Appendix G
Essential Fish Habitat (EFH) Assessment

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

January 13, 2025

Peter S. Butler
Regional Administrator
USDOT, Federal Transit Administration Region 1
Volpe Center, 220 Binney Street
Cambridge, MA 02142

Re: North Station Draw One Bridge Replacement Project

Dear Mr. Butler:

We have reviewed the Essential Fish Habitat (EFH) Assessment for the North Station Draw One Bridge Replacement Project located on the Charles River in Boston, Massachusetts. According to the EFH Assessment, prepared by TRC Environmental Corporation (TRC) on behalf of the Federal Transit Administration (FTA) and Massachusetts Bay Transportation Authority (MBTA), the proposed project would replace the existing two structures comprising the Draw One Bridge over the Charles River with three new vertical lift bridge structures. Associated activities include the replacement of Signal Tower A, replacement of the approach trestles, and related adjustments and upgrades to track alignments, communications, and signaling systems. According to section 2.2.1 *Construction Schedule and Sequence* of the provided documents, construction is expected to begin in 2026 and be completed in 2034, being undertaken in five phases. The new bridge span upstream of existing structures is to be constructed first, followed subsequently by each of the remaining bridge spans in two successive phases so that four tracks remain operational throughout the construction period.

Previous coordination on this project with us included agency coordination meetings on May 7, 2020, April 15, 2021, and February 25, 2022. Permitting timelines were discussed and we provided guidance on time of year (TOY) restrictions for winter flounder and diadromous species within the project site. Habitat delineations, EFH, and NOAA Trust Species were sufficiently described and the best management practices (BMPs) that were incorporated into the proposed project were very detailed and included sufficient minimization and avoidance measures for protecting EFH and diadromous fish. Therefore, we have no further conservation recommendations to offer for this project.

Please note that a distinct and further EFH consultation must be reinitiated pursuant to 50 CFR 600.920(1) if new information becomes available or the project is revised in such a manner that affects the basis for the above EFH conservation recommendations. If you have any questions regarding information in this letter, please contact Alexa Cacacie at alexa.cacacie@noaa.gov.

Sincerely,

Christopher Boelke
Chief, New England Branch
Habitat and Ecosystem Services

cc: Jonathan Schmidt, FTA
Michelle Muhlanger, FTA
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Essential Fish Habitat Assessment

North Station Draw One Bridge Replacement Project

November 2024

Prepared For:

Massachusetts Bay Transportation Authority (MBTA)
10 Park Plaza
Boston, MA 02116

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LIST OF ACRONYMS AND DEFINITIONS

Notation	Definition
BMP	Best Management Practice
^oC	Degrees Celsius
CCTV	Closed-circuit television
cSEL	Cumulative sound exposure levels
CWA	Clean Water Act
CZM	Coastal Zone Management
dB	decibels
DCR	Massachusetts Department of Conservation and Recreation
DFE	Design Flood Elevations
DMF	Massachusetts Division of Marine Fisheries
Draw One Bridge	Commuter rail draw bridges just north of North Station
EFH	Essential Fish Habitat
^oF	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FMC	Fishery Management Council
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
HAPC	Habitat Area of Particular Concern
ILF	Massachusetts In-Lieu Fee Program
LNG	Liquid natural gas
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Bureau of Geographic Information
MBTA	Massachusetts Bay Transit Authority
MEPA	Massachusetts Environmental Policy Act
mg/L	Milligrams per liter
MGH	Massachusetts General Hospital
MHW	Mean high water
mph	miles per hour
mS/cm	Millisiemens per centimeter
MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
MWRA	Massachusetts Water Resources Authority
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
North Bank Bridge	North Bank Pedestrian and Bicycle Bridge north of the Draw One Bridge (**Figure 1** on page 2 and **Figure A4** on page 17)
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unites
OHWM	Ordinary High Water Mark

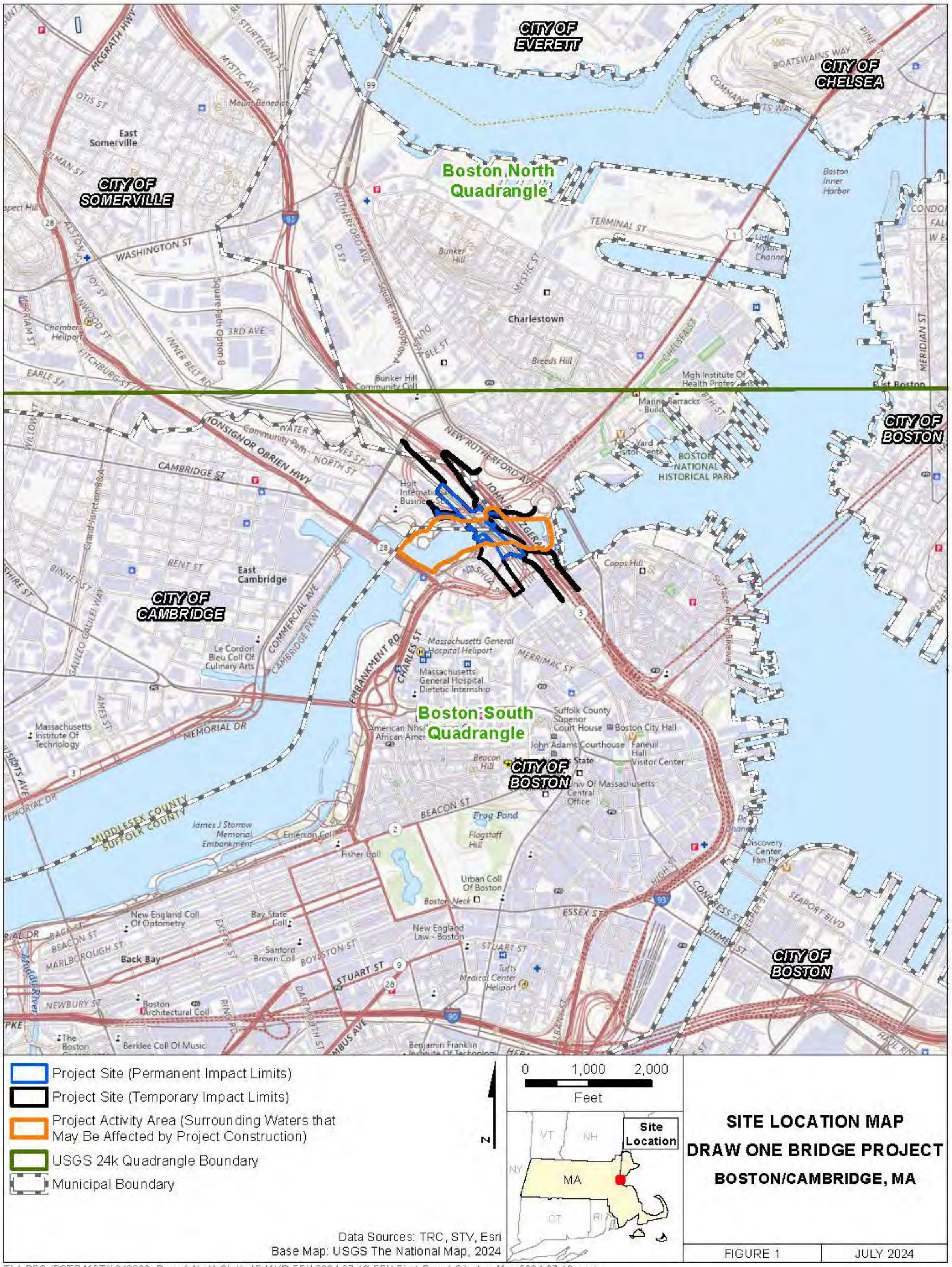
Notation	Definition
PAHs	Polyaromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PLC	Programmable logic controller
Proposed Project	Draw One Bridge Replacement Project
Project Site	Area where permanent and temporary impacts are expected from construction of the Proposed Project (**Figure 1** on page 2)
Project Activity Area	Waters surrounding the Project Site that may be affected by Project construction (**Figure 1** on page 2)
ppt	parts per thousand
PSU	practical salinity units
ROW	Right of way; land owned by the MBTA
SAV	Submerged Aquatic Vegetation
SEL_{cum}	Cumulative Sound Exposure Levels
SFA	Sustainable Fisheries Act
SIH	Signal Instrument House
Silt Producing Activity	Various construction activities that when performed in a water body disturb the sediment on the bottom of the waterbody which mixes with the water, increasing the amount of sediment in the water.
SPCC	Spill Prevention, Control and Countermeasures
SPMTs	Self-propelled modular transporters
SWPPP	Stormwater Pollution Prevention Plan
SWQS	Massachusetts Surface Water Quality Standards
T-pad	Area owned by MTBA north of the Draw One Bridge to be used by the contractor for construction storage and staging shown on **Figure A5** on page 19.
TOY	Time of Year
TRC	TRC Environmental Corporation
TSS	Total Suspended Solids
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
WOTUS	Waters of the United States
WQC	Water Quality Certificate
YOY	Young-of-the-Year

1.0 PROJECT PURPOSE AND OVERVIEW

The Massachusetts Bay Transit Authority (MBTA) is seeking funds to be provided through the Federal Transit Administration (FTA), as the lead federal agency for the Draw One Bridge Replacement Project (the Proposed Project). The Proposed Project would replace the existing two structures comprising the Draw One Bridge over the Charles River with three new vertical lift bridge structures. Associated activities include replacement of the adjacent Signal Tower A, replacement of the approach trestles, and related adjustments and upgrades to track alignments and communications and signaling systems. **Figure 1** on page 2 highlights the direct footprint of the work area including the temporary impacts (shown on figures as "Project Site (Temporary Impact Limits") and permanent impact areas (shown on figures as "Project Site (Permanent Impact Limits") for the Proposed Project. "Project Site" is used throughout the document to refer to the temporary and permanent impacts. The Project Site, comprising approximately 8 acres, is roughly located within the bounds of the Charles River (in the same area as the previous Draw One Bridge) but extends 200 feet upstream and 300 feet downstream of the existing Draw One Bridge. The purpose of the Proposed Project is to bring the Draw One Bridge into a state of good repair, improving the reliability and safety of MBTA Commuter Rail and Amtrak service at North Station in Boston. The details of construction are further detailed in Section 2.0 while conditions within the Project Activity Area (the surrounding waterbodies within an 0.25-mile radius from the center of the Project Site) are described in Section 4.0.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), (16 U.S.C. § 1801 *et seq.*) established a management system to promote conservation of marine fisheries resources along the United States coastlines. This included the establishment of eight regional Fishery Management Councils (FMCs) that develop fishery management plans to properly manage fishery resources, the designation of federally managed species and their respective habitats throughout all life stages referred to as Essential Fish Habitat (EFH). The MSA requires federal agencies, FTA in this case, to consult with National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) on any action or proposed action authorized, funded, or undertaken by such agency that may adversely affect EFH identified under the MSA. The MSA further mandates NOAA Fisheries to coordinate with other federal agencies to avoid, minimize, or otherwise offset effects on EFH that could result from activities that are proposed by, funded by, or receiving approvals and/or authorizations from federal agencies.

The Sustainable Fisheries Act (SFA) of 1996 was an amendment to the MSA. The SFA recognized that many fisheries are dependent on nearshore and estuarine habitats for at least part of their life cycles and included evaluation of habitat loss and protection of critical habitat, which are explained in Section 5.0. The Fish and Wildlife Coordination Act (FWCA) requires that all federal agencies consult with NOAA Fisheries when proposed actions might result in modifications to a natural stream or body of water. The FWCA also requires that federal agencies consider the effects that projects would have on fish and wildlife such as shellfish, diadromous species, crustaceans, or their habitats, and other commercially and recreationally important species that are not managed under a federal fisheries management plan, may serve as prey for a number of federally-managed species, and are considered a component of EFH. Stressors and potential impacts are discussed in Section 6.0. These species and their habitats are referred to as NOAA Fisheries Trust Resource Species and will be considered as part of the EFH/FWCA consultation process which may result in additional recommendations to avoid, minimize, or offset any adverse effects concurrently with EFH conservation recommendations, as explained in Section 5.0.



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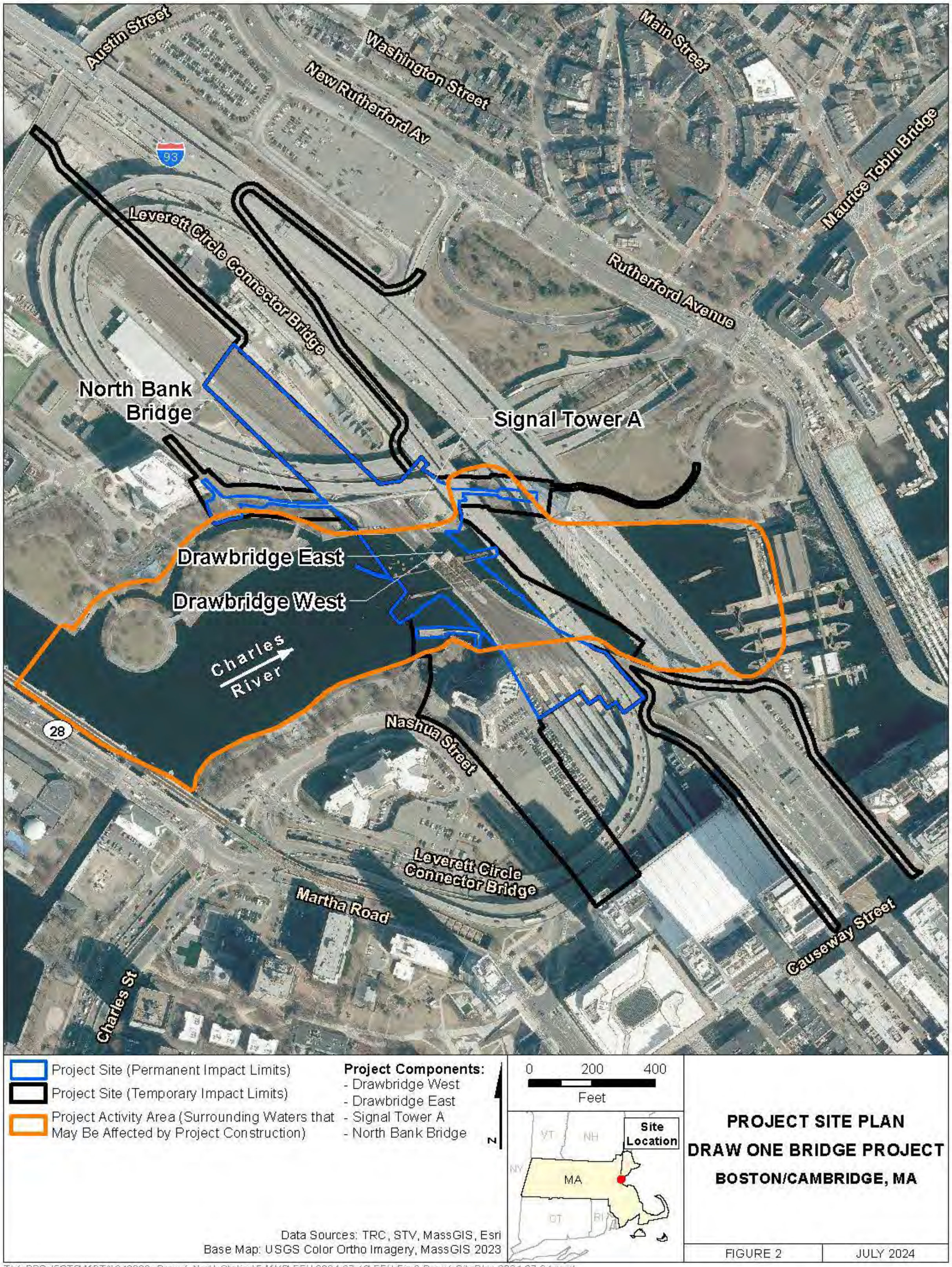

