Chapter 3 – Environmental Analyses

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3. ENVIRONMENTAL ANALYSES

3.1. Introduction

The Draft Environmental Impact Report (DEIR) provided a complete description and analysis of the project and its alternatives. It includes a description of existing conditions and identification and analysis of potential impacts related to the physical, biological, chemical, economic, and social conditions of the project site, its immediate surroundings, and the region. It also provides a discussion of the project's consistency with regulations pertaining to each area of potential impact. The project website provides links to the full DEIR document. Hyperlinks to each DEIR section are also provided in Appendix H, *DEIR Web Links*.

This FEIR chapter responds to the Secretary's Certificate by providing additional analyses of wetlands impacts; water quality and stormwater impacts; water use and wastewater impacts; climate change impacts; greenhouse gas impacts; and site contamination and hazardous materials. Proposed mitigation to avoid, reduce and/or minimize all impacts is discussed in this chapter as well. This FEIR chapter also summarizes environmental impacts identified in the DEIR related to the following:

- Land use and property
- Wetlands
- Chapter 91 waterways and tidelands
- Water quality and stormwater
- Water use and wastewater
- Traffic and transportation
- Climate change adaptation
- Air quality
- Noise and vibration
- Greenhouse gas emissions
- Historic resources
- Site contamination and hazardous materials
- Construction impacts

3.2. Summary of Potential Environmental Impacts

Table 3-1 provides a summary of potential environmental impacts including permanent, temporary, and construction-related impacts from the proposed project. These impacts were compared to the effects of the No Build Alternative in the year 2035, except where otherwise noted. Mitigated impacts are also included where appropriate.

Table 3-1 — Summary of Potential Environmental Impacts

Environmental Impacts	South Station	Widett Circle	Readville – Yard 2
Land Use and Property	• Acquire United States Postal Service (USPS) property (approximately 14 acres). • Acquire parcel adjacent to 245 Summer Street to reopen Dorchester Avenue (approximately 0.2 acres). • Reopen Dorchester Avenue to public right-of-way.	• Acquire Cold Storage and New Boston Food Market properties (approximately 25.1 acres). • Acquire Widett Circle and Foodmart Road (approximately 6.2 acres). • Acquire a portion of Department of Public Works (DPW) facility at Broad Interlocking (0.1 acres)	• Partial acquisition of James G. Grant Co. LLC property (approximately 0.7 acres).
Wetlands	• Direct impact to approximately 2.9 acres of Land Subject to Coastal Storm Flowage (LSCSF). • Direct impact to approximately 700 linear feet of coastal bank • Direct impact to approximately 7.9 acres of coastal bank 100-foot buffer zone	• No wetland impacts.	• Direct impact to approximately 0.01 acres of Riverfront Area. • Direct impact to 0.3 acres of 100-foot buffer zone. • Direct impact to 0.6 acres of isolated vegetated wetlands.
Chapter 91 Waterways and Tidelands	• Removes the nonwater-dependent USPS facility from filled Commonwealth Tidelands. • Expands existing transportation infrastructure. • Reopens approximately 5.0 acres of filled tidelands to public access. • Provides approximately 0.5 miles of newly reopened public	• Not subject to Chapter 91.	• Not subject to Chapter 91.

Environmental Impacts	South Station	Widett Circle	Readville – Yard 2
	roadway. • Creates approximately 3.0 acres of pedestrian-oriented open space.		
Water Quality and Stormwater	• Reduces impervious cover by 7.3 acres. • Reduces peak flow rate and runoff volume to below pre-development conditions. • Provides stormwater recharge via a bioretention area. • Improves water quality by removing approximately 80% of total suspended solids (TSS).	• Reduces impervious cover by 14.7 acres. • Reduces peak flow rate and runoff volume to below pre-development conditions. • Would provide groundwater recharge if feasible. • Improves water quality by removing approximately 80% of TSS.	• Increases impervious cover by 2.0 acres. • Reduces peak flow rate and runoff volume to below pre-development conditions. • Would provide groundwater recharge if feasible. • Improves water quality by removing approximately 80% of TSS.
Water Supply and Wastewater	• Increases water use and wastewater generation by approximately 44% over existing conditions.	• Decreases water use and wastewater generation by approximately 55% over existing conditions.	• Increases water use and wastewater generation by approximately 80% over existing conditions.
Transportation	• Increases ridership by approximately 11% in 2025 and by approximately 13% in 2035. • Would meet the MBTA's Service Delivery Policy related to crowding impacts on rapid transit and local bus routes. • The Silver Line platform would experience a Daily pedestrian flow increase of 2% to 4% on Silver Line platforms and up to 6% on Red Line platforms.	• No ridership or transit capacity impacts.	• No ridership or transit capacity impacts.

Environmental Impacts	South Station	Widett Circle	Readville – Yard 2
Traffic	• Without mitigation, increases Level of Service (LOS) at one intersection and decreases LOS at three intersections; four are unchanged. With mitigation, LOS increases at seven intersections and LOS decreases at one intersection.	• No impact. Trip generation at layover site is minimal.	• No impact. Trip generation at layover site is minimal.
Climate Change Adaptation	• Raising the seawall will help mitigate flooding from projected 2 feet of sea level rise by the year 2050. • Subject to flooding from 1% annual chance flood (100-year) with 3.2 feet of sea level rise by the year 2070. • Subject to increasing incidence of extreme heat events.	• Subject to flooding from 1% annual chance flood with 3.2 feet of sea level rise by the year 2070. • Subject to increasing incidence of extreme heat events.	• Subject to increasing incidence of extreme heat events.
Air Quality	• No adverse air quality impacts expected as a result of the project.	• No adverse air quality impacts expected as a result of the project.	• No adverse air quality impacts expected as a result of the project.
Noise and Vibration	• Prior to mitigation, moderate noise impact is projected at 245 Summer Street and across Fort Point Channel at Necco Street due to removal of noise buffering USPS facility. The proposed noise wall would mitigate this impact. • No vibration impact.	• No noise or vibration impacts.	• Prior to mitigation, moderate noise impact is projected along Wolcott Street and Riley Road. The proposed noise wall extension would mitigate this impact. • No vibration impact.

Environmental Impacts	South Station	Widett Circle	Readville – Yard 2
Greenhouse Gas Emissions	• Reduction in stationary source greenhouse gas (GHG) emissions by approximately 8% in compliance with the Massachusetts Stretch Energy Code. • Approximately 5% net reduction in carbon dioxide ($CO_{2)}$ emissions from locomotives near South Station, due to decreased congestion and idling time on the tracks. • Saves 46,000 tons of CO_2 per year in the Boston Region Metropolitan Planning Organization (MPO) region.	• Stationary sources not modeled.[1] Facility to comply with Stretch Code. • Increase in mobile source CO_2 emissions by approximately 5,800 tons per year in 2025 and 2035.	• Stationary sources not modeled.[1] Facility to comply with Stretch Code. • Increase in mobile source CO_2 emissions by approximately 2,500 tons per year in 2025 and 2035.
Historic Resources	• No adverse effect on historic properties identified in the Area of Potential Effect (APE). • Improved views to and from Fort Point Channel Historic District due to removal of USPS building and construction of Harborwalk. • No archaeological sensitivity.	• No historic properties affected. • No archaeological sensitivity.	• No historic properties affected. • No archaeological sensitivity.
Site Contamination/ Hazardous Materials	• Identification of three Recorded Environmental Conditions (RECs) and six Historic Recorded Environmental	• Identification of two RECs and seven HRECs.	• Identification of four RECs.

[1] *In a pre-DEIR filing meeting with MEPA and DOER on November 26, 2013, it was confirmed that building energy modeling was not required for the layover facility sites.*

Environmental Impacts	South Station	Widett Circle	Readville – Yard 2
	Conditions (HRECs).		
Construction Impacts	• Temporary rail service impacts, minimized to greatest extent possible. • Temporary traffic disruption and congestion. • Construction within Dorchester Avenue and the USPS parcel can occur with minimal impact to abutting properties, subject to state, local and agency provisions. • Temporary construction impacts may include fugitive dust emissions, direct emissions from construction equipment, and increased emissions from motor vehicles. • Construction noise levels may exceed City of Boston noise limits, but work would be completed in accordance with the City of Boston's noise control ordinances. • Construction vibration levels may exceed FTA criterion for human annoyance. • Potential exposure of contaminated soils, debris or groundwater during construction.	• Construction can occur with minimal impact to abutting properties and railroad operations, subject to state, local and agency provisions. • Temporary construction impacts may include fugitive dust emissions, direct emissions from construction equipment, and increased emissions from motor vehicles. • Potential exposure of contaminated soils, debris or groundwater during construction.	• Construction can occur with minimal impact to abutting properties and railroad operations, subject to state, local and agency provisions. • Temporary construction impacts may include fugitive dust emissions, direct emissions from construction equipment, and increased emissions from motor vehicles. • Construction noise levels may exceed City of Boston noise limits, but work would be completed in accordance with the City of Boston's noise control ordinances. • Potential exposure of contaminated soils, debris or groundwater during construction.

3.3. Land Use and Property

This section discusses the project's impact on property and associated land uses, and also provides the following information requested in the Secretary's Certificate:

- The extent of proposed land acquisitions associated with the layover facilities, and characterization of the existing conditions on the affected properties (Sections 3.3.2);
- Extent and location of known easements within the SSX project area, and clarification of how those easements may impact project construction and operation (Sections 3.3.3); and
- A discussion of MassDOT's legal and regulatory obligations associated with private property acquisitions (Section 3.3.4).

3.3.1. Impact Summary

Land use impacts associated with the project include:

- Acquisition of the U.S. Postal Service (USPS) property (approximately 14 acres);
- Acquisition of a parcel located adjacent to 245 Summer Street (approximately 0.2 acres);
- Reopening Dorchester Avenue to create a public right-of-way (approximately 5.0 acres);
- Acquisition of the Cold Storage and New Boston Food Market properties (approximately 25.1 acres);
- Acquisition of portion of Department of Public Works/City of Boston property (approximately 0.1 acres);
- Acquisition of Foodmart Road and Widett Circle (approximately 6.2 acres); and
- Partial acquisition of the James G. Grant Co. LLC property (approximately 0.7 acres).

3.3.2. Existing Condition of Land to be Acquired

South Station

Figure 3-1 illustrates property ownership in the South Station headhouse area. Expansion of South Station would require the purchase of the adjacent 14-acre parcel currently owned and occupied by the USPS. The USPS currently operates an approximately one million square foot General Mail Facility (GMF) with 90 tractor-trailer loading bays and 242 vehicular parking spaces on the parcel. The USPS site also includes approximately five acres of Dorchester Avenue, a former public roadway converted to federal property for USPS use only. The majority of the land occupied by the GMF would be used for the expansion of the terminal including additional tracks, platforms, and access improvements to the terminal.

The section of Dorchester Avenue previously conveyed for USPS use would be converted back to a public right-of-way, upgraded to meet the *Boston Complete Streets Design Guidelines* and MassDOT's *Healthy Transportation Engineering Directive*, and ownership would be transferred back to the City of Boston. The right-of-way would also include a section of Harborwalk that would connect existing sections of Harborwalk north and south of the project area.

The reopening of Dorchester Avenue would require acquisition of an approximately 0.2-acre parcel of land adjacent to 245 Summer Street at the intersection of Dorchester Avenue and Summer Street. This parcel includes a portion of the patio for the 245 Summer Street building, a retaining wall, and a landscaped buffer between the patio and the sidewalk along Dorchester Avenue. It was part of a previous land transfer from the City of Boston to the owners of 245 Summer Street (BDC Summer St 121A LP). The acquisition of this area is required to provide a safe and functional multimodal intersection at this

location, consistent with MassDOT and City of Boston standards. Further design would determine the extent of the impact and MassDOT would continue to work with the property owner to minimize any impacts.

Widett Circle

Figure 3-2 illustrates property ownership in the Widett Circle area. The proposed Widett Circle layover facility site totals approximately 30.2 acres, and is located in South Boston along the MBTA's Fairmount Line approximately one track-mile from South Station. This site is comprised of publicly and privately-owned parcels on two public roads, Widett Circle and Foodmart Road. As shown in Figure 3-2 and Table 3-2, one of the private parcels is owned by Art Mortgage Borrower Propco and three parcels are owned by the New Boston Food Market. The site also includes City of Boston public roads, a parcel owned by Amtrak, and portions of parcels owned by the City of Boston and the Commonwealth of Massachusetts.

In order to construct the Widett Circle layover facility, the MBTA would acquire up to 31.4 acres of land from various owners as shown below in Table 3-2. While all property belonging to New Boston Food Market would be acquired, the railroad portion referred to as "Parcel E" would remain as an easement for Amtrak use, and therefore, would not be used for the layover facility. Table 3-2 lists the acreage of the properties within the project site boundary, as well as the acreage of those properties to be acquired by MassDOT as part of the project.

Table 3-2 —Widett Circle Properties

Parcel/Owner	Address	Acres within Project Site Boundary	Acres to be Acquired
Department of Public Works Facility/City of Boston	400 Frontage Road	0.1	0.1
Cold Storage/Art Mortgage Borrower Propco	100 Widett Circle	5.0	5.0
New Boston Food Market #1	Widett Circle	0.8	3.7
New Boston Food Market #2	63 Foodmart Road	7.5	7.5
New Boston Food Market #3	22 Foodmart Road	8.9	8.9
Public Roads/City of Boston	N/A	6.2	6.2
Commonwealth of MA	N/A	0.3	0
Amtrak	N/A	1.4	0
Total		**30.2**	**31.4**

Further description of the real estate transactions that would need to be completed are as follows (as shown on Figure 3-2):

- Broad Interlocking is located adjacent to the Widett Circle area. A realignment of the Fairmount Line/Dorchester Branch Track 1 and Track 2 would be necessary in this location. The proposed realignment could require a small partial acquisition of the City of Boston Department of Public Works (DPW) Lot and could impact the garage access ramp located adjacent to the tracks. MassDOT would continue to work with Boston DPW throughout the design process to minimize potential impacts.
- Amtrak owns a parcel that includes the rail right-of-way at the throat of the proposed layover facility. MassDOT would require easements from Amtrak to perform work within this area.

- The parcel at 100 Widett Circle is referred to as the Cold Storage parcel. Cold Storage currently contains a temperature-controlled food storage and distribution facility, owned by Art Mortgage Borrower Propco 2006 2 LP, and used by Americold/Crocker & Winsor Seafoods. The building has an active rail siding served by CSX Transportation, Inc. (CSXT) with space for six freight cars. This parcel would need to be acquired in its entirety.
- The three parcels on Foodmart Road currently comprise the New Boston Food Market. The New Boston Food Market Development Corporation is made up of approximately 30 units leased to multiple businesses in the food processing, food storage, and food logistics industry. Created as an Urban Renewal Corporation, the property is tax-exempt under M.G.L. Chapter 121A (760 CMR 25). Existing buildings on the Widett Circle site total approximately 292,400 sf and the majority of the area around the structures and tracks is paved. One of the three parcels, shown as "New Boston Food Market #1" in Figure 3-2, is primarily a track easement for Amtrak and some trackwork as part of the SSX project would be necessary within this easement area. Although the entire parcel would likely be purchased, only a portion would be required for the layover facility. It is anticipated that the Amtrak track easement would remain. The New Boston Food Market parcels would need to be acquired in their entirety.
- The proposed Widett Circle layover facility site would also require the City of Boston to abandon Foodmart Road and Widett Circle. MassDOT would acquire this land.

Readville – Yard 2

Figure 3-3 illustrates property ownership in the Readville – Yard 2 area. The Readville – Yard 2 site is the location of the existing MBTA Readville layover facility located primarily at 50 Wolcott Court in Readville. The approximately 17.5-acre site is located along the MBTA Fairmount Line/Dorchester Branch, approximately 8.8 track-miles from South Station. Readville – Yard 2 is a maintenance repair facility and the largest layover yard used by the MBTA for its south side service. Currently, it is possible to store up to 10 commuter rail trainsets of varying lengths. Other functions include materials storage, located along the eastern border of the site.

Approximately 0.7 acres of land currently owned by James G. Grant Co. LLC (a private demolition and debris management company) would be required to accommodate the planned expansion of Readville – Yard 2. This area, directly adjacent to the existing tracks, is currently used as a salvage yard and does not contain any permanent structures.

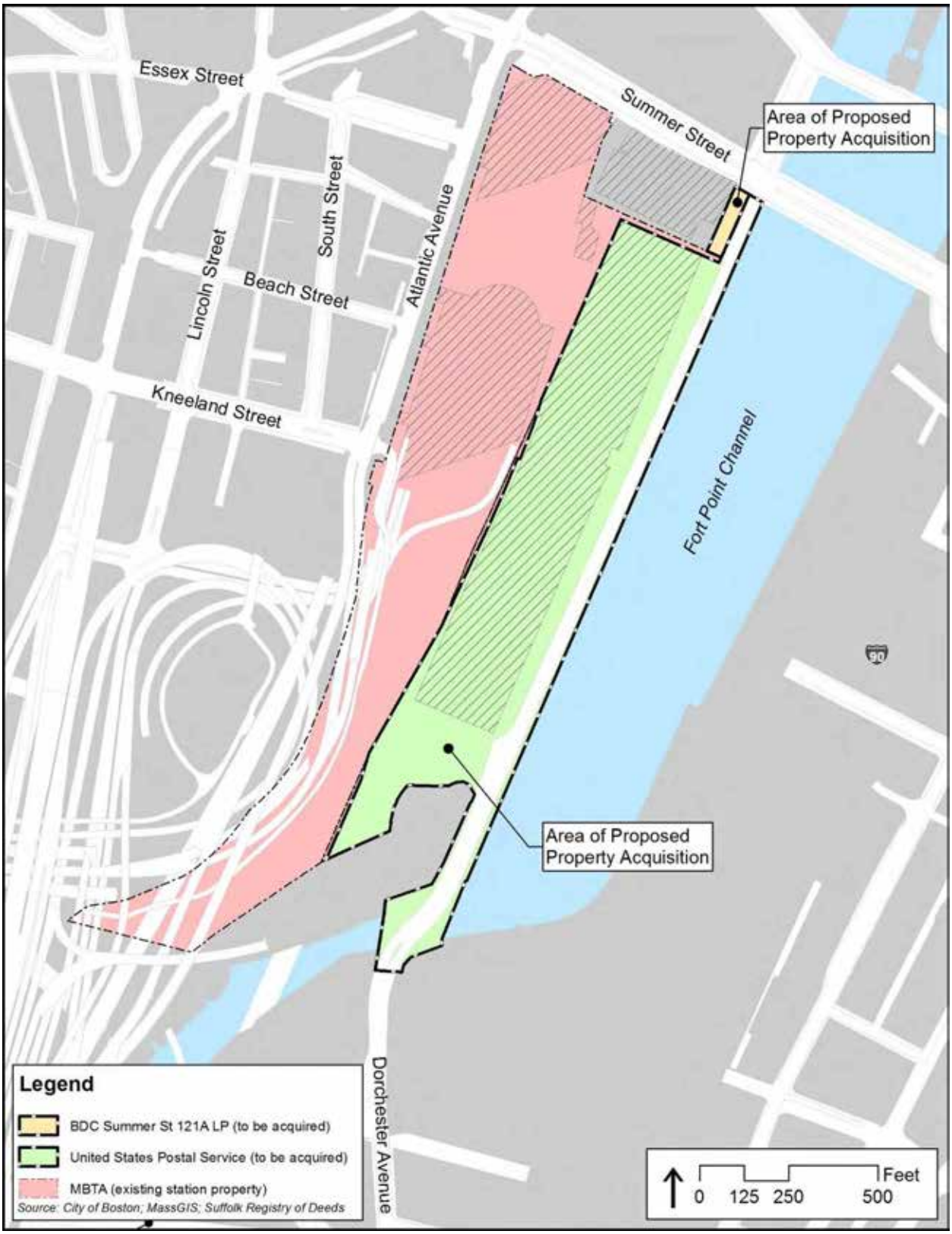


Figure 3-1 — Property Ownership and Proposed Property Acquisitions - South Station

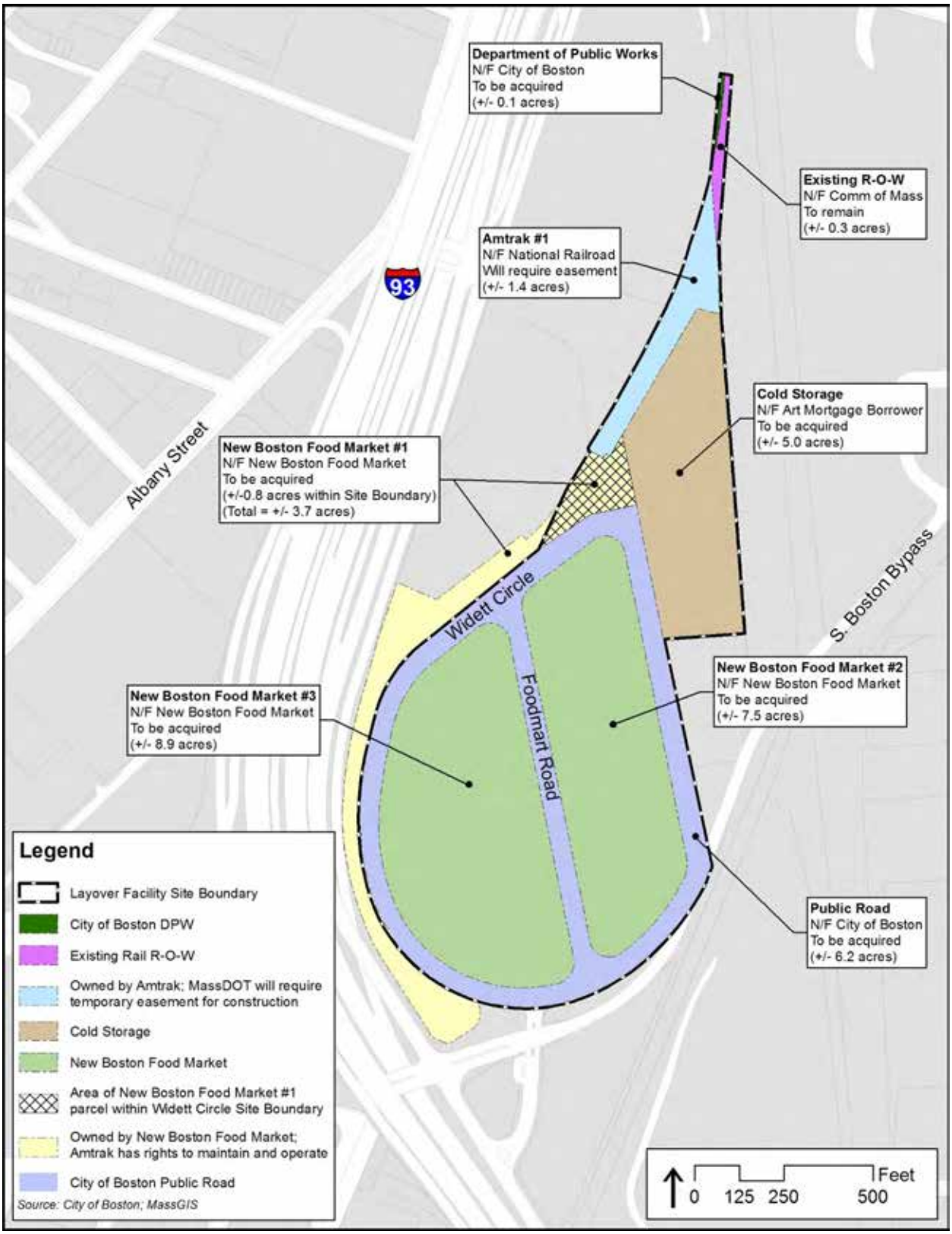


Figure 3-2 — Property Ownership and Proposed Property Acquisitions - Widett Circle

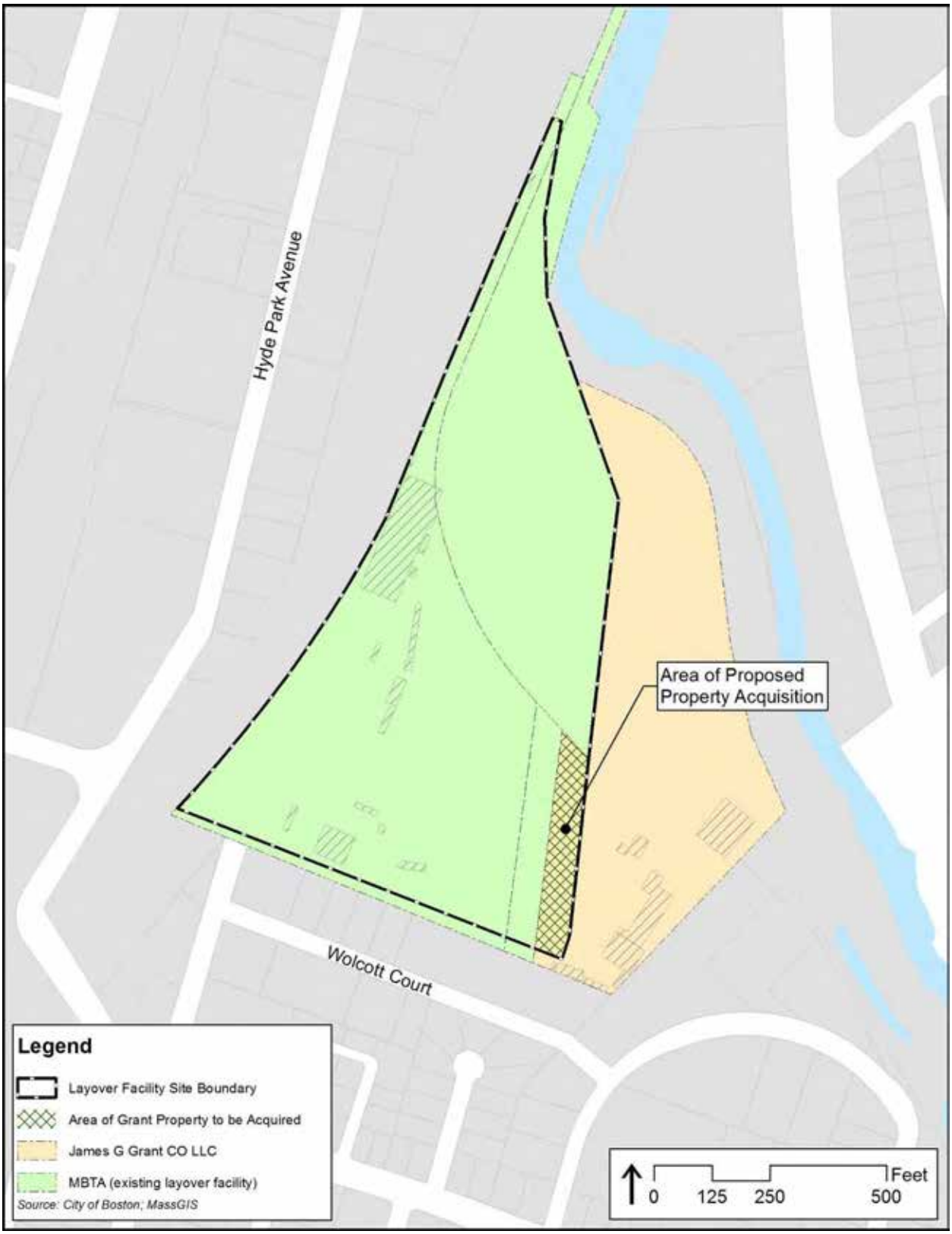


Figure 3-3 — Property Ownership and Proposed Property Acquisitions - Readville – Yard 2

3.3.3. Project Site Easements

The Secretary's Certificate requested that any easements be identified, and that their impact on project construction and operation be clarified. Based on research done to date, MassDOT does not anticipate any significant impacts as a result of the easements identified below. Property easements associated with the agreements between the MBTA, Boston Redevelopment Authority (BRA), USPS, and 245 Summer Street would need to be addressed as part of the acquisition of the USPS parcel. Field verification of utility locations would be conducted prior to construction. At that time impacts on project construction and operations would be assessed and minimized to the extent practicable.

South Station

The following easements have been identified on MassDOT/MBTA property:

- September 25, 1964 – The Boston Terminal Corporation granted a drainage easement to the Turnpike Authority (now MassDOT) for a 36-inch force main and an 8-inch force main within a 30-foot wide strip of land, containing approximately 5,900 square feet.
- May 10, 1979 – The MBTA entered into an agreement with the BRA, USPS, and Summer Street Realty (245 Summer Street) to grant numerous property easements to each party member for access to each other's parcels, and place development restrictions on certain parcels. MassDOT would continue to work with each of these parties throughout the SSX project.
- July 18, 1979 – The MBTA granted a permanent property easement to Summer Street Realty (245 Summer Street) for a two-way pedestrian and vehicular passage in and over land located between 245 Summer Street, and the USPS building and between the USPS building and the existing tracks and platforms at South Station.
- July 5, 1984 – A permanent sewer easement was granted to the Boston Water and Sewer Commission (BWSC) extending from the intersection of Kneeland Street and Atlantic Avenue, south along the MBTA property line to the Broadway street line.
- November 18, 1994 – A utility easement was granted for a subsurface utility corridor as part of the Central Artery/Tunnel project that extends from Kneeland Street across Atlantic Avenue and under the existing tracks south of the platforms.

The following easements have been identified on the USPS property:

- February 5, 1960 – Boston Terminal Corporation land was taken by the U.S. "subject to and reserving all existing easements for public utilities traversing said premises…" and includes the 132-inch x 52-inch changing to an 81-inch x 81-inch drain pipe as an extension of the Kneeland Street combined sewer system to the Fort Point Channel.
- March 16, 1961 – A utility easement was granted by the federal government "for public utilities." This easement is located behind the existing USPS building in the paved area adjacent to the existing tracks.
- August 5, 1974 – The taking of Dorchester Avenue, a 92-foot wide public way adjoining Fort Point Channel, remains subject to "existing easements for public roads and highways, public utilities, railroads and pipelines …."
- May 2, 2008 – The USPS granted a permanent sewer easement to the Commonwealth of Massachusetts (Mass Highway) for the purposes of maintaining and operating a sanitary sewer and related structures and appurtenances. The area is located within the former Dorchester Avenue right-of-way.

Widett Circle

The following easements have been identified on the Widett Circle site:

- August 8, 1916 – The Art Mortgage Borrower Propco parcel was granted a 15-foot wide City of Boston sewer easement that connects the railroad property to Widett Circle.
- August 11, 1965 – A 100-foot drainage easement was granted to enclose Dorchester Creek. Located on the easterly portion of Widett Circle, it follows the centerline of the 54-foot wide roadway and curves to the east through parcels owned by the State, south of Cold Storage. The easement encroaches on the properties abutting both sides of Widett Circle.
- March 25, 1966 – New Boston Food Market granted a track easement to Amtrak, which included rights to operate and maintain the tracks and their appurtenances, and the washer facilities and their service utility requirements, on the parcel labeled as "New Boston Food Market #1" (also referred to as "Parcel E") in Figure 3-2.
- October 21, 1968 – The New Boston Food Market parcel known as "Parcel E" contains a 40-foot wide Boston Edison Company (BECO) easement connecting Frontage Road with Parcel E, and a 10-foot wide BECO easement crossing Parcel E.

Readville – Yard 2

The following easements have been identified on the Readville – Yard 2 site:

- April 3, 1896 – A water main easement was granted on the south side of the Readville – Yard 2 site to accommodate a water main beneath Wolcott Court. The water main crosses the yard in a northerly direction before crossing the Neponset River. The pipe has a maximum interior diameter of 14 inches and was installed with a minimum of four feet of cover according to the easement agreement.
- May 14, 1934 – A 10-foot sewer easement and a 30-foot passage easement in the vicinity of Wolcott Court run parallel to and roughly 120 feet north of Wolcott Street. The sewer easement runs easterly within the 30-foot passage easement, turns in a northerly direction into the Readville Yard, then turns easterly crossing the Neponset River.

3.3.4. MassDOT's Legal and Regulatory Obligations

Any required property acquisitions would be carried out in the following ways to minimize impacts:

- Acquisition would be limited to the minimum footprints required to support each function, including access roads, stormwater management facilities, and employee parking areas, where required.
- All property acquisitions and relocations would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, 42 USC 4601; CFR 49 Part 24 and/or M.G.L. 79; M.G.L. 79A through the MBTA's real estate acquisition team.
- The preferred goal of MassDOT/MBTA is to reach agreements with owners for the purchase of properties required for the SSX project. Property owners would be offered just compensation based on fair market value established by a certified appraiser.

3.4. Wetlands

This section provides a summary of the project's impact on wetland resource areas, and also provides the following information requested in the Secretary's Certificate:

- The location and type of wetlands resource areas on all project sites (Section 3.4.1).
- Clarification of the jurisdiction of the potential isolated vegetated wetland on the Readville – Yard 2 layover facility site, and how MassDOT would meet any applicable regulations and/or performance standards (Section 3.4.2).

3.4.1. Impact Summary

The Massachusetts Wetlands Protection Act (WPA) establishes jurisdiction over special resource areas, including the following resources specific to the SSX project sites: coastal wetlands, rivers, land under water, land subject to coastal storm flowage, land subject to flooding, and riverfront areas. Resource impacts were calculated based on preliminary project footprints that represent the areas within each site boundary where permanent or temporary construction is likely to take place.

South Station

The South Station site has limited vegetation and mainly impervious surfaces. There are no vegetated federal wetlands located in the study area or site boundary. The WPA provides jurisdictional authority over several resource areas within and adjacent to Fort Point Channel, including land under the ocean, land subject to tidal action, coastal bank, and Land Subject to Coastal Storm Flowage (LSCSF). A 100-foot buffer zone extends from the Fort Point Channel's coastal bank. Resource impacts include approximately 700 linear feet of coastal bank and 7.9 acres of 100-foot jurisdictional buffer to coastal bank.

LSCSF corresponds to the elevation of the 1% annual chance floodplain indicated on the 2016 Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs). Approximately 2.9 acres of LSCSF is anticipated to be impacted at the South Station site (presented in Figure 3-4). In accordance with the WPA, construction at South Station will need to be preceded by a Notice of Intent and Orders of Conditions in accordance with the requirements in 310 CMR 10.00.

Widett Circle

The Widett Circle site and the surrounding areas are densely developed urban lands consisting of buildings, roadways, and existing rail yards. The site has minimal vegetation and is comprised mainly of impervious surfaces. There are no WPA jurisdictional resources identified within the Widett Circle project boundary. While the project would not affect any land below the 1% annual chance floodplain, approximately 25 acres of 0.2% annual chance floodplain (formerly known as the "500-year floodplain"), would be impacted by the project.

