of the Boston Zoning Code ("Code"), hereby gives notice that B.T.U.H.W.F. Building Corporation (the "Proponent") filed on January 15, 2015 an Expanded Project Notification Form (PNF) for Large Project Review for the Boston Teachers Union Health and Welfare Fund Building Replacement Project (the "Proposed Project") located at 188 Mount Vernon Street in the Dorchester neighborhood of Boston.

The Proponent proposes to replace their existing 32,500 gross square foot (gsf) building located at 188 Mount Vernon Street in Dorchester. The replacement building (the "Project") will contain 52,469 gsf (exclusive of the mechanical penthouse), to be used for: Boston Teacher Union Health and Welfare Fund Offices, Boston Teacher's Union offices, an optical shop, a credit union, meeting spaces, conference rooms and function halls. All of these uses are present in the existing building. The Project also includes the construction of a two story parking garage behind the replacement building. The Project will be constructed in two phases. Phase I is the demolition and replacement of the building and construction of on-site improvements including landscaping, 135 surface-grade parking areas, internal vehicular circulation and sidewalks; Phase II is the two story parking garage that will be constructed over the surface parking lot constructed in Phase I. Phase II will include a total of 308 spaces. The new building will have a maximum building height of 50 feet (excluding mechanical roof structures and penthouses not designed or to be used for human occupancy). The new building will have a Floor Area Ratio (FAR) of 1:1.

Other site plan features will include a one-way vehicle loop drive to a passenger drop-off located at the main building entrance; an eight-foot wide pedestrian walkway along the entire northerly properly line in the direction towards Carson Beach for future connection to the Boston Harbor Walk; and a 6,500-square foot event plaza (located within the Project's front parking area) designed for planned outdoor functions and events; public benches, three parking spaces dedicated to public use located in the northwest corner of the parcel and bicycle racks for both Proponent use and public use. Both the building entrance passenger drop-off area and the function/event patio area are designed using permeable paver blocks, rather than standard asphalt pavement. The site design also includes a loading area and waste/recycle enclosure area, handicapped parking spaces and accessible routes in conformance with ADA and AAB Regulations, electric vehicle charging station, new site lighting, landscaping and utility infrastructure.

The Proponent is seeking issuance of a Scoping Determination by the BRA pursuant to Section 80B-5 of the Code. The BRA in the Scoping Determination for such PNF may waive further review pursuant to Section 80B-5.3(d) of the Code, if, after reviewing public comments, the BRA finds that such PNF adequately describes the Proposed Project's impacts.

The PNF may be reviewed in the office of the Secretary of the BRA, Room 910, Boston City Hall, Boston, MA 02201, between 9:00AM and 5:00PM, Monday through Friday, except legal holidays. Public comments on the PNF should be transmitted to Lance Campbell, BRA at the address stated above or via email at lance.campbell@boston.gov, within 30 days of this notice or no later than Tuesday February 17, 2015.

BOSTON REDEVELOPMENT AUTHORITY
Brian P. Golden
Executive Director / Secretary
January 15, 2015