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Consultation with NOAA Fisheries is required whenever a federal agency is going to undertake or approve activities or work in an area that has the potential to affect EFH. FTA is using this EFH Assessment to support consultation with NOAA Fisheries, which would also support other federal actions, such as the United States Army Corps of Engineers (USACE) Section 404 and Section10 permits and a United States Coast Guard (USCG) Permit. In the following narrative, the Proposed Project description, existing conditions, the EFH species of the Project Activity Area, as well as impacts and mitigation measures are discussed alongside the EFH Worksheet (rev. August 2021) **(Appendix A).**

1.1 Agency Correspondence

Three interagency consultation meetings have occurred (May 7, 2020, April 15, 2021, and February 25, 2022) to discuss the Proposed Project, likely permitting/review programs, the schedule, data needs, and the permitting timeline **(Appendix B).** These interagency consultation meetings included members from MBTA, FTA, FRA, NOAA Fisheries, the USCG, USACE, the Massachusetts Division of Marine Fisheries (DMF), the Massachusetts Department of Environmental Protection (MassDEP), Massachusetts Department of Conservation and Recreation (DCR), Cambridge and Boston Conservation Commission, Coastal Zone Management (CZM) Office and the Massachusetts Environmental Policy Act (MEPA) Office.

In response to questions asked during the interagency consultation meetings, email correspondence from Kaitlyn Shaw (NOAA Fisheries) dated May 4, 2021, provided guidance on time of year (TOY) restrictions (Section 3.1) and Best Management Practices (BMPs) (Section 3.2). Additionally, discussions during the interagency consultation meetings further guided the design and permitting process and helped confirm some of the BMPs and TOY restrictions that will be followed during the Proposed Project construction. FTA and MBTA met with the Greater Atlantic Regional Fisheries Office (GARFO) Protected Resources Division on November 26, 2024, to discuss the Proposed Project and consultation approach.

2.0 PROPOSED PROJECT

The Proposed Project would replace the existing Draw One Bridge over the Charles River, which currently comprises two bascule bridge structures, with three new vertical lift bridge structures. It would provide six, rather than the current four, tracks across the Charles River to maintain service during construction and operations. It would also replace the adjoining Signal Tower A and the approach spans and upgrade track alignments and communications and signaling systems. The purpose of the Proposed Project is to bring the Draw One Bridge into a state of good repair, improving the reliability and safety of MBTA Commuter Rail and Amtrak.

2.1 Project Components

2.1.1 Vertical Lift Bridges

The two operational bridge structures (of the original four) each carry two rail tracks over the Charles River. The Proposed Project includes the replacement of the original four bridges with three vertical lift bridge structures. Each new vertical lift bridge would support two tracks, for a total of six tracks over the Charles River.

Throughout the construction period, four tracks would remain in service. One new vertical lift bridge would be constructed to the west of the existing bridges and commissioned, then each of the existing draw spans would be replaced in succession. Once construction is complete, any one bridge could be removed from service for maintenance or repair while leaving four bridge tracks in operation.

The proposed bridges would rise 76 feet above the water level and have a 45-foot horizontal clearance, a 5.17-foot vertical clearance in the closed position, and a 32.2-foot vertical clearance when open. The existing bridges rise 51.5 feet above the water level and have a 65-foot horizontal clearance, a 5.38-foot vertical clearance in the closed position, and infinite vertical clearance when open. The new bridge structures accommodate future electrification of the rail lines by providing sufficient vertical clearance for fixed catenary when the bridge spans are fully open. The elevation of both the existing and proposed bridge structures is constrained by the elevation of adjacent track, which is at an elevation of approximately 11 feet. Although the Design Flood Elevation (DFE) for the Proposed Project is 13.1 feet, track elevations cannot be adjusted to clear this elevation as they are constrained by platform access at North Station and connections north of the Charles River.

Foundations from the two previously demolished bascule bridges would be removed. The north and south trestles of the existing structures would be replaced, as would the existing fender system. The new bridge and trestles would span the same distance of approximately 550 feet as the existing bridge infrastructure.

2.1.2 Signal Tower A Replacement

Existing operational controls would be relocated from a temporary control tower to a new Tower A building. The new building would be constructed along the seawall on the north bank of the Charles River, east of the mainline tracks, positioned to best serve operation of the proposed new three-span structure.

2.1.3 North Bank Bridge Modification

The North Bank Bridge would be raised approximately one foot to accommodate the new track alignment required with the new bridge structures. This would require the relocation of two bridge supports, the addition of one additional support, modification of the bridge truss structure, and modification and lengthening of the bridge landings in North Point Park and Paul Revere Park. Regrading of adjacent park pathways would require the relocation of an existing staircase in North Point Park. Landscaping at each end of the bridge would be replaced to tie into existing park infrastructure.

2.1.4 Track Work

Trackwork and associated signals would extend throughout the Project Site to connect the new bridge tracks to the mainline tracks north of Tower A. Trackwork, including reconstruction of direct fixation and platform modifications where required, and associated signals would be constructed to connect the new bridge tracks to station tracks.

Existing tracks would be realigned to provide consistent spacing and new special track work and signals will be installed to facilitate the track phasing required to allow the three proposed lift bridges to be constructed while maintaining connectivity of four tracks between the station and the rail lines north of the bridges. Existing track will have new ballast, ties, and rails installed as part of the project. Where new portions of track are being added to align with the third bridge or where track is constructed along a new alignment to realign to new bridges, new subgrade, drainage, ballast and track work and signals will be constructed.

2.1.5 Signal System

The Proposed Project would replace up to three sets of Signal Instrument Houses (SIHs). The microprocessor controller equipment for each of the new SIHs would support the new track and signal system configuration. All wayside devices, cables, and infrastructure (e.g., cable troughs, signal heads, railroad switches, etc.) currently located within MBTA right of way (ROW) and serving the existing Draw One Bridge would be upgraded with the Proposed Project.

2.1.6 Switch Heaters

Approximately 11 existing switch heaters would be replaced, and an additional six switch heaters would be installed to accommodate the new track alignment across the river, for a total of 17 proposed switch heaters. The types of switch heaters (e.g., gas- or electric-powered) that would be installed as part of the Proposed Project have not yet been determined.

2.1.7 Drainage System

A drainage system would be added to the north trestles to collect runoff from the proposed bridge and Tower A infrastructure and provide infiltration and detention before being returned to the Millers River at a new outfall to be installed along the west bank of the river, just south of the North Bank Bridge. Similarly, a drainage system would be added to the south trestles to collect runoff and direct it to a water quality structure that would remove sediment and other stormwater pollutants (e.g., nitrogen, phosphorous) before returning runoff to the Charles River at a new outfall to be installed along the south bank of the river within the limits of the MBTA ROW.

2.1.8 Safety and Security

Safety and security measures would be implemented in accordance with MBTA's policies and procedures and would consist of fencing, a closed-circuit television (CCTV) system, exterior lighting located along the bridge structure, and navigational lighting to meet USCG requirements. Further, MBTA would maintain controlled access locations at the bridge stair towers, Tower A doors, and pedestrian and vehicular fence gates for MBTA's situational awareness of the bridge and Tower A.

2.1.9 Resilience

The Proposed Project has been designed in accordance with MBTA's Flood Resiliency Design Directive and Drainage Design Directive. Electrical and mechanical equipment within Tower A (e.g., control desk, programmable logic controller [PLC]) would be located on the second floor, above the DFE of 13.1 feet. Flood walls and a deployable flood barrier would be provided at Tower A, and submersible equipment (e.g., junction boxes, lift span bearings, etc.) would be utilized on the bridge structure.

2.2 Construction Schedule, Sequence and Access

Based on permit/mitigation requirements that have been set forth, MBTA will include in the contract specifications parameters and requirements for the contractor, which are aligned with what is presented in the document below and will include all identified BMP's, commitments, and other measures presented. The construction methods described within the document will be followed to the extent practicable; however, actual construction methods and materials may vary slightly, depending in part on how the construction contractors choose to implement their work to be most cost effective, within the requirements set forth in this document and, in turn, the bid, contract, and construction documents, as well as to comply with mitigation requirements. It is understood that substantial deviations from these methods would require reinitiation of consultation; such deviations are not anticipated and will be avoided.

2.2.1 Construction Schedule and Sequence

Construction is expected to begin in 2026 and be complete in 2034. Construction would be undertaken in five phases. The existing Signal Tower A would be demolished and replaced in the first phase. The new bridge span, to the west/upstream of the existing structures, would be constructed and commissioned first, then each of the existing bridge spans would be replaced in two successive stages so that four tracks across the Charles River would remain in operation at all times. In-water work would be undertaken approximately eight hours per day and five days per week: primarily during the daytime from 7am to 3pm. At certain times in construction, nighttime work may be performed between 3pm to 11pm and 11pm to 7am with differences and changes based on weather conditions and Project and contractor schedules. Additionally, work will be completed outside of the TOY restrictions, which are discussed in Table 6 below, and therefore the Proposed Project will not likely stop work during the winter due to the potential for barges to be used for material delivery and storage.

The contractor will be required to follow the sequencing in the contract documents. The contractor will determine the details of the sequencing activities and associated staging. Bridge construction will be carried out in five phases following site preparation and mobilization, which is estimated to take approximately four months, as shown in **Table 1**, below, and on **Figure A1** on page 10.

Table 1. Construction Sequence and Duration

Phase	Key Components	Estimated Duration (months)
Site Preparation & Mobilization	Signal duct banks, temporary control tower relocation, demolition of existing bridge foundations west of the bridges in use, western temporary trestle construction, early track and signal work	4
Bridge Phase 1	Demolition of Existing Tower A, Construction of Proposed Tower A, North Bank Bridge Modification, West Bridge north and south approach trestles and West Bridge vertical lift span, track and signal work in order to maintain service, one track on West Bridge brought into service	31
Bridge Phase 2	Construction of new south approach trestles between west and center bridges, track and signal work, second track on West Bridge brought into service	5
Bridge Phase 3	Eastern temporary trestle construction, Center Bridge demolition, Center Bridge new north approach trestle and vertical lift span, track and signal work, one track on Center Bridge brought into service	20
Bridge Phase 4	Construction of new south approach trestle between center and east bridges, track and signal work, second track on Center Bridge brought into service, demolition of west temporary trestle	9
Bridge Phase 5	East Bridge demolition, construction of East Bridge north approach trestles and East Bridge vertical lift span, track and signal work, East Bridge brought into service, demolition of east temporary trestle	27
	Total	**96**
Source: STV (Jan 2023)		

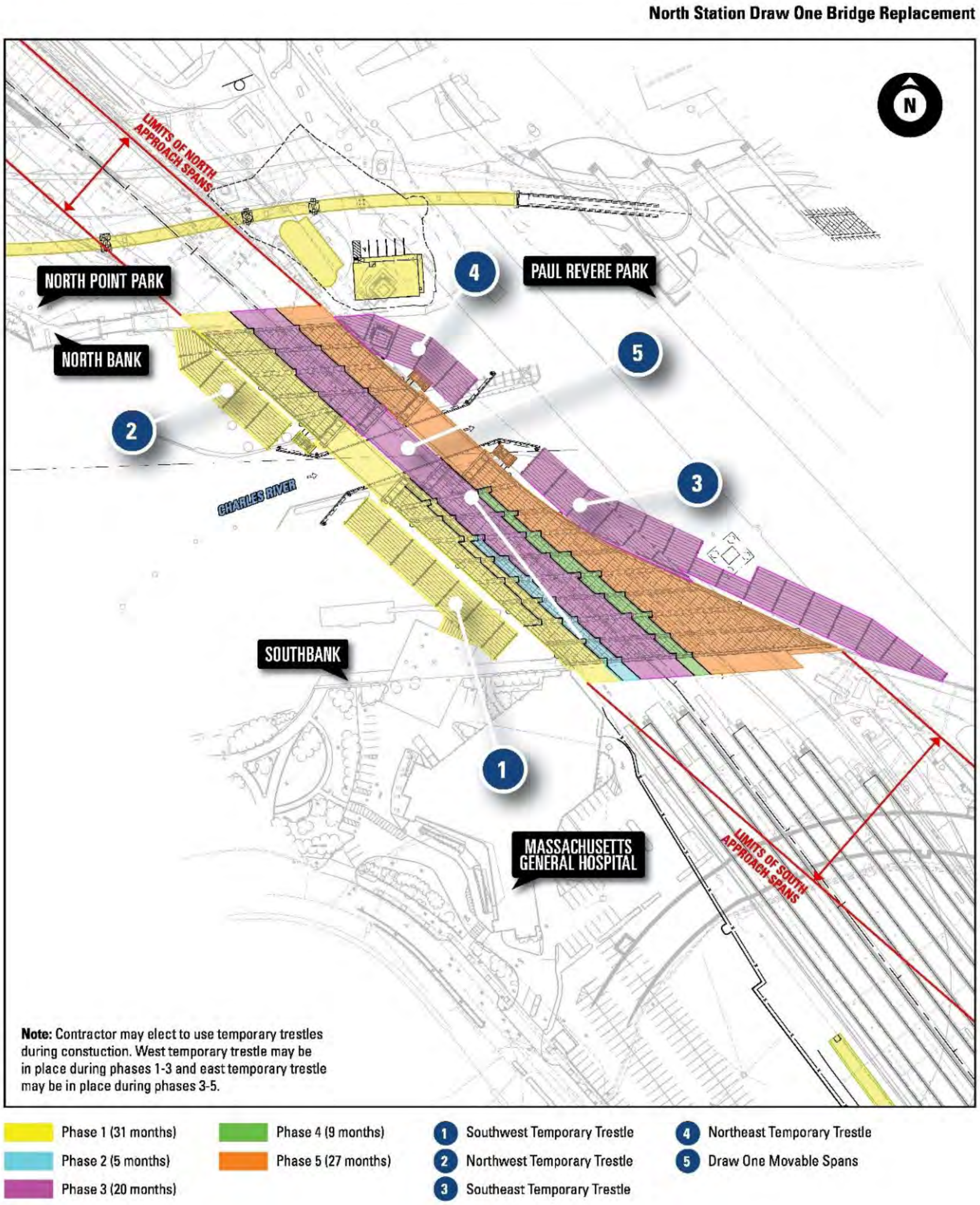


Figure A1: Bridge Construction Phases

Three pier foundations of the North Bank Pedestrian and Bicycle Bridge (North Bank Bridge) on MBTA right-of-way conflict with the Proposed Project construction. Existing piers 3, 4, and 5 of the North Bank Bridge are located on MBTA property, and one (Pier 3) conflicts with the Proposed Project. To allow for construction of the Proposed Project, the North Bank Bridge would be required to be raised 1 foot. This would entail relocating two bridge supports (existing Piers 3 and 4) and adding one additional support (Pier 4A), modifying the bridge truss structure, and modifying and lengthening the landings of the bridge within North Point Park and Paul Revere Park (Figure A2 on page 12 below).