Readville – Yard 2

The Readville – Yard 2 site consists of existing rail infrastructure, disturbed ground, sparsely vegetated grass, and shrub patches among actively-used materials storage areas and the disturbed edge of the wooded riparian buffer to the Neponset River. A site investigation was conducted on December 7, 2015 to evaluate resources at the Readville – Yard 2 site. The bank of the Neponset River was flagged and the associated jurisdictional 25-foot riverfront area and 100-foot buffer zones were established from this boundary. In addition, one bordering vegetated wetland was delineated along the river and five isolated vegetated wetlands were delineated within the footprint of the proposed facility. The five isolated vegetated wetlands are highly and regularly disturbed, include invasive species, are not indicative of natural wetlands and likely developed due to former and on-going land use operations.

As presented in Figure 3-5, approximately 0.01 acres of riverfront area and 0.28 acres of 100-foot buffer zone would be impacted as a result of the proposed improvements at this location. In accordance with the WPA, construction at Readville – Yard 2 would need to be preceded by the filing of a Notice of Intent and Order of Conditions in accordance with the requirements in 310 CMR 10.00.

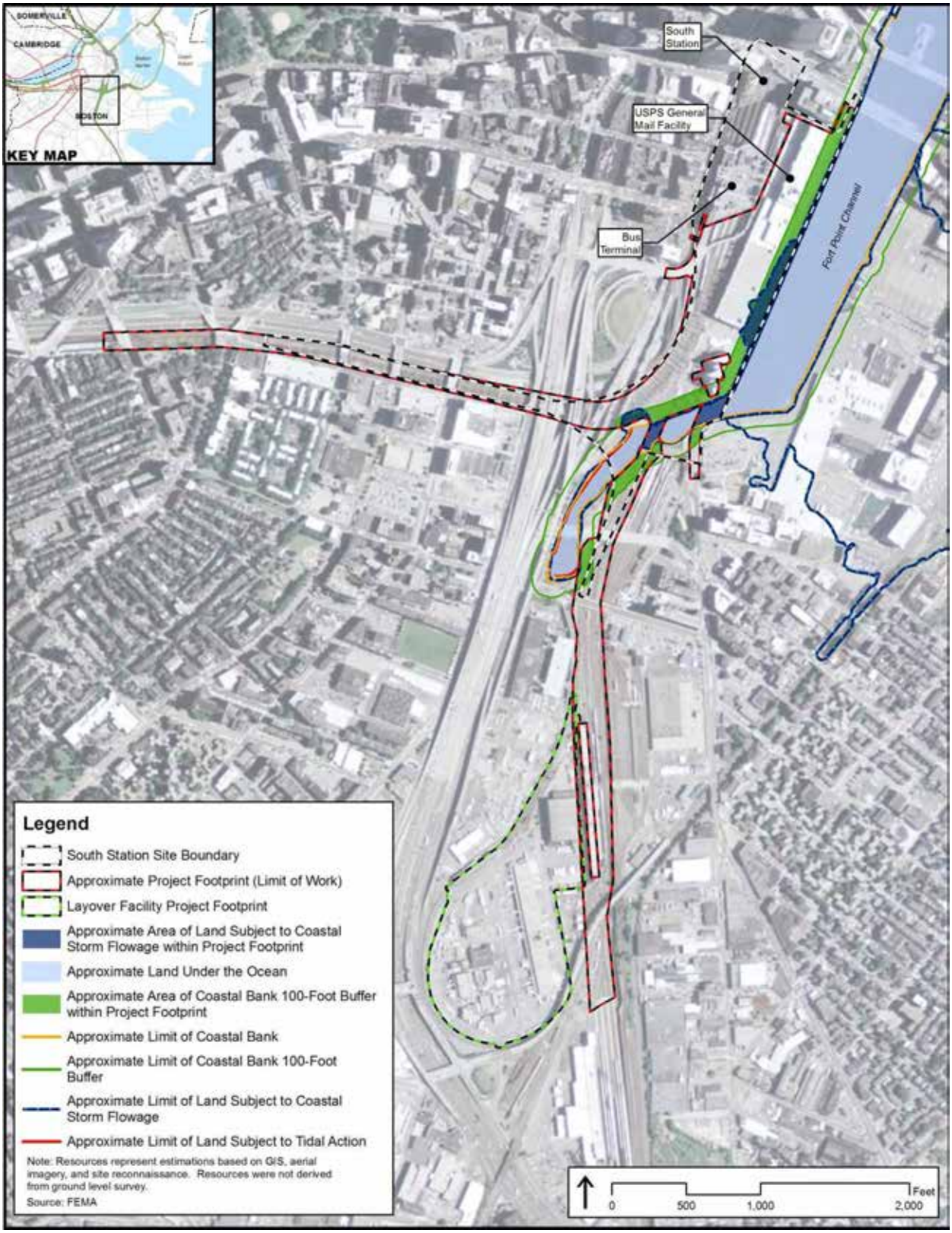


Figure 3-4 — Wetlands Resources - South Station & Widett Circle Layover Facility

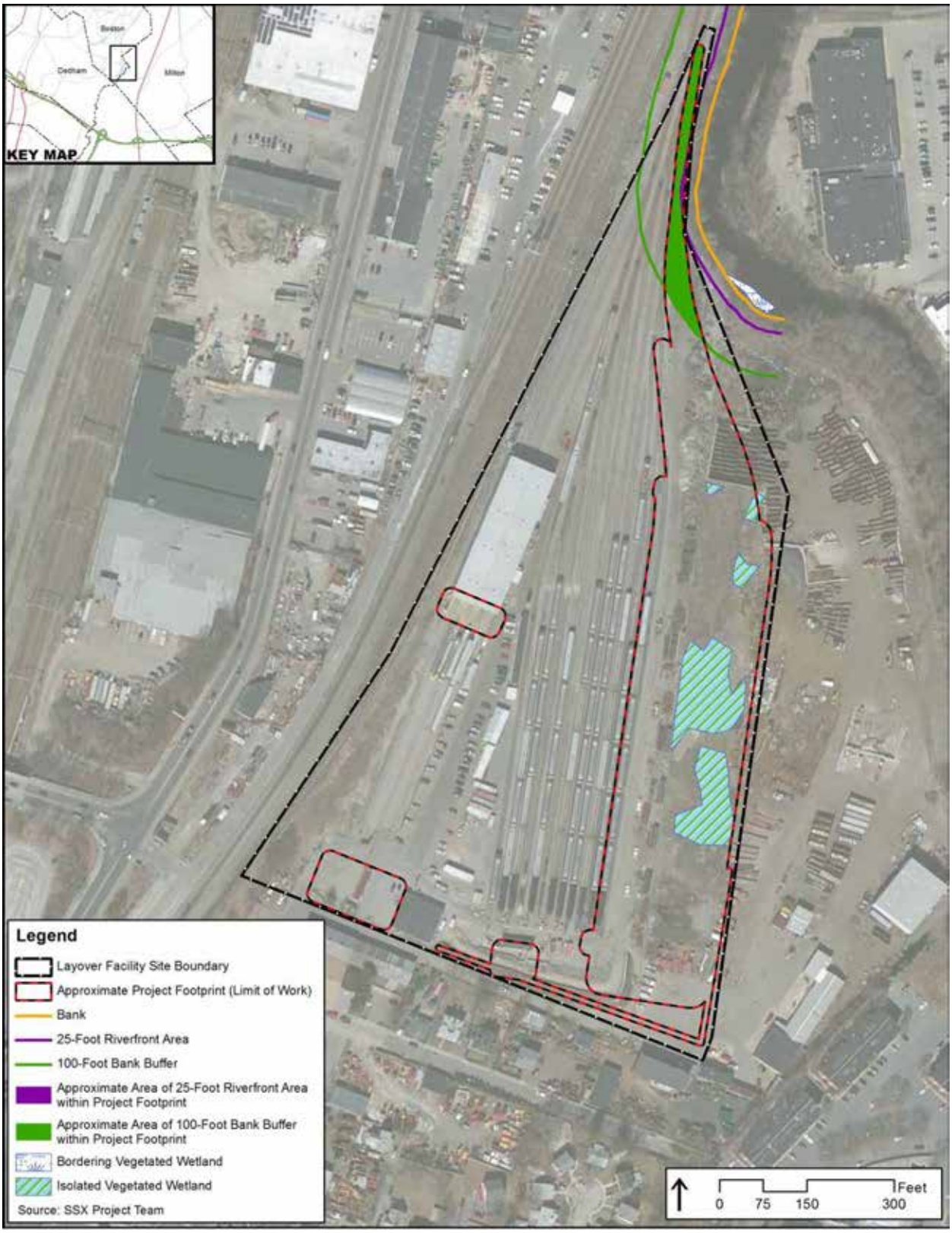


Figure 3-5 — Wetlands Resources - Readville – Yard 2 Layover Facility

3.4.2. Isolated Vegetated Wetlands

In addition to the impacts stated above, nearly the entire approximately 0.64 acre area of the five isolated vegetated wetlands would be impacted as a result of the work at this site. In order to determine potential jurisdiction of the non-bordering (isolated) vegetated wetlands, an evaluation of the hydrologic characteristics was made to determine if the land setting and wetlands meet the jurisdictional criteria as isolated land subject to flooding (ILSF). Similarly, an assessment of the likelihood of the isolated wetlands being federally jurisdictional under Section 401 and 404 of the Clean Water Act was made. Both the on-site evaluation and digital hydrologic volume estimations of these five isolated vegetated wetland areas confirmed that they are not jurisdictional under the WPA as ILSF, and would not require WPA regulation at the state or local level.

These five wetlands do appear to meet the U.S. Army Corps of Engineers' (USACE) criteria for a significant nexus consideration as to the designation of Waters of the United States. Further consultation with the USACE will take place as design advances to determine federal jurisdiction of these five resources. The determination by the USACE would establish whether a Section 401 water quality certification is needed from Massachusetts Department of Environmental Protection (MassDEP). In the event that a Section 404 permit is required from the USACE, and if 401 water quality certification is required, the appropriate steps would be taken to file the application and to meet the prescribed performance standards.

3.5. Chapter 91 Waterways and Tidelands

This section includes a summary of the project's impact on filled tidelands, and also provides the following information requested in the Secretary's Certificate:

- An updated discussion demonstrating how the South Station site would be designed to meet the Chapter 91 licensing criteria (Section 3.5.2); and
- An updated discussion of how the project complies with the Public Benefit Determination criteria (301 CMR 13.00) (Section 3.5.3).

3.5.1. Impact Summary

The project would result in substantial benefits to public rights in filled tidelands at the South Station site, including:

- Removing the nonwater-dependent USPS facility from filled Commonwealth Tidelands;
- Expanding the existing transportation infrastructure at South Station to meet current and future intercity and commuter rail service needs through the construction of critical infrastructure facilities, including new tracks, platforms, a new headhouse fronting on Dorchester Avenue, and related pedestrian-oriented and rail facilities;
- Reopening approximately five acres of filled tidelands to public access that have been closed since 1966, and providing approximately 0.5 miles of newly reopened public roadway; and
- Creating approximately three acres of publicly-accessible open space.

The Widett Circle and Readville – Yard 2 sites are not under Chapter 91 jurisdiction.

3.5.2. Chapter 91 Licensing Criteria

The project would require a new nonwater-dependent infrastructure license in compliance with 310 CMR 9.0 for the construction of tracks, platforms and a new headhouse fronting on Dorchester

Avenue. The project would meet applicable regulatory requirements for nonwater-dependent structures as outlined in the Chapter 91 regulations at 310 CMR 9.55. Of note is the exemption for nonwater-dependent infrastructure facilities from the regulatory standards at 310 CMR 9.51 (Conservation of Capacity for Water-Dependent Use), 310 CMR 9.52 (Utilization of Shoreline for Water-Dependent Purposes), and 310 CMR 9.53 (Activation of Commonwealth Tidelands for Public Use).

In accordance with 310 CMR 9.55, nonwater-dependent infrastructure facility projects are required to include mitigation and/or compensation measures as deemed appropriate by the Department to ensure all feasible measures are taken to avoid or minimize detriments to the water-related public interests. Such interests include, but are not limited to:

- The protection of maritime commerce, industry, recreation and associated public access;
- The protection, restoration, and enhancement of living marine resources;
- The attainment of water quality goals;
- The reduction of flood and erosion-related hazards on lands subject to the 1% annual chance flood event or to sea level rise, especially those in damage-prone or natural buffer areas;
- The protection and enhancement of public views and visual quality in the natural and built environment of the shoreline; and
- The preservation of historic sites and districts, archaeological sites, and other significant cultural resources near waterways.

The project has no negative impact on maritime commerce or industry. Benefits to the public trust rights in tidelands are described in Section 3.5.3.

The project would have no negative impact on the protection, restoration, or enhancement of living marine resources. Through the improvements to water quality described in Section 3.6, the project would help protect living marine resources that may be present in the Fort Point Channel.

Sections 3.4, Wetlands, and 3.10, Climate Change, describe how the site would be designed to reduce flood and erosion-related hazards on land subject to coastal storm flowage for today and the future.

As described in Section 3.5.3, Assessment of Public Benefits, the project involves converting the approximately 14-acre USPS facility to an expanded publicly accessible multimodal transportation facility and a reopened Dorchester Avenue. This would substantially enhance public waterfront access and public views of the natural and built environment along the water's edge.

Finally, the project preserves the historic headhouse and has no adverse impact on cultural resources near waterways. Section 3.14, Historic Resources, provides additional details.

3.5.3. Assessment of Public Benefits

This section includes an updated discussion of how the project complies with the Public Benefit Determination (301 CMR 13.00) criteria established for nonwater-dependent projects located completely or partially within filled tidelands or landlocked tidelands.

Purpose and Effect of the Development

The project's purpose is to expand South Station's rail capacity and related layover capacity in order to meet current and future high-speed, intercity, and commuter rail service needs. The expansion of South Station would enable planned growth in passenger rail along the Northeast Corridor (NEC) and within the Commonwealth of Massachusetts, and would facilitate accompanying improvements in corridor and regional intermodal and multimodal mobility, passenger experience and comfort, economic development, and quality of life.

There are three fundamental transportation deficiencies (needs) the project would address to improve both current and future railroad operations:

- Terminal capacity constraints
- Insufficient layover space
- Inadequate station facilities

The project would have many permanent beneficial effects on the South Station site and surrounding community, including improvements to transportation infrastructure, new public waterfront access to approximately 0.5 miles along the Fort Point Channel and public access to approximately 5.0 acres of public land currently closed to public access and use.

Impact on Abutters and Community

The South Station component of the project would result in a substantial benefit to the general community by addressing critical rail transportation needs; reopening Dorchester Avenue to pedestrian, bicycle and vehicular traffic; and creating a new neighborhood destination that has been effectively isolated from public use since the 1960s when the portion of Dorchester Avenue east of South Station was purchased by the USPS for its exclusive use. The planned transportation improvements would enhance rail service for the traveling public, while providing local transportation improvements and other benefits in the South Station neighborhood including:

- Constructing approximately one-half mile of cycle track and Harborwalk within Dorchester Avenue and providing new pedestrian and bicycle connections between Summer Street and the existing public portions of Dorchester Avenue in South Boston;
- Improving vehicular traffic flow by reducing curbside congestion on Atlantic Avenue; providing an alternative road to accommodate curbside activity; and separating vehicular traffic from pedestrian and bicycle activity;
- Improving pedestrian connections around and through the South Station site to the neighboring communities of the Leather District, Chinatown, and the South Boston Waterfront/Innovation District; and
- Expanding the existing intermodal and multimodal transportation network through improved interconnections between the South Station Rail Terminal and South Station Bus Terminal, as well as with the MBTA Red and Silver Lines.

In addition to the aforementioned intermodal and multimodal transportation improvements, the SSX project would result in economic benefits to the community. As stated in DEIR Section 4.15.2, Potential Impacts, the project would result in an increase in permanent employment within South Station and in system-wide rail-related employment, as well as temporary construction jobs.

Enhancement of Property

As previously mentioned, the project would enhance the 49-acre property (including the South Station and USPS parcels and Dorchester Avenue) by converting an approximately 14-acre parcel from a USPS facility to an expanded publicly accessible multimodal transportation facility and a reopened Dorchester Avenue. The project would provide substantially improved pedestrian, bicycle and vehicular accessibility.

The project would create an expanded headhouse, appropriately designed to complement the existing historic headhouse and provide new and expanded pedestrian connections through the site, to neighboring communities, and to the Fort Point Channel. At the South Station site, the project would re-activate the waterfront along the Fort Point Channel.

Enhanced rail service at South Station would advance MassDOT's goal of promoting mode shift by improving the access, convenience, and availability of transit as a viable alternative to people who would otherwise commute or travel to Boston by car.

The project would advance MassDOT's vision as a national leader in promoting sustainability in the transportation sector. The expansion of South Station would incorporate applicable sustainable design measures, including adaptation strategies. The project would be planned, designed, constructed, and operated consistent with MassDOT policies that identify goals of reducing greenhouse gas emissions; promoting healthy transportation options of walking, bicycling, and public transit; and supporting smart growth development.

The project would comply with all applicable state and federal water quality regulations, which prohibit the degradation of water quality. Consistent with MassDEP's stormwater management policies, the project would include new best management practices (BMPs) to improve water quality to the extent practicable. Both layover facility sites would include improvements in stormwater quality discharged from the sites through the implementation of stormwater BMPs.

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

The SSX project would result in substantial improvement in public benefits in tidelands through the reactivation of approximately five acres of filled tidelands from their existing predominantly private use to a mix of public interior and exterior uses, which would reactivate the now closed tidelands. At the South Station site, the project would include the reopening of Dorchester Avenue to a public right-of-way to serve bicycle, pedestrian and vehicular users. The replacement of the USPS function with the new headhouse and open space would greatly improve public use and access to filled tidelands at the site. The reopening of Dorchester Avenue would make accessible approximately 0.5 miles along the Fort Point Channel that has been closed to public use since 1966.

By providing South Station users as well as the general public with direct access to Fort Point Channel via an extended Harborwalk, the SSX project would advance an objective of the *Fort Point Channel Watersheet Activation Plan* to enhance *"*the civic role" of Fort Point Channel.[2]

Traditional public trust rights in tidelands and the right to fish, fowl, and navigate have long been precluded at the South Station site by the closure of the site by the USPS. However, the modern expression of these traditional public trust rights on filled land would be realized by the conversion from USPS uses to a combination of rail transportation improvements and restored public access to the waterfront to activate filled tidelands.

Community Activities on the Site

The project would substantially benefit community activities at the South Station site by converting the existing access-restricted USPS site to rail transportation uses to serve public needs, accompanied by substantial improvements in the public activation of Dorchester Avenue. In the existing condition, there are no community activities at the site. As a result of the project, the expanded South Station site would become an important public space attracting rail transportation users and activating approximately one-half mile of Fort Point Channel as an attractive bicycle and pedestrian corridor.

Environmental Protection/Preservation

The project would require multiple local, state and federal approvals, which are listed in Section 1.6, Anticipated Permits and Approvals. These reviews and required approvals would ensure that the project

[2] Boston Redevelopment Authority. *Fort Point Channel Watersheet Activation Plan*. May 2002. Page 8.

minimizes potential environmental impacts to the extent practicable and provides appropriate mitigation for unavoidable impacts.

Before any state agency permit or approval process may commence, the project must undergo Massachusetts Historical Commission State Register Review and Section 106 of the National Historic Preservation Act Review. The project would include work within and adjacent to the South Station headhouse, which is individually listed on the State and National Registers of Historic Places. It would also include work on the seawall, which is a contributing structure to the Fort Point Channel Historic District The project is also located proximate to a number of historic districts, including the Leather District Historic District, the Fort Point Channel Historic District, and the Fort Point Channel Landmark District, which are listed on the State and National Registers of Historic Places. Furthermore, the project requires federal funding and would be subject to review under Section 106 of the National Historic Preservation Act. Section 1.5.2 provides an update on the project-related Section 106 process.

Public Health and Safety

The project would promote public health and safety through implementing a site design that would provide a safe and universally accessible facility from all directions. The design includes on-site and off-site transportation improvements to increase pedestrian and bicyclist safety and accessibility in the neighborhood. Improvements include a new and expanded urban landscape and appropriate lighting and signage to provide a safe well-lit environment for residents, visitors, customers and employees on a permanent basis.

Transportation improvements at South Station would advance public health and safety. Currently, the South Station headhouse facilities are unable to adequately support anticipated passenger service needs. MassDOT seeks to upgrade and modernize existing station platforms to meet current MassDOT design standards and MBTA's and Amtrak's future berthing requirements to accommodate longer trainsets needed to meet future demand. The new pedestrian platforms, circulation, and waiting areas for transit and rail facilities would be designed to provide an acceptable level of service for passengers and other station visitors. Additionally, platform upgrades would be implemented to be in compliance with Americans with Disabilities Act (ADA) and life safety regulations, including emergency egress considerations.

General Welfare

The project would protect the general welfare by improving public infrastructure and expanding transportation capacity, including reducing redundant moves to reposition trains due to a lack of adequate layover space. It would substantially improve the public realm by opening approximately 5 acres of land to public use for pedestrian, bicycle and vehicular use. All of these improvements are being planned in consultation with local, state and federal agencies to avoid potential adverse impacts and maximize project benefits. The SSX project would comply with all applicable local, state and federal environmental protection standards.

3.6. Water Quality and Stormwater

This section includes a summary of the impacts of the project on water quality and stormwater, and also provides the following information requested in the Secretary's Certificate:

- A complete stormwater report with supporting data and graphics (Appendix A, *Stormwater Analysis Technical Report*);
- A description and assessment of the condition of the stormwater and combined sewer overflow (CSO) pipes and outfalls to Fort Point Channel (Section 3.6.2);

- A report on the outcome of soil investigations undertaken to determine the infiltration capabilities and overall suitability of the existing soils for the implementation of surface or subsurface detention, retention, and/or filtration systems at all three project sites (Section 3.6.3);
- A demonstration of the feasibility of stormwater management BMPs (Section 3.6.4);
- Clarification of which proposed BMPs would be implement to meet Total Daily Maximum Load (TMDL) and Land Use with Higher Potential Pollutant Load (LUHPPL) requirements (Section 3.6.4);
- An assessment of the feasibility and potential benefit of constructing a dedicated drainage system for the South Station and Readville – Yard 2 sites (Section 3.6.5); and
- Evaluation of the current condition of the 54-inch drainage pipe at Readville – Yard 2 (Section 3.6.6).

3.6.1. Impact Summary

The project sites are currently covered in a combination of pervious (highly penetrable by water) and impervious (highly impenetrable by water) surfaces. They are also covered by ballast, which is a crushed stone trackbed with characteristics of both pervious and impervious surfaces. As a result of the project, the South Station and Widett Circle sites would undergo a decrease in impervious coverage, as shown in Table 3-3. Readville – Yard 2 would experience an increase in impervious coverage due to 2.0 acres of new pavement. Ballast cover would increase in all three locations. Overall, the project will result in an increase of 0.2 acres of pervious area.

Table 3-3 — Existing and Proposed Land Use Cover

Cover Type	Existing Cover (ac)	Proposed Cover (ac)	Change (ac)	% Change
South Station				
Impervious (pavement, buildings, etc.)	27.2	20.4	-6.8	-25%
Ballast	21.1	26.9	5.8	27%
Pervious (green space, BMPs, etc.)	0.7	1.7	1.0	143%
Total	**49.0**	**49.0**	**0.0**	
Widett Circle				
Impervious (pavement, buildings, etc.)	27.5	12.9	-14.7	-53%
Ballast	2.7	14.3	11.7	433%
Pervious (green space, BMPs, etc.)	0.0	3.0	3.0	N/A
Total	**30.2**	**30.2**	**0.0**	
Readville – Yard 2				
Impervious (pavement, buildings, etc.)	4.5	6.5	2.0	44%
Ballast	6.4	8.2	1.8	28%
Pervious (green space, BMPs, etc.)	6.6	2.8	-3.8	-58%
Total	**17.5**	**17.5**	**0.0**	

Project impacts on water quality and stormwater conditions are described below.

South Station

At the South Station site all peak flows and peak runoff volumes in the post-development condition would be less than the pre-development condition, resulting in an improvement to existing conditions and thereby complying with the Stormwater Regulations. Recharge of stormwater would be provided through the installation of BMPs including a bioretention area in the vicinity of the station. These BMPs would provide approximately 80% Total Suspended Solids (TSS) removal from stormwater runoff from all impervious surfaces on the project site. They would not infiltrate stormwater into the ground in order to avoid potential structural issues related to the proximity of the seawall. The BMPs would improve water quality over existing conditions by providing a comprehensive stormwater management system combined with a 6.8-acre reduction in impervious cover, which would provide treatment for the entire project site.

Widett Circle

At the Widett Circle site, the project would result in a reduction in peak flow rates and runoff volume to less than existing conditions for the 2, 10, 25, and 100- year storm event due to a 14.7-acre decrease in impervious surfaces. Peak flow rate and volume calculations are provided in Appendix A, *Stormwater Analysis Technical Report*. The inclusion of BMPs would further reduce the peak flow rates and volumes from existing conditions. Infiltration may be prohibited as a result of high groundwater, poor draining soils, or soil/groundwater contamination. The project would improve the water quality with the incorporation of a comprehensive stormwater management system by reducing impervious cover by 14.7 acres and providing stormwater BMPs. Proposed BMP's are described in Section 3.6.4.

Readville – Yard 2

At the Readville – Yard 2 site, the project would result in an increase in the proposed peak flow and runoff volumes for the 2, 10, 25, and 100 – year storm events due to the 2.0-acre increase in impervious cover. Peak flow rate and volume calculations are provided in Appendix A, *Stormwater Analysis Technical Report*. However, stormwater BMPs would be installed to ensure peak flow rates and volumes are reduced to pre-development rates. Infiltration may be restricted due to the soil contamination and possible high groundwater due to proximity to the Neponset River. Stormwater BMPs would provide 80% TSS removal of stormwater runoff from all proposed impervious surfaces. BMPs are discussed in Section 3.6.4.

3.6.2. Existing Drainage and Combined Sewer Systems

Existing drainage conditions, described in more detail in Appendix A, *Stormwater Analysis Technical Report*, include 10 stormwater outfalls from the South Station site that discharge to the Fort Point Channel. Three CSOs (BOS 064, 065, and 068) are also in the immediate vicinity of the South Station site. Figure 3-6 presents the location of existing stormwater infrastructure and combined sewer connections at South Station.

According to the December 2012 *Preliminary Assessment Report for Seawall at Fort Point Channel*, nine cast iron pipes penetrate the seawall at locations corresponding to the Dorchester Avenue drainage inlets. Most of the 12-inch diameter pipe show some form of deterioration, either separation of surface layers or moss growth. A large CSO, in the form of an arched granite stone culvert, is protected with siltation and board elements. The BWSC plans to rehabilitate sections of the existing CSO pipe with a 60-inch reinforced fiberglass structural liner. Design plans and other applicable drainage information have been requested from BWSC to assist in developing the final drainage design.

The proposed drainage infrastructure would connect to the existing system, the condition of which would be confirmed prior to final design with the use of record plans and field inspection, and closed circuit videos (CCTV). At this phase of project development, no additional outfalls into the channel are anticipated.

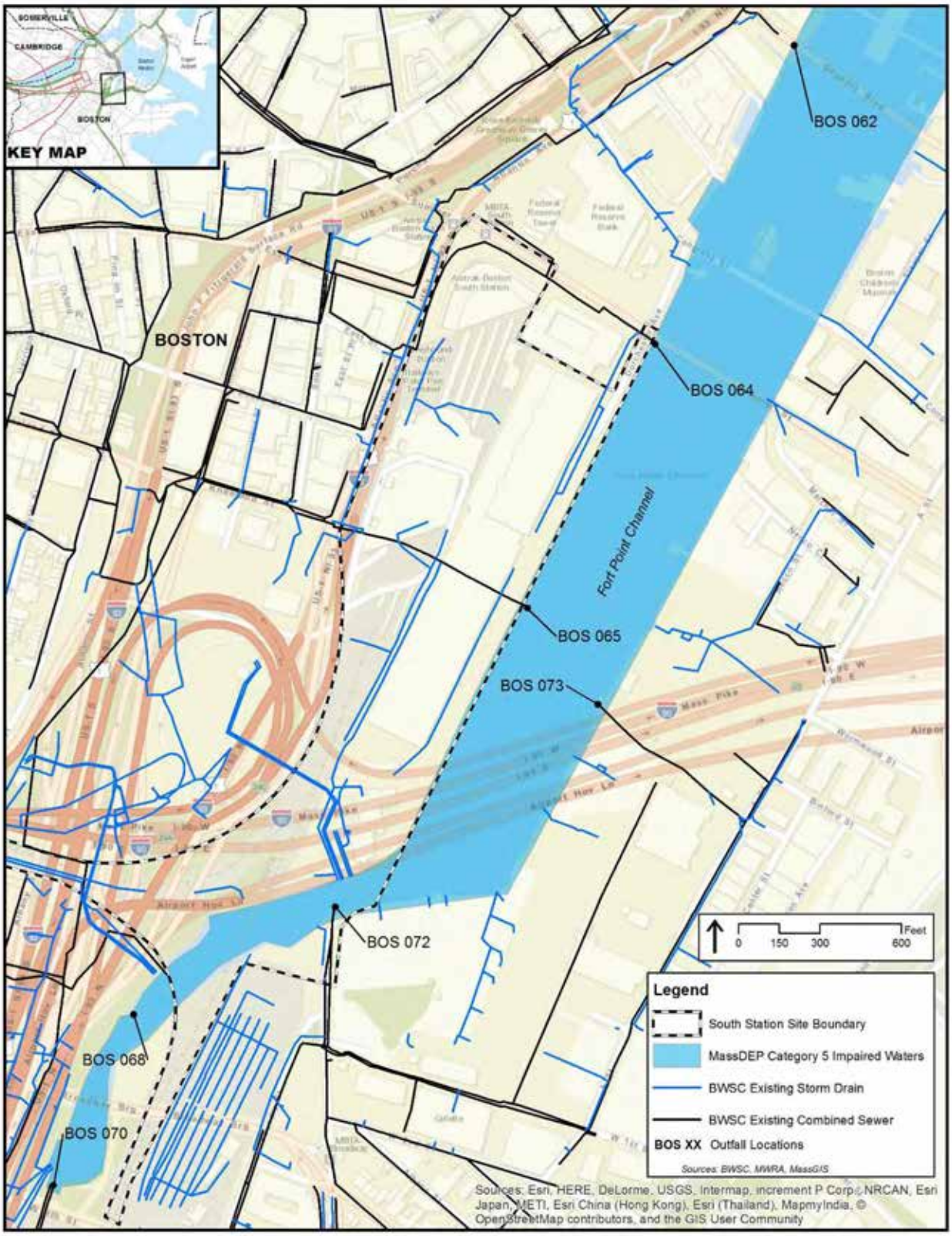


Figure 3-6 — Existing Stormwater Infrastructure - South Station

3.6.3. Soil Conditions and Infiltration Capacity

South Station

Soils in the approximate area of South Station's existing tracks are composed of fill, organic silt, clay, and till peat. These soil types were obtained from a boring location near the existing tracks south of the building limits. There were no signs of inorganic silt or sand at the sampled locations. Similar conditions appeared in the vicinity of the existing USPS building. Samples at these locations show instances of fill, silt, sand, clay, mud, and gravel.

The soil borings also show groundwater elevations varying in depth from 2.8 feet to 17 feet below the surface. Depending on the prevalence of clay in the soil, infiltration could be possible at locations where the water table is at a lower elevation. Additional soil information would be obtained and incorporated into the final design.

Layover Facilities

According to U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey maps, the underlying soils at Widett Circle and Readville – Yard 2 are classified as urban land. Urban land is defined as excavated and filled land over natural soils where specific soil characterization is not available through the NRCS soil survey.

The DEIR presented a Phase 1 Environmental Site Assessment for the Widett Circle and Readville – Yard 2 layover facilities based on MassDEP records, and an updated assessment is presented in Section 3.15, Site Contamination and Hazardous Materials. The assessment did not identify any open Release Tracking Numbers (RTNs) or sites with Activity and Use Limitations (AULs) at Widett Circle, but based on current and past industrial uses it is possible some contamination could be encountered that would restrict stormwater infiltration. The assessment did identify one RTN (RTN #3-15991) that remains open at the Readville – Yard 2 site. Infiltration may be restricted at Readville due to existing soil/groundwater contamination, however subsequent testing may allow for site-wide infiltration or pockets of infiltration. MassDOT would complete geotechnical borings and/or test pits during the design development phase to determine the hydraulic permeability, groundwater elevations, and soil/groundwater contamination levels, and the potential to implement infiltration and non-infiltration BMPs. Appendix A, *Stormwater Analysis Technical Report,* further describes the existing soil conditions.

3.6.4. Stormwater Best Management Practices

South Station

Stormwater BMPs are measures designed to reduce volume and peak runoff rates and improve water quality. The existing drainage system and the potential location of the BMP proposed for the South Station site are shown in Figure 3-7, while Figure 3-8 provides an example of the type of BMP that would be implemented.

In the space adjacent to Dorchester Avenue low impact development (LID) measures would be implemented, including a bioretention area with pre-treatment. The LID techniques would detain runoff and decrease the peak flow volume of the CSOs during rain events. Standard structural measures would be used for pre-treatment in conjunction with the LID measures, such as deep sump catch basins and water quality structures. Near the station entrance, some smaller BMP measures could be installed, which may include tree box filters; porous pavement; surface basins, swales, or gravel wetlands; and/or other multi-functional stormwater treatment measures. Figure 3-9 provides examples of the types of proposed BMPS, while Figure 3-10 presents their potential locations. Figure 3-11 presents a section view of Dorchester Avenue's proposed stormwater management system. These measures would also reduce pollutant loads. Appendix A, *Stormwater Analysis Technical Report*, presents more detailed information about the proposed BMPs.