Construction activities may occur up to seven days a week. Work shifts would be primarily during the daytime from 7am to 3pm. At certain times in the construction as defined by weather and the Project and contractor's schedule, nighttime work may be performed between 3pm to 11pm and 11pm to 7am.

Various construction activities when performed in a waterbody disturb the sediment on the bottom of the waterbody which mixes with the water, increasing the amount of sediment in the water. These activities are referred to as "silt producing" activities. Construction activities that disturb a relatively small amount of sediment are referred to as minor silt producing activities and those that disturb a relatively large amount of sediment are referred to as major silt producing activities.

For the Proposed Project, all major silt producing activities, such as pile (timber, steel, and sheet piles) removal, dredging of the channel/riverbed to realign the navigational channel with the new bridge structures, riverbed disturbance for removal of existing piles or caissons by cutting below the mudline, and removal of a bottom laid cable used for the existing bridge would be conducted outside of the prime TOY fisheries windows (February 15 to July 15 and September 1 to November 15) or with silt curtains. Per the Proposed Project contracting requirements, the specific construction methodologies will be developed by the contractor, and until that is known, a more specific schedule is not available.

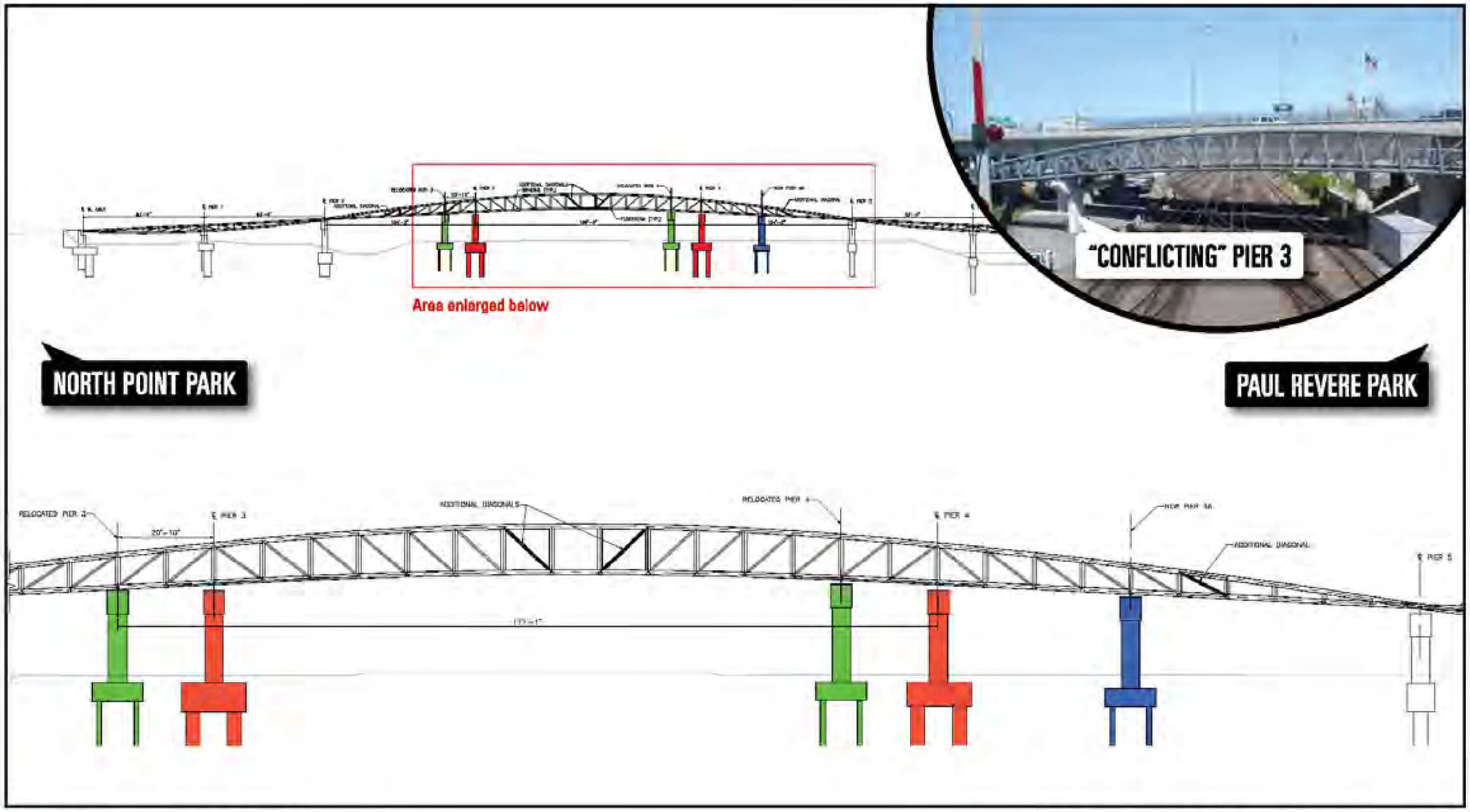
2.2.2 Construction Access

The primary areas of construction within the Project Site are the Draw One Bridge, existing Signal Tower A, and the MBTA owned construction materials staging area and laydown site (T-Pad) in Somerville, Massachusetts **Figure A3** on page 14 below.

Access to the T-Pad is expected to occur throughout the Proposed Project and can be used for material deliveries that will utilize the existing tracks to make deliveries to the Project Site. Access to these primary construction areas will be accomplished through developed and/or disturbed areas via the following quadrants shown on **Figure 1** on page 2 and **Figure A1** on page 10 above:

- The Southwest Quadrant - access near Massachusetts General Hospital (MGH) allows access for construction of the Draw One Bridge Phases 1 through 3, west of the bridges currently in service. This area, proposed for use as construction access, is disturbed and currently comprises of the MGH, associated parking lots, and portions of North Station. The existing MGH ramp and dock into the river are proposed to be removed and reinstalled after construction is complete.

North Station Draw One Bridge Replacement Project



Existing Pier Location to be Demolished

Proposed Pier Location and Additional Diagonals

Newly Constructed Additional Pier

Note: the picture shows the North Bank Bridge facing north from the north side of the existing Draw One Bridges.

Figure A2: North Bank Bridge – Modifications

North Station Draw One Bridge Replacement Project

Figure A3: Construction Laydown Area – T-Pad

- The Northwest Quadrant - access to construct the Draw One Bridge Phases 1 through 3, the west end of the North Bank Bridge, and access to the mainline tracks up through the T-Pad. This area, proposed for use as construction access, is currently comprised of walking paths, as well as mowed and landscaped areas of the North Point Park; however, it has been historically disturbed by the construction and use of the previous rail bridges and tracks.
- The Southeast Quadrant - access to construct the Draw One Bridge Phases 3 through 5 (eastern bridge). This area, proposed for use as construction access, is disturbed and currently comprises of existing roadways and parking lots associated with the Charles River Dam and Locks and North Station.
- The Northeast Quadrant - access to construct the Draw One Bridge Phases 3 through 5 (eastern bridge), the replacement Tower A, the east end of the North Bank Bridge, and access to the T-Pad. This area, proposed for use as construction access, is currently comprised of walking paths and mowed and landscaped areas of the Paul Revere Park, as well as existing roadways which has been historically disturbed by the construction and use of the previous rail bridges and tracks.

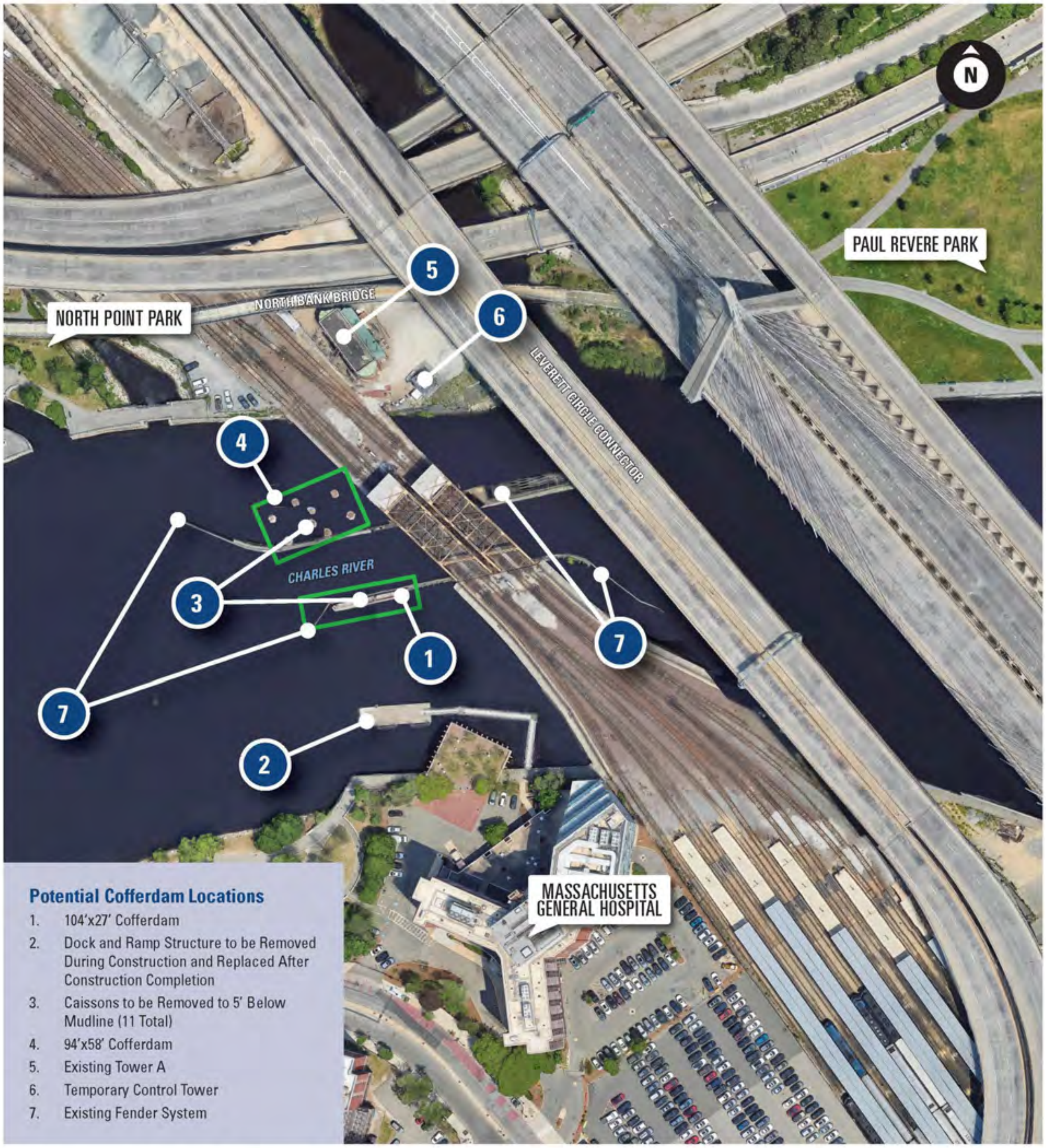
2.3 Construction Overview

2.3.1 Substructures

Construction of the bridge substructures would comprise the installation of a combination of foundation types, including spread footings along the riverbanks and the following within the river: concrete-filled pipe piles, micropiles, composite fiberglass-reinforced piles, drilled shafts, and driven H-piles. In-river foundations would include a total of 12 drilled shafts, 321 concrete-filled pipe piles, and 39 micropiles. The navigational channel fender system associated with the bridge and the navigational channel would require 207 composite piles within the river. The North Bank Bridge modifications would require 16 micropiles on land. Tower A would require 65 driven H-piles on land.

2.3.2 Cofferdams

To support the removal of eleven caissons from the demolished bridge structures to the west of the existing Draw One Bridge, two cofferdams may be installed. One cofferdam, approximately 98 feet (29 meters) long by 58 feet (18 meters) wide, would encapsulate the set of eight caissons on the north side of channel (Location 4 on **Figure A4** on page 17). A second cofferdam, approximately 104 feet (32 meters) long by 27 feet (8 meters) wide, would encapsulate the three caissons on the south side of channel with the concrete cap on top which connects all three of the caissons (Location 1 on **Figure A4** on page 17). If used, it is expected that the cofferdams be in the water for approximately four months while the caissons within the cofferdams are removed. Please see Section 2.4.1.1 below for more information on caisson removal and **Table 4** below for more information on sheet piles.



Note: Contractor may elect to use Cofferdams as shown to assist in the demolition of remaining caissons and piers.

Figure A4: Potential Cofferdam Locations

2.3.3 Temporary Trestles and Barges

Construction work activities for each bridge structure would begin simultaneously at multiple locations, starting with the construction of temporary work trestles to drive piles using barge-mounted equipment. Four temporary work trestles for materials and equipment would then be constructed, two on the east side and two on the west side of the Project Site (**Figure A5** on page 19 and **Figure A6** on page 20). Each trestle could be in place for approximately six years. The temporary work trestles are expected to have an overwater length of up to 1,000 feet (305 meters) in total, with individual lengths ranging from 150 feet (45 meters) to 465 feet (142 meters) and a width of 40 feet (12 meters); they would be placed as shown on **Figure A5** on page 19 and **Figure A6** on page 20. The use of several barges is anticipated for the construction of the temporary trestles, drilled shafts, caps, and piers (**Figure A5** on page 19 and **Figure A6** on page 20). Barges may also be used for mounted cranes, storage barges, and material delivery. Precast concrete, steel reinforcement bars, structural steel members, and machinery components may be transported to the Project Site by barge.

Drilled shaft construction for lift span piers could begin concurrently and be performed using barge-mounted equipment or trestle-supported equipment. The abutments and approach trestle piles would be constructed using equipment mounted on the work trestles or located on constructed portions of each proposed bridge structure.

2.3.4 Land-Side Structures

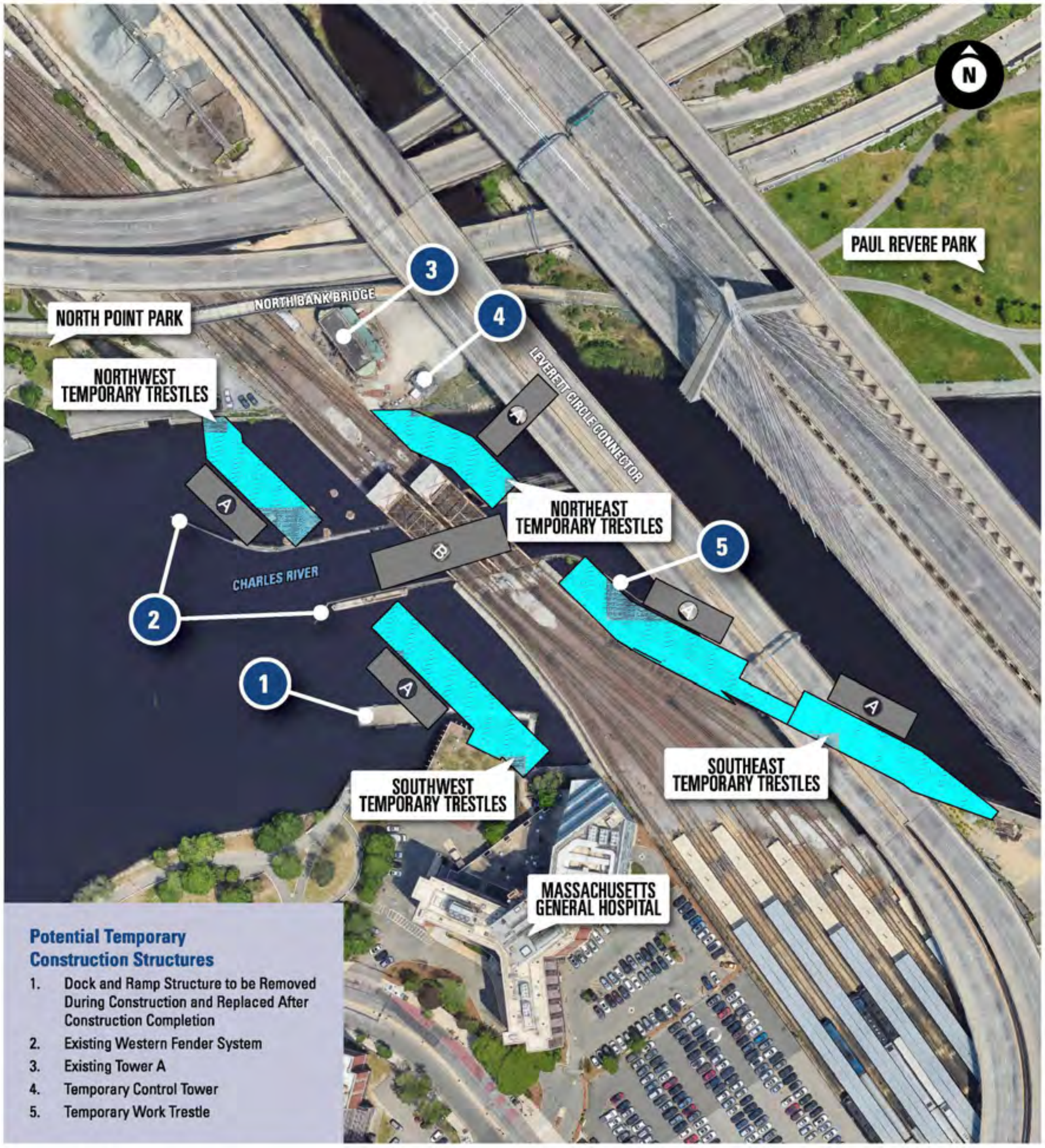
As currently contemplated, Phase 1 work activities would include demolition of the original unused Tower A, relocating the existing temporary Tower A onto the Northeast Temporary Trestle structure which will be installed in the river adjacent to the existing north bank seawall, and construction of a new Tower A (**Table 1**). Foundation work would comprise the installation of test pits to determine the extent of the existing seawall landward and the installation of driven piles with land-side equipment. Phase 1 would include the installation of a water detention system below the proposed parking lot at the new Tower A site and a new waterline utility using jack and bore methods beneath the MBTA tracks adjacent to the Tower A site.

Modification of the North Bank Bridge is assumed to start during Phase 1 of construction. New foundations for the relocated Pier 3, relocated Pier 4, and new Pier 4A would consist of the installation of micropiles from ground supported equipment. The North Bank Bridge superstructure would be raised approximately one foot in height to allow for the additional track to be constructed under this bridge. Additional work would consist of regrading the approach pathways at each end of the North Bank Bridge after it is raised and adjusting the drainage structures (**Figure A2** on page 12).

2.3.5 Superstructure

Superstructures of the new bridge structures would be erected from the temporary work trestles in Phases 1, 2, 4, and 5. Phase 3, the new eastern bridge, would be constructed from a combination of the already-constructed bridge and the temporary work trestles. Materials delivery would primarily be by barge or rail; materials would be stored at the T-Pad, on barges, or on the temporary trestle system.

North Station Draw One Bridge Replacement

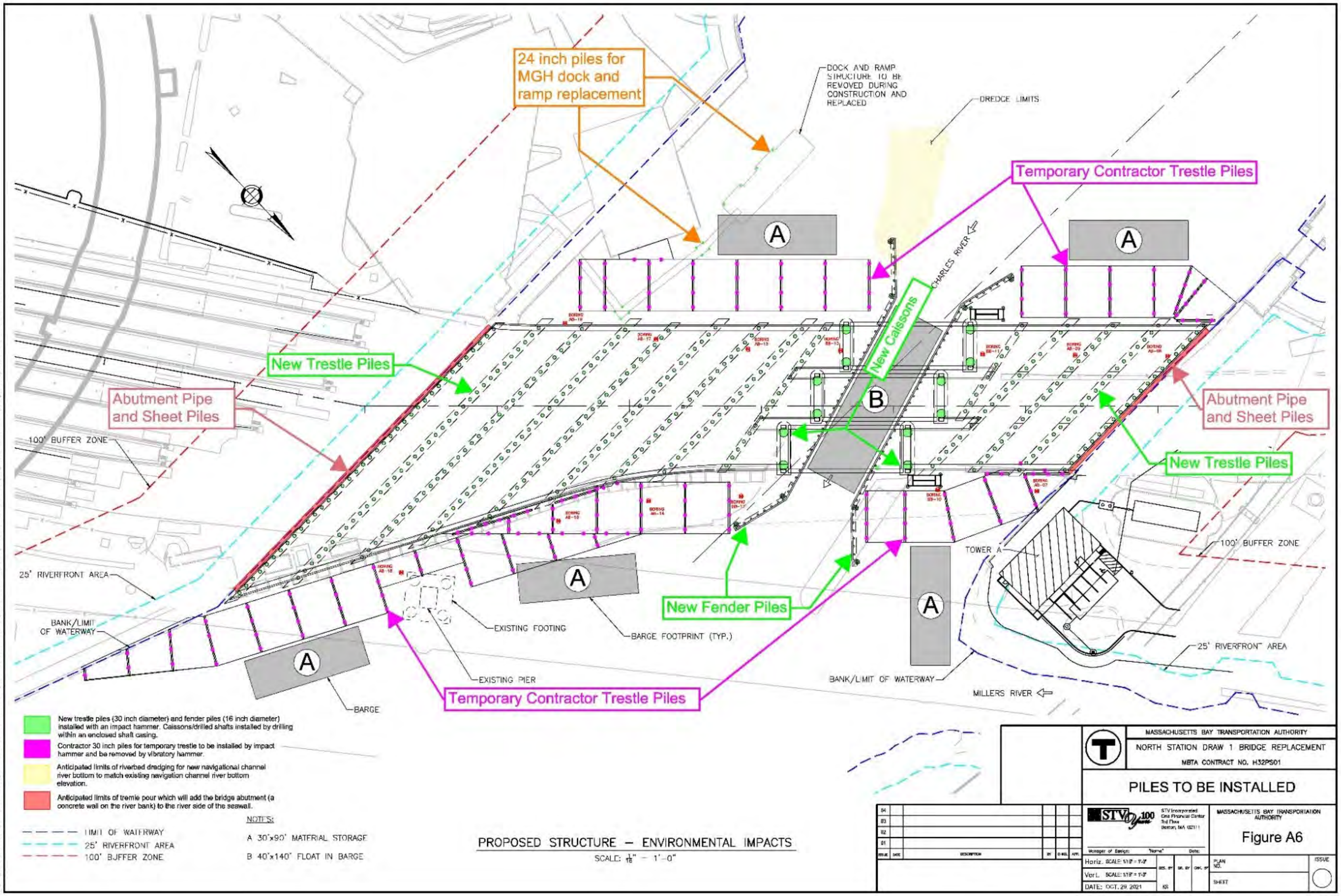


A Barge for Material Delivery and Storage

B Barge for Float-out of Existing Spans (Temporary Channel Closure)

Note: Contractor may elect to use temporary trestles and barges during construction. All of the barges and temporary trestles shown are underneath the elevated overhead structures.

Figure A5: Temporary Trestles with Barges



24 inch piles for MGH dock and ramp replacement
DOCK AND RAMP STRUCTURE TO BE REMOVED DURING CONSTRUCTION AND REPLACED
DREDGE LIMITS
Temporary Contractor Trestle Piles
CHARLES RIVER
New Caissons
New Trestle Piles
Abutment Pipe and Sheet Piles
100' BUFFER ZONE
25' RIVERFRONT AREA
BANK/LIMIT OF WATERWAY
New Fender Piles
EXISTING FOOTING
BARGE FOOTPRINT (TYP.)
EXISTING PIER
BARGE
TOWER A
BANK/LIMIT OF WATERWAY
MILLERS RIVER
A
B
New trestle piles (30 inch diameter) and fender piles (16 inch diameter) installed with an impact hammer. Caissons/drilled shafts installed by drilling within an enclosed shaft casing.
Contractor 30 inch piles for temporary trestle to be installed by impact hammer and be removed by vibratory hammer.
Anticipated limits of riverbed dredging for new navigational channel river bottom to match existing navigation channel river bottom elevation.
Anticipated limits of tremie pour which will add the bridge abutment (a concrete wall on the river bank) to the river side of the seawall.
LIMIT OF WATERWAY
25' RIVERFRONT AREA
100' BUFFER ZONE
NOTES:
A 30'x90' MATERIAL STORAGE
B 40'x140' FLOAT IN BARGE
PROPOSED STRUCTURE – ENVIRONMENTAL IMPACTS
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
NORTH STATION DRAW 1 BRIDGE REPLACEMENT
MBTA CONTRACT NO. H32PS01
PILES TO BE INSTALLED
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
Figure A6
DATE: OCT. 29 2021

2.3.6 Demolition of Remaining Movable Span Structures and Tower A

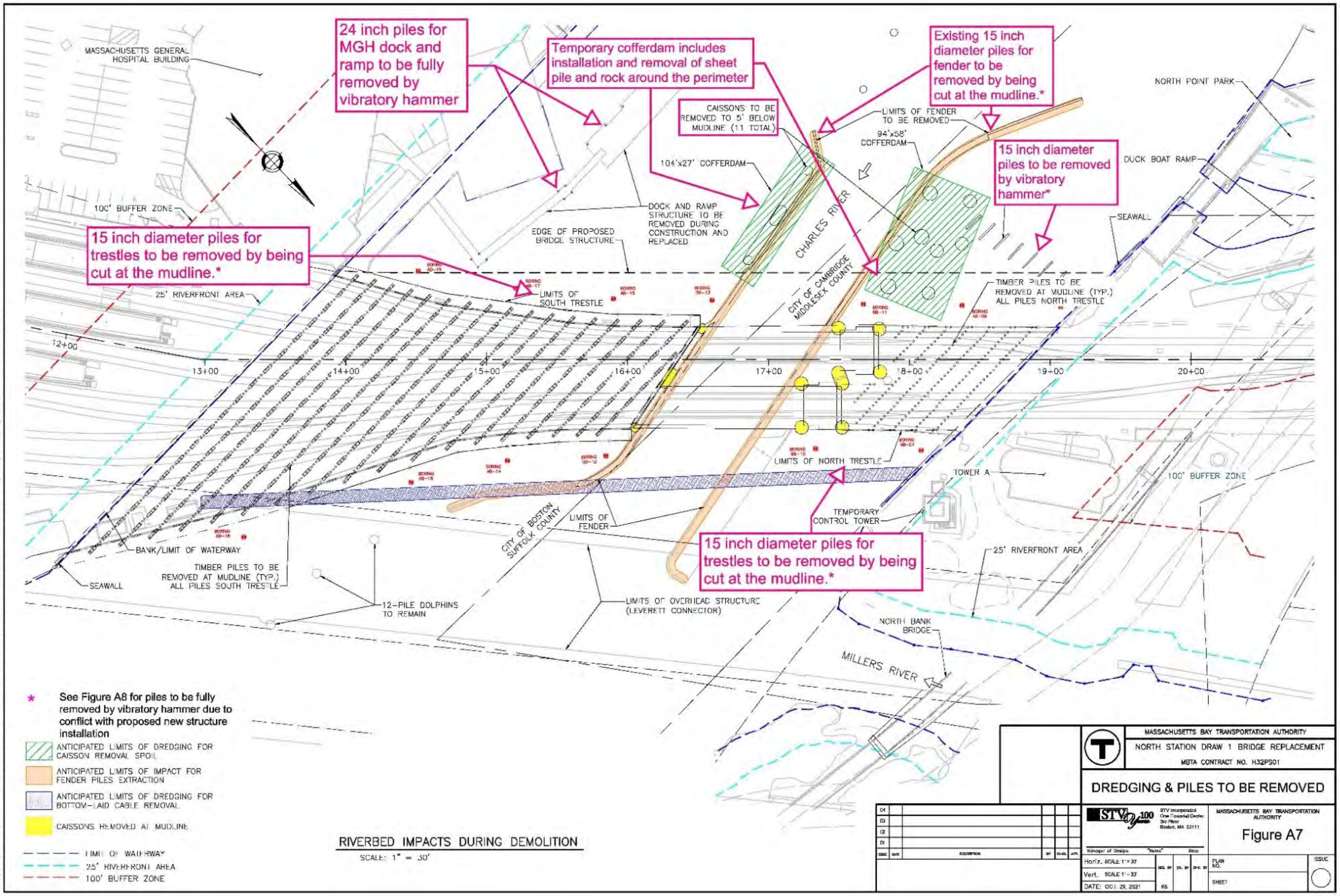
Demolition of the original Tower A would include abatement of existing hazardous materials and relocation of any remaining electrical and bridge operation related services out of Tower A so existing equipment can be decommissioned. Selective demolition will be used to remove the existing Boston and Maine cast stone sign from the façade along with any other elements that may be used in the mitigation measures undertaken pursuant to Section 106 of the National Historic Preservation Act of 1966 Memorandum of Agreement. Shielding will be erected to protect the tracks, existing signal equipment, and the North Bank Bridge. Traditional demolition methods would then be used to demolish the building and foundation, which may include excavators, demolition hammers, and steel shears.