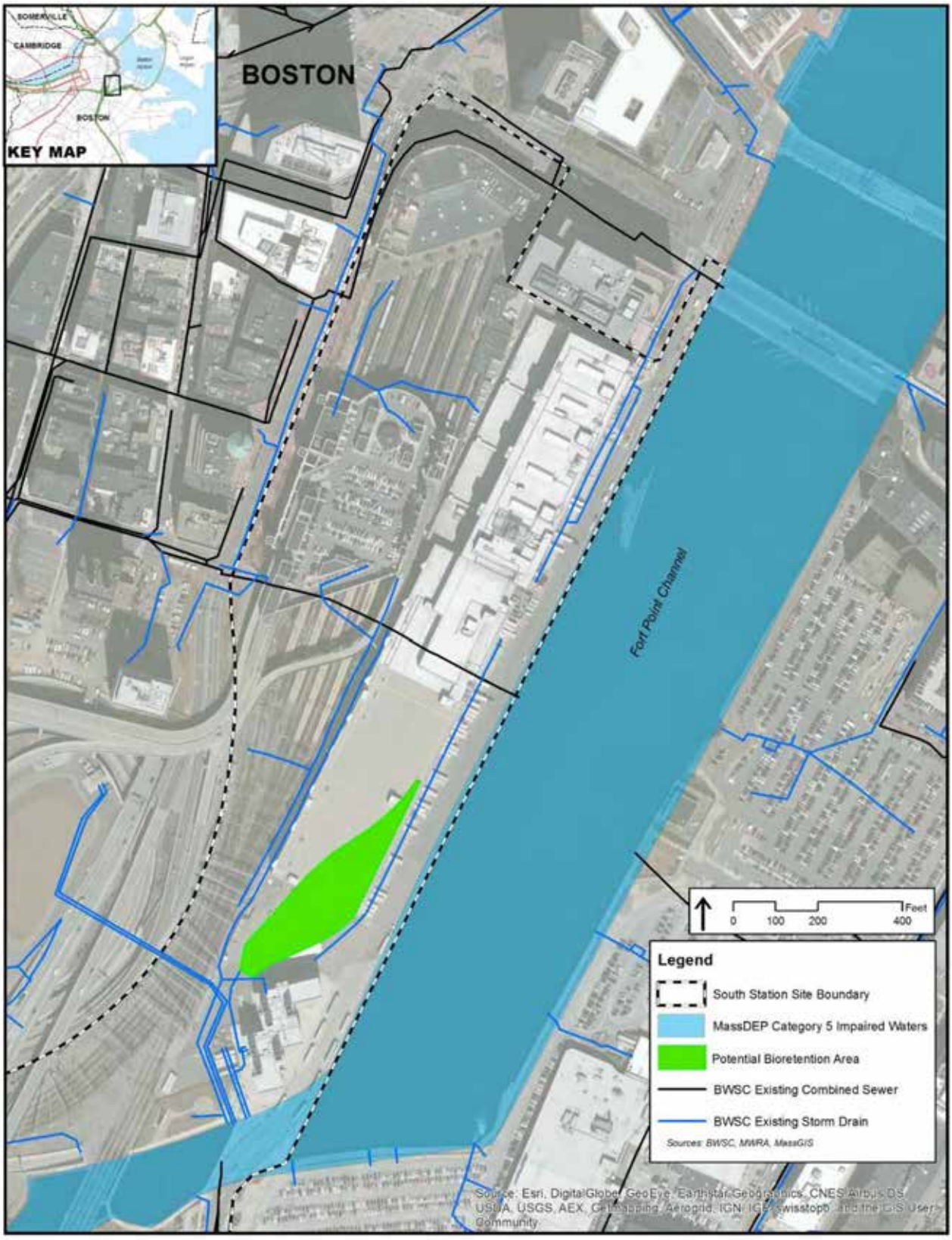
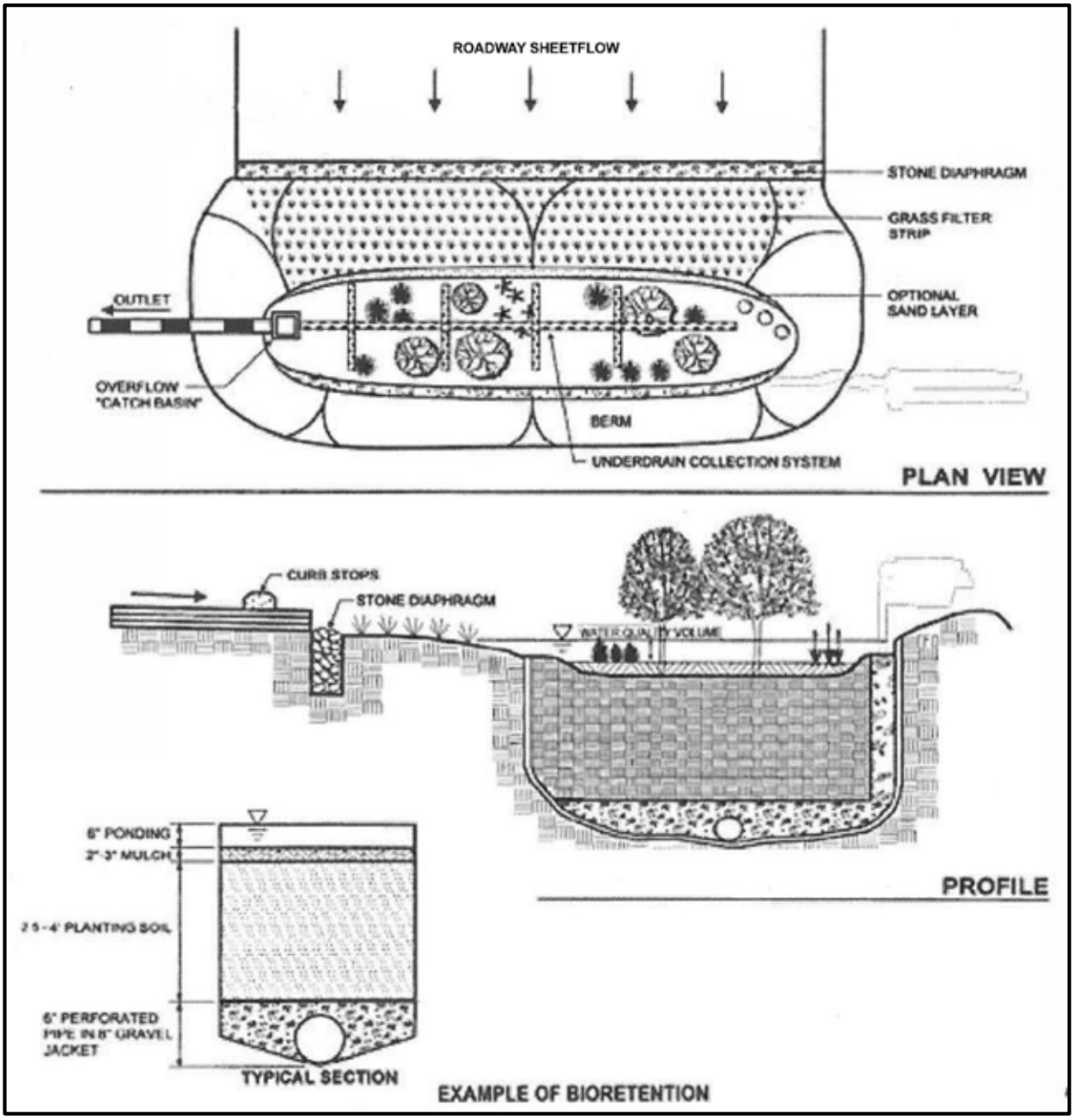


Figure 3-7 — Stormwater Management - South Station



Source: Adapted from the Massachusetts Stormwater Handbook, Volume 2, Chapter 2: Structural BMP Specifications for the Massachusetts Stormwater Handbook.

Figure 3-8 – Stormwater Bioretention BMP Details

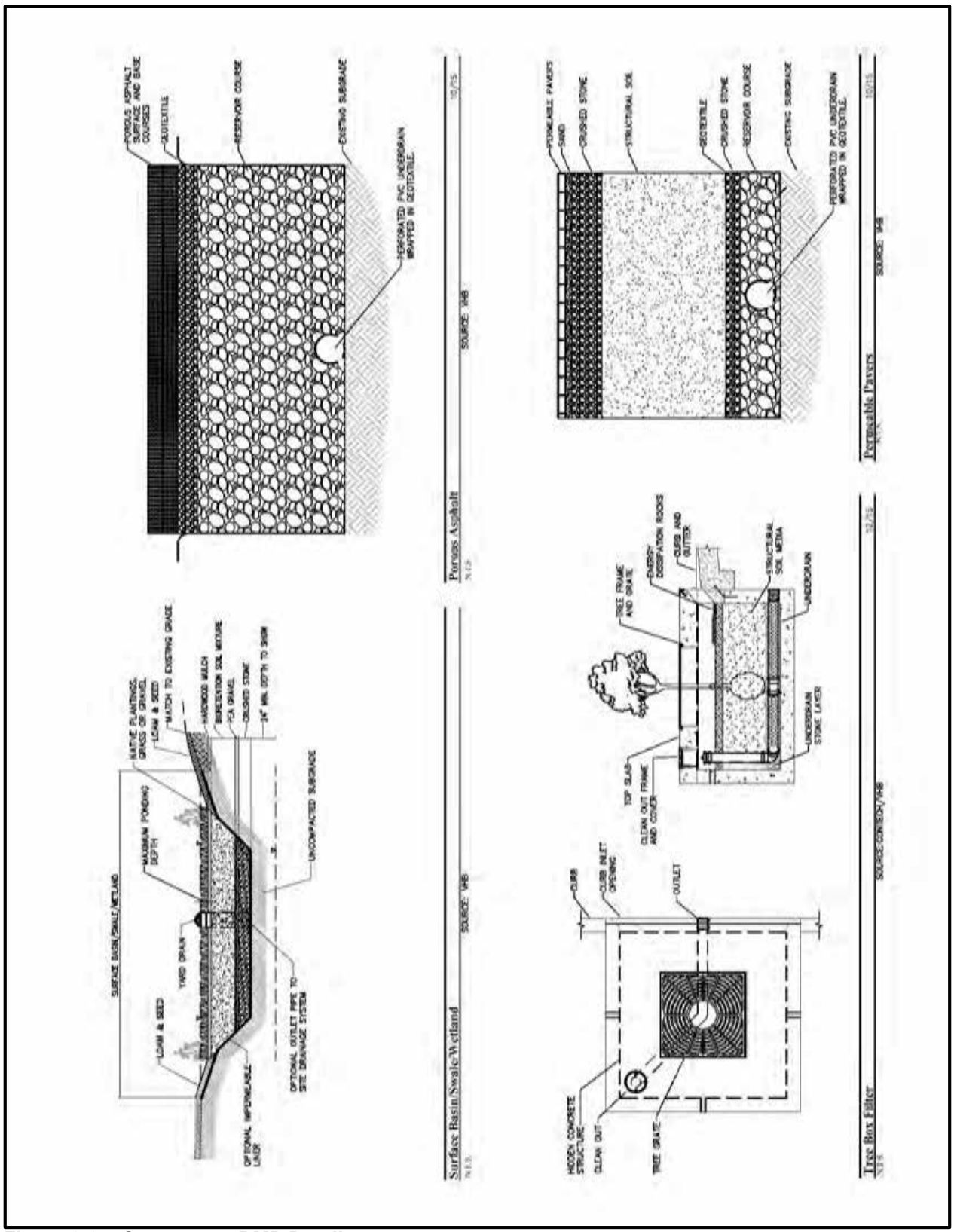


Figure 3-9 – Stormwater BMP Details

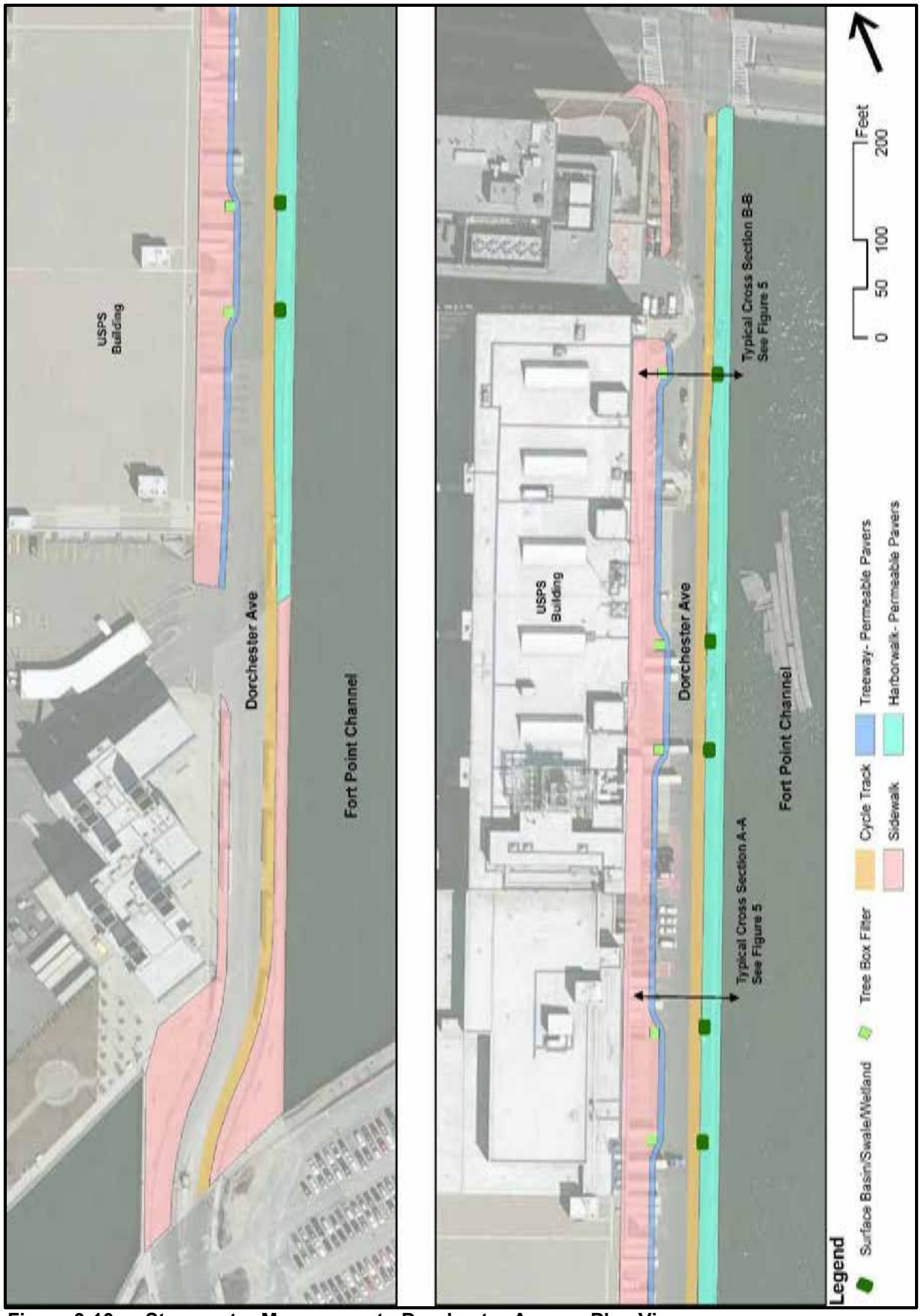


Figure 3-10 — Stormwater Management - Dorchester Avenue Plan View

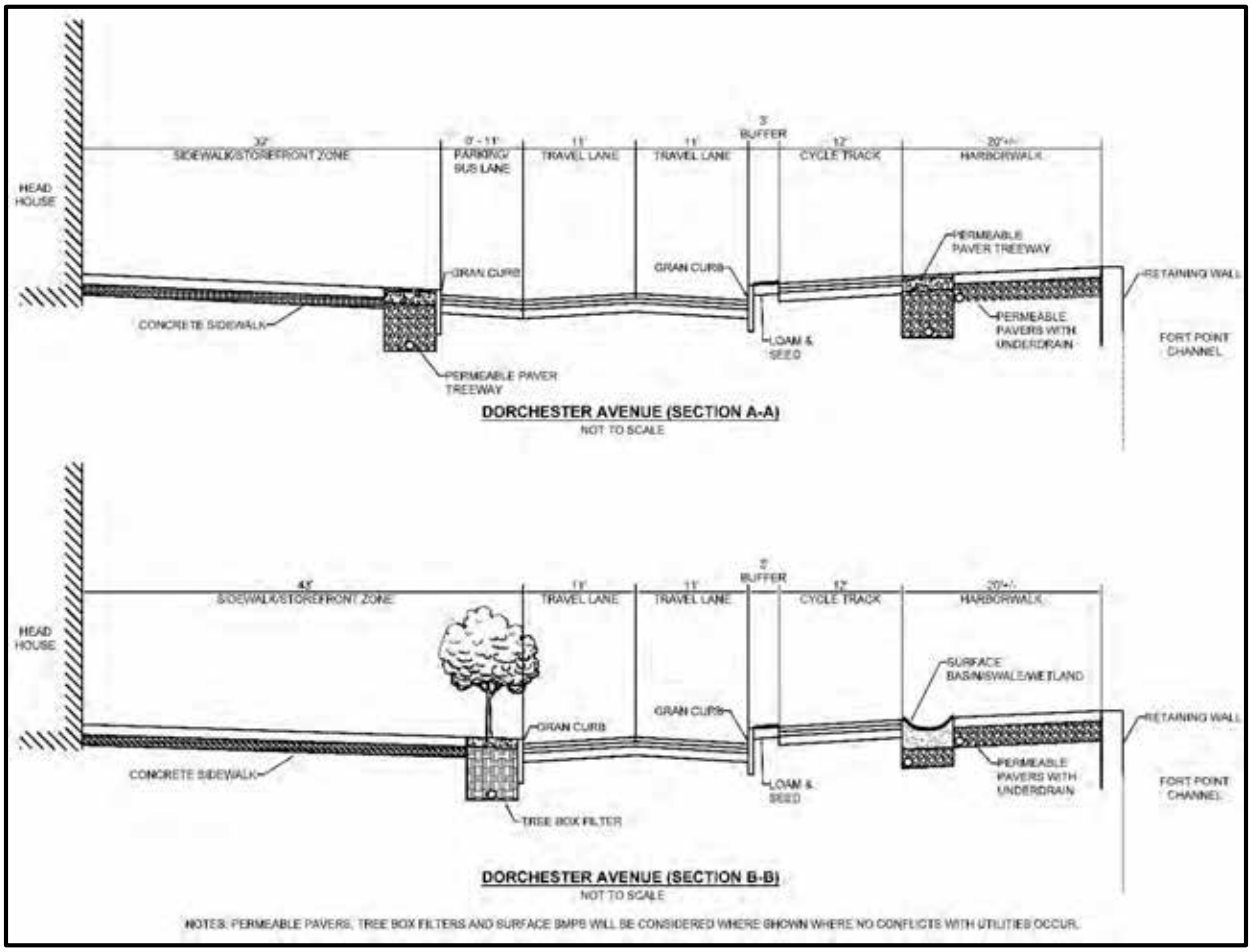


Figure 3-11— Stormwater Management - Dorchester Avenue Section

The South Station site is considered a Land Use with a Higher Potential Pollutant Load (LUHPPL) and, therefore, would be designed with suitable BMPs sized to treat the one inch Water Quality Volume and provide the pretreatment requirement of 44% TSS removal prior to infiltration. Appendix A, *Stormwater Analysis Technical Report*, provides a detailed description of the alternatives and potential stormwater BMPs. Figure 3-12 depicts a conceptual track drainage plan for South Station.

MassDOT would develop a Post Construction Stormwater Operation and Maintenance (O&M) Plan for South Station during the final design. The City of Boston would develop the Post Construction Stormwater Operation and Maintenance (O&M) Plan for the Dorchester Avenue portion of the South Station site.

Layover Facilities

The project is required to meet the Massachusetts Stormwater Management Standards, and the Neponset River TMDL. Comprehensive stormwater management systems with BMPs are proposed at Widett Circle and Readville – Yard 2 to comply with these standards (see Figures 3-13 and 3-14). The project team has coordinated with the BWSC regarding the project and would continue to do so as the project advances to the next phase of project development.

As the design progresses, locations, types, and sizes of the stormwater BMPs would be refined. Potential BMPs include porous pavements, vegetated grass swales and basins, leaching basins, and green roofs. Figures 3-13 and 3-14 highlight the potential BMP locations for each layover facility.

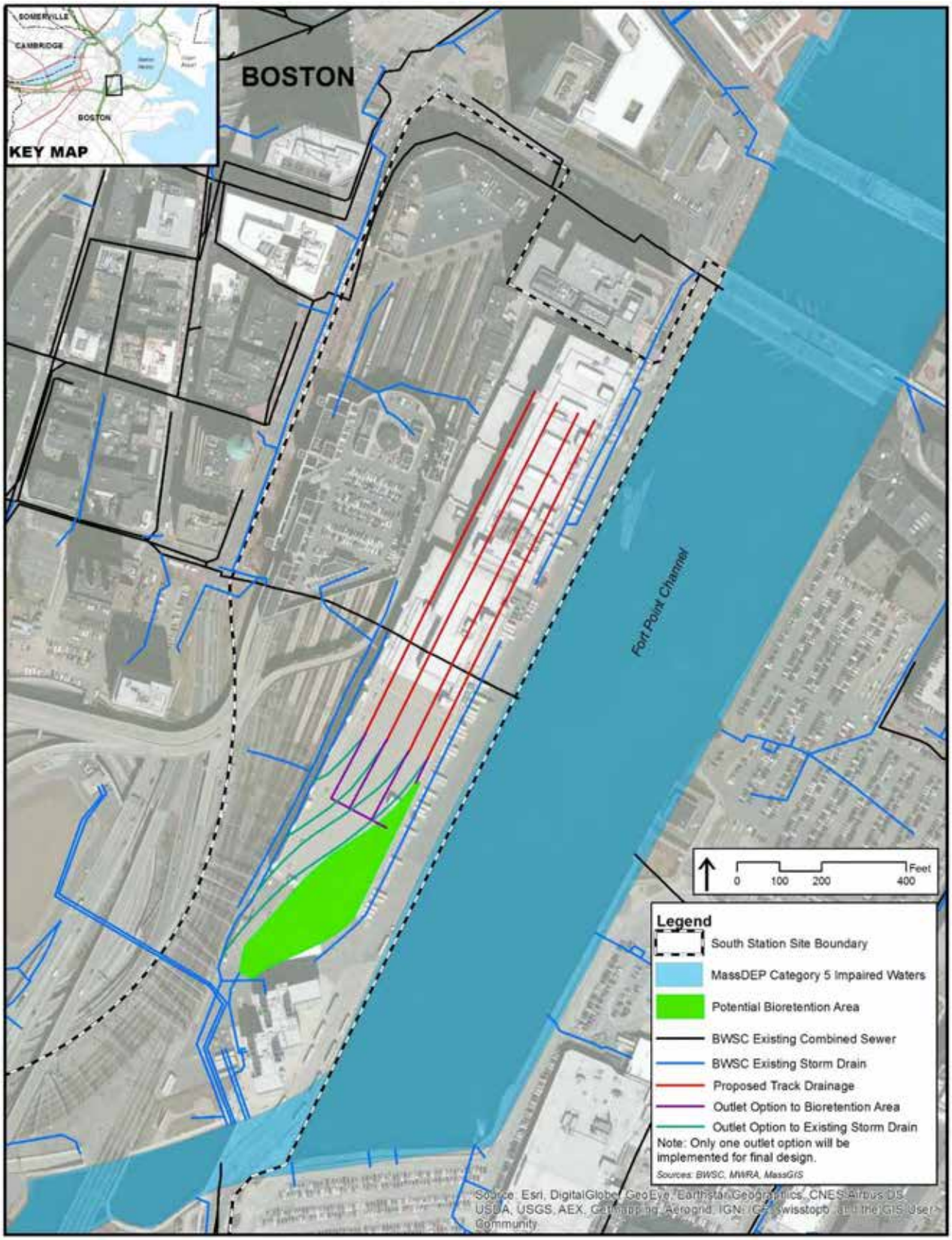


Figure 3-12 — South Station Track Drainage Concept Plan

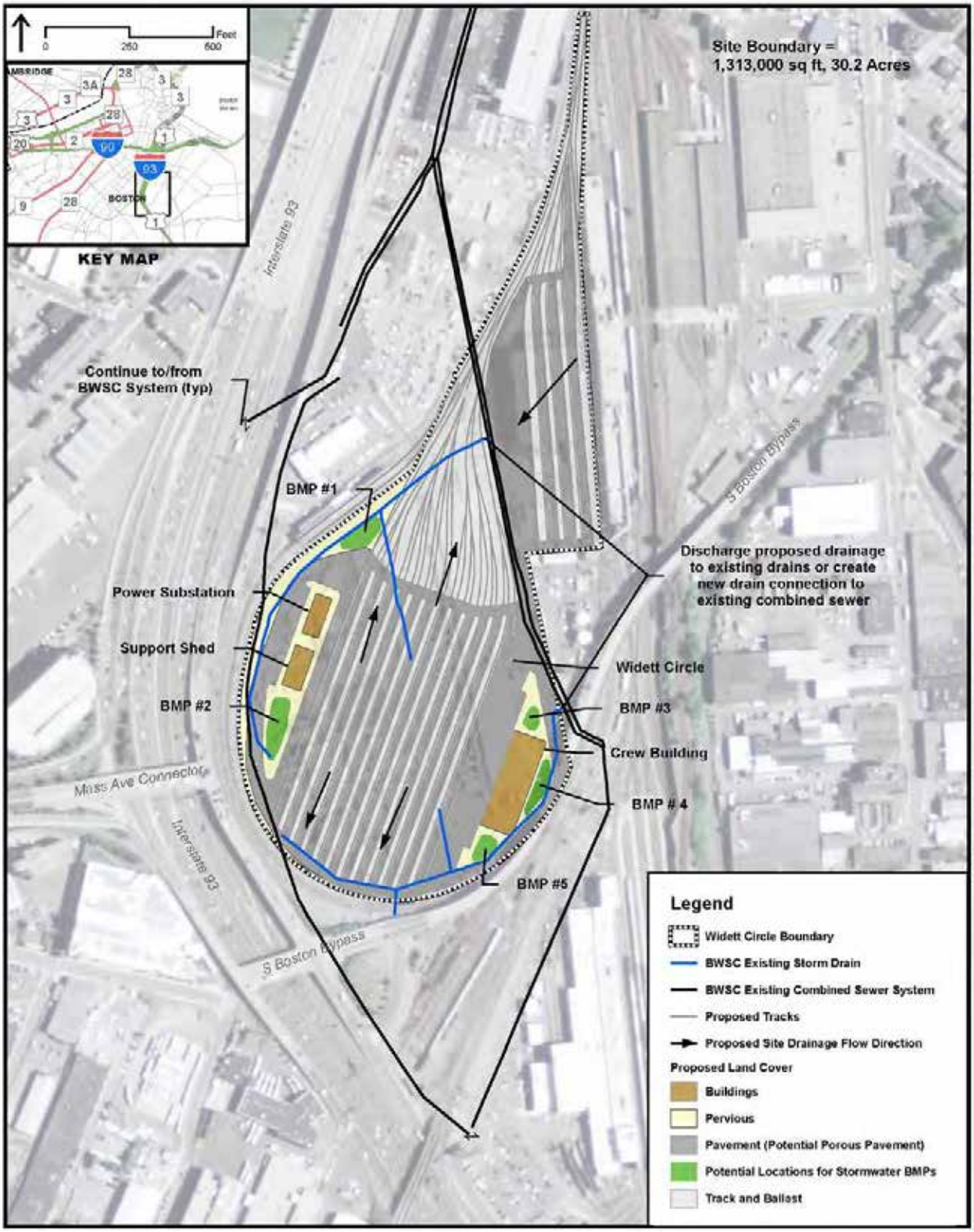


Figure 3-13 — Stormwater Management - Widett Circle Layover Facility

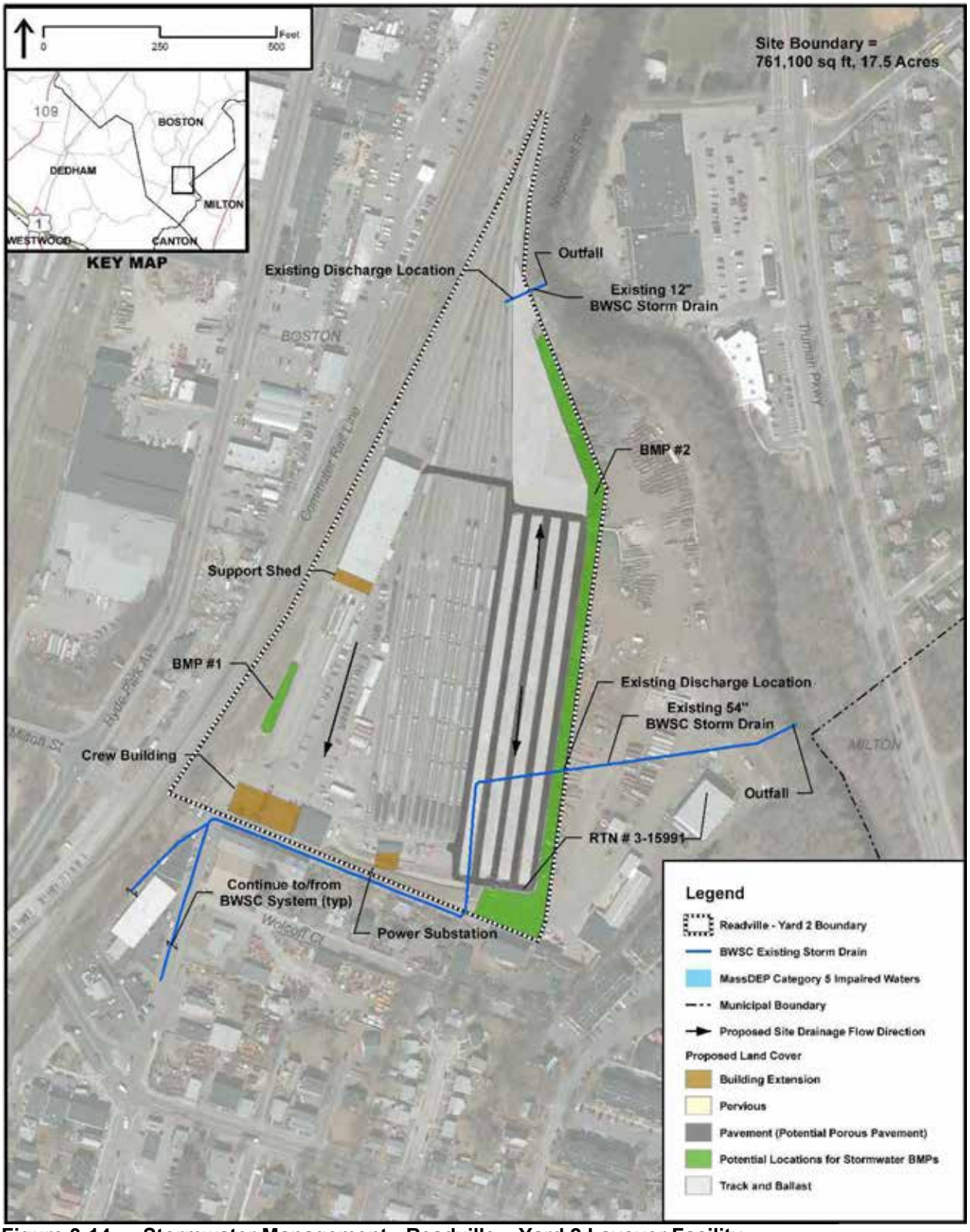


Figure 3-14 — Stormwater Management - Readville – Yard 2 Layover Facility

The project intends to utilize infiltration, if possible, to maximize the pollutant removals from the BMPs and provide groundwater recharge. Future subsurface investigations would identify any potential constraints that could prohibit the use of infiltration measures. Each BMP would provide peak rate attenuation and water quality treatment. The project would provide pretreatment with deep sump catch basins, drip pans and water quality structures.

The layover sites are considered LUHPPLs and, therefore, would be designed with suitable BMPs sized to treat the one inch Water Quality Volume and provide the pretreatment requirement of 44% TSS removal prior to infiltration. Appendix A, *Stormwater Analysis Technical Report*, provides a detailed description of the alternatives, potential stormwater BMPs, and compliance with regulatory requirements including calculations for the required Water Quality Volume.

MassDOT would develop a Post Construction Stormwater Operation and Maintenance (O&M) Plan for the layover facilities during the final design.

3.6.5. Potential Dedicated Drainage Systems

The proposed drainage system at the South Station site will connect to the existing system and discharge via the existing outlets. The design provides a reduction in impervious area and therefore would result in reduced peak rate flows and volumes from existing conditions to the combined sewer system. Developing a new, dedicated drainage discharge system, however, could require easements and additional utility relocation for work within the project site. A dedicated drainage system, also known as a separate sewer system, consists of two different sewer pipes for sanitary and stormwater flows. The sanitary sewer pipe transports sanitary sewage collected from the laterals (plumbing connections) of homes, businesses, and industry to treatment plants. The stormwater sewer pipe carries water collected from street inlets, building downspouts, and other storm sewer lines to a nearby receiving stream and is discharged through a stormwater outfall.

An additional outfall would cause more disruption to the Fort Point Channel both during construction and afterward. The watershed of the South Station site is located at the most downstream location of the existing CSO system. It is expected that stormwater from South Station would enter and be discharged from the CSO prior the peak flow rates of the larger upstream watershed entering the CSO at this location. For this reason, and due to potential reduction in peak flow rates resulting from the project, no benefit would be gained by constructing a dedicated drainage system.

The proposed drainage system at Readville – Yard 2 would connect to the existing system and discharge via the existing drainage points. Developing a new, dedicated drainage discharge system from the site to the Neponset River would require easements and additional permitting for work within resource areas. An additional outfall would cause more disruption to the river resource both during construction and due to the permanent outfall. Similar to South Station, the watershed of Readville – Yard 2 is also located at the most downstream location of the existing 54-inch BWSC drainage system. It is expected that drainage from Readville – Yard 2 will enter and be discharged prior to the peak stormwater rates of the larger upstream watershed entering the 54-inch pipe at this location. Additionally the peak flow rates from the Readville – Yard 2 project site may be reduced from existing conditions further reducing the stress to the 54-inch pipe. As a result of the potential reduction in peak flow rates, and the stormwater from the Readville – Yard 2 site being discharge prior to the peak flow rates from the upstream watershed, there would be no significant benefit to constructing a dedicated drainage system.

3.6.6. Readville – Yard 2 Storm Drain Condition

In the southern portion of the site, there is a 54-inch storm drain just east of the existing track layout that drains an upstream neighborhood and outfalls to the Neponset River. The age and condition of this pipe are unknown. During the project's design phase MassDOT would inspect the storm drain and assess its condition to determine if the pipe should be relocated, replaced or if a structural liner could be installed.

MassDOT would coordinate with BWSC during the design phase to inspect and upgrade the existing system within Readville – Yard 2, as necessary.

3.7. Water Use and Wastewater

This section includes a summary of the project's impact on water use and wastewater, and also provides the following information requested in the Secretary's Certificate:

- A table further clarifying existing and proposed project-related wastewater flows, including those that may currently be attributable to the USPS facility and those identified as part of the SSAR project (Section 3.7.1);
- Demonstration that any proposed changes to the physical configuration, location, and/or hydraulic performance of sewers and outfalls would not affect compliance with Federal Court mandates and regulatory requirements (Section 3.7.2);
- Clarification of potential water use and wastewater generation at the proposed layover facilities based upon operational programming (e.g., car washing) (Section 3.7.3); and
- Identification of any additional permitting requirements if industrial wastewater discharges are proposed as part of the project and discussion of BMPs that could be implemented to reduce water use and wastewater discharges (e.g., use of recycled wash water) (Section 3.7.3).

3.7.1. Impact Summary

South Station

The estimated total water usage at the South Station site would be approximately 538,000 gallons per day (gpd) and the wastewater generation at the site would be approximately 490,000 gpd (Table 3-4), an increase of approximately 30% over existing conditions. The estimated water usage and wastewater generation at the South Station site would be partially offset by the removal of the USPS facility. The domestic water use for the station was calculated on a conceptual level based on the estimated sewage generation with an added 10% factor to account for consumption, system losses and other use.

Table 3-4 — Estimated Existing and Proposed Water Usage and Wastewater Generation for South Station

Location	Existing Water Usage (gpd)	Proposed Water Usage (gpd)	Existing Wastewater Generation (gpd)	Proposed Wastewater Generation (gpd)	% Change
Headhouse	253,000	456,500	230,000	415,000	80%
South Station Retail (floor 2)	1,199	1,199	1,090	1,090	0%
South Station Office (floors 2-5)	10,384	10,384	9,440	9,440	0%
Bus Terminal	83,105	95,150	75,550	86,500	14%
Bus Terminal Parking	220	220	200	200	0%
USPS Building (removal)	24,992	-24,992	22,720	-22,720	-100%
Total	372,900	538,461	339,000	489,510	44%
Total Project-Related Increase		**165,561**		**150,560**	

Additionally, the SSX project would incorporate water efficiency measures, such as low flush toilets, which would minimize the use of water and wastewater generation. Proposed improvements would include upsized service connections to the expanded terminal concourse. Depending upon the construction staging and location of service connections within the new buildings, replacing the existing sewer main could be required within Dorchester Avenue. BWSC indicates that there is adequate capacity available in its water and sewer mains in the immediate vicinity of the South Station site to accommodate the SSX project. The water system design approach, as well as existing capacity, would be further evaluated as design progresses.

MassDEP's Policy on Managing Infiltration and Inflow (I/I) in MWRA Community Systems[3] requires that additional wastewater flow be offset by reducing I/I into sewer systems if a project exceeds any MEPA threshold for an EIR and generates 15,000 or more gpd of wastewater. Inflow is stormwater that enters the wastewater system through rain leaders, basement sump pumps or foundation drains illegally connected directly to a sanitary sewer pipe, while infiltration is groundwater that seeps into sewer pipes through cracks, leaky pipe joints and/or deteriorated manholes. Demonstration of compliance with this policy generally consists of calculating the net increase in wastewater flows to the sewer system and identifying improvements to the sewer system that directly connect to the MWRA interceptor system. Mitigation is required at a 4:1 ratio: for every one gallon of flow into the system due to the new development, four gallons of inflow and/or infiltration must be removed from the system. As project design advances, and in consultation with MassDEP and BWSC, MassDOT would develop an I/I plan to mitigate for increased flows at the South Station site. BWSC indicates there likely is not adequate existing piping in the immediate vicinity of the project site to meet the I/I requirements. Sewer systems that are hydraulically connected to the mains in the vicinity of the South Station site potentially could be used to meet I/I sewer system rehabilitation requirements, however, and opportunities to implement an I/I program may exist in other areas in Boston.

Layover Facilities

The layover facility sites would require domestic sewer for the crew building and support shed proposed at each site. Only light maintenance activities are proposed at the facilities, therefore, no industrial wastewater would be generated. According to BWSC, its existing systems at both sites have adequate capacity to handle the proposed water demand and wastewater discharge. Capacity would be further evaluated as project design advances. Due to the low amount of wastewater anticipated to be generated from the layover facility sites (below the 15,000 gpd threshold), they would be exempt from MassDEP's I/I offset requirements. For more details see Appendix A, *Stormwater Analysis Technical Report*.

As shown in Table 3-5, the Widett Circle layover facility would require approximately 6,440 gallons of water per day. As a result of the project there would be a decrease in the overall water demand and wastewater generated at the site from existing conditions, due to fewer personnel on site and no industrial water use. Water usage would decrease by approximately 8,020 gpd from existing conditions; and wastewater generation would decrease by approximately 7,290 gpd, or 55% from existing conditions.

Table 3-5 — Estimated Wastewater Generation and Water Usage for Widett Circle

Location	Existing Water Usage (gpd)	Proposed Water Usage (gpd)	Existing Wastewater Generation (gpd)	Proposed Wastewater Generation (gpd)	% Change
Widett Circle	14,460	6,440	13,140	5,850	-55%

[3] Massachusetts Department of Environmental Protection, Policy No. BRP 09-01, September 24, 2010.

Table 3-6 — Estimated Wastewater Generation and Water Usage for Readville – Yard 2

Location	Existing Water Usage (gpd)	Proposed Water Usage (gpd)	Existing Wastewater Generation (gpd)	Proposed Wastewater Generation (gpd)	% Change
Readville – Yard 2	2,150	3,870	1,950	3,510	80%

As shown in Table 3-6, the Readville – Yard 2 layover facility would require approximately 1,720 gallons of water per day for the additional and/or expanded facilities for a total of 3,870 gpd. The new wastewater discharge would be 3,510 gpd accounting for an increase over existing conditions by an estimated 1,560 gpd, or 80%.

3.7.2. Impacts to Existing Combined Sewer Overflows

Existing wastewater collection at the South Station site is provided through a series of BWSC sanitary sewer mains, combined sewer mains, and CSOs. In general, sanitary sewers convey wastewater (sewage). During storm events with higher flows where capacity is exceeded, wastewater and stormwater flows combine and are diverted to CSOs, which outlet to Fort Point Channel. A gravity sewer main exists along the west side of Dorchester Avenue and at different points collects sewage from the USPS facility, the I-90 Vent Building, and the existing headhouse. At and adjacent to the South Station site, two combined sewer mains, originating off-site via Beach Street and Kneeland Street, discharge to Fort Point Channel via one of two CSOs (BOS 064 or BOS 065) along Dorchester Avenue. A third CSO, BOS 068, is located within the site just south of the existing USPS facility.

This combined sewer line flows northward from Foundry Street as a 30-inch by 60-inch reinforced concrete pipe. As the combined sewer crosses Broadway it then heads eastward and crosses Dorchester Avenue. From there it enlarges to a 40-inch by 60-inch concrete culvert where it discharges to Fort Point Channel. During final design, MassDOT would confirm existing outlet discharge flows through data collection and/or field inspection.

Presently the USPS building is situated over the BWSC's 81-inch by 81-inch Kneeland Street CSO. Demolition of the USPS building and any construction activity for SSX facilities would be required to maintain the structural integrity and provide outlet protection of this CSO, and also access for continued inspection and maintenance activities.

Once the existing wastewater system is fully modeled, a plan would be developed to mitigate the impacts from the expansion of the rail facility. Measures to reduce or eliminate stormwater entering into the wastewater system while keeping the post-construction flow rate to that of the pre-construction rate would be implemented.

3.7.3. Industrial Wastewater

Per BWSC regulations, there would be no industrial wastewater produced at South Station as part of this project. Neither coach washing nor heavy maintenance are proposed at the layover facilities, therefore no industrial wastewater permits are required.

3.8. Transportation

This section describes the various track alternative configurations considered for the SSX project, as well as a description of the project's layover facilities. The following additional information requested by the Secretary's Certificate is summarized below and detailed in Appendix D, *Track Configuration Alternatives Analysis - Tier 2 Screening Technical Report*:

- A description of how each modeled alternative would meet Amtrak and the MBTA's future service plans, project OTP and delay goals, and allow parallel moves between Tower 1 Interlocking and the terminal (Section 3.8.2 and Appendix D);
- An evaluation of the impact of the modeled alternatives on existing infrastructure, construction staging, capital and maintenance costs, and operations (Section 3.8.2 and Appendix D);
- An assessment of platform capabilities and berthing abilities, a description of how platforms may or may not meet established MBTA and Amtrak requirements for longer trainsets, and potential impacts to future operations and service capabilities (Section 3.8.2 and Appendix D);
- An analysis of potential design modifications to extend platform lengths (Section 3.8.2 and Appendix D);
- A discussion of how the preferred interlocking design would eliminate or reduce delays in a scenario where a locomotive becomes disabled within its trackwork (Section 3.8.2 and Appendix D);
- An explanation for the perceived discrepancy between increases in track layout capacity and future ridership projections (Section 3.8.3);
- A discussion of the expanded assessment of preferred layover facility operations at Widett Circle, BPY, and Readville – Yard 2 which supported the selection of the preferred layover sites (Section 3.8.4);
- An explanation of how the location and operations at any of the potential layover facility sites would impact Main Line services for Amtrak, the MBTA and freight services due to necessary train deadheading and midday storage requirements (Section 3.8.5);
- Identification of proposed maintenance or other rail-related operations that would be undertaken at each layover facility (Section 3.8.6); and
- A phasing plan that addresses sequencing and timing of the potential layover facility sites based on operational need and available storage capabilities (Section 3.8.7).

3.8.1. Impact Summary

This section presents projected ridership at South Station and assesses transportation system impacts associated with the project alternatives. Future conditions are presented for 2025, the project's approximate opening year; and 2035, the horizon year.

Ridership

In 2025, total South Station ridership (Amtrak intercity rail; MBTA commuter rail, rapid transit and local bus; and intercity/commuter bus) for the project would increase by approximately 11% over 2025 No Build condition ridership. In 2035 ridership would increase by approximately 13% over 2035 No Build condition ridership.

Transit Capacity

The project would meet the MBTA's Service Delivery Policy of not increasing crowding impacts to rapid transit or local bus routes over those expected under the No Build Alternative. For commuter rail, 2035 passenger loading on the outbound Canton/Stoughton/South Coast Rail Line is projected to exceed the MBTA Service Delivery Policy's acceptable level of crowding during the peak evening hour. Over the entire three-hour evening peak period, however, there would be more than sufficient capacity to accommodate the projected passenger load demands. Project-related ridership increases at stations in the Downtown core (Park Street, Downtown Crossing, Government Center and State Street) would be

imperceptible. The project would result in a 2% to 4% increase in daily Silver Line platform activity at South Station (measured in passenger boardings and alightings) above the 2035 No Build Alternative levels. The project would increase passenger activity on South Station's Red Line platforms by up to 6% above No Build Alternative levels.

3.8.2. Terminal Track Configuration Alternatives Analysis

MassDOT conducted a Tier 1 screening analysis of four terminal track configuration alternatives (Alternatives 1 through 4) for the DEIR. The Tier 1 analysis included five rating criteria: platform accessibility from each service line, platform berthing lengths, infrastructure maintenance requirements, constructability, and capital cost. Due to the major impacts to existing infrastructure and challenges that would be encountered throughout the construction period, Alternatives 1 and 4 were deemed "not feasible" and were dismissed from further consideration. Alternatives 2 and 3 advanced to the Tier 2 screening analysis (Figures 3-15 and 3-16). Both alternatives are equal in environmental impacts. The results of this Tier 2 analysis is summarized in the following section and discussed in greater detail in Appendix D, *Track Configuration Alternatives Analysis – Tier 2 Screening Technical Report*. Alternatives 2 and 3 were further evaluated base d on the following criteria:

- Platform Rating: Including platform accessibility by each service route and ability of a platform to accommodate Amtrak and MBTA berthing requirements.
- Operations Rating: Measured by the ability to accommodate future service plans and to meet OTP and delay goals.
- Constructability Rating: Measured by the degree to which the alternatives would minimize impacts to existing infrastructure and minimize disruption to passenger service.
- Capital Cost Rating: Measured by order-of-magnitude costs for the construction of each alternative.
- Maintenance Cost Rating: Measured by the level of overall maintenance required for the special trackwork at Tower 1 Interlocking for each alternative.

MassDOT selected Alternative 3 as the preferred track configuration alternative to advance to preliminary engineering, based on the results of the Tier 2 screening analysis, as well as input from project stakeholders. The Alternative 3 terminal track layout is illustrated in Figure 3-16. Alternative 3 would maintain the existing platform configuration at South Station and expand the terminal track configuration to the east with four new platforms and seven new tracks parallel to the existing tracks. Existing platforms would remain at their current width of 17 feet – 6 inches and the new platforms would be 26 feet wide to meet current NFPA and ADA standards. The existing Platform G would require extensive lengthening modifications, but all other existing platforms would not require modifications. This alternative would allow for the longest platform length of 1,085 feet, with the shortest platform length being 708 feet.

MassDOT anticipates that several berthing tracks would be lengthened through standard upgrades and design modifications. Two design modifications may be requested as part of the project to enhance platform capabilities and accommodate berthing length requirements. One design modification would locate the locomotive and a portion of the first coach beyond the end of the platform. The second platform lengthening modification includes using a fixed-type bumping post to replace some of the longer hydraulic bumping posts in use today. Figure 3-16 shows 14 berthing tracks would accommodate MBTA desired length (850 feet) and three berthing tracks would accommodate Amtrak desired length (1,050 feet).

One of the main benefits of Alternative 3 is that there would be minimal impact to the Tower 1 Interlocking track configuration. Additional terminal tracks are accommodated by adding special trackwork to the existing interlocking with minimal impact to existing operations. In addition to reducing the construction staging impacts, this alternative would provide the maximum platform accessibility. This increased flexibility over the existing infrastructure allows for greater route options for dispatchers in the event of delays.

In addition to preserving the existing platforms and tracks, Alternative 3 avoids impact to the existing bus terminal and minimizes the impact to the future bus expansion foundations and columns. The bus terminal is close to capacity today and there are plans to expand it in the future. By expanding the rail capacity without impacting the bus expansion, this alternative increases the opportunities for multimodal connections; in addition, all existing and new platforms could have direct access to the bus terminal as well as other modes available at South Station. This alternative also allows for the opportunity for future joint development along Dorchester Avenue as the new proposed terminal expansion does not occupy all of the terra firma adjacent to the street.

The proposed 20-track South Station layout envisions infrastructure that can support up to seven trains moving simultaneously through the Tower 1 Interlocking area. This proposed layout reduces the number of conflicting movements through the terminal area by making it possible for most trains to use the approach interlockings at Cove and Broad, thereby allowing faster and more efficient crossover moves in preparation of berthing at station platforms. The Cove Interlocking on the NEC allows crossovers to occur at 20 to 30 mph, versus the speed of 10 mph in the Tower 1 Interlocking area, making the necessary crossover movements more efficient. The proposed universal interlocking at Broad Interlocking would push the converging movements to an area of higher-speed crossovers and away from the Tower 1 Interlocking area.

The most substantial modification would be at Broad Interlocking with the introduction of a third running track. This running track would contain an approximately 850-foot section between Broad and Tower 1 Interlockings that would provide sufficient space to stage one trainset outside of Tower 1 Interlocking. This would help with maintaining speed and maximizing efficient train movements through the Tower 1 Interlocking. Other improvements at Broad Interlocking would include the installation of new universal crossovers on the north end of the interlocking and maintain moves to the Wye track and Service and Inspection (S&I) Facility. A new yard lead would be established and the MBTA's S&I facility yard tracks would be realigned. The proposed track realignment of the Fairmount Line/Dorchester Branch may require a partial acquisition of the Boston Department of Public Works (DPW) property and may impact the garage access ramp. Further discussion of the proposed interlocking improvements is provided in Appendix D, *Track Configuration Alternatives Analysis – Tier 2 Screening Technical Report*.

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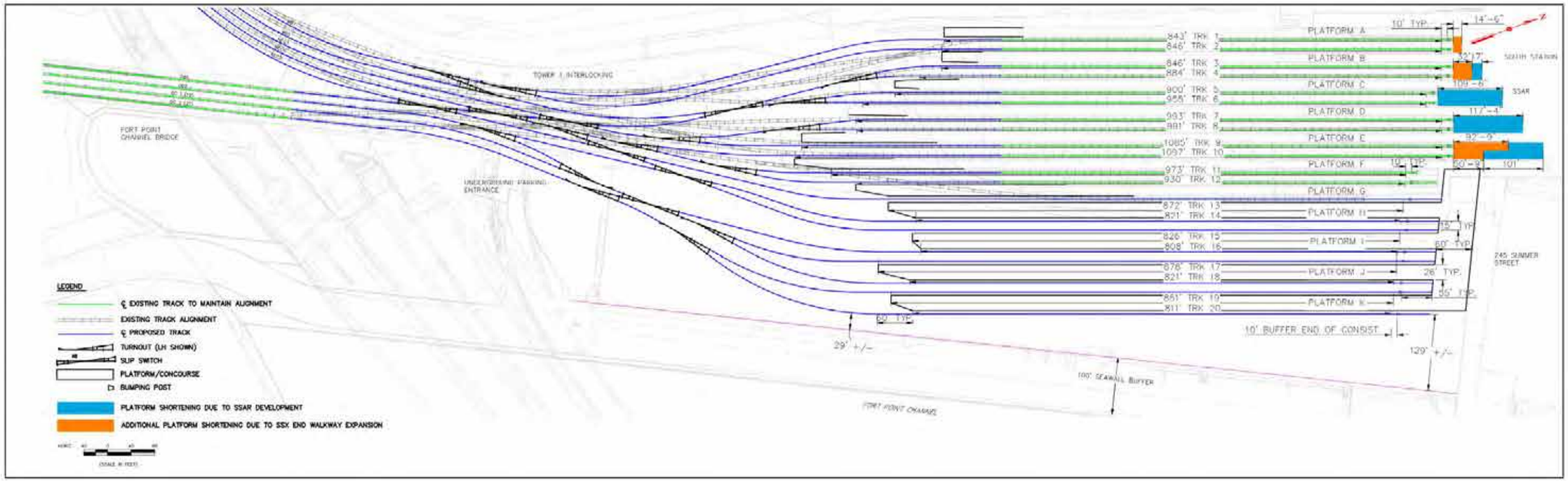


Figure 3-15 —Constrained Rail Alternative 2 - Streamline Operations

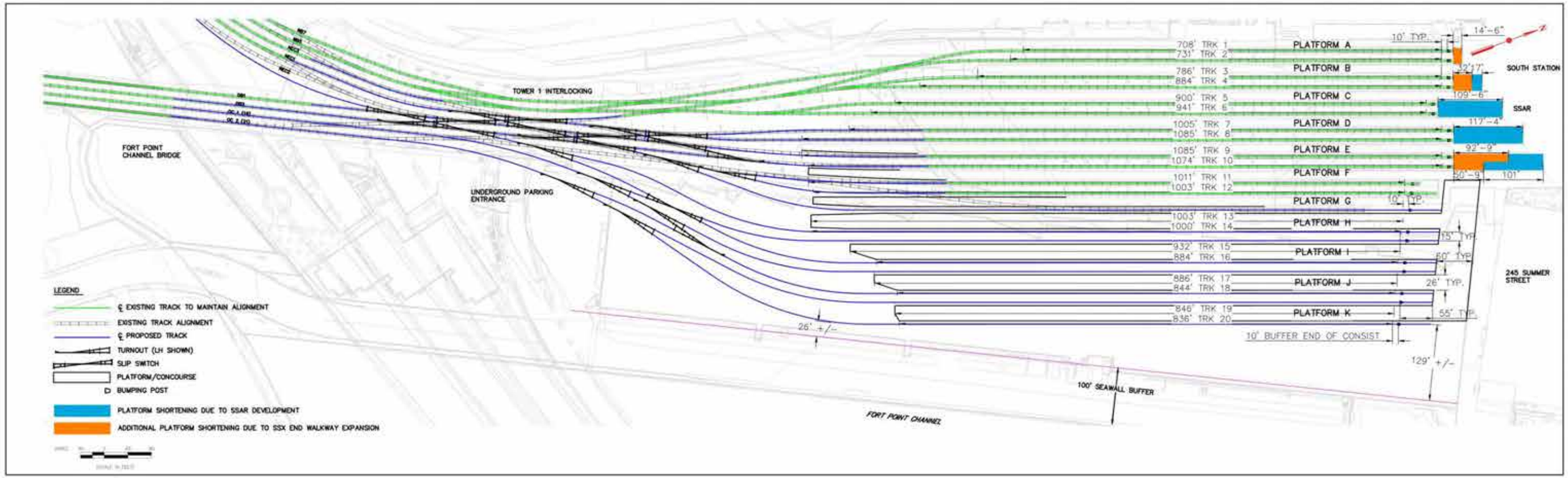


Figure 3-16 — Constrained Rail Alternative 3 – Minimize Disruptions to Operations

3.8.3. Track Layout Capacity and Future Ridership

The Secretary's Certificate requested an explanation of the perceived discrepancy between the proposed number of additional tracks and future ridership projections. As described in the DEIR, an analysis was performed to determine the maximum throughput at a reconfigured Tower 1 Interlocking given its physical constraints, as well as the optimal track configuration at South Station to maximize capacity. The analysis concluded that, based on the throughput that could be supported through a reconfigured Tower 1 Interlocking, a total of 20 platform tracks at South Station (which would require the addition of seven platform tracks to the existing station) would provide the optimum configuration to maximize capacity.

For project planning purposes, MBTA South Side commuter rail service levels were projected for the 2035 horizon year. Amtrak also provided projected 2035 horizon year service levels for intercity rail service. These service plans do not necessarily represent the maximum number of trains that could be accommodated at an expanded South Station with 20 platform tracks. Both MBTA commuter rail and Amtrak intercity ridership projections were based on the developed 2035 horizon year service plans, the markets served by each rail service, and the capacities of the trains, such as the lengths and configurations (i.e. bi-level vs. single level coaches), that would be provided to these markets.

3.8.4. Preferred Layover Facility Operations Assessment

During the DEIR, MassDOT evaluated combinations of BPY (to the west of South Station) and Widett Circle and an expanded Readville – Yard 2 (to the south of South Station) based on layover capacity, program needs, and operational performance. BPY is now subject to environmental review as part of the I-90 Allston Interchange project (EEA No. 15278). The I-90 Allston Interchange project is further refining the concept design and environmental evaluation of BPY, which is occurring concurrently with the SSX project. For environmental review of the SSX project, BPY is assumed to be in use as a midday layover facility prior to 2035. This does not obviate the need for additional midday layover facilities for the SSX project. As such, Widett Circle and an expanded Readville – Yard 2 have been selected as the preferred layover sites.

In order to optimize South Station operations, MBTA revenue trains entering South Station from the south ideally would lay over on the south side. Likewise, MBTA revenue trains entering from the west ideally would lay over on the west side. All Amtrak trains enter the South Station Terminal from the west and lay over at the existing Southampton Street Yard on the south and would continue to do so in the future. While there would always be a need for some trains to cross over between the south and west at Tower 1 Interlocking, providing additional MBTA midday layover facilities to the west and south would considerably increase South Station's capacity and efficiency of operations. Operational benefits would include:

- Allowing Amtrak trains nearly exclusive use of the central platforms at South Station;
- Allowing for a greater number of trains to move in and out of the terminal; and
- Reducing conflicting movements at Tower 1 Interlocking that consume critical railroad operational capacity.

3.8.5. Layover Location and Operations Impacts on Rail Services

As discussed in the FEIR Appendix E, *Rail Operations Analysis Technical Report*, the operations analysis conducted for the SSX project evaluated all train moves and evaluated impact to all rail services in and out of South Station. In addition to all revenue train moves, the simulation models also included all MBTA and Amtrak non-revenue train movements between South Station and the layover facilities. Future freight operations, assumed to operate as they do today within the project study area, would not be

negatively impacted by the proposed future service and infrastructure improvements. The results of the operations analysis indicate that the proposed infrastructure would support proposed future operations and meet or exceed the MBTA Commuter Rail Schedule Adherence Standard, exceeding the OTP threshold of 95% of all trips departing and arriving at terminals within five minutes of scheduled departure and arrival times. The results also meet or exceed Amtrak's 2030 OTP target for Acela Express service and Northeast Regional service (95%).[4] These results indicate the proposed terminal infrastructure is robust and flexible enough to provide reliable service given the large increase in future 2035 trip volumes.

3.8.6. Activities at Layover Facilities

The purpose of the Widett Circle and expanded Readville – Yard 2 midday layover facilities is to provide a location to stage MBTA's commuter rail trains and relieve train crews between revenue runs, typically during off-peak hours in the midday period. The average layover duration is approximately 4 hours and 30 minutes. These facilities also provide a place for storing essential supplies for the locomotive such as fuel, sand, lubricants, and coolants; and they provide for sanitary systems maintenance and water for the coaches equipped with restrooms. The interior of each coach is cleaned and minor running repairs are performed while each train is out of service. Examples of running repairs include replacement of lights, brake shoes, air hoses, and HVAC components; fixing jammed doors and repairing seats; and checking and topping off fluids as needed to support train operations. No new heavy maintenance functions are proposed at Widett Circle or Readville – Yard 2. Routine service, inspection, and repairs are conducted at the MBTA's South Side S&I facility. Extensive equipment repairs are conducted at the MBTA's Commuter Rail Maintenance Facility located on the North Side of the MBTA Commuter Rail System.

3.8.7. Layover Phasing Plan

Because the MBTA's needs for future midday layover will grow over time, there are opportunities to phase the construction of the proposed layover facilities to meet existing layover needs and as MBTA's commuter rail services are expanded in the future. MassDOT assumes BPY is constructed prior to 2035, which would help support short-term south side midday layover capacity and maintenance needs. MassDOT anticipates construction at the South Station site and layover facility sites could advance independently and on separate timelines. Service enhancements to passenger rail service are anticipated by 2035, which could be supported by the expansion of Readville – Yard 2, followed by the full buildout of Widett Circle as demand increases.

3.9. Traffic – Vehicles, Pedestrians, and Bicycles

This section discusses the impacts of the project on vehicular traffic, pedestrians, and bicyclists, and also provides the following information requested in the Secretary's Certificate:

- A reevaluation of the feasibility of additional intersection mitigation measures to further reduce the number of intersections in the study area that currently, or in the future, operate at Level of Service (LOS) E and F. If additional mitigation is not proposed, the FEIR should discuss why mitigation measures are infeasible (Section 3.9.2);
- An update of proposed Transportation Demand Management (TDM) measures, traffic-related elements of the proposed Construction Management Plan (CMP), or other relevant traffic mitigation measures as necessary to reflect final design elements of the project (Section 3.9.3);

[4] *Amtrak Intercity Passenger Rail On-Time Performance: Twentieth Quarterly Report to Congress*. February 2013. Viewed June 12, 2013 at www.fra.dot.gov

- Details regarding traffic monitoring (Section 3.9.4);
- Additional data regarding trip diversion to Dorchester Avenue (Section 3.9.5);
- Graphics identifying proposed routes to and from South Station from key roadways and locations (Section 3.9.5);
- A discussion of curbside drop-off/pick-up area design (Section 3.9.6);
- The use of Dorchester Avenue by MBTA buses (Section 3.9.7);
- South Station pedestrian and bicycle connections between South Station and surrounding areas (Section 3.9.8);
- Details regarding bicycle parking (Section 3.9.9);
- A discussion of how public realm infrastructure improvements would be maintained (Section 3.9.10); and
- A discussion of any potential water taxi service (Section 3.9.11).

3.9.1. Impact Summary

MassDOT analyzed the operations of 21 intersections in the South Station study area and two intersections each in the Widett Circle and Readville – Yard 2 study areas under the No Build and Build Alternatives. The analysis identified eight intersections, all of which are within the South Station study area, which would benefit from changes to improve traffic flow and increase pedestrian and bicycle mobility.

3.9.2. Intersection Mitigation Feasibility Analysis

LOS is the traffic engineering metric used to denote the different vehicle[5] operating conditions that occur on a given roadway or intersection under various volume loads. LOS A represents the best operating conditions, while LOS F represents the worst operating conditions. Typically, an overall LOS D or better is considered acceptable for motor vehicles in an urban environment. In some cases, LOS E conditions are acceptable for motor vehicles in an urban environment in order to accommodate pedestrians or bicyclists.

To both address LOS deficiencies as well as improve conditions for motor vehicles, pedestrians, and bicycles, mitigation would consist of several measures, including:

- Providing dedicated curbside space for taxicabs, passenger drop-off and pick-up, and private shuttles along the reopened portion of Dorchester Avenue to address excessive curbside congestion along Atlantic Avenue;
- Increasing curbside capacity by removing six parking meters from Atlantic Avenue;
- Improving bicycle accommodations on Atlantic Avenue; and
- Upgrading eight intersections (shown in Table 3-7 and Figure 3-17) to improve traffic flow, reduce queuing, and improve pedestrian and bicycle mobility.

These intersection improvements represent opportunities to improve operating conditions and the quality of service for all modes: pedestrians, bicyclists, and motor vehicles. However, as indicated in Table 3-7, not every peak hour LOS E/F operating condition in the study area can be mitigated for motor vehicles.

[5] The DEIR analyzed LOS for vehicles within the study area. While pedestrian LOS was analyzed within South Station itself, it was not analyzed for the traffic study area. Bicycle LOS was not analyzed.

There are intersections in the study area that would continue to operate at LOS E/F during peak hours that cannot be mitigated without impacting accommodations for pedestrians and bicyclists. For example, while adding vehicular travel lanes on Summer Street or Atlantic Avenue would be needed to fully address LOS E/F conditions along this corridor, doing so would result in deteriorated pedestrian mobility due to longer wait and walk times. There is a heavy concentration of pedestrians in the area of South Station. Therefore, peak hour vehicular operating condition performing at LOS E/F is an acceptable tradeoff to maintain safe and efficient pedestrian mobility in the area and avoid favoring the automobile over non-automobile modes. This approach is consistent with the City of Boston's Complete Streets Guidelines[6], MassDOT's Healthy Transportation Compact initiative, and MassDOT's Project Development and Design Guide.

Table 3-7 identifies the eight intersections selected for implementation of mitigations measures, and compares their overall intersection LOS under No Build and Build Alternatives prior to mitigation. There is one location, Summer Street at Dorchester Avenue, where the vehicle LOS decreases slightly during the morning peak hours (from LOS C to LOS D) due to the additional signal time that is provided to pedestrians and bicyclists under the mitigated conditions. Although the vehicle LOS decreases slightly, the intersection will continue to operate at an acceptable LOS D or better.

Table 3-7 — Comparison of No Build and Build Alternative Overall Intersection LOS

	2035 No Build Alternative		2035 Build Alternative[a]		2035 Mitigated Condition	
Intersection	Morning Peak Hour LOS	Evening Peak Hour LOS	Morning Peak Hour LOS	Evening Peak Hour LOS	Morning Peak Hour LOS	Evening Peak Hour LOS
Atlantic Avenue at Summer Street	F	D	F	D	D	D
Purchase Street at Summer Street	D	B	D	B	B	A
Surface Road at Essex Street/Lincoln Street	D	F	C	F	B	E
Summer Street at Dorchester Avenue	E	E	C	C	D[b]	C
Congress Street at Dorchester Avenue	C	C	C	D	C	C
Atlantic Avenue at Kneeland Street	F	E	F	E	E	D
Dorchester Avenue at West Broadway/ Traveler Street	F	E	F	F	D	D
Dorchester Avenue at West 4th Street	E	C	E	E	D	E

[a] Build Alternative LOS is pre-mitigation
[b] Vehicle LOS decreases slightly during the morning peak hours (from LOS C to LOS D) due to the additional signal time that is provided to pedestrians and bicyclists under the mitigated conditions.
Note: LOS = Level of Service

[6] City of Boston Complete Streets Guidelines website: http://bostoncompletestreets.org

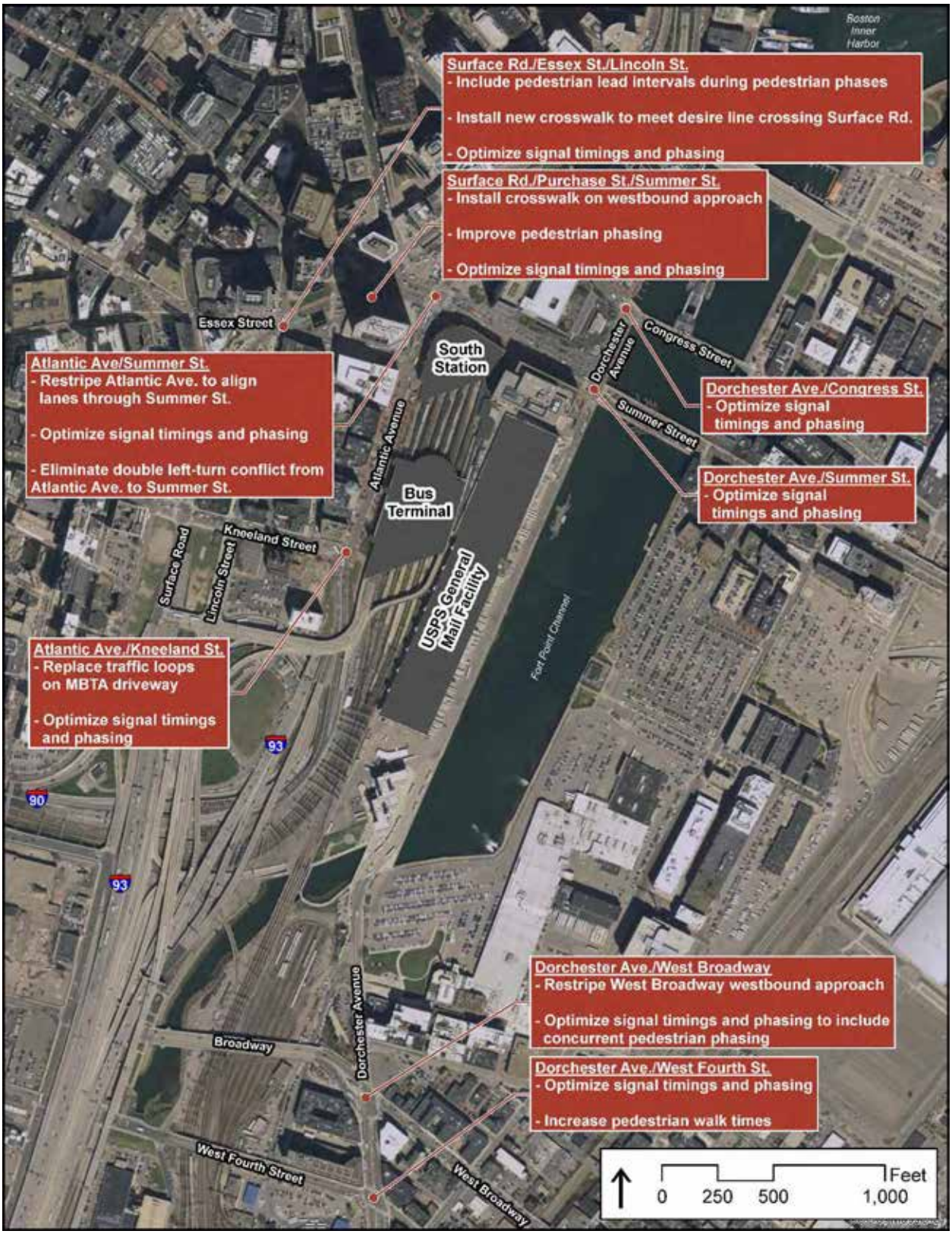


Figure 3-17 — South Station Site - Traffic Mitigation Measures

3.9.3. Transportation Demand Management Commitments

In addition to intersection improvements, and consistent with MassDOT's efforts to reduce automobile dependency, transportation demand management (TDM) commitments for the SSX project would include the following:

- Incorporate bicycle parking in the new headhouse on Dorchester Avenue;
- Participate in the U.S. EPA SmartWay Transport Program to increase energy efficiency and reduce greenhouse gas emissions;
- Provide electronic signage displaying transit schedule information;
- Accommodate curbside space for a shuttle bus stop along Dorchester Avenue for shuttle buses that currently serve the South Boston Waterfront/Innovation District;
- Collaborate with the City of Boston to improve bicycle accommodations along Atlantic Avenue from Kneeland Street to Summer Street; and
- Prepare a CMP for BTD to minimize disruption in the area throughout construction.