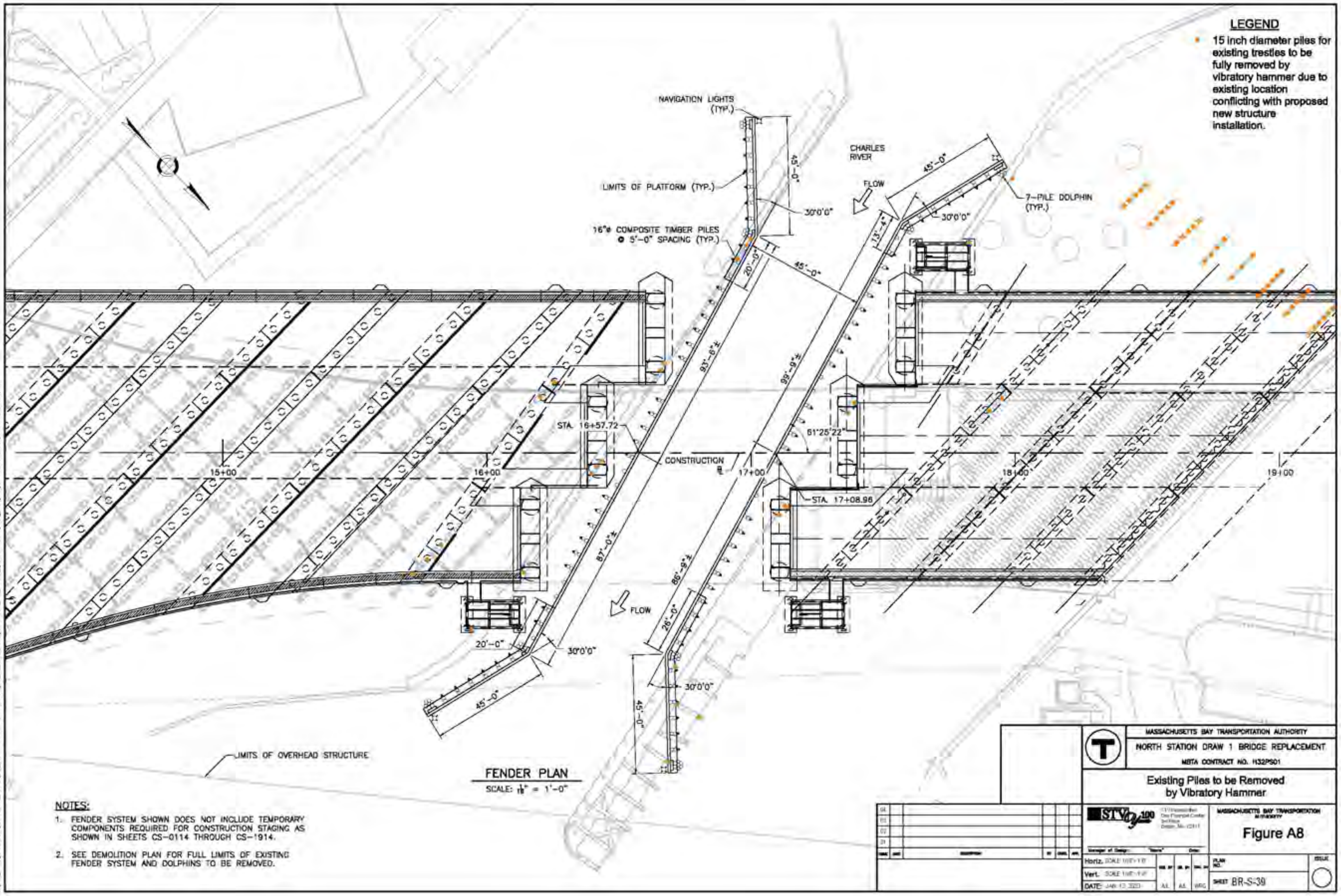
Foundations for the existing Draw One Bridge that would be demolished with the Proposed Project include 25 piers and 21 caissons, as well as the navigational channel fender system and Tower A.

Demolition of the remaining operational Draw One Bridge movable span structures would likely entail removing the counterweight and machinery room and transporting them to the existing Tower A site for demolition using self-propelled modular transporters (SPMTs), which are multi-axle trailers designed for large and heavy cargoes. The existing trusses would be cut apart and portions removed by crane, and remaining portions floated out on a barge. Existing caissons outside of the navigable channel would be demolished down to the mudline by wire saw cutting, cutting torches, or other mechanical means chosen by the contractor. Caissons within the proposed navigational channel would be demolished down to five feet below the proposed channel elevation. Caisson demolition is anticipated to be performed by wire-saw cutting and removing sections of each caisson. Alternate methods could include the use of silt curtains and demolition hammers.

Demolition of the south approach trestle would entail cutting the existing deck precast panels at the original construction joints and removing sections of the deck. Pier caps would have areas of local demolition so sections could be removed. Where original timber piles were grouted into the pier caps, the tops of piles would be cut to facilitate pile cap removal. Timber piles would be cut off at the mudline, except at locations where they would conflict with the proposed foundations, in which case they would be extracted. Approximately 1,380 timber piles would be cut off at the mudline and 20 piles would be extracted at the existing south approach trestles (**Figure A7** on page 23).

Demolition of the operational north approach trestle and navigational channel fender would consist of removal of deck timber and timber pile caps prior to cutting timber piles off at the mudline. Where timber piles conflict with the proposed foundations, the piles would be extracted. Where piles would be located in the proposed channel, the piles would be cut off five feet below the mudline. Approximately 560 piles would be cut off at or below the mudline and 50 piles would be extracted at the operational north approach trestles and existing navigational channel fender system (**Figure A7** on page 23 and **Figure A8** on page 24).


24 inch piles for MGH dock and ramp to be fully removed by vibratory hammer
Temporary cofferdam includes installation and removal of sheet pile and rock around the perimeter
Existing 15 inch diameter piles for fender to be removed by being cut at the mudline.*
15 inch diameter piles to be removed by vibratory hammer*
15 inch diameter piles for trestles to be removed by being cut at the mudline.*
15 inch diameter piles for trestles to be removed by being cut at the mudline.*
MASSACHUSETTS GENERAL HOSPITAL BUILDING
CAISSONS TO BE REMOVED TO 5' BELOW MUDLINE (11 TOTAL)
LIMITS OF FENDER TO BE REMOVED
94'x58' COFFERDAM
104'x27' COFFERDAM
NORTH POINT PARK
DUCK BOAT RAMP
SEAWALL
100' BUFFER ZONE
DOCK AND RAMP STRUCTURE TO BE REMOVED DURING CONSTRUCTION AND REPLACED
EDGE OF PROPOSED BRIDGE STRUCTURE
CHARLES RIVER
CITY OF CAMBRIDGE MIDDLESEX COUNTY
TIMBER PILES TO BE REMOVED AT MUDLINE (TYP.) ALL PILES NORTH TRESTLE
25' RIVERFRONT AREA
LIMITS OF SOUTH TRESTLE
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
LIMITS OF NORTH TRESTLE
TOWER A
100' BUFFER ZONE
TEMPORARY CONTROL TOWER
CITY OF BOSTON SUFFOLK COUNTY
LIMITS OF FENDER
BANK/LIMIT OF WATERWAY
TIMBER PILES TO BE REMOVED AT MUDLINE (TYP.) ALL PILES SOUTH TRESTLE
SEAWALL
12-PILE DOLPHINS TO REMAIN
LIMITS OF OVERHEAD STRUCTURE (LEVERETT CONNECTOR)
25' RIVERFRONT AREA
NORTH BANK BRIDGE
MILLERS RIVER
* See Figure A8 for piles to be fully removed by vibratory hammer due to conflict with proposed new structure installation
ANTICIPATED LIMITS OF DREDGING FOR CAISSON REMOVAL SPOIL
ANTICIPATED LIMITS OF IMPACT FOR FENDER PILES EXTRACTION
ANTICIPATED LIMITS OF DREDGING FOR BOTTOM-LAID CABLE REMOVAL
CAISSONS REMOVED AT MUDLINE
LIMIT OF WATERWAY
25' RIVERFRONT AREA
100' BUFFER ZONE
RIVERBED IMPACTS DURING DEMOLITION
SCALE: 1" = 30'
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
NORTH STATION DRAW 1 BRIDGE REPLACEMENT
MBTA CONTRACT NO. H32PS01
DREDGING & PILES TO BE REMOVED
STV
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
Figure A7
Horiz. SCALE 1" = 30'
Vert. SCALE 1" = 30'
DATE: OCT. 29, 2021


LEGEND
15 inch diameter piles for existing trestles to be fully removed by vibratory hammer due to existing location conflicting with proposed new structure installation.
NAVIGATION LIGHTS (TYP.)
LIMITS OF PLATFORM (TYP.)
16"φ COMPOSITE TIMBER PILES @ 5'-0" SPACING (TYP.)
CHARLES RIVER
FLOW
7-PILE DOLPHIN (TYP.)
STA. 16+57.72
STA. 17+08.96
CONSTRUCTION ℄
15+00
16+00
17+00
18+00
19+00
LIMITS OF OVERHEAD STRUCTURE
FENDER PLAN
SCALE: 1/16" = 1'-0"
NOTES:
1. FENDER SYSTEM SHOWN DOES NOT INCLUDE TEMPORARY COMPONENTS REQUIRED FOR CONSTRUCTION STAGING AS SHOWN IN SHEETS CS-0114 THROUGH CS-1914.
2. SEE DEMOLITION PLAN FOR FULL LIMITS OF EXISTING FENDER SYSTEM AND DOLPHINS TO BE REMOVED.
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
NORTH STATION DRAW 1 BRIDGE REPLACEMENT
MBTA CONTRACT NO. H32PS01
Existing Piles to be Removed by Vibratory Hammer
Figure A8
BR-S-39

2.3.7 Construction Staging Areas

Construction staging areas, also referred to as “laydown areas,” are sites used for storage of materials or equipment, assembly, or other temporary construction-related activities. Staging areas are typically fenced for security and to protect the public, have gates to allow vehicle access, take deliveries, and are often lighted for security. Staging areas of adequate size and proximity to the work activities are essential to support construction activities.

One construction staging area is an existing MBTA commuter rail material storage yard and maintenance staging area known as the “T-Pad.” The T-Pad is located at 28 Inner Belt Road, in Somerville, Massachusetts, which is north approximately 5,000 feet on rail from the center of the Charles River (**Figure A3** on page 14 above).

The T-Pad site currently contains a bridge and building shop as well as track material storage and MBTA Operations staging area to support MBTA Commuter Rail maintenance, but these uses would be temporarily relocated during Proposed Project construction. The T-Pad yard has a direct connection into the existing track network throughout the Project Site. The site’s rail proximity would allow for equipment to get on and off rail on uncontrolled track, thereby not delaying MBTA Commuter Rail operations. This close proximity also enables ballast cars and flat cars to be loaded to move track materials from the laydown area to the project construction sites.

Additional laydown areas would be located in construction zones based on the track phasing. During the construction of the movable spans, the two tracks that connect to the bridge under construction, immediately north of the bridges, would be out of service and can be used for onsite laydown areas during each phase.

If the construction contractors choose to use staging areas that differ from those identified herein, they will be required to obtain all the necessary permits and approvals from federal, state and local regulatory agencies. This would include any remote staging areas for loading barges with material and equipment, or for partial preassembly.

2.4 In-water Construction Details

The overall footprint within which bottom disturbance could occur is shown in **Figure 2** on page 3 above.

2.4.1 Demolition

The existing bridge superstructure would be sequentially demolished using cranes mounted on the temporary trestle and/or barges. This section of the bridge currently above the water will be kept above the water throughout demolition. In-water demolition activities are described below.

2.4.1.1 Caisson Removal

To remove the foundations/caissons of the currently unused bridge structures within the navigational channel, sediment would be excavated to a depth of five feet below mudline, while caissons at the bridge would be cut at the mudline to minimize sediment disturbance. Wire saw cutting, cutting torches, or other mechanical means would be used to cut metal and pneumatic hammers or other tools chosen by the contractor would be used to break up and remove the concrete.