Details of each element of the TDM plan for the project would be refined throughout the engineering design phase. MassDOT would coordinate with the City of Boston to identify elements of the CMP to minimize disruption to transit users, pedestrians, bicyclists, and drivers in the area throughout construction.

3.9.4. Traffic Monitoring

Since the proposed project does not include joint development, MassDOT no longer proposes parking at the site. Traffic monitoring activity would apply to construction phases of the project and not to building occupancy milestones as it normally would for a development project. During construction, a Construction Management Plan would be prepared for approval by the Boston Transportation Department (BTD) to minimize disruption to transit users, pedestrians, bicyclists, and drivers in the area.

3.9.5. Trip Diversion to Dorchester Avenue

The project is expected to reduce curbside traffic on Atlantic Avenue due to the diversion of a portion of this traffic to Dorchester Avenue. Determining how much South Station traffic would shift from the Atlantic Avenue curb to Dorchester Avenue was based on several factors, such as curbside capacity (number of spaces), curbside demands (pick-up, drop-off, and taxicabs), and traffic patterns to South Station as illustrated in Figure 3-18. Based on a review of the curbside trip origins and destinations, overlaid onto the key roadways used by South Station traffic, the proposed project is expected to shift 30% to 40% of curbside traffic from Atlantic Avenue to Dorchester Avenue. Detailed information including traffic network diagrams quantifying the shift in vehicle trips is contained in DEIR Appendix 9, *Traffic Analysis Technical Report*.

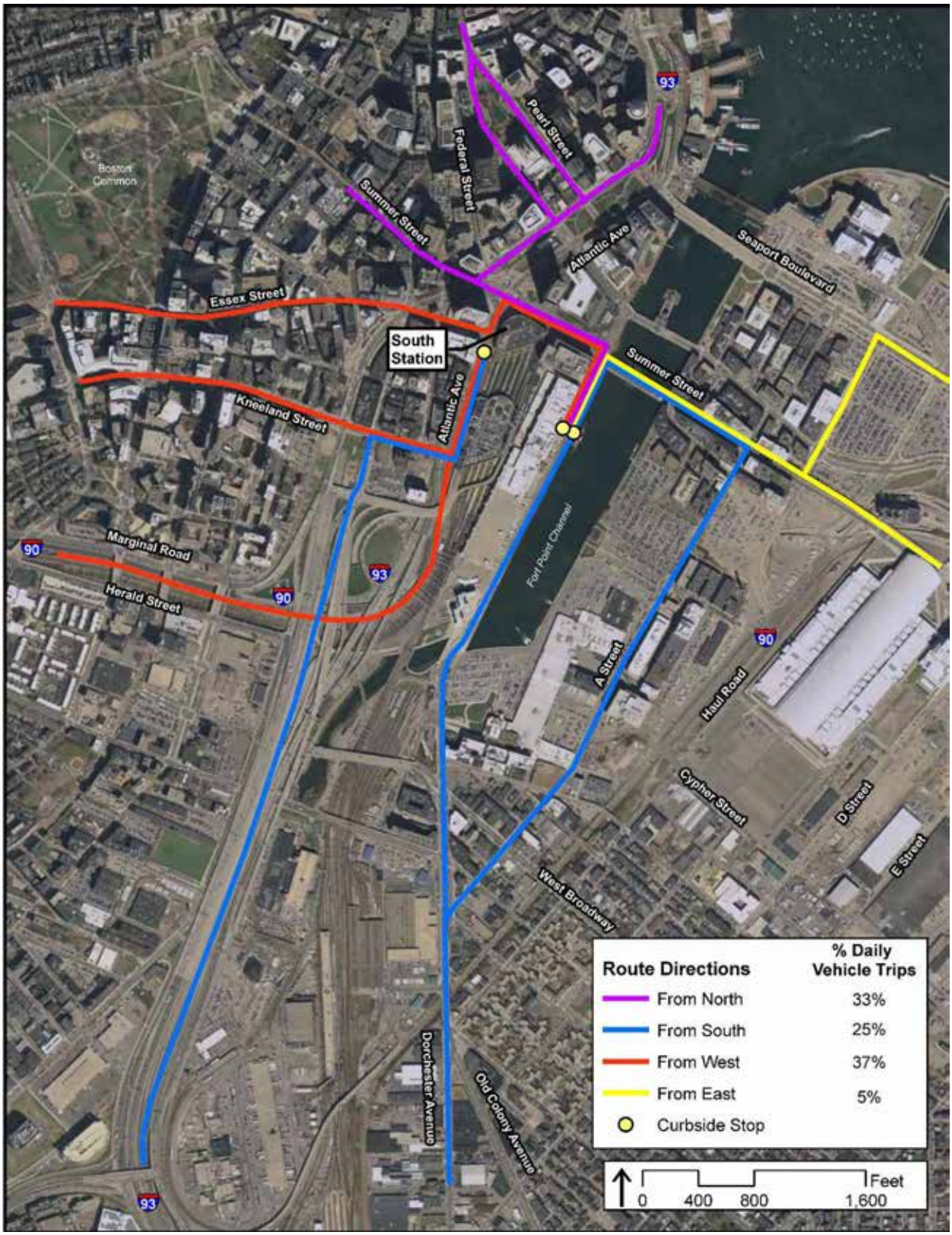


Figure 18 – Proposed Key Routes to South Station

3.9.6. Curbside Drop-Off/Pick-Up Area Design

The cross-section layout and conceptual design for the reopened portion of Dorchester Avenue has been coordinated with City of Boston staff to prioritize safe and efficient accommodations for pedestrians and bicyclists. The cross-section and conceptual alignment for the newly opened portion of Dorchester Avenue prioritizes pedestrian and bicycle accommodations on the Fort Point Channel side of the roadway, separated from the vehicular curbside activity at the expanded headhouse on Dorchester Avenue.

3.9.7. Use of Dorchester Avenue by MBTA Buses

Dorchester Avenue presents an opportunity for MBTA bus service and the potential to add a dedicated stop at the expanded headhouse. The two primary bus stops that serve South Station on Summer Street are heavily utilized. Dorchester Avenue could accommodate direct bus service between South Station and the rapidly growing South Boston Waterfront/Innovation District without requiring buses to enter the congested downtown Dewey Square area. To avoid having to travel through congested Dewey Square, buses from the South Boston Waterfront/Innovation District could divert onto Dorchester Avenue and stop in the vicinity of the new headhouse, then turn around at the I-90 Vent Building if desired by the MBTA. Dorchester Avenue could also present an opportunity to revisit other bus routes in the area to provide a more direct connection to downtown, such as Route 11, which currently travels along the public portion of Dorchester Avenue to Foundry Street before diverting off Dorchester Avenue. MassDOT would continue to coordinate with the MBTA to determine the opportunity of accommodating bus service on the reopened portion of Dorchester Avenue.

3.9.8. Pedestrian and Bicycle Connections

The project includes area-wide enhancements to pedestrian and bicycle connections and the expanded headhouse would incorporate bicycle parking. The reopening of Dorchester Avenue presents an opportunity to extend the existing Harborwalk by approximately one-half mile along the Fort Point Channel. This extension would close one of the last remaining gaps in an otherwise continuous waterfront walkway in Downtown Boston. The reopened segment of Dorchester Avenue would include a new cycle track that is buffered from traffic and parallel to the newly created Harborwalk along the Fort Point Channel. The proposed cycle track would connect with existing bicycle infrastructure and complement future plans by the City, including the South Bay Harbor Trail and the Summer Street Corridor cycle track. There are existing Hubway bicycle sharing stations on Dorchester Avenue, at the end of the South Bay Harbor Trail, on Atlantic Avenue, and on Summer Street, which would complement the new cycle track and plans for bicycle parking within the expanded headhouse.

3.9.9. Bicycle Parking

The approximate size and location of proposed long-term and short-term bicycle parking would be determined as the designs for the headhouse and Dorchester Avenue progress. As part of the design approvals for Dorchester Avenue, the location and size of any new Hubway stations would be reviewed with the City of Boston. A review of bicycle demands in the area and Hubway origin-destination data indicates that a new Hubway station on Dorchester Avenue would be approximately the same size of the existing Hubway station on Atlantic Avenue (47 bicycle slots).

3.9.10. Maintenance of Public Realm Infrastructure

The public realm improvements along Dorchester Avenue, to include the proposed Harborwalk extension and cycle track, would be the responsibility of the City to maintain, or develop maintenance agreements (if desired). Since Dorchester Avenue would be a City-owned public right-of-way, the City would be

responsible for any maintenance and repairs to the hardscape, landscape, drainage systems, pavement markings, lighting, signage, and traffic signals.

3.9.11. Water Transportation

Under Chapter 91, as a nonwater-dependent infrastructure facility, the project is exempt from the regulatory standards at 310 CMR 9.51 (Conservation of Capacity for Water-Dependent Use), 310 CMR 9.52 (Utilization of Shoreline for Water-Dependent Purposes), and 310 CMR 9.53 (Activation of Commonwealth Tidelands for Public Use). Because this project includes transportation improvements only, additional public benefits related to waterfront access and/or water transportation are not required. In the future if private development is proposed, the inclusion of water transportation may be reassessed.

3.10. Climate Change

This section includes a summary of the impacts that climate change is anticipated to have on the project, and also provides the following information requested in the Secretary's Certificate:

- A sensitivity analysis comparing the results of this vulnerability assessment and its associated model, the Boston Harbor Flood Risk Model, with that presented in the DEIR to determine if the extent of potential flooding during the evaluated scenarios encompasses a larger than anticipated area (Section 3.10.1);
- Additional data on the potential depths of inundation within the SSX project area in the 1% annual chance flood event, the 1% annual chance flood event plus two feet of sea level rise, and hurricane modeled events (Section 3.10.1);
- A discussion of how climate change and storm adaptation and resiliency measures would be selected and implemented, either as part of the original project design, or within the design life of the project, with a clear commitment to implementation by MassDOT (Section 3.10.2);
- Consideration of how adaptable the proposed infrastructure would be in the future, and consideration of upfront adaptation measures that would be very difficult to implement once the infrastructure is in place (Section 3.10.3);
- An explanation of how climate change adaptation and resiliency measures are incorporated into the stormwater management system (Section 3.10.4); and
- A description of the nature, potential scope, and location of the impacts of sea level rise and coastal storms on the three Combined Sewer Overflow (CSO) outlets to Fort Pint Channel near South Station. Potential mitigation measures to minimize seawater entering back into the CSO lines, as well as the anticipated responsible party, are identified (Section 3.10.5).

3.10.1. Vulnerability Assessment Comparison

The DEIR provided a climate change and adaptation analysis, including assessment of potential risks associated with a two-foot rise in sea level. It also included an analysis of hurricane modeling. The analysis in this FEIR summarizes the results presented in the DEIR; provides updates based on newly available flood information from FEMA;[7] provides results of the MassDOT-Federal Highway Administration (FHWA) Boston Harbor Flood Risk Model (BH-FRM) analysis;[8] and responds to specific requests for clarification and expansion from the DEIR certificate and the comment letters. Tables 3-8 and

[7] FEMA, Flood Insurance Rate Maps for Suffolk County Massachusetts, Revised March 16, 2016.
[8] MassDOT-FHWA, Pilot Project Report: Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery, June 2015.

3-9 provide comparisons of the components of the flood vulnerability studies conducted for the DEIR and the FEIR.

Table 3-8 — Flood Vulnerability Comparison: South Station

		South Station		
	Source	BFE (NAVD88)	SFHA Area[a]	Flood Depths
DEIR	2013 Preliminary FIRMs	10-13 ft	2.9 acres	N/A
	2013 Preliminary FIRMs + 2' SLR	12-15 ft	38 acres	N/A
FEIR	2016 FIRMs	10 ft	3 acres	N/A
	2016 FIRM BFEs + 2' SLR	12 ft	28 acres	N/A
	BH-FRM 2013	N/A	N/A	Negligible
	BH-FRM + 0.62' SLR (2030)	N/A	N/A	Negligible
	BH-FRM + 3.2' SLR (2070)	N/A	N/A	0.5 – 2.5 ft

Notes: BFE = Base Flood Elevation; NAVD88 = National Vertical Datum of 1988; SFHA = Special Flood Hazard Area; FIRM = Flood Insurance Rate Map; SLR = sea level rise.
a Area subject to the 1% annual chance flood.

Table 3-9 — Flood Vulnerability Comparison: Widett Circle

		Widett Circle		
	Source	BFE (NAVD88)	SFHA Area[a]	Flood Depths
DEIR	2013 Preliminary FIRMs	Not Impacted	Not Impacted	N/A
	2013 Preliminary FIRMs + 2' SLR	14 ft	30 acres	N/A
FEIR	2016 FIRMs	10 ft	26 acres	N/A
	2016 FIRM BFEs + 2' SLR	12 ft	30 acres	N/A
	BH-FRM 2013	N/A	Not Impacted	Not Impacted
	BH-FRM + 0.62' SLR (2030)	N/A	Not Impacted	Not Impacted
	BH-FRM + 3.2' SLR (2070)	N/A	30 acres	1.5 – 2.0 ft

Notes: BFE = Base Flood Elevation; NAVD88 = National Vertical Datum of 1988; SFHA = Special Flood Hazard Area; FIRM = Flood Insurance Rate Map; SLR = sea level rise.
a Area subject to the 1% annual chance flood.

DEIR Analysis: Summary

Sea levels are rising in Boston Harbor and across the globe, as evidenced through empirical data. In order to assess future risk and planning for rising seas, Massachusetts Office of Coastal Zone Management (CZM) recommends selecting specific sea level rise scenarios. As directed by the Secretary of EEA, the DEIR assessed the impacts of a two-foot sea level rise on the SSX project, which is consistent with planning for a project with a design life of 50 years. To assess the project's vulnerability to flooding, floodplains in the study areas were identified using both the 2009 and preliminary 2013 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) and Flood Insurance Study (FIS), as well as a two-foot sea level rise added to the base flood elevations (BFEs)[9] presented in those documents.

South Station

For the DEIR, the project site's BFEs were evaluated at heights of 10 to 13 feet.[10,11] The existing ground elevation at South Station varies from approximately nine to 16 feet. This indicates that a portion of the South Station site is already vulnerable to flooding without any projected sea level rise. The DEIR found that at these elevations approximately 2.9 acres of the site are within the 1% annual chance floodplain,

[9] A base flood elevation (BFE) is the elevation to which floodwater is anticipated to rise during the base flood, which FEMA FIRMS identify as the flood having a one percent change of being equaled or exceeded in any given year, commonly referred to as the "100-year flood."
[10] All elevation references are based on the North American Vertical Datum of 1988 (NAVD 88).
[11] Federal Emergency Management Agency. Preliminary Flood Insurance Study, Suffolk County Massachusetts, November 15, 2013.

and approximately 18.9 acres are within the 0.2% annual chance floodplain. Adding two feet to the flood elevations to reflect a future sea level rise scenario would amplify the risk at South Station and increase flood elevations to a range of 12 to 15 feet. An elevation of 14 feet for the 1% annual chance flood was ultimately selected for future sea level rise analysis. The extent of potential flooding at the South Station site under this scenario would encompass approximately 38 acres of the SSX project footprint, representing nearly complete inundation of the site and infrastructure.

Widett Circle

The DEIR indicated that the current 1% annual chance flood event does not reach the Widett Circle layover facility site by an overland connection. However, there could be risks of flooding through unknown underground connections, such as storm drainage pipes. A future two-foot rise in sea level, with a corresponding 1% annual chance flood elevation of 14 feet as presented in the DEIR, would result in flooding over a direct overland connection to Fort Point Channel. During the 1% annual chance flood event, the Widett Circle layover facility project footprint would be completely inundated.

Readville – Yard 2

The Readville – Yard 2 layover facility site is located approximately six miles inland from Boston Harbor and is not within a coastal flood hazard area. Based upon the distance of the site from the ocean, the site's elevation, and the presence of downstream dams, it is anticipated that a two-foot rise in sea level would not impact the sites coastal flooding characteristics.

DEIR Analysis: SLOSH Model

Application of the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model was described in DEIR Section 5.3.4, Hurricane Surge. The SLOSH model's Hurricane Surge Inundation Maps show areas of coastal Massachusetts that would become inundated based upon different categories of hurricanes. The maps show that a Category 2 hurricane would inundate the majority of the area in and around South Station, and a Category 1 hurricane would inundate the entire area surrounding Widett Circle. These maps are based on current sea level conditions only and do not account for future sea level rise. Hurricane surge elevations from the Massachusetts Hurricane Evacuation Study are not published, and as a result predicted future surge conditions due to sea level rise were qualitative in the DEIR study. Because elevations are not available for flooding associated with different hurricane intensities, effects due to a projected two-foot sea level rise were estimated. With a rise in sea level, hurricane surge inundation scenarios are expected to increase to some proportionate elevation and horizontal extent, similar to the anticipated effects of projected sea level rise upon 1% annual chance flood events.

FEIR Analysis: Updated FEMA FIRMS

Following completion of the DEIR, the preliminary 2013 FIRMs were appealed and removed from circulation. In 2015 FEMA released updated FIRMs for Suffolk County that took effect March 16th, 2016.

South Station

The 2016 FIRMs update the BFEs for the portions of Fort Point Channel adjacent to South Station. Of particular note, the preliminary 2013 FIRMs reported varied flood depths, whereas the updated BFEs are uniform for this entire area at an elevation of 10 feet. Based upon this new floodplain data, approximately 3 acres of the South Station project footprint would be inundated by the 1% annual chance flood. Figure 3-19 provides a visual representation of the areas at risk of inundation during the 1% annual chance flood. Adding two feet to the flood elevation to reflect a future sea level rise scenario would amplify the risk at South Station and increase flood elevation to approximately 12 feet. Figure 3-20 presents the extent of potential flooding at the South Station site under this scenario. In the absence of

mitigation, the 1% annual chance floodplain would encompass approximately 28 acres of the South Station project footprint.

Widett Circle

The 2016 FIRMs also indicate that the current 1% annual chance flood event does not reach the Widett Circle layover facility site by an overland connection. As presented in Figure 3-19, the 0.2% annual chance flood event would inundate the entire project footprint. As shown in Figure 3-20, with a two-foot rise in sea level, the 1% annual chance flood event has a much larger extent, and would completely inundate the entire Widett Circle layover facility project footprint.

Readville – Yard 2

As described in the DEIR Results Summary above, Readville – Yard 2 site is not within the coastal zone. FIRM panels for this area were not recently updated; therefore no new data exist for the area in the vicinity of Readville – Yard 2.

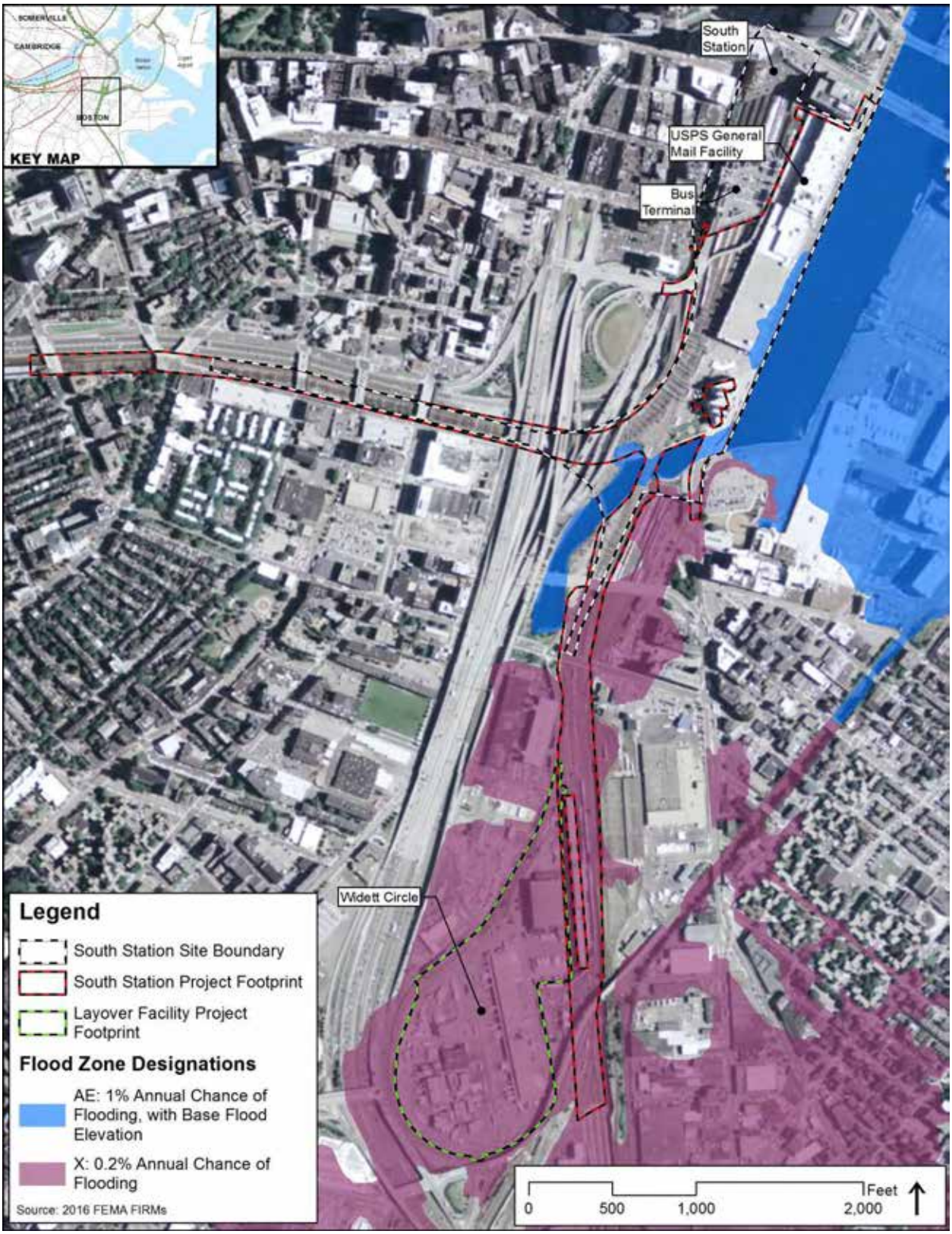


Figure 3-19 — FEMA Floodplain Existing Conditions - South Station and Widett Circle

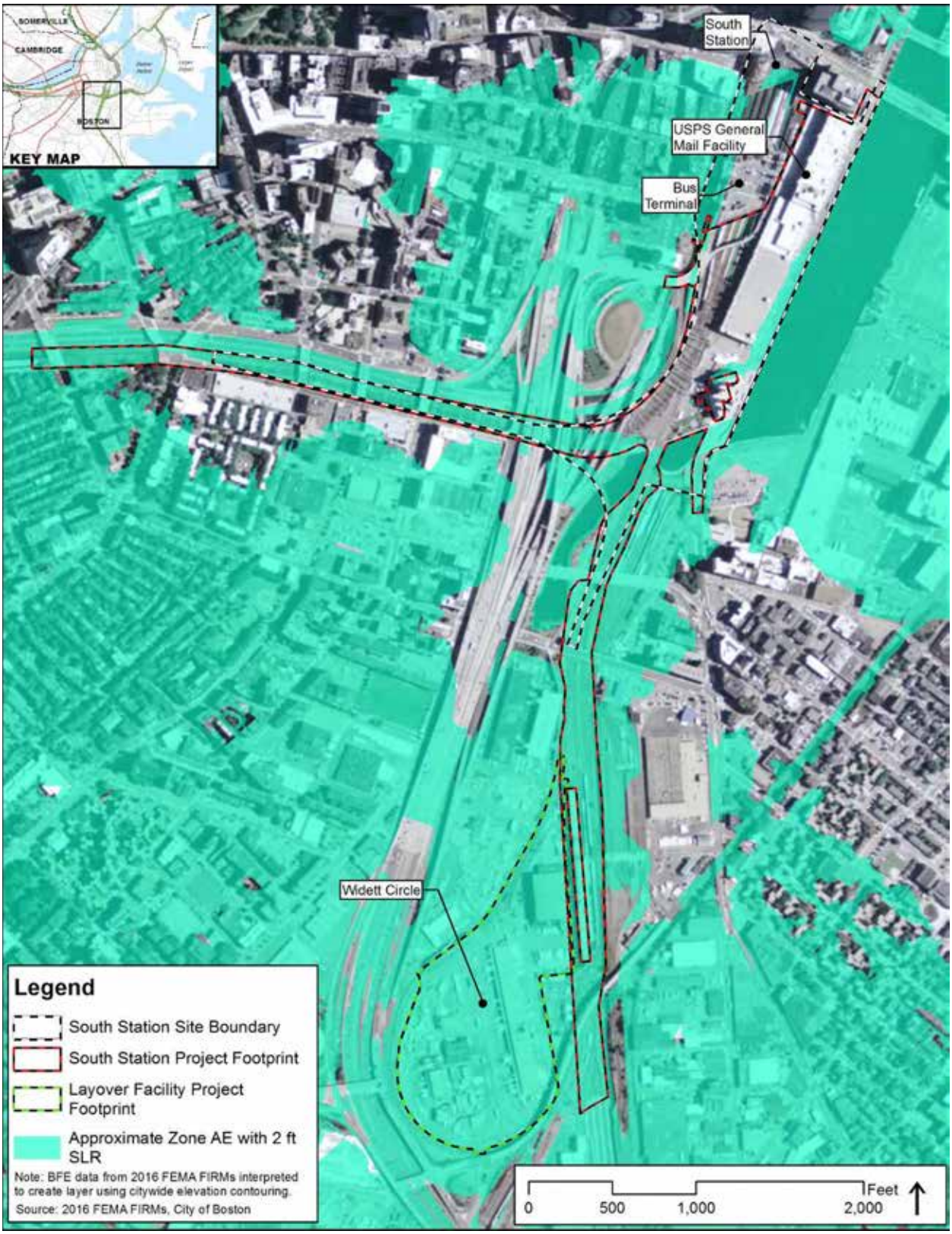


Figure 3-20 — Area Susceptible to Flooding with Two Feet of Sea Level Rise

FEIR Analysis: Boston Harbor Flood Risk Model

In 2015, MassDOT completed a pilot project report titled *Climate Change and Extreme Weather Vulnerability Assessments and Adaptation Options for the Central Artery*. This report provides an evaluation and analysis of the vulnerability of Boston's Central Artery to sea level rise and storm-driven flooding scenarios using the newly-developed BH-FRM. The model provides information on both flooding extent and flood depths for current and future conditions. Consistent with the Secretary's request, this FEIR applies the model to the project sites, and compares the modeled outputs to the 2016 FIRMs.

South Station

Figure 3-21 shows the extent of the 1% coastal flood exceedance probability (CFEP) at three different time periods for the area around South Station as modeled by BH-FRM. The current (2013) 1% CFEP event is analogous to FEMA's 1% annual chance flood event. Similar to the 2016 FIRMs, the BH-FRM depicts a scenario wherein flood waters would enter the South Station site along Fort Point Channel's western seawall. The BH-FRM also offers results for sea level rise over the coming decades of 0.62 feet (2030) and 3.2 feet (2070). The 0.62-foot SLR scenario projects flooding conditions similar to those of the 2013 CFEP maps and 2016 FIRMs. However, the 3.2-foot SLR scenario illustrates significant changes to the potential flooding extent. A 3.2-foot rise in sea level would cause inundation over much of the South Station project footprint, as well as much of the areas surrounding South Station, during the 1% annual chance flood event.

The BH-FRM also provides data on flooding depths for the 1% CFEP event. As presented in Figure 3-22 and Figure 3-23, shallow flooding would occur within the South Station project footprint during the 1% CFEP under current conditions, as well as in 2030 with a projected rise in sea levels of 0.62 feet. Flood depths become a greater concern under the conditions of a 3.2-foot rise in sea levels by 2070. As presented in Figure 3-24, portions of the South Station platform areas could flood to a depth of between 0.5 feet and 1.5 feet. The portion of the South Station project footprint including tracks extending both west away from South Station and south towards Widett Circle could flood to a depth of between 1.0 and 2.5 feet.

Widett Circle

A comparison of the 2016 FIRMs and the BH-FRM presents similar outcome for Widett Circle. As presented in Figure 3-22, no flooding would occur at Widett Circle as a result of a 1% CFEP. Figure 3-23 indicates that the 0.62-foot SLR scenario does not result in increased flooding conditions. However, the 3.2-foot SLR scenario would affect Widett Circle during the 1% CFEP. A 3.2-foot rise in sea level would inundate the entire Widett Circle project footprint, as well as much of the area surrounding Widett Circle. As presented in Figure 3-24, the entire project footprint of Widett Circle could flood to depths ranging from 1.5 feet to 2.0 feet during 1% CFEP event with 3.2 feet of SLR.

Tables 3-8 and 3-9 provide a comparison of the flooding characteristics described in the DEIR and FEIR flood vulnerability analyses.