Two cofferdams may be installed to support caisson removal. One approximately 98-foot by 58-foot cofferdam would surround the set of eight caissons on north side of channel, and a second approximately 104-foot by 27-foot cofferdam would encapsulate the three caissons that supported the "rest piers" on south side of channel. Cofferdam installation using a vibratory hammer or impact hammer would be conducted from a barge prior to the construction of the temporary trestle and would take approximately one week. The cofferdams would not be dewatered but would be closed to contain debris and disturbed sediment. Cofferdam sheet piles would also be removed via vibratory or impact hammer. As needed, silt curtains or other methods of minimizing sediment dispersal would be installed around the cofferdams during their removal. It is anticipated that each cofferdam would be in place for approximately four months during the Site Preparation and Mobilization construction phase.

2.4.1.2 Timber and Steel Pile Removal

Timber piles would be removed by cutting the piles three feet below the mudline or defined bottom channel. Full removal would be undertaken where piles conflict with the proposed structure and the remaining piles would be cut at the mudline and placed on a barge for upland disposal (**Figure A7** on page 23). A pneumatic shear would cut the pile, while an excavator or other device with a grapple would connect to the pile and lift it out of the water and onto a barge. If positioning pneumatic shear equipment for cutting steel is determined to be difficult, piles may be cut using a thermal or arc process or mechanical methods. Piles would be properly disposed of or considered for reuse (e.g., dried, chipped and used for biofuel). See **Table 2** for details on the timber and steel pile removal.

Table 2. Removals by Vibratory Hammer

<table>
<tr><th>Figure No.</th><th>Structure (action)</th><th>Size & Diameter</th><th>Duration of Work</th><th>Technique</th></tr>
<tr><td>A7</td><td>48 Existing Bridge Trestle piles removed</td><td>• 15" diameter
• timber</td><td rowspan="3">• 15 days to remove all ~86 piles in this table</td><td rowspan="3">• 3 to 6 piles per day
• 30 minutes of vibratory hammer per pile</td></tr>
<tr><td>A6</td><td>22 Existing Navigational Fender piles removed</td><td>• 15" diameter
• timber</td></tr>
<tr><td>A6</td><td>16 MGH dock and ramp piles removed</td><td>• 24" diameter (conservative est.)
• Steel or fiberglass</td></tr>
</table>

2.4.1.3 Bottom-laid Cable Removal

While the cable comprises a bottom-laid system on the riverbed, portions of the cable may have settled into the underlying sediments. Therefore, cable removal may require excavation of any overlaying sediments to a sufficient depth to either expose the cable or allow it to be pulled out of a partially excavated trench. The removed cable would be placed on a barge for proper upland disposal or recycling.

2.4.2 Dredging

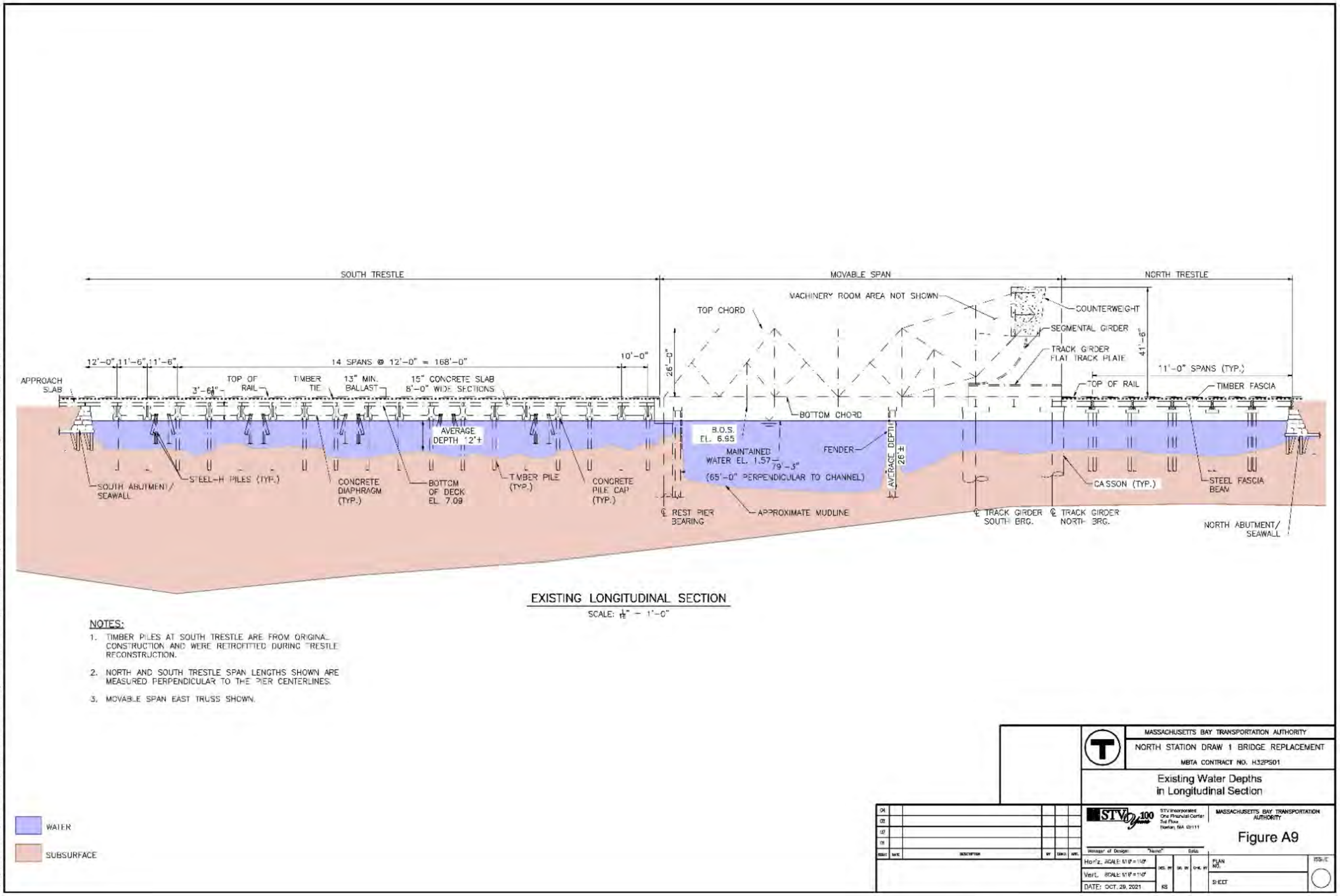
This section describes all activities that remove structures or soil from the riverbed.

Dredge volume includes the volume of existing piles and structures removed in addition to removed sediments. The estimated dredge volume associated with bridge and approach trestle demolition and construction totals 2,689 cubic yards of riverbed material (**Figure A7** on page 23 and **Figure A8** on page 24). Volumes of sediment to be dredged by project stage is presented in **Table 3**. The estimated fill volume for drilled shafts is 1,487 cubic yards (**Figure A6** on page 20). The estimated total temporary surface area disturbance of the riverbed associated with Proposed Project demolition and construction is 30,912 square feet (0.71 acres), and the estimated total area of permanent fill to be placed in the riverbed from all construction activity is 11,411 square feet (0.26 acres).

Dredging would involve removing underwater sediment via barge-mounted bucket excavator or clamshell dredge. Excavated sediment would be loaded onto containment barges for proper disposal, most likely at a contained landfill suitable for receipt of contaminated soils.

Sediment-disturbing activities during Proposed Project demolition and construction would include:

1. Existing structure demolition
    a. Demolition of existing caissons (21 total: 11 for previous bridges not in service, 10 for current bridges in service), including the optional installation of temporary cofferdams around previous bridge caissons as determined by the contractor.
    b. Pile extraction and/or cutting of existing MGH dock and ramp, bridge trestles, and navigational channel fender system piles (**Figure A4** on page 17**, Figure A6** on page 20, **Figure A7** on page 23, and **Figure A9** on page 28)
    c. Bottom-laid cable removal.
2. Proposed structure construction
    a. Installation of temporary work trestle system
    b. Construction of proposed bridge drilled shafts and trestle piles, MGH dock and ramp replacement piles, and navigational channel fender piles.
    c. Existing riverbed dredging - Dredging is proposed for areas outside of the proposed fender system that now may be in the assumed travel path for vessels traversing the channel and are no longer protected by the existing fender to ensure the required depth of the navigational channel.
    d. Construction of the king (sheet) pile abutments along the north and south seawalls
3. Proposed temporary structure demolition impacts.
    a. Temporary work trestle piles extraction


SOUTH TRESTLE
MOVABLE SPAN
NORTH TRESTLE
MACHINERY ROOM AREA NOT SHOWN
TOP CHORD
COUNTERWEIGHT
SEGMENTAL GIRDER
TRACK GIRDER
FLAT TRACK PLATE
41'-6"
11'-0" SPANS (TYP.)
TOP OF RAIL
TIMBER FASCIA
12'-0" 11'-6" 11'-6"
14 SPANS @ 12'-0" = 168'-0"
10'-0"
26'-0"
APPROACH SLAB
TOP OF RAIL
TIMBER TIE
13" MIN. BALLAST
15" CONCRETE SLAB 8'-0" WIDE SECTIONS
BOTTOM CHORD
AVERAGE DEPTH 12'±
B.O.S. EL. 6.95
MAINTAINED WATER EL. 1.57
79'-3"
(65'-0" PERPENDICULAR TO CHANNEL)
FENDER
AVERAGE DEPTH 26'±
SOUTH ABUTMENT/ SEAWALL
STEEL-H PILES (TYP.)
CONCRETE DIAPHRAGM (TYP.)
BOTTOM OF DECK EL. 7.09
TIMBER PILE (TYP.)
CONCRETE PILE CAP (TYP.)
℄ REST PIER BEARING
APPROXIMATE MUDLINE
℄ TRACK GIRDER SOUTH BRG.
℄ TRACK GIRDER NORTH BRG.
CASSON (TYP.)
STEEL FASCIA BEAM
NORTH ABUTMENT/ SEAWALL
EXISTING LONGITUDINAL SECTION
NOTES:
1. TIMBER PILES AT SOUTH TRESTLE ARE FROM ORIGINAL CONSTRUCTION AND WERE RETROFITTED DURING TRESTLE RECONSTRUCTION.
2. NORTH AND SOUTH TRESTLE SPAN LENGTHS SHOWN ARE MEASURED PERPENDICULAR TO THE PIER CENTERLINES.
3. MOVABLE SPAN EAST TRUSS SHOWN.
WATER
SUBSURFACE
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
NORTH STATION DRAW 1 BRIDGE REPLACEMENT
MBTA CONTRACT NO. H32PS01
Existing Water Depths in Longitudinal Section
STV
Figure A9
DATE: OCT. 29, 2021

A summary of the dredging and fill estimates for the various elements of the Project is provided in **Table 3**, below.

Table 3. Dredge/Excavation Volumes and Surface Area Permanent Impacts Associated with the Draw One Bridge Replacement

Figure No.	In Water Activity (Below MHW/OHW)*	Demolition (D) and Construction (C) Impacts			
		Dredge Volume (CY)	Fill Volume (CY)	Temporary Riverbed Disturbance (SF)	Perm Fill in Riverbed (SF)
Demolition					
A4 & A7	Removal of Caissons from Bridge Not In Service[1]	386	0	694	0
A7	Removal of Bridge Trestle and Fender Timber Piles (16-inch) & Trestle Steel H-piles (piles cut off)	1567	0	11,122	0
A7 & A8	Removal of Timber Trestle Piles (piles extracted)[3,5]	143	0	86	0
A4 & A7	Removal of Caissons from Bridge Not In Service with Optional Cofferdams and Bridges In Use[2]	500	0	8,260	0
A7	Bottom-Laid Cable Removal	10	0	3,800	0
A7	MGH Dock and Ramp 24-inch Pile Removal	84	0	50	0
	Total for Demolition (6 lines above)	2,689	0	24,012	0
Construction					
A6	Drilled Shafts[4]	941	1,487	0	462
A6	Micropiles for King Pile Abutment	77	96	0	35
A6	New Bridge 30-inch Trestle Piles and 16-inch Navigational Channel Fender Piles	0	1,149	0	1,865
A6	Temporary Work Trestle 30-inch Pile Installation[6]	0	900	1,600	0
A6	Riverbed Dredging to get Navigational Channel to Correct Depth	220	0	3,700	0
A6	Tremie Pour Behind King Pile Abutment North and South Seawalls[7]	0	1,200	0	9,000
A6	MGH Dock and Ramp 24-inch Pile Replacement	0	84	0	50
	Construction (7 lines above)	1,238	4,915	5,300	11,411
Additional Demolition					
A6	Temporary Work Trestle 30-inch Pile Extraction[8]	900	0	1,600	0
Total Loss or Alteration of Resource Area		**4,827**	**4,915**	**30,912**	**11,411**

Table 3. Dredge/Excavation Volumes and Surface Area Permanent Impacts Associated with the Draw One Bridge Replacement

Figure No.	In Water Activity (Below MHW/OHW)*	Demolition (D) and Construction (C) Impacts			
		Dredge Volume (CY)	Fill Volume (CY)	Temporary Riverbed Disturbance (SF)	Perm Fill in Riverbed (SF)
Combined Total		9,742		42,323	
Total with added 10% Dredge Volume and Fill Area Factor of Safety for Permitting Purposes		10,716		46,555	

[1] Cut at mudline. Existing piles and caissons not located where new construction is proposed are to be removed at the mudline (dredging impact = 0).
[2] Existing caissons within the proposed navigational channel are to be removed 5 feet below mudline at 1:3 slope.
[3] Existing piles located where new construction is proposed are to be removed using vibratory hammer extraction method.
[4] Drilled shafts assumed to extend 60 feet below mudline.
[5] Includes North & South Approach Trestles. Piles assumed to extend 25 feet below mudline.
[6] Layout of temporary work trestle may change based on contractor approach to Project construction, to be determined. Impacts are multiplied by 2 due to uncertainty in the final layout.
[7] Assumes no fill below mudline for tremie pour.
[8] Volume of temporary trestle piles removed; surface area included in Figure A7 on page 23. Removal assumed to use vibratory hammer extraction method. Impacts are multiplied by 2 due to uncertainty in the final layout.

*These activities are not changing the nature of the land. The final conditions would be essentially the same as existing conditions.

2.4.2.1 Drilled Shaft Installation

The movable span would be supported on piers, which in turn would be supported on concrete drilled shafts installed through the sediment directly into bedrock. Each of the 12 drilled shafts would be 7 feet in diameter. Other than a momentary disturbance when each casing is first lowered onto the channel bottom, sediment disturbance during installation would only occur within the enclosed shaft casing. The casing is essentially the formwork for the concrete drilled shaft, and both the casing and drilled shaft would be permanent.

During drilling activity within the shaft, sediments would be moved within and up the casing to the drilling equipment, and would not enter the water. As the drilling continues, the casing would continue to advance downward into the sediment until the casing is seated on bedrock. A rock socket would then be drilled into the bedrock in a similar manner. Concrete would be pumped into the casing to finish construction of the drilled shaft. Concrete placement for the proposed drilled shafts would be undertaken using a pump truck on a temporary trestle. See **Figure A10** on page 32 below for the Proposed Water Depths in Longitudinal Sections.

2.4.2.2 King Pile Abutment

King pile abutment installation would comprise installing pipe piles with sheet piles between them, both driven beyond the mudline to form a wall structure. A concrete abutment cap would be cast on top of the wall created by the pipe and sheet piles and concrete would be placed between the sheet pile and pipe pile wall and abutment cap and the existing seawall using the tremie pour technique to reduce concrete washout from the surrounding water. The tremie pour will also allow concrete to fill underneath the existing seawall extending the seawall. The extended seawall and sheet pile and pipe pile wall formed together with the concrete would comprise the abutment portion of the bridge on the riverbank. Pipe piles and sheet piles would be driven by pneumatic hammer or vibratory hammer, or a combination of both, depending on subsurface conditions.

Additional information on the pipe and sheet piles for the king pile abutment is in **Table 4** and **Figure A10** on page 32 below.

2.4.2.3 Fender, Trestle Piles, and Temporary Piles Installation

The proposed fender system would line both sides of the navigational channel under the bridge, acting as a “guard rail” for boats, barges, and other vessels to help avoid collisions into, or allisions with, the new bridge that would compromise its structural integrity and damage vessels. Twelve seven-foot-diameter drilled shafts are proposed for the new bridge structures. The proposed fenders would be made up of 207 sixteen-inch diameter composite piles. 321 30-inch-diameter piles and 39 13-inch-diameter micropiles for the approach trestles would be driven to an adequate depth to provide the required lateral capacity for the new bridge structures. 16 24-inch steel piles would be installed to support the replacement MGH ramp and dock (**Figure A6** on page 20). A quantity of 167, thirty-inch diameter piles would be driven to provide temporary trestles for the required load capacity to support the contractor’s equipment. As identified below in **Table 4**, piles will be driven either by a crane mounted pneumatic hammer or vibratory hammer. See **Table 4** for details on the installation of navigational channel fender piles, approach trestle piles, and temporary contractor trestle piles.

The temporary work trestles will be removed towards the end of construction once they are no longer required to support construction (**Figure A5** on page 19 and **Figure A6** on page 20). See **Table 5** for details on the removal of the temporary trestle piles post construction.

2.4.2.4 Pier Caps

Prefabricated steel/concrete formwork frames would be installed on the drilled shafts and act as the form for the pier caps. Concrete placement for the pier caps above mean high water (MHW) would likely be performed using a concrete pump truck.

2.5 Vessel Activity

While not definitive since a construction contractor has not been selected, construction is likely to primarily involve barges and tugboats, small work boats (25 feet in length), and occasional shallow draft material supply vessels operating between staging areas and the Project Construction Site. In most instances, construction support vessels coming from Boston Harbor are likely to move slow speeds, less than ten knots. Transit routes are unknown at this time but are likely to be either from staging areas in East Boston or Quincy/Weymouth based on the limited number of contractors that are qualified to undertake work specific to a movable bridge.

In addition, Boston hosts a commercial fishing fleet and has port facilities for oil tankers, liquid natural gas (LNG) tankers, container ships, and cruise ships. While exact numbers cannot be known since vessel tracking is not performed across all vessel types, it is likely that the baseline vessel activity between potential home ports and/or staging areas in Weymouth/Quincy and Boston/East Boston and the Charles River is well in excess of several thousand transits per year. It is estimated that Project-related construction vessel transits would number in the hundreds during Proposed Project construction.

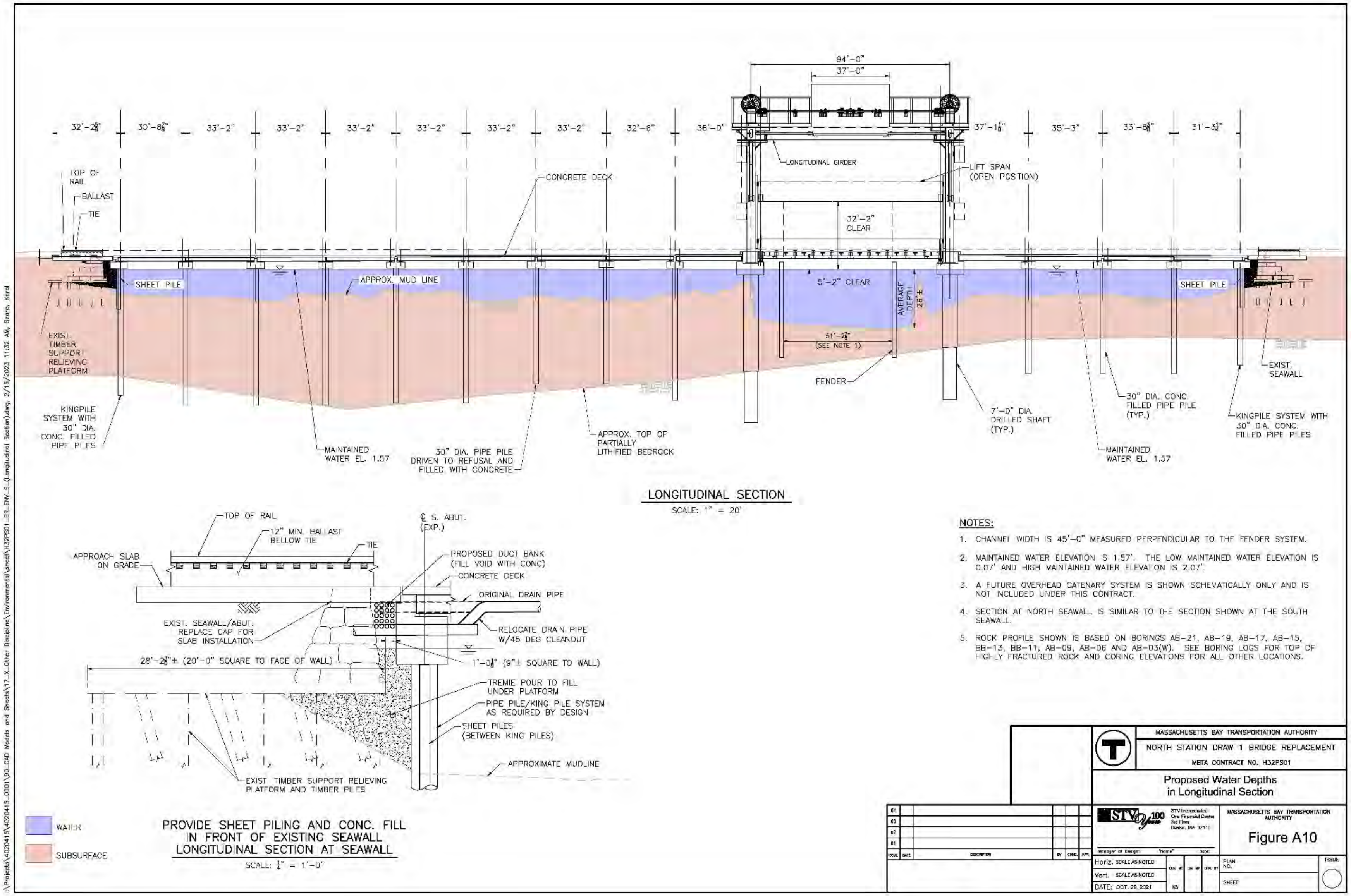

LONGITUDINAL SECTION
SCALE: 1" = 20'
PROVIDE SHEET PILING AND CONC. FILL IN FRONT OF EXISTING SEAWALL LONGITUDINAL SECTION AT SEAWALL
SCALE: ½" = 1'-0"
NOTES:
1. CHANNEL WIDTH IS 45'-0" MEASURED PERPENDICULAR TO THE FENDER SYSTEM.
2. MAINTAINED WATER ELEVATION IS 1.57'. THE LOW MAINTAINED WATER ELEVATION IS 0.07' AND HIGH MAINTAINED WATER ELEVATION IS 2.07'.
3. A FUTURE OVERHEAD CATENARY SYSTEM IS SHOWN SCHEMATICALLY ONLY AND IS NOT INCLUDED UNDER THIS CONTRACT.
4. SECTION AT NORTH SEAWALL IS SIMILAR TO THE SECTION SHOWN AT THE SOUTH SEAWALL.
5. ROCK PROFILE SHOWN IS BASED ON BORINGS AB-21, AB-19, AB-17, AB-15, BB-13, BB-11, AB-09, AB-06 AND AB-03(W). SEE BORING LOGS FOR TOP OF HIGHLY FRACTURED ROCK AND CORING ELEVATIONS FOR ALL OTHER LOCATIONS.
WATER
SUBSURFACE
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
NORTH STATION DRAW 1 BRIDGE REPLACEMENT
MBTA CONTRACT NO. H32PS01
Proposed Water Depths in Longitudinal Section
Figure A10
DATE: OCT. 28, 2021

Table 4. Installation of Piles by Impact Hammer

Structure (action)	Size & Diameter	Duration of Work	Technique
New Bridge Trestle piles (installation)	• 30" diameter • Steel	• Phase 1: 49 days • Phase 3: 19 days • Phase 4: 11 days • Phase 6: 60 days • Phase 8: 16 days • Phase 10: 121 days	• 3 to 5 piles per day • 6000 blows per day; 2000 blows per pile • 5 days a week and 8 hours per day
Contractor Temporary Trestle piles (installation) [1, 2]	• 30" diameter • Steel	• Southwest temp trestle: 22 days[1] • Northwest temp trestle: 14 days[1] • Southeast temp trestle: 25 days[2] • Northeast temp trestle: 16 days[2]	• 3 to 5 piles per day • 6000 blows per day; 2000 blows per pile • 5 days a week and 8 hours per day
New Navigational Channel Fender piles (installation)	• 16" diameter • Solid fiberglass plastic	• 35 days	• 3 to 5 piles per day • 6000 blows per day; 2000 blows per pile • 5 days a week/8 hours per day
Replacement MGH dock and ramp (replacement)	• 24" diameter (conservative) • Steel	• 16 piles, 4 days	• 3 to 5 piles per day • 6000 blows per day; 2000 blows per pile • 5 days a week and 8 hours per day

Table 4. Installation of Piles by Impact Hammer

Structure (action)	Size & Diameter	Duration of Work	Technique
Sheet Pile for King Pile Abutment	• 24" diameter (conservative) • Steel	• 132 piles, 16 days	• 6 piles per day • 20 strikes per pile • 5 days a week and 8 hours per day • Installed alternating between pipe piles (below)
Pipe pile for King Pile Abutment	• 30" diameter (conservative) • Steel	• 49 piles, 17 days	• 3 piles per day • 6000 blows per day; 2000 blows per pile • 5 days a week and 8 hours per day • Installed alternating between sheet piles (above)
Temporary sheet piles for cofferdams[3]	• 24" diameter (conservative) • Steel • No pipe piles in the cofferdam	• 250 piles, 15 days	• 15 to 20 piles per day • 200 strikes per pile • 5 days a week and 8 hours per day

Notes:

[1] Temporary work trestles on the west side of the bridges will be in place for approximately 6 years before being removed.

[2] Temporary work trestles on the east side of the bridges will be in place for approximately 4 years before being removed.

[3] Temporary sheet piles for the cofferdams will be in place for approximately 4 months before being removed.

Table 5. Vibratory Removal of Temporary Trestle Piles

Structure (action)	Size & Diameter	Duration	Technique
Contractor Temporary trestle piles (removal)	• 30" diameter • Steel	• Southwest temp trestle: 22 days • Northwest temp trestle: 14 days • Southeast temp trestle: 25 days • Northeast temp trestle: 16 days	• 3 to 6 piles per day • 30 minutes of vibratory hammer per pile
Temporary sheet piles for cofferdams	• 24" diameter • Steel	• 250 piles, 15 days	• 15 to 20 piles per day • 20 minutes of vibratory hammer per pile

2.6 Operation

Once construction is finished, bridge operations would be similar to current operations except that there would be six tracks crossing the river on three bridge structures instead of four tracks crossing the river on two bridge structures today. The Proposed Project is intended to bring the Draw One Bridge to a state of good repair, reducing the need for in-water repair and unscheduled maintenance activities.

3.0 Conservation Measures

3.1 Time of Year (TOY) Restrictions

TOY restrictions for the Proposed Project's construction schedule are proposed as a method of offsetting potential construction-period effects, as discussed in more detail in Section 3.0.

The DMF released Technical Report TR-47, *Recommended TOY for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts* in April 2011, revised January 2015 (Evans et al., 2015), in which the recommended TOY restrictions for any in-water construction work are listed. Five of the 26 EFH-designated species in the vicinity of the Proposed Project have associated TOY restrictions, including Atlantic cod (*Gadus morhua*), winter flounder (*Pseudopleuronectes americanus*), Atlantic surfclam (*Spisula solidissima*), longfin inshore squid (*Doryteuthis pealeii*), and northern shortfin squid (*Illex illecebrosus*). **Table 6** presents managed EFH species and NOAA Fisheries Trust Resource Species with the TR-47-recommended spring and fall TOY restrictions for each, in the Project region. NOAA Fisheries Trust Resource Species potentially present in the Project Activity Area with spring and fall TOY restrictions include alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), white perch (*Morone americana*) and American eel (*Anguilla rostrata*).

Table 6. EFH and NOAA Fisheries Trust Resource Species with Construction TOY Restrictions in the Project Activity Area[1]

Species	Spring TOY Restrictions	Fall TOY Restrictions
EFH Listed Species		
Atlantic cod	April 1 – June 30	Dec. 1 – Jan. 31
Winter flounder	Feb. 15 – June 30	-
Atlantic surfclam[2]	June 15 – Oct. 15	-
Longfin inshore squid	April 15 – June 15	-
Northern shortfin squid[2]	June 15 – Oct. 15	-
NOAA Trust Resource Species - Diadromous		
Alewife	April 1 – June 15	Sept. 1 – Nov. 15
Blueback herring	April 1 – June 30	Sept. 1 – Nov. 15
American shad	May 1 – July 15	Sept. 30 – Oct. 31
Rainbow smelt	March 1 – May 31	-
White perch	April 1 – June 15	-
American eel	March 15 – June 30	Sept. 15 – Oct. 31

[1]Source: DMF Technical Report TR-47 (Evans et al., 2015).