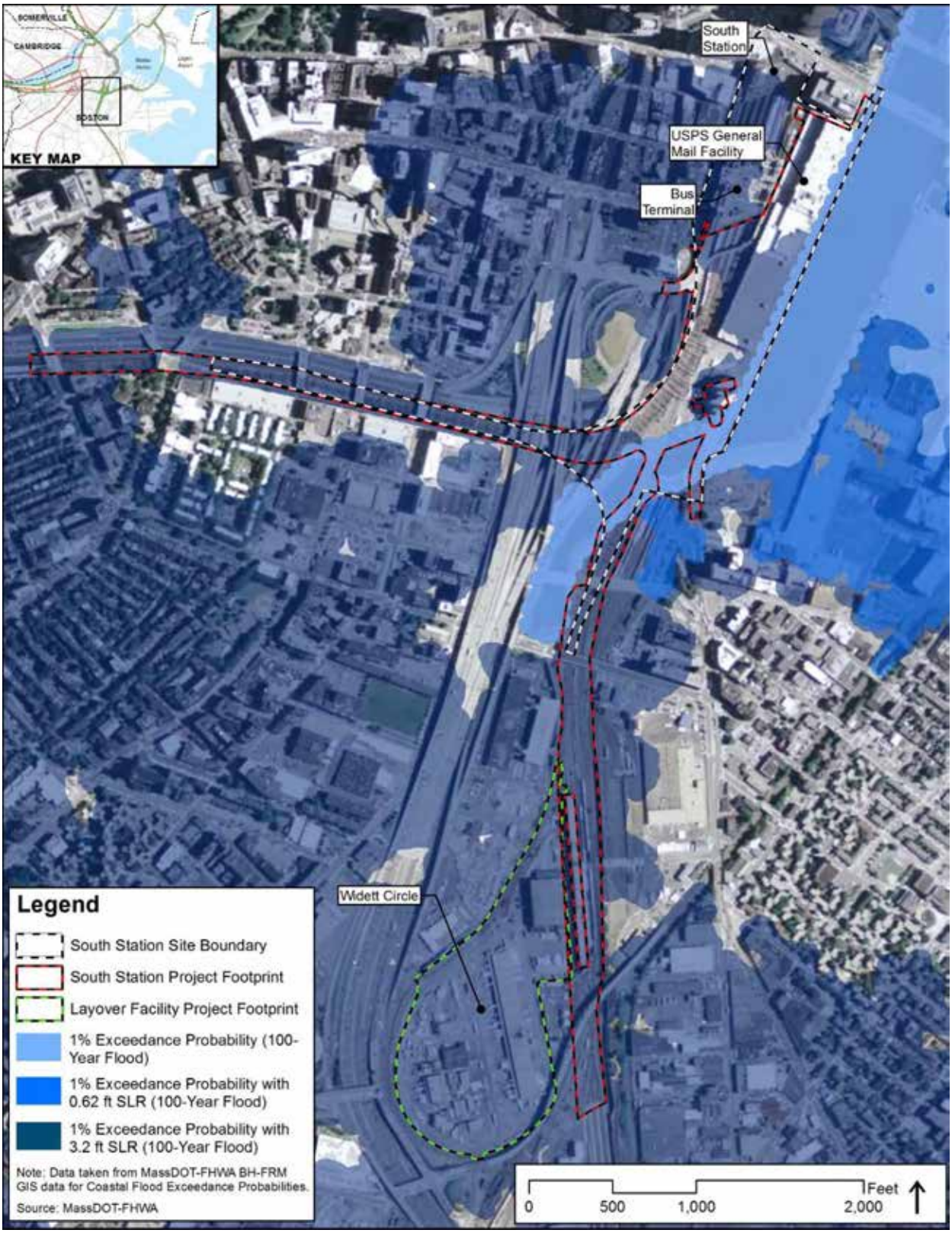


Figure 3-21 — Boston Harbor Flood Risk Model 1% Exceedance 2013, 2030 and 2070

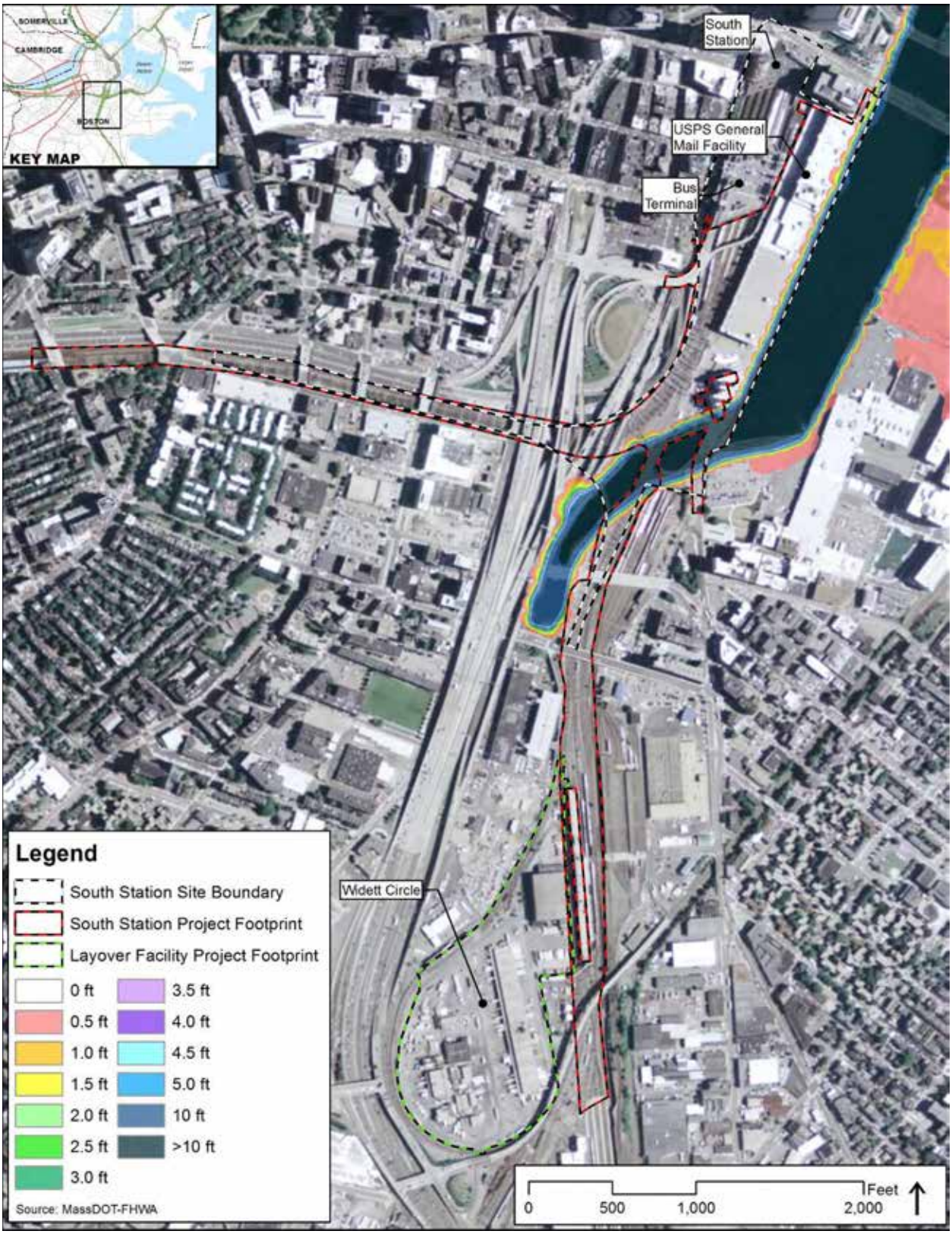


Figure 3-22 — Boston Harbor Flood Risk Model 1% Flood Depths 2013

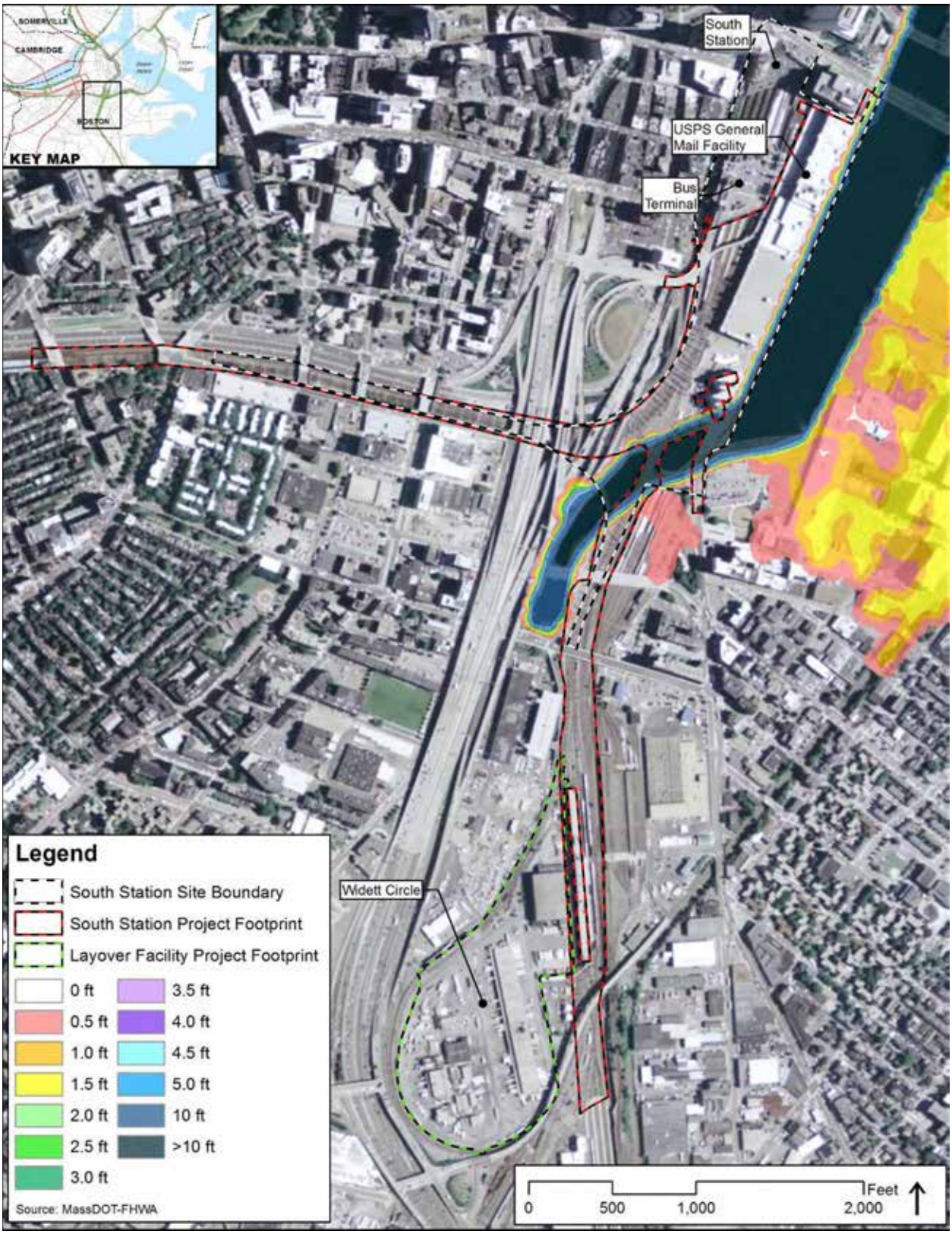


Figure 3-23 — Boston Harbor Flood Risk Model 1% Flood Depths 2030

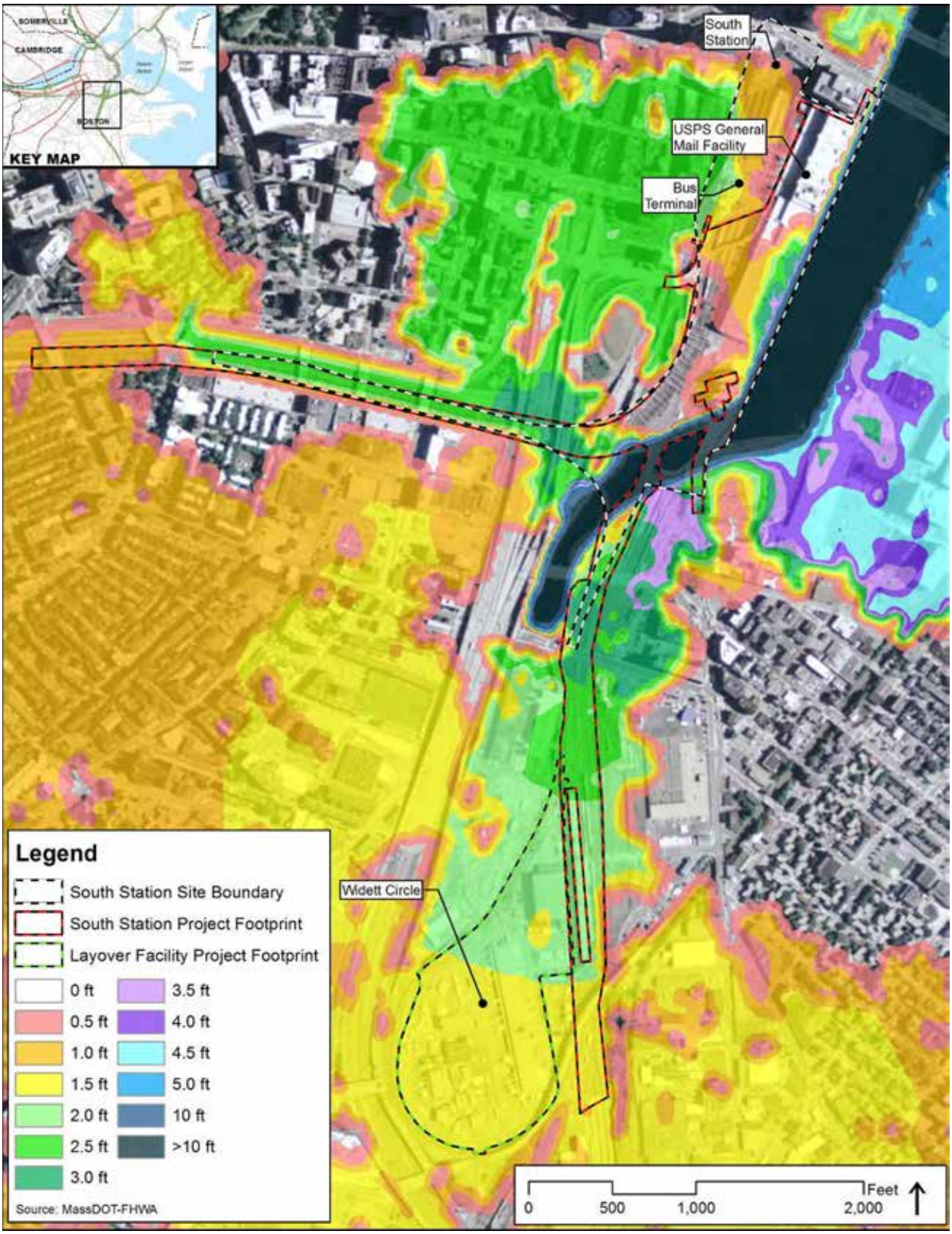


Figure 3-24 —Boston Harbor Flood Risk Model 1% Flood Depths 2070

3.10.2. Selection and Implementation of Adaptation and Resiliency Measures

In an effort to minimize impacts to the project resulting from climate change, including changes to air temperature, flood frequency and extent, and stormwater drainage, MassDOT is committed to implementing adaptation and resiliency measures. To mitigate the impact of temperature increases, MassDOT would consider sustainable design guidelines during the design of public buildings to alleviate extreme heat (DEIR, Section 5.1.3).

Site-specific elements for mitigating for impacts due to rising sea level and hurricanes would be selected and implemented as further analysis of the effects of climate change on the site and surrounding areas is performed. Since the DEIR, a proposal to raise the seawall has been added to the project, largely in response to the potential impacts of sea level rise. CZM estimates up to nearly two feet of sea level rise by the year 2050, which would raise the BFE established by FEMA at this location from 10 feet to 12 feet. To mitigate flooding on the project site, the seawall and the adjacent portion of Dorchester Avenue would be raised from their current elevation of 10.5 feet to 12.0 feet to match the elevation of the existing seawall to the north and south. Raising the seawall and adjacent roadway in this manner would help protect the South Station site in the area along Dorchester Avenue where the USPS facility is currently located from future coastal storm flooding.

MassDOT is currently working with the FHWA to expand the BH-FRM by providing additional information to the analysis described in Section 3.10.1, Vulnerability Assessment Comparison. Mitigation methods that MassDOT would consider to minimize South Station's vulnerability to flooding events include various repair and maintenance procedures of underground systems during design and construction. Specifically, elevating power/heating, ventilation and air conditioning (HVAC) sources and relocating critical systems to higher levels would be considered. Designing infrastructure and critical equipment to accommodate seawater flooding, water-proofing subsurface site elements, and using corrosion protection elements and materials for underground structures are additional solutions. New products and materials that are used to implement these strategies would be selected to have environmentally, economically, and socially preferable life-cycle impacts. As design progresses, MassDOT would continue to look to implement adaptation and resiliency strategies that would be easier to incorporate during planning and construction of the SSX project as a preventative measure to avoid modifying the infrastructure as a reactionary measure in the future.

3.10.3. Timing of Adaptation Measures

As the design progresses, MassDOT would continue to identify strategies that could be incorporated during the construction of the SSX project as a preventative measure as opposed to modifying the infrastructure as a reactionary measure in the future.

3.10.4. Stormwater Management Adaptation and Resiliency Measures

Storm drainage systems and associated infrastructure would be affected by the change in amount, frequency, and timing of precipitation due to climate change. The proposed drainage systems for the project would be sized using the storm event rainfall totals and distributions from the *Northeast Regional Climate Center Extreme Precipitation Analysis* (http://precip.eas.cornell.edu/) which accounts for the most recent rainfall data. According to the documentation "The website will provide a subset of users access to extreme rainfall statistics through the most recent year (i.e., there will be an automatic update of the rainfall statistics on an annual basis). In future years, these updates will provide the necessary information for considering subsequent updates and provide a readily available source of updated statistics. In other words, the already calculated updated rainfall statistics can be adapted as the new standard if desired." Therefore, by using this data for drainage system sizing, the project would be accounting for the recent trend of larger, more extreme rain events. As design progresses, calculations would be cross-checked with the BWSC's 2015 *Wastewater and Storm Drainage System Facilities Plan,*

Final Report,[12] which identifies recommended annual rainfall volumes for use in identifying the frequency, overall magnitude and operation costs of future wet weather discharges, as well as the 10-year, 24-hour design storm to use for drainage and conveyance calculations.

3.10.5. Mitigating the Impact of Sea Level Rise on Combined Sewer Overflows

Sea level rise could affect downstream CSOs and MWRA facilities, which in turn could affect the performance of the South Station wastewater system. The three CSO outlets to Fort Point Channel (CSO 064, CSO 065 and CSO 068) may require additional mitigation measures to minimize seawater entering back into the combined sewer lines. The BWSC's plan to modify CSO and storm drain outfall operations includes:

- Ensuring all CSO outfalls have tide gates to protect facilities and operations from flooding due to a combination of storm surge and sea level rise;
- Use recommended design flood elevations (ranging from 18 to 22 feet Boston City Base) to determine if and when backflow prevention is required on storm drain system outfalls; and
- Periodically reevaluate the frequency and procedures for tide gate and outfall maintenance and replacement to assure proper operations under more frequent submergence due to higher sea levels.

Further coordination with BWSC would be performed as the project progresses. MassDOT would comply with all BWSC requirements related to this plan.

3.11. Air Quality

This section includes a summary of the project's potential impact on air quality, and also provides the following information requested in the Secretary's Certificate:

- Clarification on whether the air quality analysis conducted in the DEIR considered the potential concentration of air pollutants within the platform and track area at South Station subsequent to the construction of Build Alternatives 2 or 3. If this analysis did not evaluate this condition, the FEIR should include supplemental analyses of criteria pollutants, ultrafine particulates (UFPs) and diesel particulate matter (DPM) in the Build Condition (Section 3.11.2).

3.11.1. Impact Summary

Project-related impacts would include emissions generated by locomotives entering and leaving the South Station Rail Terminal and related layover facilities and vehicular traffic. Based on the results of the emissions inventory analysis for the air quality study area, the small increases in pollutant emissions in the vicinity of the South Station site or the layover facility sites due to the project would not lead to exceedances of the Massachusetts or National Ambient Air Quality Standards (MAAQS and NAAQS) and no adverse air quality impacts are expected to occur as a result of the project. Additional impacts include:

- The results of the carbon monoxide (CO) modeling analysis at the selected traffic intersections in the air quality study areas indicate that increases in project-related motor vehicle traffic volumes would not lead to exceedances of the NAAQS or MAAQS for CO, and no adverse air quality impacts are expected to occur as a result of the project. Based on the CO hot spot analysis, no mitigation measures would be required for any of the traffic intersections analyzed for the project.

[12] Boston Water and Sewer Commission. Wastewater and Storm Drainage System Facilities Plan, Final Report. 2015

- The results of the mobile source air toxics (MSAT) analysis indicate that there would be only a slight increase in MSAT emissions due to the project compared to MSAT emissions from the No Build Alternative. These small increases would be unlikely to result in adverse health effects within the South Station study area.
- Based on a qualitative assessment of DPM emissions, with an increase in the use of diesel-powered vehicles, DPM emissions are expected to increase. For each project year, the project would produce more DPM emissions than the No Build Alternative.
- A qualitative assessment of UFP emissions found that they are expected to increase over time. For each project year, the project would produce more UFPs than the No Build Alternative.

Temporary air quality impacts could result from construction activities associated with the project. Construction-related impacts can include fugitive dust emissions, direct emissions from construction equipment, and increased emissions from motor vehicles on local streets due to traffic disruption. These impacts would be mitigated to the greatest extent practicable as described in Section 3.16, Construction Impacts.

3.11.2. Concentration of Air Pollutants

MassDOT selected Alternative 1 as the preferred alternative for the project, wherein the platform and track area would not be fully enclosed. Therefore analysis of the potential concentration of air pollutants within the platform and track area at South Station is not required by the Secretary's Certificate. UFP and DPM analysis are occasionally performed for special projects and research studies using computation fluid dynamics (CFD) modeling. Current regulations do not require analyses of UFP or DPM, and such analysis are not typically performed for environmental permitting purposes.

3.12. Noise and Vibration

This section includes a summary of the project's noise and vibration impacts, and also provides the following information requested in the Secretary's Certificate:

- A discussion of how the preferred station design and South Station platform and track layout will not alter the anticipated noise and vibration characteristics of the site modeled in the DEIR (Section 3.12.2);
- Identification of how station design elements would provide noise mitigation in interior spaces (Section 3.12.3);
- A feasibility assessment of potential mitigation measures, a phasing plan for their implementation, and identification of responsible parties for their construction and maintenance (Section 3.12.3);
- A discussion on whether MassDOT would implement noise and operational BMPs equal to or more stringent than those currently utilized at other layover facilities along the commuter rail. MassDOT should confirm that a forum for citizen complaint would be implemented as a BMP in the operational plan for any proposed layover facilities and at South Station. The FEIR should identify these proposed BMPs and note any contractual obligations associated with the operator of the MBTA's commuter rail (Section 3.12.4); and
- A commitment to monitoring noise and vibration levels after service starts (with the proposed mitigation in place) to evaluate whether actual noise and vibration levels correspond with the modeled values (Section 3.12.5).

3.12.1. Impact Summary

For each identified noise-sensitive receptor location, project noise levels for the year 2035 were compared with the Federal Transit Administration (FTA) noise criteria[13] to determine impact. Noise impact assessments are based on the selected receptor's sensitivity to noise. For example, the day-night average sound level (or Ldn) is the noise metric used to assess project impacts at residential receptors, while the hourly noise level (or Leq) is used to assess impacts at non-residential and institutional receptors. The Ldn level represents the average noise level measured over a 24-hour period with a 10-dBA (A-weighted decibel) penalty added to the nighttime hours (10:00 p.m. to 7:00 a.m.) to account for people's increased sensitivity to noise while they are trying to sleep. The Leq level represents a level of constant noise that has the same acoustic energy as the fluctuating noise level measured over a given time period such as an hour. Section 3.12.3 identifies measures that would be implemented to mitigate anticipated impacts.

South Station

In the absence of mitigation, noise impacts from the project would be expected to occur at noise sensitive receptor locations across Fort Point Channel due to the removal of the USPS facility along Dorchester Avenue, which currently acts as an effective noise barrier. With the removal of the USPS facility, there would be a direct sound propagation path to sensitive noise receptors across Fort Point Channel at Necco Street. As a result, the Ldn noise level across Fort Point Channel would exceed the FTA moderate impact criteria (change in noise is noticeable, but may not be sufficient to cause a strong, adverse community reaction.). In addition, the Leq noise level at 245 Summer Street would exceed the FTA moderate impact criteria. These noise impacts would be fully mitigated by the construction of a noise wall as described in Section 3.12.3, Potential Mitigation Measures.

Because of the slow speed of the trains entering and leaving South Station, train vibration levels are not expected to exceed the FTA criterion for human annoyance (72 VdB), or the criterion for buildings where low vibration is essential for typical indoor equipment operations such as computers (65 VdB). The vibration levels would only be perceptible along the platforms when standing next to the locomotives.

Layover Facilities

There would be no noise impact from the train operations at the Widett Circle layover facility site; the nearest noise sensitive receptors located along Albany Street are approximately 1,300 feet from the acoustic center of the site.

At the Readville – Yard 2 layover facility site, the midday peak activity hour Leq noise level would exceed the FTA moderate impact criterion at the nearby single-family residential receptors located along Wolcott Street and Wingate Road, and the apartment buildings along Riley Road and Sierra Road. This impact would be fully mitigated by the expansion of the existing noise wall as described in Section 3.12.3.

Because of the slow speed of the trains entering and leaving the layover facilities, train vibration levels are not expected to exceed the FTA criterion of 72 VdB (vibration level in decibels referenced to 1 micro inch per second) for human annoyance. Vibration levels from the track switches and crossovers would exceed the FTA annoyance criterion at residential receptors located within 130 feet of a switch. At Widett Circle and Readville – Yard 2, residential receptors are not located within 130 feet of any switches or crossovers.

[13] Federal Transit Administration, Office of Planning and Environment. *Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06)*. May 2006. http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf

Construction Noise and Vibration

The results of the detailed construction noise assessment conducted for the DEIR indicate that the highest construction noise levels would occur during the demolition of the USPS facility and the construction of the headhouse. The construction of the headhouse could require the use of an impact pile driver that generates a maximum noise level of 101 dBA (a-weighted decibels) at a distance of 50 feet. Because of the close proximity of the office building at 245 Summer Street to the construction activity, the construction noise levels at this location are expected to exceed the City of Boston construction noise limits during the demolition of the USPS facility, the construction of the headhouse, and the construction of the tracks and platforms. The construction noise levels at residential locations along Atlantic Avenue and the Fort Point Historic District are expected to exceed the City of Boston construction noise limit of 75 dBA if pile driving is required. Without pile driving, the construction noise levels at these residential locations would not exceed 75 dBA. In addition, if pile driving is required, the construction noise level would exceed the City of Boston construction noise limit of 80 dBA for commercial receptors such as the main South Station headhouse.

The construction noise levels for the Widett Circle layover facility would be below the City of Boston L10 (noise level exceeded 10% of the time) construction noise limit of 75 dBA because of the distance (1,200 feet) of the nearest residential receptors along Albany Street from the Widett Circle construction activity. However, the construction noise levels at the Readville – Yard 2 layover facility would exceed the construction noise limit at the single-family residences along Wolcott Street and Wingate Road, and the apartment buildings on Riley Road and Sierra Road.

In general, the vibration levels generated by the typical construction equipment proposed for this project would not result in structural damage to nearby buildings, but could exceed the FTA human annoyance criterion of 72 VdB. The vibration levels from the typical construction equipment used on this project would range from 80 VdB for a jackhammer at a distance of 25 feet, to 87 VdB for a mounted impact hammer at a distance of 25 feet. Although these vibration levels are below the building damage threshold of 100 VdB, they would exceed the FTA criterion of 65 VdB for buildings with sensitive equipment such as the building at 245 Summer Street.

Also, an impact pile driver, such as the one proposed for the headhouse construction, could generate vibration levels in the range of 104 to 110 VdB at a distance of 25 feet depending on the size and foot-power rating of the impact hammer. A pile driver with a vibration level of 110 VdB at a distance of 25 feet would result in a vibration level of 100 VdB (the threshold for building damage) at a distance of 65 feet. In addition, these vibration levels could impact the sensitive computer equipment in the basement of 245 Summer Street.

Based on the list of proposed construction equipment to be used in the construction of the Widett Circle and Readville – Yard 2 layover facilities, vibration levels are expected to be below the building damage criterion of 100 VdB and the FTA human annoyance criterion of 72 VdB. At the Widett Circle layover facility, vibration levels during construction are expected to be below 50 VdB at the nearest sensitive receptors along Albany Street, and below 60 VdB at the nearest sensitive receptors at the Readville – Yard 2 layover facility.

3.12.2. Modeled Noise and Vibration Characteristics

The selected Build Alternative's station design and South Station platform and track layout will not alter the anticipated noise and vibration characteristics of the site modeled in the DEIR. The criteria established by the FTA were used to evaluate impacts at noise-sensitive receptor locations adjacent to or near South Station and the layover facility sites. The FTA guidelines assess noise impacts based on the selected land-use's sensitivity to noise. Train noise reflected from nearby building structures such as the headhouse and

the overhead bus terminal facility at South Station are not factors that can be input into the FTA noise model, therefore changes to the station design since the DEIR do not impact the results of the model. The number of train operations and track assignments has not changed for the selected Build Alternative between the DEIR and the FEIR. Consequently, the results of the noise modeling analysis remain unchanged for the preferred alternative.

3.12.3. Potential Mitigation Measures

South Station

Noise mitigation for the interior headhouse space and waiting area at South Station would be provided by the doors that separate the headhouse from the tracks and platforms. No additional mitigation would be necessary.

At South Station, a noise barrier of 1,450 feet in length is recommended to provide noise mitigation for the entire Fort Point Historic District including Dorchester Avenue, which would now be open to pedestrians as part of the Harborwalk. This is the approximate length of the existing USPS facility that now provides noise mitigation from the train operations at South Station. This noise barrier (18 feet high and 1,450 feet long) would provide approximately 10-12 dBA (a-weighted decibels) noise reduction to the Fort Point Historic District and the Dorchester Avenue Harborwalk. To be effective, the proposed noise barrier must block the direct line of sight (sound propagation path) between the noise source (idling locomotive) and the receptor. The noise barrier is most effective when it is either near the noise source or near the receptor. For practical purposes, the proposed South Station noise barrier would be located on South Station property along the easternmost track on the Dorchester Avenue side of the station (Figure 3-25). The structural design of a noise barrier would be in accordance with the current edition of the AASHTO's *Guide Specifications for Structural Design of Sound Barriers,*[14] and with MassDOT's *Standardized Foundations for Sound Barrier Walls*.[15]

Construction of the noise barrier would likely occur following the removal of the USPS facility and before the construction of Dorchester Avenue and the Harborwalk. MassDOT would be responsible for the construction and maintenance.

Readville – Yard 2

At the Readville – Yard 2 layover facility, the existing berm/noise barrier is approximately 400 feet long and 18 feet high relative to the elevation of the tracks. It would be reconfigured to provide additional noise mitigation to the single-family homes along Wolcott Street and Wingate Road and the apartment buildings on Riley Road and Sierra Road. Work would include removal of approximately 200 feet of the existing barrier and addition of up to approximately 600 feet of modified/new barrier, for a proposed barrier measuring approximately 18 feet high by 800 feet long. Figure 3-26 shows the location of the existing and proposed berm/noise barrier. In addition, electric power stations, also known as shore power, would be constructed so that the locomotives can be plugged in to reduce the amount of engine idling time at the layover facility.

[14] American Association of State Highway and Transportation Officials (AASHTO). *Guide Specifications for Structural Design of Sound Barriers*. 1989, amended in 1992 and 2002.

[15] Massachusetts Department of Transportation. *Standardized Foundations for Sound Barrier Walls*. September 2004.

3.12.4. Noise and Vibration Operational Best Management Practices

MassDOT adheres to federal regulations for noise mitigation at all of its facilities. The MBTA currently provides a customer support forum for inquiries, comments, and concerns via its website (http://www.mbta.com/customer_support/feedback/) and by phone (617-222-3200 or 800-392-6100; TTY 617-222-5146). All inquiries are reviewed carefully by the Customer Support Group.

3.12.5. Noise and Vibration Monitoring

In order to provide a high level of protection from additional noise impacts, the project has designed a noise barrier that would provide a far greater noise reduction than required. Therefore, monitoring of post-construction noise levels is not necessary as part of this project. Due to the slow speed of the trains entering and leaving South Station, the vibration levels from the trains are not expected to exceed the FTA criterion for human annoyance.

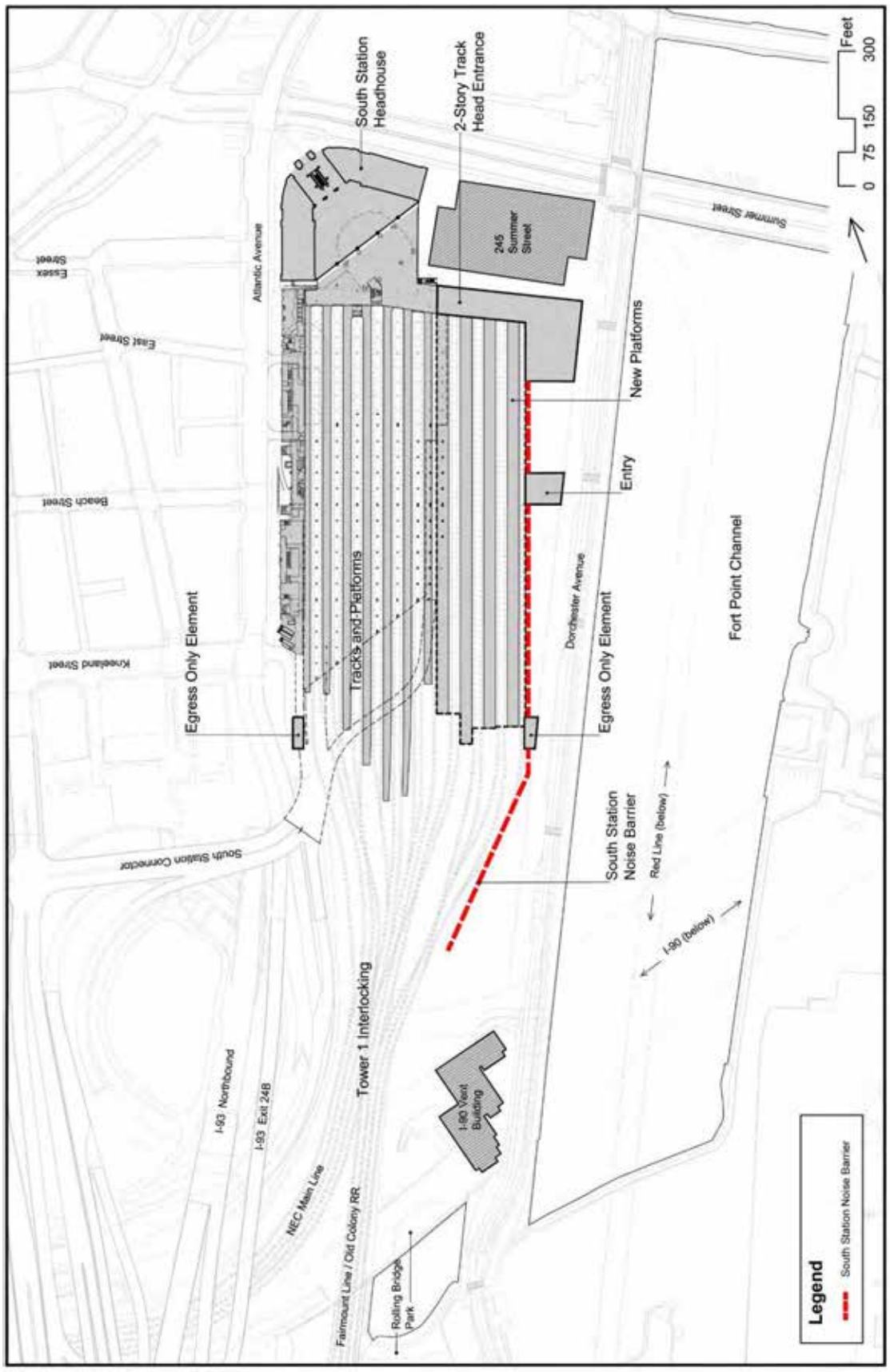


Figure 3-25 —South Station Proposed Noise Barrier

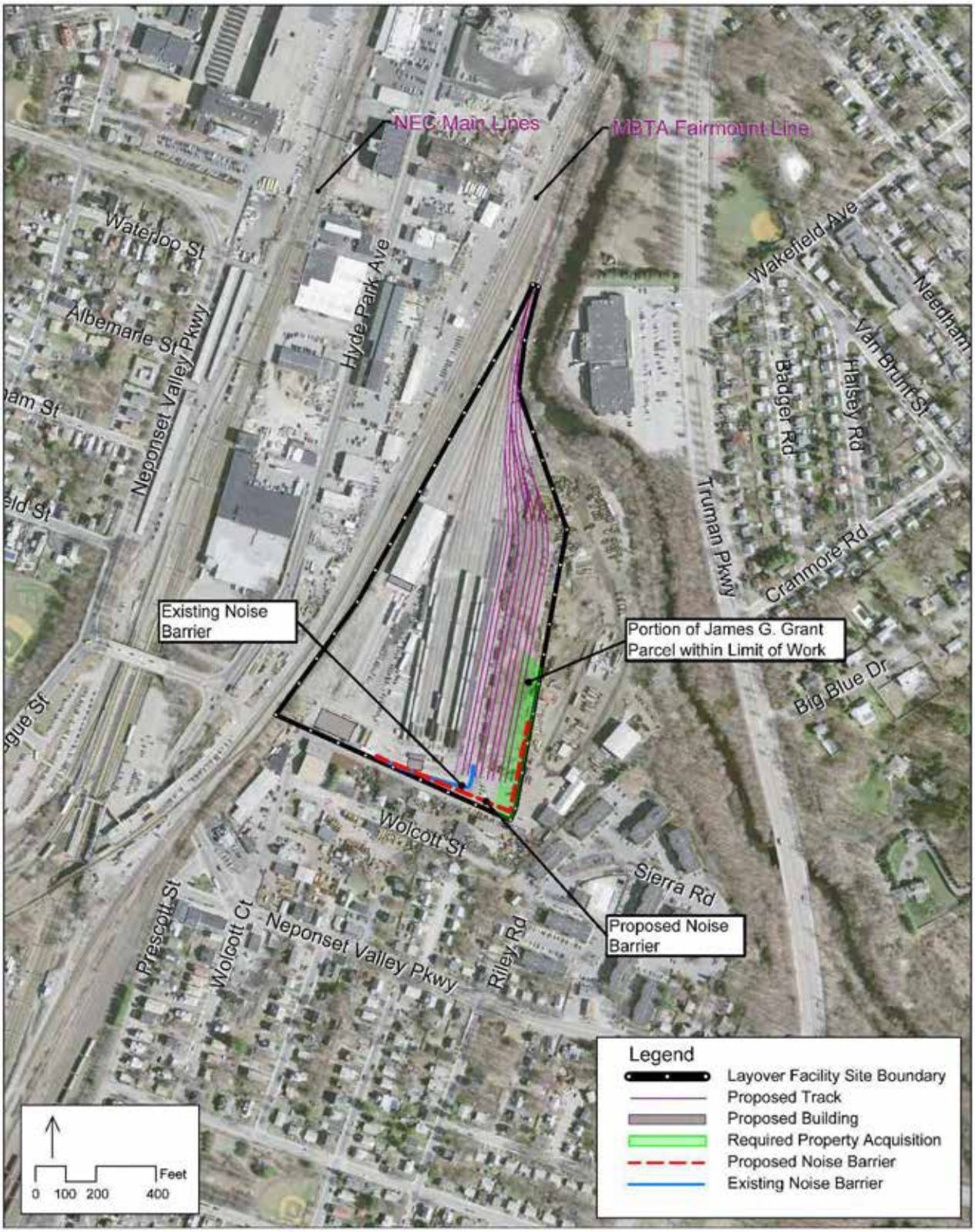


Figure 3-26 — Readville – Yard 2 Expansion of Existing Noise Barrier

3.13. Greenhouse Gas Emissions

This section includes a summary of the impacts of the project on greenhouse gas emissions, and also provides the following information requested in the Secretary's Certificate:

- A clear and complete listing of modeling inputs for items such as equipment, walls, ceilings, windows, lighting, and heating, ventilation and air conditioning (HVAC) units, etc. that were modeled in the No Build and Build Alternative to allow for an easier comparison with Building Code requirements (Section 3.13.2);
- Additional analysis of technical and economic feasibility of the following potential renewable energy sources: Veolia steam network connections, including the use of steam to power absorption chillers; solar photovoltaic (PV) or solar hot water (SHW) installations; and on-site combined heat and power (CHP), including CHP-serving absorption chillers (Sections 3.13.3-6);
- A commitment to construct buildings to be "solar ready" to facilitate future installation of PV systems. If PV is not financially feasible, MassDOT should commit to revisit the PV financial analysis on a regular timetable and to implement PV when the financial outcomes meet specified objectives (Section 3.13.4);
- A revised mobile source emissions analysis that accounts for indirect electrical use associated with the proposed plug-in facilities at South Station and the layover sites (Sections 3.13.7-8);
- Clarification on which standards MassDOT must adhere to in the final design process and those which are merely informational. The FEIR should clarify how the project intends to meet these standards given, in some cases, the outdated benchmarks (e.g., ASHRAE 90.1-2004 for LEED Plus) compared to current Massachusetts Stretch Code standards (Section 3.13.9); and
- Clarification on which sustainable infrastructure rating system MassDOT intends to adopt to ensure the project design meets targeted sustainability goals (Section 3.13.9).

3.13.1. Impact Summary

This project is subject to review in accordance with the *MEPA Greenhouse Gas Emissions Policy and Protocol* (GHG Policy, May 2010 version). The *GHG Policy* requires that for certain projects undergoing review by the MEPA Office, GHG emissions be quantified and measures to avoid, minimize, or mitigate such emissions be identified. In addition to quantifying project-related GHG emissions, the GHG Policy requires proponents to quantify the impact of proposed mitigation in terms of energy savings and GHG emissions.

The DEIR Section 4.11 and DEIR Appendix 12 provided the GHG analysis for the project. Consistent with the DEIR:

- The analysis focuses on emissions of CO_2. This is because CO_2 is the predominant contributor to global warming, CO_2 is by far the predominant GHG emitted from the types of sources related to the SSX project, and CO_2 emissions can be calculated for these source types with readily-available data;
- GHG emissions can be categorized into two groups: (1) emissions related to activities that are stationary on the SSX project sites; and (2) emissions related to transportation. Activities on the site can be further broken down into direct sources and indirect sources. Direct sources include GHG emissions from fuel combustion. Indirect sources include GHG emissions associated with water use, electricity, and other forms of energy that are imported from off-site power plants via the regional electrical grid or local steam distribution system for use on-site;

- The analysis calculates GHG emissions for a baseline case from which progress in energy use and GHG emissions reductions for the SSX project is measured (generally compliance with building codes and "business as usual" operations) and a proposed case, including measures incorporated into the building design that exceed those measures required for compliance (Figures 3-27 and 3-28); and
- Stationary source CO_2 emissions are predominantly based on natural gas and electricity use. The emission factors used for the calculation are 11.69 pounds of CO_2 per therm of natural gas used (from the U.S. Energy Information Administration),[16] and 719 pounds of CO_2 per megawatt hour electricity used (annual average from the January 2014 version of the ISO New England Electric Generator Air Emissions Report). Although the current version of the ISO air emissions report shows a slightly higher CO_2 emission rate (1%), the factors used in the DEIR are retained to allow direct comparison to the results in the DEIR.

As a result of compliance with the Massachusetts Stretch Energy Code, project-related stationary source GHG emissions at South Station would be reduced by approximately 8% as indicated in Table 3-10. As is typical for smaller buildings, the layover facility sites would comply with building energy code and Stretch Code requirements through prescriptive energy efficiency measures.

MassDOT also analyzed transportation-related, or mobile source, GHG impacts of the SSX project. The results show an approximately 5% net reduction in CO_2 emissions from locomotives in the immediate vicinity of South Station, associated with decreased congestion and idling time on the tracks, as depicted in Table 3-11. The project-related emissions totals in Table 3-11 do not account for the use of electric plug-in facilities, which result in indirect CO_2 emissions from electricity use. Plug-ins allow MassDOT to limit locomotive idling during layovers, by providing shore power. This is discussed further in Section 3.13.7, Effect of Locomotive Plug-Ins. Additionally, the totals represent a conservative approach and do not account for the anticipated GHG reduction associated with traffic intersection improvements (and decreased motor vehicle idling time).

Table 3-10 — Calculated Total Project-Related Stationary Source GHG Emissions

	Gas Use (MMBtu[a]/year)	Electric Use (MMBtu/year)	Gas CO_2 Emissions (tons/year)	Electric CO_2 Emissions (tons/year)	Total CO_2 Emissions (tons/year)
Baseline Case (MA Building Code, 8th Edition)	4,300	20,270	251	2,136	2,387
Mitigated Case (Proposed)	2,712	19,299	159	2,033	2,192
Reduction	1,588	971	92	103	195
% Reduction	**37%**	**5%**	**37%**	**5%**	**8%**

[a] MMBTU= one million British Thermal Units

[16] U.S. Energy Information Administration (EIA). http://www.eia.gov/oiaf/1605/coefficients.html#tbl3, accessed August 5, 2014.

Table 3-11 — Project-Related CO_2 Emissions by Alternative

Transportation Sources	2012 Existing (tpy)	2025 No Build (tpy)	2025 Build (tpy)	2035 No Build (tpy)	2035 Build (tpy)	2035 Net Difference (tpy)	% Difference
Motor Vehicles near South Station	11,767	12,321	12,491	12,771	13,010	239	2%
Intercity buses near South Station	581	732	767	785	819	34	4%
Locomotives near South Station	15,233	14,603	13,870	14,603	13,870	-733	-5%
Locomotives to/from Widett Circle	0	0	5,753	0	5,753	5,753	N/A
Locomotives to/from Readville – Yard 2	3,135	3,135	5,643	3,135	5,643	2,508	80%
Total	**30,716**	**30,791**	**38,524**	**31,294**	**39,095**	**7,801**	**25%**

tpy = tons per year

The total potential CO_2 emissions that would result from the project are shown in Table 3-11. While not directly comparable (because the analysis methodologies are different), the regional analysis of transportation-related CO_2 emissions shows a decrease in region-wide[17] CO_2 emissions associated with the transportation improvements at South Station of approximately 46,000 tons/year (shown in Section 11.2 of DEIR Appendix 12).

Table 3-12 — 2035 Potential GHG Emissions Summary

Emissions Source	Annual CO_2 Emissions (tpy)
Stationary Source direct emissions	159
Stationary Source indirect emissions	2,033
Transportation mobile source emissions	7,801
Indirect emissions from electricity for plug-ins	2,717
Total	**12,710**

tpy = tons per year

3.13.2. Building Energy Modeling Details

While the station design has progressed, the general sizing and configuration of the terminal expansion are not substantially changed, and the results of the building energy modeling presented in the DEIR are still valid. A summary of program changes since the DEIR is in Table 3-13 below:

Table 3-13 — Comparison of Program Space: DEIR and FEIR

Program Element	DEIR		FEIR	
	Conditioned Space	Total Area	Conditioned Space	Total Area
Platform Level	160,000	243,000	43,200	223,200
Elevated Concourse Level	45,000	160,000	69,000	69,000
Back of House (20%)	--	--	58,440	58,440
Contingency (10%)	--	--	35,064	35,064
Totals	**205,000**	**403,000**	**205,704**	**385,704**

[17] The Boston Region MPO region encompasses 101 cities and towns, stretching from Boston to Ipswich in the north, Duxbury in the south, and to approximately Interstate 495 in the west.

The stationary source estimates of GHG emissions were generated by building energy modeling using eQUEST v3.64. Consistent with the DEIR, the GHG Baseline Case and the GHG Mitigated (Proposed) Case have the following design assumptions:

For the GHG Baseline Case, an overhead variable air volume (VAV) ventilation system would serve the expansion. Cooling would be provided by 0.4 kilowatt (kW)/ton integrated part-load volume (IPLV) minimum efficient centrifugal chillers tied to a constant primary, variable secondary hydronic loop. Heating would be provided by 80%-efficient natural draft, non-condensing boilers, tied to a common variable speed building hot water loop. Ventilation has been estimated at 14.3 cubic feet per minute (cfm)/person based on ASHRAE 62.1.[18] Variable speed fans would run continuously and fan power is estimated at 1.31 watts per cfm of supply air. In all zones 50% efficient enthalpy energy recovery units would be required due to high occupant densities. Interior lighting would be limited to 0.77 watts per square foot with occupancy sensors and code minimum daylighting along the perimeter and top floor skylight areas.

For the GHG Mitigated Case, an overhead VAV system would continue to serve the expansion. Cooling would be provided by 0.34 kW/ton IPLV centrifugal magnetic bearing chillers (improved from baseline), tied to a constant primary, variable secondary hydronic loop. Heating would be provided by 96% efficient condensing boilers (improved from baseline), tied to a common variable speed building hot water loop. Ventilation has been estimated at 14.3 cfm/person based on ASHRAE 62.1. Variable speed fans would run continuously and fan power is estimated at 1.31 Watts per cfm of supply air. In all zones 75% efficient enthalpy energy recovery units (improved from baseline) would be required due to high occupant densities. Interior lighting would be limited to 0.62 Watts per square foot (improved from baseline) with occupancy sensors and optimized perimeter daylighting that exceeds code requirements along the perimeter and top floor skylight areas.

Key model inputs that were used for the terminal expansion are in Table 3-14 below. This includes a listing of modeling for equipment, walls, ceilings, windows, lighting, HVAC units, and other factors that were modeled in the Baseline Case and Build with Mitigation (Proposed) Case. Specific inputs such as R-values and U-values (for insulation), chiller and boiler efficiencies, lighting power density, etc. are included below as requested by the Secretary's Certificate on the DEIR:

Table 3-14 — Key Building Energy Model Inputs for South Station

Model Input Parameter	SSX Baseline[19]	SSX Build With Mitigation (Proposed)[20]
Building Envelope		
Roofs	R20 ci above deck, U-0.048	Identical to baseline
Walls-Above Grade	R13+R7.5 ci, U-0.064	Identical to baseline
Slab-On-Grade Floors	F=0.73	Identical to baseline
Conditioned Area (SF)	205,000	Identical to baseline
Building Fenestration		
Vertical Fenestration Area (% of Wall area)	20%	Identical to baseline
Vertical Glazing Description	Curtainwall	Identical to baseline
Vertical Glazing U-factor	U-0.45	U-0.38

[18] ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) Standards 62.1 and 62.2 are the recognized standards for ventilation system design and acceptable indoor air quality.
[19] The Baseline case is the project as if it were designed to meet, but not exceed, the 8th edition of the Massachusetts Building Code (Code), with amendments, issued by the Board of Building Regulations and Standards (BBRS). See DEIR Appendix 12 Section 3.1, for details.
[20] The Build With Mitigation (Proposed) Case is the project as proposed, with mitigation measures incorporated into the building design that exceed those measures required for compliance with the 8th edition of the Code, including measures to meet Stretch Code. See DEIR Appendix 12 Section 3.2, for details.

Model Input Parameter	SSX Baseline[19]	SSX Build With Mitigation (Proposed)[20]
Vertical Glazing SHGC	SHGC-0.4	Identical to baseline
Fenestration Visual Light Transmittance	VLT-0.6	Identical to baseline
HVAC – Air Side		
Primary HVAC Type	VAV	Identical to baseline
Fan System Operation	On 24/7	Identical to baseline
Outdoor Air Design Min Ventilation	Transportation - 14.3 cfm/per	Identical to baseline
Economizer High-Limit Shutoff	70F drybulb	Delta enthalpy control
Total System Fan Power (Conditioned)	292 kW	288 kW
6.5.3.1.1B Pressure Drop Adjustments	0.5" Ducted return 0.9" MERV 14 0.1" ERV	Identical to baseline
Exhaust Air Energy Recovery	50% total effectiveness both systems	75% total effectiveness on both systems
Demand Control Ventilation	Not required	Identical to baseline
Supply Air Temperature Reset Parameters	Increased 5F based on load	Identical to baseline
HVAC – Water Side		
Number of Chillers	2	Identical to baseline
Chiller Capacity (Per Chiller)	958T	945T
Chiller Efficiency	0.59 kW/Ton FL 0.4 kW/Ton IPLV	0.59 kW/Ton FL 0.34 kW/Ton IPLV
Chilled Water Loop Supply Temperature	44F	Identical to baseline
Chilled Water (CHW) Loop Delta-T	12F	Identical to baseline
CHW Loop Temp Reset Parameters	44F @ 80F OA 54F @ 60F OA Ramped linearly in between	Identical to baseline
CHW Loop Configuration	Constant primary, variable secondary	Identical to baseline
Primary CHW Pump Power	9 kW	8.8 kW
Secondary CHW Pump Power	32 kW	31.6
Number of Cooling Towers / Fluid Coolers	One per chiller	Identical to baseline
Cooling Tower Fan Power	35.3 kW	34.9 kW
Cooling Tower Fan Control	Two Speed	Identical to baseline
Condenser Water Leaving Temperature	70F with wet bulb reset to 85F	Identical to baseline
Condenser Water (CW) Loop Delta-T	10F	Identical to baseline
Number of CW Pumps	2	Identical to baseline
CW Pump Power	49.6 kW	49 kW
CW Pump Speed Control	Constant	Identical to baseline
Number of Boilers	2	Identical to baseline
Boiler Part-Load Controls	Staged to meet load	Identical to baseline
Boiler Capacity (Per Boiler)	9 MMBTUh	8.8 MMBTUh
Boiler Efficiency	0.8	96% Condensing Type
Boiler Water Loop Supply Temperature	180F	140F

Model Input Parameter	SSX Baseline[19]	SSX Build With Mitigation (Proposed)[20]
Hot Water or Steam (HHW) Loop Delta-T	50F	30F
HHW Loop Temp Reset Parameters	180F @ 20F OA 150F @ 50F OA Ramped linearly in between.	140F @ 50F OA 110F @ 0F OA Ramped linearly in between.
HHW Loop Configuration	Variable Primary	Identical to baseline
Primary HHW Pump Power	6.7 kW	11.9 kW
Service Hot Water		
SHW Equipment Type	Gas Storage	Identical to baseline
Equipment Efficiency	0.8	Identical to baseline
Temperature Controls	110F	Identical to baseline
Peak Flow	45.8 GPM	Identical to baseline
Lighting		
Automatic Lighting Shutoff Method	Scheduled	Identical to baseline
Gross Lighted Floor Area	205,000	Identical to baseline
Interior Lighting Power Calc Method	Building area method	Identical to baseline
Interior Lighting Power Density (Average)	Transportation 0.77 W/SF	20% better than code: Transportation 0.62 W/SF
Daylight Dimming Controls	Applied to primary side-lighted areas according to ASHRAE Code Section 9.4.1.4 and to top-lighted areas according to ASHRAE Code Section 9.4.1.5	Identical to baseline
Automatic Exterior Lighting Control	Photocell Controlled	Identical to baseline
Total Exterior Lighting Power	79.2 kW	20% better than code: 64 kW
Miscellaneous		
Escalators and Elevators	60 elevators & escalators, nominally 20HP each: 895 kW peak capacity, adjusted for diversity, 2200 full load hours	Identical to baseline
Process loads	1.24 W/SF includes food kiosk load estimate	Identical to baseline

3.13.3. Feasibility of Veolia Steam Use

Additional analysis of the feasibility of the use and GHG benefit of Veolia steam was conducted for this FEIR. Veolia steam in the SSX project area is provided by a mix of CHP sources (from Kendall Generating Station (KGS) in Cambridge) and traditional boilers (primarily from Kneeland Street Station in Boston). A CHP has significant efficiency and environmental advantages, as described by the Massachusetts Department of Environmental Protection (MassDEP)[21]:

> *"In a combined heat and power (CHP) system, the engine or combustion turbine is connected to an electrical generator for electrical power production. The hot exhaust gasses from the engine or combustion turbine are directed through a heat recovery system, such as a boiler, to recover thermal energy for use in heating, cooling, or other uses. This approach eliminates the need for a second combustion unit and therefore eliminates the emissions such a combustion unit would*

[21] Proposed Amendments to 310 CMR 7.00, March 2008.

produce. CHP systems make more efficient use of fuel, such as natural gas or fuel oil, than two, separate stand alone, combustion units, one for electricity and one for thermal energy such as steam thus reducing the net emissions of greenhouse gas and other air contaminants."

Veolia's "Green Steam" project includes a recently completed 7,000-foot steam pipeline extension that allows the company to export more CHP steam from its newly-acquired Kendall Station to Boston customers.[22]

Veolia estimates that the energy supplied would be a mix of 70% cogenerated steam and 30% conventional for the heating portion (space heat/HW), and 90/10 for the cooling load.[23] Veolia does not offer service that is 100% cogenerated steam; the use of traditional boilers is needed for reliability.

Available guidance from MEPA and the Department of Energy Resources (DOER),[24] includes inputs and assumptions regarding operation of the Cambridge district steam (DS) system that DOER obtained from its operator, Veolia. A review of feasibility followed available guidance, adjusted to reflect project-specific information provided by Veolia.

The analysis in Appendix B, *Greenhouse Gas Analysis Documentation,* reviews an alternative where the project would have 100% of its heating needs (building heat and domestic hot water) supplied by Veolia district steam, and 100% of its building cooling needs supplied by Veolia district steam (through the use of absorption chillers instead of electric chillers). The analysis shows an approximately 20% improvement in stationary source GHG emissions attributable to the project based on the use of Veolia steam.

The assumptions and methodologies are generally as laid out in the DOER guidance, which was developed with input from Veolia. Significantly, from that guidance, the analysis assumes:

- Electricity provided by KGS reaches customers with negligible losses from transmission or other inefficiencies.
- All KGS DS is generated by CHP at the efficiencies provided in the DOER guidance (note that the district steam system has boilers that do not operate based on this assumption).
- Greater than 99% of the fuel combusted to generate CHP steam and electricity at KGS is natural gas (note that the district steam system has a combustion turbine that can fire distillate oil, and boilers that can fire distillate and residual oil; there is 0% distillate or residual oil firing based on this assumption).
- The average nominal enthalpy[25] loss, generally described as the heat transferred during a constant pressure process, for the Dalkia Cambridge steam distribution system is 12%.

The implementation of district steam would depend on an energy cost analysis to be completed during the design phase. MassDOT would continue to work with Veolia on terms for possible connection to the district steam system; the final decision would be based on economic, reliability, complexity, and environmental factors.

3.13.4. Feasibility of Solar Photovoltaic Installation

As stated in the DEIR, it is possible to use project roof space for solar PV panels. The preliminary feasibility analysis presented in the DEIR concluded that the terminal expansion would provide

[22] Cogenerated "Green Steam" reduces carbon footprint in Boston and Cambridge. http://www.veolianorthamerica.com/en/boston-cambridge-mass, accessed December 16, 2015.

[23] Steve Almeida, Veolia. South Station Expansion Project. Personal Communication, November 13, 2015.

[24] John J. Ballam, Massachusetts Office of Energy and Environmental Affairs. Guidance for the Application of the MEPA GHG Policy and Protocol to the use of the Dalkia Cambridge CHP District Steam as a Fuel Source. Draft March 11, 2014.

[25] When a substance changes at constant pressure, enthalpy tells how much heat and work were added to (or removed from) the substance.

70,000 square feet of roof space suitable for solar PV panels. A shadow model was also provided as part of the technical report and assumed that 50% of the total roof surface could be available for solar panel placement which brings the usable roof area to 35,000 square feet.

An array of 35,000 sf was estimated to have an output rating of approximately 420 kW of peak direct current (DC). The DEIR describes the use of a photovoltaic model, PV Watts, to determine the total MWh of output from the solar PV setup. This model predicts an annual output of approximately 462 MWh. Actual electricity generated could be lower because the model inputs assume an optimal panel tilt, but the panel tilt may need to be reduced to avoid wind shear.

Displacing energy from the distribution grid would result in a potential GHG savings. The energy generated from the solar PV does not contribute to GHG production and as such would reduce the project's GHG emissions by a proportional amount to the GHG produced to generate the displaced grid energy. Assuming all of the solar PV electricity displaces use of electricity from the distribution grid, the potential annual GHG savings would be 166 tons of CO_2.

Two key implementation challenges for solar PV include future shadowing and the ability to make electrical interconnections. Expected shadowing based on current nearby buildings is included in the analysis. However, future development in the area could easily add shadowing that would render the use of solar PV nonviable. Based on initial contact with the local electricity supplier (Eversource, formerly NSTAR[26,27]), the connection to the electrical grid would likely be through spot network vaults rather than through the radial distribution system. Spot network vaults offer more reliable electricity supply, but are not well suited to receive electricity from distributed generation sources. If the SSX project were served by spot network vaults, any interconnected generation source would be limited to $1/15^{th}$ of the minimum facility load to prevent excess power from flowing into the network and tripping the network protectors in the vault. The connection would also need to use inverter-based equipment. Scaled from the monthly eQUEST modeling results in Figure 3-27, the minimum hourly facility load would be less than 600 kW, which would mean that any on-site generation would be limited to less than 40 kW (approximately one-tenth the size of the system described above).

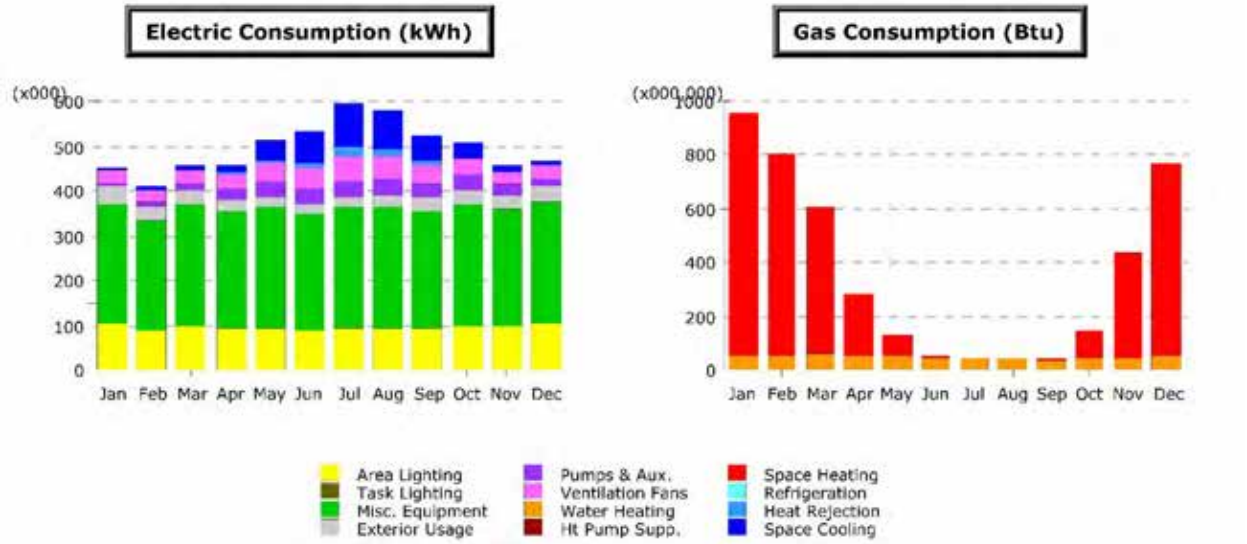
No specific permitting issues have been identified.

3.13.5. Feasibility of Solar Hot Water Installation

Another option for renewable energy usage is the use of solar hot water. The DEIR discusses how solar hot water may be used as a supplement to typical gas-fired domestic hot water heating systems, sometimes providing hot water directly and other times preheating water that is then brought to normal temperature by a gas-fired boiler. The space required for solar hot water would be the same as the space described above for solar PV; combined solar PV and hot water systems are feasible. To allow solar hot water generation (which occurs during daylight hours) to match demand (which occurs at all hours), solar hot water systems typically include storage tanks.

[26] James Ruberti, NStar, "*Electrical Grid*," Personal Communication, July 25, 2014.
[27] Joseph Feraci, NStar, "*Electrical Grid*," Email/personal communication, July 25, 2014.

Terminal Expansion Baseline Run Date/Time: 06/26/14 @ 15:47



Electric Consumption (kWh x000)

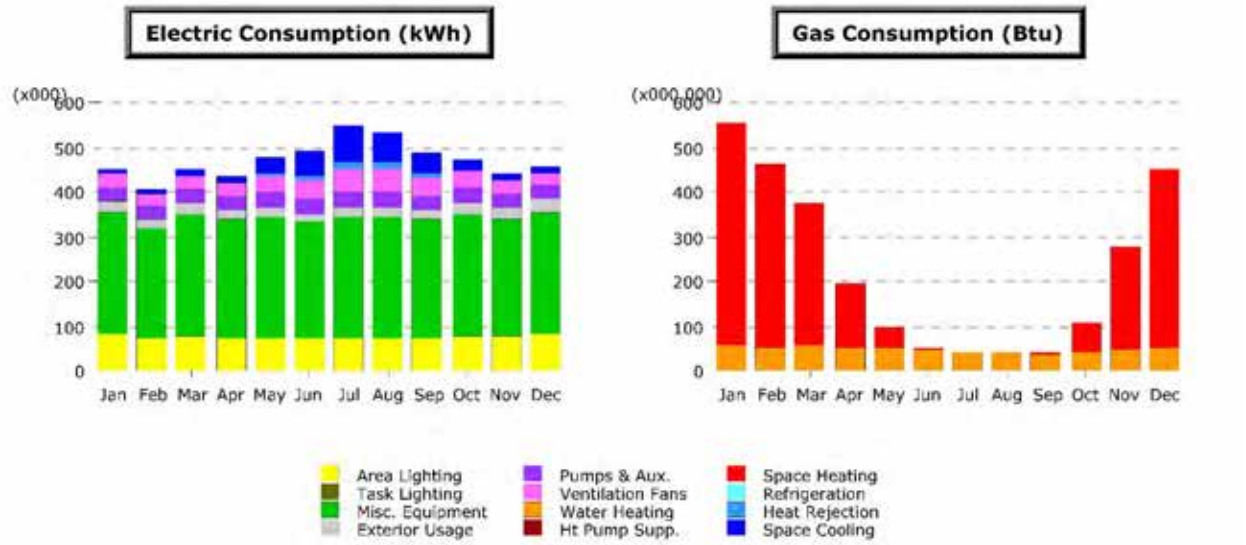
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	5.6	6.6	9.8	19.2	45.1	68.8	97.2	84.1	57.0	32.0	14.4	10.0	449.9
Heat Reject.	0.1	0.1	0.2	0.7	4.7	10.1	18.0	14.5	7.6	2.2	0.5	0.2	58.7
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	28.0	26.1	30.1	30.9	43.0	48.3	56.3	54.3	44.2	37.4	28.3	28.9	456.1
Pumps & Aux.	10.2	11.5	17.1	27.0	32.4	33.5	36.2	35.3	32.2	31.4	22.7	16.8	306.3
Ext. Usage	36.1	30.2	30.1	25.7	23.6	21.3	22.6	25.3	27.8	32.2	34.1	36.9	345.7
Misc. Equip.	270.1	244.5	271.5	264.0	271.5	262.6	271.6	271.5	262.6	271.6	259.4	271.6	3,192.5
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	101.5	89.0	96.9	90.3	92.1	86.7	90.6	92.0	92.1	98.7	97.8	102.1	1,129.8
Total	451.6	408.0	455.7	457.9	512.3	531.2	592.4	576.9	523.6	505.5	457.3	466.5	5,939.0

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	900.8	751.2	547.8	228.7	75.1	9.7	-	1.5	8.5	107.7	387.3	722.8	3,741.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	53.9	51.0	56.8	52.1	50.7	43.7	40.8	39.0	37.0	40.2	45.3	48.8	559.2
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	954.7	802.2	604.6	280.8	125.7	53.4	40.8	40.5	45.5	147.9	432.6	771.7	4,300.4

Figure 3-27 — Monthly eQUEST Building Model Results – Baseline Case

Terminal Expansion Proposed Run Date/Time: 06/26/14 @ 15:47



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	12.1	11.4	14.2	18.5	36.0	55.1	80.7	69.4	45.8	26.4	15.7	14.0	399.3
Heat Reject.	0.3	0.3	0.4	1.0	4.9	9.8	17.4	14.0	7.8	2.6	0.8	0.5	59.8
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.2	1.0	0.9	0.5	0.2	0.0	0.0	0.0	0.0	0.2	0.7	1.0	5.7
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	27.7	25.6	29.3	30.0	40.7	45.6	52.8	51.0	41.4	35.6	27.6	28.3	435.5
Pumps & Aux.	31.0	28.1	31.6	31.3	33.4	33.2	35.8	34.8	32.7	33.0	31.0	30.8	386.7
Ext. Usage	28.9	24.2	24.1	20.6	18.9	17.0	18.1	20.2	22.2	25.7	27.3	29.5	276.8
Misc. Equip.	270.1	244.5	271.5	264.0	271.5	262.6	271.6	271.5	262.6	271.6	259.4	271.6	3,192.5
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	81.2	71.2	77.6	72.2	73.7	69.4	72.5	73.6	73.7	79.0	78.2	81.7	903.9
Total	452.5	406.2	449.6	438.1	479.2	492.7	548.9	534.5	486.2	474.2	440.8	457.3	5,660.2

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	500.3	412.0	315.3	142.0	49.2	6.2	1.7	1.6	6.2	66.8	229.6	402.5	2,133.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	53.9	51.0	56.8	52.1	50.7	43.7	40.8	39.0	37.0	40.2	45.4	48.8	559.3
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	554.2	463.0	372.1	194.0	99.9	49.9	42.5	40.6	43.2	107.0	274.9	451.3	2,692.6

Figure 3-28 — Monthly eQUEST Building Model Results – Proposed Case

As stated in the DEIR, a recent MEPA filing for an unrelated project[28] used publicly-available tools and calculators to estimate that a solar hot water system in Boston would generate about 120 MMBtu of useful heat per year per 1,000 sf of useful panel space. Scaling that estimate to the amount of space available for the SSX project at the South Station site mentioned above in the PV section, solar hot water was estimated to generate about 4,200 MMBtu per year. This exceeds the expected domestic hot water use for the terminal expansion, which is 559.3 MMBtu per year per Figure 3-28.

Similarly to the displacement of electricity from the grid discussed in the solar PV section above, solar hot water would displace heat energy in the form of boiler fuel usage. If the heat from the solar hot water displaces fuel use in a natural gas-fired boiler, the annual GHG savings equates to approximately 245 tons of CO_2.

Implementation challenges for solar hot water installation are related to excess supply, future shadowing, interconnections with Veolia steam, and available financial incentives.

The solar hot water system described above would exceed the expected domestic hot water use associated with the terminal expansion project. Additional uses/customers for this hot water would need to be identified (including possibly the existing South Station).

As discussed above, expected shadowing based on current nearby buildings is included in the analysis. However, future development in the area could easily add shadowing that would render the use of solar hot water nonviable.

Solar hot water systems typically interface with traditional hot water heaters. The use of solar hot water interconnected with a district steam-based hot water supply system could add complexity and create reliability issues.

The DEIR mentions the eligibility of these solar hot water systems for the federal energy Investment Tax Credit (ITC) program. The Massachusetts Clean Energy Center currently offers the Commonwealth Solar Hot Water Program (CSHW)[29] Commercial Scale also offers financial incentives for solar hot water feasibility studies and construction projects for commercial-scale buildings, and financing options. However, it is not clear whether funding would be available through the CSHW program at the time of SSX project construction. Similarly, solar hot water may qualify for Alternative Energy Credits (AEC) but the logistics of obtaining AECs are not currently established.

No specific permitting issues have been identified.

3.13.6. On-Site Combined Heat and Power

A third option for energy savings is the installation of an on-site combined heat and power (CHP) system. A gas-fired CHP system can produce electricity and hot water. CHP would reduce the need for natural gas for domestic hot water heating while providing a portion of the building's electricity needs.

CHP may be a feasible technology if the building can effectively use the otherwise-waste heat on a nearly continuous year-round basis. Based on the monthly eQUEST modeling results in Figure 3-27, the minimum natural gas combustion for heating is 40.6 MMBtu per month, which is about 0.05 MMBtu per hour. Any system sized to meet that thermal load would be small (5 or 10 kW). Vendor specifications for a 10kW micro-CHP are included in Appendix B, *Greenhouse Gas Analysis Documentation.*

[28] The Boston Garden, EEA# 15052, January 31, 2014.
[29] Massachusetts Clean Energy Center. http://www.masscec.com/solicitations/commonwealth-solar-hot-water-commercial-scale, accessed 7/30/2014.

A larger system could be designed to serve the domestic hot water needs, winter heating needs, and some or all of the summer cooling needs (through the use of absorption chillers). However, such a system would be idle during shoulder months (spring and fall) when neither significant building heat nor cooling is needed. Also, as discussed above electric interconnection issues are very likely to preclude use of on-site CHP larger than about 40 kW.

Calculations in Appendix B, *Greenhouse Gas Analysis Documentation,* show that for a 10 kW micro-CHP, expected fuel consumption is 940 MMBtu/year, which would displace 269 MMBtu/year of electricity and 446 MMbtu/year of boiler natural gas on a site basis. No net energy savings is predicted on a site basis.

CHP has been widely credited with reducing GHG emissions, but that is generally true only in relatively large systems because the efficiency of small CHP systems cannot compete with grid generated electricity.

Calculations in Appendix B, *Greenhouse Gas Analysis Documentation,* show that for a 10 kW micro-CHP, only a nominal GHG emissions reduction is expected (less than one ton per year).

As discussed above, electrical interconnection through spot network vaults could limit the size of the CHP. An on-site CHP would be redundant if solar hot water or connection to Veolia's district steam system is implemented. More generally, the size of the system makes it challenging to realize a significant GHG benefit.

No specific permitting issues have been identified.

3.13.7. Effect of Locomotive Plug-Ins

The GHG analysis for the transportation impacts due to plug-ins compares the greenhouse gas emissions from the no plug-in case to the case where the trains spend 3.5 hours[30] plugged in per layover. A "plug-in" refers to when the trains receive power from the grid-based ground power receptacles (also known as "shore power") at the layover facilities. When plugged in, the train can shut down the Head-End Power (HEP) generator on the locomotive for the duration of the layover. Regardless of whether or not a train gets plugged in, there is still the possibility of time spent idling on the diesel engine. This idling time can equate to up to one hour when plugged in, with 30 minutes upon entering and another 30 minutes before departing.

The GHG analysis calculates the amount of carbon dioxide the trains release for two different layover scenarios. In the first scenario, the diesel engine runs the entire layover time. In the second scenario, the diesel engine only runs for one hour with the rest of the time spent plugged in. The increase in capacity from this project is equivalent to 38 extra locomotives in layover mode per day with approximately eight coaches per locomotive, totaling 304 coaches. Each coach and locomotive spends approximately 3.5 hours plugged-in while on layover, which is the layover time that the comparison incorporates. This analysis also assumes that all 365 days of the year are equivalent, which does not take into account reduced weekend service.

The calculations for the plugged-in trains assume a 14.3 kilowatts average power load of a fleet average coach while in layover mode and 39.8 kilowatts average power load of a typical locomotive in layover mode. The total energy usage from the plug-ins results from the total number of coaches and locomotives, the average energy use for a layover, length of layover, and number of days in a year. The total electric

[30] An average mid-day layover is approximately 4.5 hours based on equipment cycles, of which 30 minutes after arrival and 30 minutes prior to departure is assumed to be spent idling on diesel. Trains are assumed to be plugged in to shore power for the remaining 3.5 hours.

load results from the addition of the electric load from the coaches and the electric load from the locomotives. The total electric load is approximately 7,486 Megawatt-hours per year. The electric powering of the trains results in indirect emissions of carbon dioxide to generate the electricity that is used. The indirect emissions of carbon dioxide equates to approximately 726 pounds of carbon dioxide per megawatt-hour. The resulting total indirect carbon dioxide emissions are 2,717 tons of carbon dioxide per year. This is an improvement of 18,933 tons of carbon dioxide per year by using the ground power receptacles instead of idling on the diesel engine. Calculations are included in Appendix B, *Greenhouse Gas Analysis Documentation*.

3.13.8. Indirect Emissions from Amtrak Trains

For the purposes of this analysis, eight new daily electric Amtrak trains were included as part of this project. For comparison with the transportation impacts presented in the DEIR, indirect emissions from Amtrak's electric locomotive service were calculated for train locomotives idling at South Station and moving to and from Tower 1 Interlocking. It is estimated that eight additional electric Amtrak trains would each spend approximately 30 minutes per day idling at South Station. Each coach is estimated to have a 50 kW standing load which equates to a 400 kW standing load for each 8-coach trainset. For eight trains idling 30 minutes at 400 kW, the electric usage is 1,600 kWh per day. There is also a 10 kWh electric usage per train to move from the Platform to Tower 1. For eight trains this is a total electric usage of 80 kWh per day. The total electric usage per day for the eight Amtrak trains is then the sum of these two numbers, 1,680 kWh per day.

This information in kilowatt hours per day (kWh/day) can be converted to tons of CO_2 per year following MEPA's instructions, which reference average electric grid emission rate from ISO New England. Assuming that the Amtrak trains run for 365 days a year at 1,680 kWh per day, the total electric usage for the year is 613.2 MWh. The average electric grid emission rate from ISO-NE is 726 pounds of CO_2 per MWh. The total emissions from the eight Amtrak trains would then be approximately 222.6 tons of CO_2 per year.

3.13.9. Applicable Energy Codes, Standards, and Rating Systems

The City of Boston has elected to include the state's optional Stretch (Energy) Code in its building requirements. Currently, the Stretch Code (SC1) is based on a reduction of energy use from the baseline defined in the 2007 International Energy Conservation Code (IECC). Very recently, the Board of Building Regulations and Standards (BBRS) proposed a draft of the 9th edition of the Code, which would include adoption of IECC 2015, with Massachusetts-specific amendments, and would include a revision to the Stretch Code (SC2). It is anticipated that the 9th edition and SC2 will be adopted in early 2016 and be effective sometime in the 2nd quarter of that year, although the final form it will take is currently unknown. The project would adhere to the Massachusetts Stretch Code standards that are in place at the time of the application for building permits.

MassDOT may consider implementation of Leadership in Energy and environmental Design (LEED) standards and the FHWA Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) as guidance during final design.

3.14. Historic Resources

This section includes a description of potential impacts to historic resources, along with the following information, which was requested in the Secretary's Certificate:

- A matrix of potential effects for National Register-Listed or National Register-eligible historic architectural resources with the Preferred Alternative's Areas of Potential Effect (APE) (Section 3.14.2).

3.14.1. Impact Summary

MassDOT assessed potential project impacts to historic properties within and in the vicinity of the South Station site and the two layover facility sites relative to demolition activity, noise, vibration, visual, and historic rehabilitation impacts to historic properties as described below. As described below, at South Station, the project, implemented with noise mitigation and designed consistent with the historic preservation design principles, would have no adverse effect on historic properties. No historic properties would be affected in the vicinity of the layover facilities.

South Station

Table 3-15 provides a list of the historic resources within the South Station APE, their current historic designation, and recommendations for National Register eligibility.

Table 3-15 — Historic Resources within the South Station APE

Name	Historic Designation/Recommendation
Properties listed in the National and/or State Registers of Historic Places	
Fort Point Channel Historic District	Listed in National and State Registers
Leather District	Listed in National and State Registers
Russia Wharf Buildings	Listed in National and State Registers
South Station Headhouse	Listed in National and State Registers
Commercial Palace Historic District	Determined National Register eligible Listed in State Register
Fort Point Channel Landmark District	Listed in State Register (Boston Landmark District)
Properties included in the Inventory of Historic and Archaeological Assets of the Commonwealth	
Chester Guild, Hide and Leather Machine Company	Recommended National Register eligible
Chinatown District	Recommended National Register eligible
Federal Reserve Bank of Boston	Recommended National Register eligible
Kneeland Street Steam Heating Plant	Recommended National Register eligible
South End Industrial Area	Recommended National Register eligible
Keystone Building	Not evaluated; recommended for evaluation when building is 50 years old
Weld Building	Recommended National Register eligible
USPS GMF/South Postal Annex	Recommended not National Register eligible
MBTA Operations Center Power Substation	Not evaluated; recommended for evaluation when building is 50 years old
245 Summer Street	Not evaluated; recommended for evaluation when building is 50 years old
Properties Not Previously Surveyed	
Gillette	Recommended National Register eligible

The USPS GMF, which is located within the South Station APE, but is not a historic property, would be demolished. Neither direct alteration nor temporary construction impacts to the historic headhouse are anticipated as a result of the project. A wind study was not conducted for the project because as a nonwater-dependent infrastructure project subject to 310 CMR 9.55, it is not subject to the provisions of 310 CMR 9.51. In addition, since the new headhouse height would not exceed 80 feet, any impacts from wind are expected to be minimal.

Noise Impacts for Historic Resources

As described in Section 3.12.1, a moderate noise impact would be expected to occur at sensitive residential receptors within the Fort Point Channel Historic District due to the removal of the USPS facility. These noise impacts would be fully mitigated by the construction of a noise wall as described in Section 3.12.3. The primary source of noise at the existing historic headhouse is from the idling electric locomotives from the Amtrak trains that enter the station locomotive first. The project would be expected to reduce the operating noise levels at this location as a result of redistributing some Amtrak electric locomotive trains further away from the headhouse, as well as a reduction in idling times for all station locomotives. 245 Summer Street is expected to experience a moderate noise impact (an increase from 69.4 dBA to 71.1 dBA in peak hour Leq) due to the increase in idling of the Amtrak electric locomotives and the increase in the train operations on the new tracks at the north end of the station adjacent to 245 Summer Street.

At locations within the historic Leather District, the Ldn noise level is expected to decrease for two reasons. The expansion would add tracks to the east of South Station further from the Leather District and would distribute all the trains over a larger area and the project would also reduce the amount of train idling in the terminal area. This would also result in a reduction of the peak hour Leq noise level along Atlantic Avenue and within the Leather District.

At the South Station site, noise levels at receptors within the Fort Point Channel Historic District are expected to exceed the FTA moderate impact criterion of 61.7 dBA for residential receptors. As described in Section 3.12, Noise and Vibration, to reduce noise from idling locomotives across Fort Point Channel, a noise barrier would be installed along the length of the easternmost track.

The demolition and construction activity associated with the project would impact the South Station headhouse and 245 Summer Street (located within the APE but not a historic property). While construction noise levels from the project are not expected to exceed FTA construction noise limits, they are expected to exceed the more stringent City of Boston construction noise limits at the existing headhouse based on the assumed construction equipment mix. Temporary noise barriers or noise enclosures for equipment would be utilized to mitigate construction noise levels at these receptors. A Construction Noise Control Plan would be implemented to mitigate construction noise levels, including providing noise monitoring during construction to determine compliance with FTA and City of Boston construction noise limits.

Vibration Impacts for Historic Resources

The project would have no adverse effect on historic properties related to vibration impacts. Due to the slow speed of trains entering and leaving South Station (approximately 10 mph), train vibration levels would be below FTA criteria. Train activity at South Station is not expected to result in any ground-borne noise inside the building.

Vibration levels generated by the construction equipment proposed for this project would not result in structural damage to the existing headhouse or other nearby buildings, but could exceed the FTA human annoyance criterion of 72 VdB for train passengers on the nearby platforms.

Visual Impacts for Historic Resources

The project would have no adverse visual effect on views to or from historic properties included in the South Station APE. Currently, the district cannot be viewed from the southwest across Fort Point Channel because of prohibited access along Dorchester Avenue adjacent to the USPS facility. The completion of and public access to the Harborwalk along Dorchester Avenue would improve the views within the Fort

Point Channel Historic District across the Fort Point Channel. Views of the district would be improved because the Harborwalk would provide closer unimpeded views of the district across the Fort Point Channel as well as more-appealing views from the district across the Fort Point Channel towards the station.

The project would have no adverse visual impact on views to or from historic properties included within the APE. Although the station design has not been advanced beyond conceptual design, MassDOT intends for the station expansion to be consistent with the scale of the existing South Station headhouse.

Section 2.1.4 presents design principles to guide the planning and design of the SSX project. Specific to historic preservation, planning and design principles include the design being respectful of South Station's rich history, its prominent location, and its role as the transportation hub for the region; creating a work of civil architecture that complements the historic and architectural significance of the 1899 headhouse; and recognizing and protecting the historic integrity of the existing South Station headhouse and its value as a public space. The project would create a work of civic architecture that celebrates the sense of arrival and departure and whose components comprise an innovative and interesting design solution that complements the station's historic and architectural significance.

Layover Facilities

New construction at the two layover facility sites would include minimal vertical components; consequently noise, vibration, and visual impacts to historic properties within the APEs are not anticipated. New construction and/or expansion at the layover facility sites would be consistent with the surrounding industrial land uses.

Widett Circle

Existing food processing, food storage, and food logistics buildings to be demolished are located within the Widett Circle APE, but they are not historic properties. Train operation noise levels from Widett Circle would be below FTA moderate impact criteria of 68.1 dBA. Construction noise levels at the site are not expected to exceed FTA construction noise limits. Predicted new vibration at the site would not impact historic properties within the APE.

Readville – Yard 2

Noise impacts would occur at residences along Wolcott Street and Riley Road. While these areas are located within the APE, the impacted properties are not identified historic properties. Construction noise levels at the site are not expected to exceed FTA construction noise limits. Project vibration at the site would not impact historic properties within the APE.

3.14.2. Preliminary Determinations of Effect

MassDOT undertook a preliminary determination of effect analysis for historic properties located within the SSX APE, to determine whether the project would have an adverse effect upon the historical, architectural, or cultural characteristics of the historic properties. MassDOT utilized the Section 106 and Massachusetts Historical Commission (MHC) effect criteria (36 CFR 800.5 and 950 CMR 71.07(2)(b)) to determine if there would be "no historic properties affected" or if the project would have "no effect," "no adverse effect," or an "adverse effect" on historic properties. "Effect" means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register. An adverse effect is found when an undertaking may have an effect that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

MassDOT applied the criteria to assist in consultation with the MHC in accordance with State Register Review procedures. The preliminary determinations of effect are summarized in Tables 3-16 and 3-17, and indicate either No Adverse Effect or No Effect for all historic properties. A Section 106 Report will be submitted to the MHC separately as part of the NEPA/Section 106 review process. That report will provide FRA determinations of effect in compliance with Section 106.

South Station

Multiple historic properties are located within the SSX APE. These resources are summarized in Table 3-16. The project would have "no effect" on a majority of the historic properties. No direct alteration of the historic headhouse is anticipated as a result of the project, and temporary construction impacts (temporary occupancy) are not anticipated. Project impacts to historic properties within the SSX APE would be limited to potential construction noise impacts to the South Station headhouse and potential operational noise impacts to the Fort Point Channel Historic District. As described in Section 3.16.4, a Construction Management Plan/Noise Control Plan would be implemented to assure construction noise would be in compliance with FTA and City of Boston construction noise limits. To minimize or eliminate adverse noise impacts to the Fort Point Channel Historic District, a noise barrier would be installed along the length of the easternmost track, as described in Section 3.12.3. These mitigation measures would effectively eliminate or minimize any potential adverse project impacts.

The project, as designed, would not have any adverse visual impacts on the South Station headhouse or surrounding historic properties.

MassDOT has preliminarily determined that the project, implemented with noise mitigation and designed consistent with the historic preservation design principles, would have no adverse effect on historic properties.

Table 3-16 — South Station Determinations of Effect

Name	Determination of Effect
Properties listed in the National and/or State Registers of Historic Places	
Leather District	No Effect
Russia Wharf Buildings	No Effect
Commercial Palace Historic District	No Effect
Fort Point Channel Historic District	No Adverse Effect
South Station Headhouse	No Adverse Effect
Fort Point Channel Landmark District	No Adverse Effect
Properties included in the Inventory of Historic and Archaeological Assets of the Commonwealth	
Chester Guild, Hide and Leather Machine Company	No Effect
Chinatown District	No Effect
Federal Reserve Bank of Boston	No Effect
Kneeland Street Steam Heating Plant	No Effect
South End Industrial Area	No Effect
Weld Building	No Effect
USPS General Mail Facility/South Postal Annex	No Historic Properties Affected- Recommended Not National Register Eligible
Properties Not Previously Surveyed	
Gillette	No Effect

Layover Facilities

As shown in Table 3-17, there are no historic properties within the Widett Circle or Readville – Yard 2 layover site study areas.

Table 3-17 — Layover Facility Determinations of Effect

Name	Determination of Effect
Widett Circle	No Historic Properties Affected
Readville – Yard 2	No Historic Properties Affected

3.15. Site Contamination and Hazardous Materials

This section includes a summary of the environmental conditions related to site contamination and hazardous materials, along with the following information, which was requested in the Secretary's Certificate:

- A draft site-specific health and safety plan (HASP) if any Recognized Environmental Conditions (RECs) are identified during the Phase 1 Environmental Site Assessments (ESA) (Section 3.15.2);
- A discussion of how Massachusetts Contingency Plan (MCP)-regulated conditions may impact construction techniques (i.e., dewatering, foundation types, etc.) or potential site infrastructure (e.g., groundwater and stormwater management) in the Preferred Alternative (Section 3.15.3); and
- A discussion of the potential implications of the Activity and Use Limitation (AUL) on the Readville – Yard 2 site that identifies the responsible party, includes plans for remediation, and describes how compliance with the MCP may impact layover facility design or the construction timeline (Section 3.15.4).

3.15.1. Impact Summary

Phase I ESAs were conducted to support the FEIR for the South Station site (with the exception of the USPS property, which was not available to be investigated) and the Widett Circle and Readville – Yard 2 layover facility sites. A Phase 1 ESA is a report that summarizes a site visit and records review of a property and its surrounding area to determine if any additional environmental investigation is warranted to understand the liability risks associated with the identified property. The goal of these assessments was to identify RECs and Historic Recognized Environmental Conditions (HRECs) associated with the properties.

South Station

The South Station site has a history of coal storage and has been used as a railyard since the late 1800s. The Phase I ESA identified three RECs and six HRECs for the site. The RECs include historical use of the site as a railroad transportation facility; the historical fill present at the site has been documented containing elevated concentrations of polynuclear aromatic hydrocarbons (PAH) and metals; and a release of hydraulic oil at the site. A Class A-3 Response Action Outcome (RAO) was submitted for the site, asserting that remedial work has been completed and a level of "no significant risk" was achieved. Contamination has not been reduced to background levels and an AUL has been implemented. AULs are legal restrictions used in the context of the Massachusetts Contingency Plan to limit future exposure to contaminants remaining at a site. A Phase II is a comprehensive site assessment during which the risks posed to public health, welfare, and the environment are determined. Based on the RECs identified, Phase I and II ESAs would be conducted when the USPS site is available to be investigated. This would determine the potential impact to future development caused by the identified RECs.

Layover Facilities

The Widett Circle site was created by the filling of South Bay, which was completed approximately 1967. Two RECs and seven HRECs were identified during the completion of the Phase I ESA. The RECs included the fill material used during the creation of the land area and the surrounding property's use as a railroad storage and maintenance facility. The seven HRECs identified included a 100-gallon release of diesel fuel and six releases of anhydrous ammonia, all of which were closed in accordance with MassDEP regulations.

The Readville – Yard 2 site has been used as a railyard since approximately 1917. The Phase I ESA identified four RECs and zero HRECs for the site. The first two RECs are associated with Release Tracking Number (RTN) 3-15991, and include impact of onsite soils with polychlorinated biphenyls (PCBs), asbestos, heavy metals, and petroleum compounds and impacts of PCBs, heavy metals, asbestos and petroleum compounds the adjacent property owned by James G. Grant Co, Inc. (the Grant property). The remaining RECs include stained soils in the area of the fire pump building and historical use of the site as a railroad storage and maintenance facility. An AUL has been recorded for the Grant property under RTN 3-15991.

Based on the RECs identified, a Phase II ESA would be conducted to determine the potential impact to future development caused by the identified RECs.

Phase II ESAs

Based on RECs identified, Phase II ESAs would be conducted at South Station, Widett Circle, and Readville – Yard 2. MassDOT would implement a soil and groundwater sampling and analysis program to provide information to establish the presence and extent of contaminated material; determine options available to manage and dispose surplus soil generated during construction; establish requirements for treatment and management of groundwater to be dewatered during construction; avoid exacerbation of existing groundwater or soil contamination in design for construction, and meet the performance standards of 310 CMR 40.0000 with regard to construction in contaminated areas.

Based on the Phase II investigation results, MassDOT would establish oil and hazardous material concentrations in soil and groundwater and determine if MCP reportable conditions exist. Potential effects of construction on existing areas of environmental contamination and conditions that may pose a significant risk to human health, safety, public welfare, or the environment, including Imminent Hazards and/or Critical Exposure Pathways, would be identified. MassDOT would develop recommendations for specific response actions to maintain compliance with the MCP related to Oil and Hazardous Materials (OHM) on the property. MassDOT would identify response actions to be conducted prior to construction.

MassDOT would conduct a visual inspection of buildings to be demolished to identify the presence, location, and quantity of suspect asbestos-containing materials (ACM) and other regulated materials. Work plans would be developed for sampling based on the facility walk-throughs once the inspections are complete. Bulk samples of potential hazardous materials would be collected for laboratory analysis. Once the laboratory results are received, types, conditions, and quantities of potential hazardous materials and universal wastes, including PCBs, lead paint, fluorescent light tubes, light ballasts, chlorofluorocarbons (CFCs) and refrigerants associated with HVAC systems, mercury switches, emergency light batteries, and exit signs, etc. would be documented and inventoried. Finally, response actions that would be required prior to demolition would be identified.

3.15.2. Site Specific Health and Safety Plan

Draft site specific health and safety plans (HASPs) for all three project sites are included in Appendix C, *Hazardous Materials Documentation.* These plans are intended to help manage risk to workers and others near AUL areas in the event of excavation or construction activities. The final plans would specifically identify the chemicals at the sites, the types of contaminated media present and the potential routes of

exposure. The plans would also indicate the appropriate level of protection needed and the type of monitoring required.

3.15.3. Impacts on Construction Techniques

The impacts to construction activities at the sites would vary based on the required activities. Site activities would be conducted in accordance with the MCP. A Release Abatement Measures (RAM) plan would be the likely mechanism under the MCP to complete the site activities. New issues identified during the Phase II ESA work would also require typical notification and assessment requirements. The primary impact to construction activities related to soil would be the requirement to implement appropriate soil management procedures throughout the construction schedule, including appropriate dust mitigation, proper stockpiling of soils, documentation of final soil conditions, and proper disposal of excess soils. The final site conditions may require the placement of an AUL for those sites that have not yet recorded one. While the Phase I ESAs did not determine potential groundwater impacts at the sites, based on previous site uses and other site conditions, it is expected that groundwater impacts may exist that could impact construction activities. Impacts to construction activities would mainly be related to construction dewatering. In addition, the potential for vapor intrusion to structures would need to be evaluated. Appropriate permitting and treatment would be required, which could have an impact on the construction schedule and costs. Construction impacts are further explored in Section 3.16, Construction Impacts.

3.15.4. Implications of the Activity and Use Limitation at Readville – Yard 2

An AUL exists on parts of the Readville – Yard 2 site. The AUL prohibits residential use, food consumption gardening practices, and site soil disturbance without Licensed Site Professional (LSP) oversight and requires maintenance of the existing temporary cap. Additional remediation activities are being performed at the site to address the presence of PCBs identified on the site and abutting property. Upon completion of the PCBs excavation a final cap is planned to replace the temporary cap. The AUL would remain on the site once the final cap is installed. It is unknown when the construction of the final cap would be completed. With the existing AUL on the site, future construction activities would require a RAM plan to be completed by an LSP and submitted to MassDEP prior to completing the work. Periodic RAM status reports would be required during construction and a RAM completion report would be submitted at the end of construction. The implementation of the construction activities associated with the RAM plan would require oversight by an LSP. The AUL is likely to remain in place at the completion of the construction activities.

3.16. Construction Impacts

This section includes a summary of the project's construction impacts, and also provides the following information requested in the Secretary's Certificate:

- A description of how Amtrak, MBTA commuter rail and light rail, bus, and freight service would be modified and accommodated during project construction (Section 3.16.2);
- An evaluation and description of potential construction period access locations and laydown areas for station, rail and layover facilities (Section 3.16.3); and
- A revised draft CMP, as necessary, to reflect the elements of the Preferred Alternative (Section 3.16.4).

3.16.1. Impact Summary

Construction – Water and Wastewater Systems

The proposed construction at South Station would avoid impacts to existing subsurface utilities via direct contact with pipes and structure, vibrations, or settling. The use of existing wastewater systems may be required during construction to provide a wastewater discharge for construction-time needs. Effort would be made to restrict construction over sewer and water mains. If there is a conflict between utilities and structural elements within the South Station site, those lines would be relocated. Every effort would be made to avoid impacting BWSC-owned facilities. Dewatering discharges would not be connected to the sewer system and would be done in accordance with local, state, and federal standards. If required, a Construction Dewatering Discharge Permit would be obtained. Details for mitigating utility impacts as well as dewatering strategies will be presented during the final design.

Construction – Air Quality

As detailed in DEIR Sections 6.3.1, Air Quality Impacts, and 6.4.2, Emissions Control Plan, temporary air quality impacts could result from construction activities associated with the project, including fugitive dust emissions, direct emissions from construction equipment, and increased emissions from motor vehicles on local streets due to traffic disruption. The anticipated temporary construction activity does not appear to be exceptional or atypical for this type of project. Due to the close proximity of construction activities to nearby businesses and other public areas, however, mitigation measures during construction would be required. The CMP would include an emissions control plan to address impacts of fugitive dust, construction equipment and vehicle exhaust, and any additional dust control considerations. The details of specific mitigation measures are included in the DEIR.

Construction – Noise

The results of the construction noise assessment indicate that the highest construction noise levels would occur during the demolition of the USPS facility and the construction of the headhouse. Because of the close proximity of the office building at 245 Summer Street to the construction activity, the construction noise levels at this location are expected to exceed the City of Boston construction noise limits during the demolition of the USPS facility, the construction of the headhouse, and the construction of the tracks and platforms. As a result, a temporary 18-foot high noise barrier should be installed between the construction site and the office building at 245 Summer Street. If pile driving is required during the construction of the headhouse, then a noise barrier should be installed, or other noise mitigation measures should be implemented such as pre-augering the hole to reduce the amount of pile driving required, and selecting a pile driver with a smaller hammer and foot-pound force rating.

As with other major construction projects in the City of Boston, the contractor would be required to submit a Construction Noise Control Plan (CNCP) to indicate proposed mitigation methods for construction noise mitigation, and to provide noise monitoring during construction to determine compliance with the City of Boston construction noise limits. The CNCP would provide a detailed list of construction equipment used in each construction phase, including the type and location of each piece of equipment.

Construction – Vibration

In addition to noise, vibration is also a major concern at 245 Summer Street, which has critical computer systems located in the basement of the building. As a result, outdoor vibration measurements would be obtained at 245 Summer Street during construction, especially during any pile driving activity, to ensure that the vibration levels do not exceed the FTA vibration criterion of 65 VdB for moderately vibration-sensitive equipment (vibration level in decibels referenced to 1 micro inch per second) for buildings where low vibration levels are essential for interior operations. During pile driving activity, vibration

levels should also be obtained inside the basement of 245 Summer Street to ensure that the vibration levels do not exceed the specification limits of the computers.

During construction at the South Station site, precondition surveys and vibration monitoring would be conducted to document initial conditions and to monitor vibration levels during construction. The CMP would establish vibration limits and other similar performance criteria, as well as require the contractor to plan and implement mitigating measures if adverse impacts were detected during construction. Below-grade work would be conducted under the technical monitoring of a geotechnical engineer to observe and document construction procedures, monitor vibrations, and anticipate and facilitate any needed mitigation measures.

Construction – Site Contamination and Hazardous Materials

As described in Section 3.15.2, there may be potential exposure of contaminated soils, debris or groundwater during construction.

3.16.2. Potential Service Modifications

To minimize impacts to rail services and passengers a construction phasing schedule would be utilized that balances and optimizes the duration and impact of overnight work windows, weekend work outages, and strategic track closures. As the project advances through preliminary design, MassDOT would coordinate with transportation providers and rail agencies to identify opportunities for strategic closures and alternatives for replacement services. MassDOT will also develop a communication plan for coordination with passengers, communities, and businesses potentially impacted by service disruptions.

An example of a strategic track closure would be to shut down for a period of time the Old Colony Line coming into South Station and allow around-the-clock construction at South Station on tracks impacted by this route. Commuter rail passengers would be bused to South Station or transferred from the Old Colony Line at Braintree to the Red Line. This would allow the contractor an extended work window.

Any outages along the NEC would impact Amtrak operations and maintenance activities. This could require overnight closures of South Station for Amtrak with use of Back Bay Station as a temporary replacement. Closures that would impact Amtrak's access to maintenance facilities would have to be planned in advance. Freight operations would not be impacted as operations are not in the construction vicinity. Construction associated with the South Station Bus Terminal connection would be coordinated to minimize any potential disruptions to bus service. Final construction staging/phasing would be determined as part of final design through discussions with MassDOT and project stakeholders.

Work at the layover facilities and within the Dorchester Avenue and the USPS property would occur with minimal impact to abutting properties and railroad operations, subject to state, local and agency provisions.

Passenger use most likely would not be affected during peak hours for the station. Disruptions would be largely minimized during other hours by completing utility connection work in non-public spaces, and utilizing non-revenue hours for public space connections. Once areas are no longer needed for construction activities, they would be returned to public use.

Noise and vibration impacts from construction are discussed in Section 3.12.1.

3.16.3. Construction Period Access Locations and Laydown Areas

The construction sites would be secured by fence enclosures that can also be closed completely during non-work hours. During work hours, workers on site would be required to carry proper identification and training cards. Visitors would be required to sign in at the construction entrance. Construction sites would maintain a security guard presence, as determined by state, local and agency requirements.

Laydown/staging locations are envisioned in the following locations:

- South Station: The existing Dorchester Avenue, currently closed to the public, would be used as a staging area for the demolition of the USPS facility. Once the USPS building is demolished and cleared, the former building site can be used for staging of the headhouse, rail work, and Dorchester Avenue construction;
- Widett Circle: It is anticipated that the yard construction can be staged in segments that would allow for staging to be done in a separate location within the property; and
- Readville – Yard 2: It is anticipated that the yard construction can be staged in segments that would allow for staging to be done in a separate location within the yard.

At South Station, all work would be completed by construction workers and materials via Dorchester Avenue. Construction access to the Widett Circle site would occur from Widett Circle, a local street immediately adjacent to the layover facility site that connects to Interstate 93 Frontage Road. All existing businesses in this location would be closed prior to construction, therefore no access to these businesses is required. Construction access to the Readville – Yard 2 site would occur from Wolcott Court, a local street immediately adjacent to the layover facility site and the only public roadway that provides access to this location. No traffic detours are expected to be necessary as a result of construction work at any of the project sites.

The contractor would be required to abide by the requirements set forth in MassDOT's *Supplemental Specifications to the 1988 English Standard Specifications for Highways and Bridges*, dated July 1, 2015. The rail and local agencies also identify these requirements in their specifications. In an effort to minimize contradicting or redundant language in the construction contract(s), the specifications would reference the specifications of only the procuring agency. Any additional requirements would be added to the special provisions of the specifications.

3.16.4. Revised Construction Management Plan (CMP)

A revised CMP is included in Appendix G, *Construction Management Plan*. Prior to the start of work, the SSX project contractors would be required to develop a detailed CMP for the SSX project. The CMP would be prepared in accordance with the requirements noted above, and would be implemented in phases that correspond with construction staging and sequencing. Of particular importance would be a plan to open project elements for public access as soon as they are no longer needed to safely perform work (i.e. Harborwalk).The CMP would consist of a detailed plan to address construction period impacts to various environmental resources, and would address vehicular traffic, pedestrian and bicycle facilities, on-street parking, public access, emergency access to local businesses and residences, dust, noise, odor, rodents, and construction-related nuisance conditions. MassDOT would coordinate the development and review of the CMP with the City and emergency personnel to ensure that appropriate safety measures would be incorporated throughout construction.

Appendix G, *Construction Management Plan*, addresses the following construction elements:

- Air Quality Impacts
- Soil Erosion and Sediment Control

- Noise and Vibration Impacts
- Traffic Impacts
- Work Hours

Additional noise and vibration control BMPs and mitigation measures during construction would be described in the CMP and CNCP, and could include the following:

- Installing temporary noise barriers;
- Applying acoustic enclosures and setting acoustic shield requirements for jackhammers, chainsaws, and pavement breakers;
- Establishing protocols for reporting noise monitoring results, noise reduction measures used, and responses to the community;
- Locating stationary construction equipment as far as possible from noise-sensitive sites;
- Constructing noise barriers, such as temporary walls or piles of excavated material, between noisy activities and noise-sensitive receptors;
- Monitoring noise after service starts (with the proposed mitigation in place) to evaluate whether the actual noise levels correspond with the modeled values and take appropriate corrective actions if the actual values are found to be higher than the projections;
- Minimizing and/or avoiding the use of impact and vibratory equipment that generates higher vibration levels (104 to 110 VdB at a distance of 25 feet from the pile driver), to avoid potential damage to buildings located within 65 feet of such equipment; and
- If pile driving is required, considering use of pre-augering holes to reduce vibration impacts.