[2]Species are not expected to be present within the Project Activity Area and have been categorized as Category III below (See Section 6.1 for additional information), therefore TOY Restrictions for them are not proposed to be implemented into the Project BMPs and are not discussed further.

Table 7 below lists construction activities, construction methods, and the TOY restrictions per email recommendation from NOAA Fisheries dated May 4, 2021 (**Appendix B**). As noted in the table below, MBTA is committed to implementing TOY restrictions on all major silt-producing activities. MBTA shall schedule major silt-producing construction activities outside the TOY restriction periods and use silt curtains during the rest of the year for those activities. For any minor silt-producing activities that would occur during a TOY restriction, MBTA shall require the use of silt curtains to minimize impacts from silt.

Table 7. TOY by Construction Activity

Activity	Construction method	TOY Restriction[1,2]
Major Silt-Producing Activities		
Channel dredging	Dredge	February 15 to July 15 September 1 to November 15
Remove existing caissons	Dredge around caissons and cut off/demolish as required.	February 15 to July 15 September 1 to November 15
Remove existing piles where required	Extract existing piles	February 15 to July 15 September 1 to November 15
Remove temporary piles for construction trestle or any sheet pile cofferdams if used.	Extract temporary piles and sheet piles	February 15 to July 15 September 1 to November 15
Minor Silt-Producing Activities		
Remove surface laid submarine cables	Lift surface laid cable	If performed February 15 through July 15 or September 1 through November 15, silt curtain or other device is required.
Install temporary piles for temporary construction trestle or sheet pile cofferdams if used.	Drive piles or sheet piles	If performed February 15 through July 15 or September 1 through November 15, silt curtain or other device is required.
Install pipe piles for approach trestles	Drive piles	If performed February 15 through July 15 or September 1 through November 15, silt curtain or other device is required.
Install sheeting and piles at abutments	Drive piles and sheet piles	If performed February 15 through July 15 or September 1 through November 15, silt curtain or other device is required.
Install Drilled Shafts for lift spans	Install drilled shaft	If performed February 15 through July 15 or September 1 through November 15, silt curtain or other device is required.
Install navigational channel fender system	Drive piles	If performed February 15 through July 15 or September 1 through November 15, silt curtain or other device is required.
Anchoring of barges	Spud, jack-up or anchor moored barges (temporary)	None

Table 7. TOY by Construction Activity

Activity	Construction method	TOY Restriction[1,2]
[1]NOAA Fisheries Trust Resource Species TOY restrictions for upstream passage for spawning and migratory fish known to be within the Project Activity Area (**Table 6**). [2] Based on recommendation from NOAA Fisheries email **(Appendix B**).		

The effects of the minor silt-producing activities described in **Table 7** above will be controlled with measures including, but not limited to, silt curtains or potential cofferdams (at the discretion of the contractor), and water quality monitoring requirements if performed during TOY restriction dates pursuant to an email recommendation from NOAA Fisheries dated May 4, 2021 (Appendix B). Furthermore, during the TOY restrictions, the contractor will be required to maintain and allow free flow and fish passage through 75% of the river channel within the work site. This will allow any fish able to pass through the upstream and downstream dams to move through the work site.

3.2 Best Management Practices

MBTA's construction contractor will be required to implement standard construction practices and follow TOY restrictions for certain in-water activities. Restrictions on the proposed construction activity are expected to include the following which will be incorporated into the Project plans and specifications as contract requirements:

1. Piles in the area where new portions of the bridge structures will be installed must be fully removed from the riverbed. Piles within the navigational channel are to be cut off three feet below the defined bottom of channel. However, the majority of the existing piles will be cut at the mudline rather than below the mudline to minimize sediment disturbance. This activity will not be subject to TOY restrictions because it is not considered a silt-producing activity.
2. MBTA will develop a Project-specific National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP) to describe BMPs that will be implemented during construction to control erosion and contain and treat stormwater runoff generated during construction. If necessary, construction dewatering will be undertaken in compliance with the NPDES requirements for these types of activities.
3. To reduce and mitigate the risk of spills, boats, barges, and construction equipment will have spill kits readily available to address small accidental spills. Reporting of accidental spills will be done in accordance with state and federal regulations and a Project-specific Spill Prevention, Control and Countermeasures (SPCC) Plan will be developed and incorporated into contract specifications.
4. As currently contemplated, construction methods entail the use of an impact hammer, which may produce underwater noise levels (peak and SEL_{cum} [cumulative sound exposure levels]) that exceed the behavioral disturbance threshold for aquatic species. Therefore, ramp-up procedures for impact hammers, also known as a “soft start,” shall be used before continuing with the activity. The contractor will be required to employ a ramp-up period of at least 60 seconds to gradually increase sound intensity of pile driving activities, allowing species to leave the work zone. This is measure is expected to minimize underwater noise levels generated during construction activities.

3.3 Environmental Compliance and Monitoring

MBTA would also require the construction contractor to implement an environmental monitoring program overseen by a Construction Supervisor and an Environmental Monitor, both of whom would be responsible for daily inspections of work areas that would note any potential effects and recommend measures to address them. The Construction Supervisor, working with the Environmental Monitor, will be on site daily to perform inspections and will have “stop work” authority to address observed or reported infractions of required standards and procedures that pose a threat to aquatic habitat and potential inhabitants. The Environmental Monitor would confirm compliance with permit and other regulatory requirements and inspect the work area for sediment and erosion to minimize the potential for sediment-laden water to drain into the river and increase turbidity for fish.

Construction crews will be trained prior to the start of work to recognize and respond to changing field conditions, particularly as they relate to fisheries, and prevent sedimentation, unauthorized stormwater runoff, accidental spills, and releases of fuel, lubricant, grease, or oil.

4.0 PROJECT ACTIVITY AREA DESCRIPTION

4.1 Physical Characteristics

The Project Site is located near the mouth of the Charles River, within the Charles River Basin. The Charles River is approximately 79.5 miles long and the Project Site, where the direct footprint of the work is located, is approximately 0.75 miles from its confluence with Boston's Inner Harbor. The Project Site is surrounded by a densely developed urban environment characterized by limited access highways, commercial businesses, a sand and gravel facility, a rail station, a hospital, and protected open spaces, such as mowed parkland, along the Charles River. The Charles River channel is situated in an east-west orientation under the Draw One Bridge and hardened with sea walls on each bank. Marinas and moorings are located upstream of the Draw One Bridge and the Charles River Dam and Locks are located downstream (**Figure 2** on page 3).

The Project Activity Area includes waterbodies surrounding the Project Site that may experience effects such as temporary increases in turbidity and noise during construction. It includes the upstream and downstream portions of the Charles River and the confluence of the Millers River as it flows into the Charles River just downstream of the Draw One Bridge (**Figure 2** on page 3). The Project Activity Area, approximately 27 acres, encompasses a majority of the Project components (with the exception of vessel traffic) and includes the Charles River from the Charles River Dam Road out to the Charles River Dam Locks (described below).

The Millers River flows into the Charles River immediately north and east of the Project Site. The exposed, or daylighted, portion of the river emanates from a culvert approximately 1,200 feet (366 meters) upstream to the north of the Draw One Bridge. The modern-day Millers River is a remnant of what used to be a much longer river; owing to development, most of the river now flows through culverts. The exposed portion of the river is located under the Leverett Circle Connector Bridge. Though there is some riparian corridor along the current extent of the Miller River, a majority of its extent has been hardened with riprap under overpasses and highway infrastructure. Therefore, this area is highly disturbed habitat.

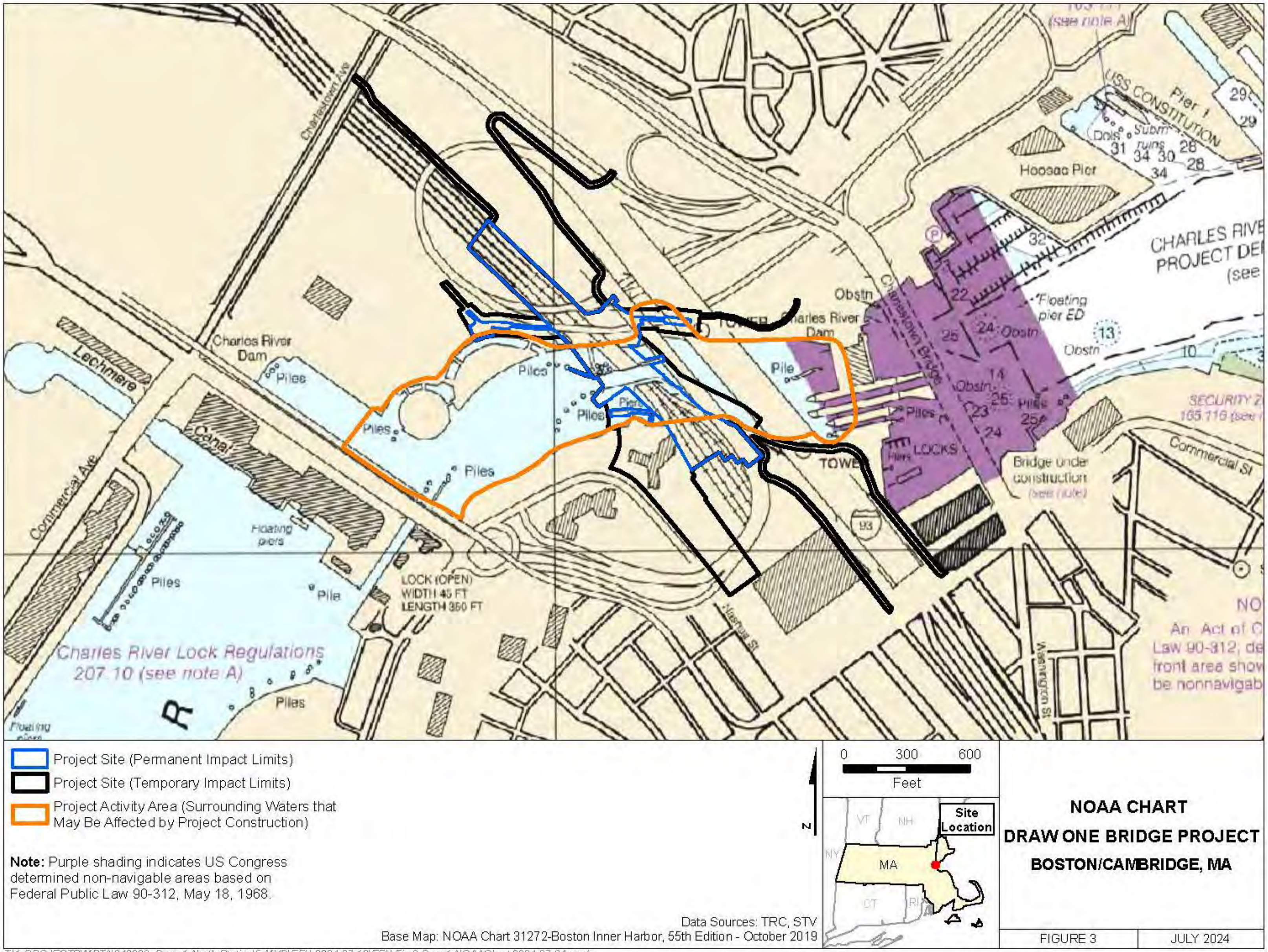
The Project Site is located in the lower portion of the Charles River Basin, which separates Boston and Cambridge. Although historically tidal, this portion of the river was cut off from the ocean by the Charles River Dam and Locks, which turned the river into a basin. The water level of the portion of the Charles River Basin that contains the Project Site is controlled by DCR via the Charles River Dam and Locks and is associated with seasonal flows within the Charles River as well as stormwater flows.

The Charles River Dam and Locks were constructed in 1978 and are operated by DCR. The locks are located 700 feet (213 meters) downstream of the Project Site and within the Project Activity Area, just west of the North Washington Street (Route 99) bridge. One of the three locks is wider than the other two to accommodate the occasional passing of larger vessels. These concrete and steel structures create a physical barrier largely preventing the upstream flow of water from the Boston Inner Harbor into the Charles River (Brady et al., 2005).

The Charles River Dam and Locks operate 24 hours a day. The locks remain closed, however, for the vast majority of any given 24-hour period. Openings occur much less frequently during winter months than during summer months, reflecting the seasonal nature of the recreational boat traffic that generates most openings.

The Charles River is home to numerous freshwater fish species, including golden shiner (*Notemigonus crysoleucas*), yellow perch (*Perca flavescens*), bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), largemouth bass (*Micropterus nigricans*), redbreast sunfish (*Lepomis auratus*), black crappie (*Pomoxis nigromaculatus*), white sucker (*Catostomus commersonii*), chain pickerel (*Esox niger*), redfin pickerel (*Esox americanus americanus*), smallmouth bass (*Micropterus dolomieu*), and pumpkinseed (*Lepomis gibbosus*) (CRWA, 2003). It is also home to a few diadromous or migrating species, as described in Section 6.2 below.

Fish can pass through the lock system when it is opened, but the variability of opening frequency throughout the year affects fish passage, which is therefore also highly variable. A vertical slot fishway/ladder alongside the locks enables passage of migratory finfish (Brady et al., 2005). The fish ladder was installed in 1978 and modified in the early 1990s to improve its functioning. It is 170 feet (52 meters) long, with 29 slots (Brady et al., 2005). The condition of the fish ladder was considered to be “fair” and its function was deemed “not passable” in the January 2005 Technical Report TR-18 released by the DMF. A NOAA Fisheries navigation chart excerpt has been provided as **Figure 3** on page 43.



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4.2 Description of the Aquatic Habitat

4.2.1 Currents and Tides

At the location where the Draw One Bridge crosses the Charles River, the River has a relatively slow-moving current owing to the Charles River Dam Locks, which changed the formerly tidal character of the Project Site. Currents under the bridge vary based on seasonal flow levels in the Charles River, as well as pre- and post-storm conditions, such as tides, wind, etc. Lock openings and some leakage create a bottom-oriented salt wedge that migrates upstream into the lower Charles River Basin, but there are no reversing tidal flows upstream of the lock and dam system.

Bridge structures on the north and south banks of the Charles River are within the Federal Emergency Management Agency (FEMA) 100-year floodplain.

4.2.2 Depth and Bathymetry

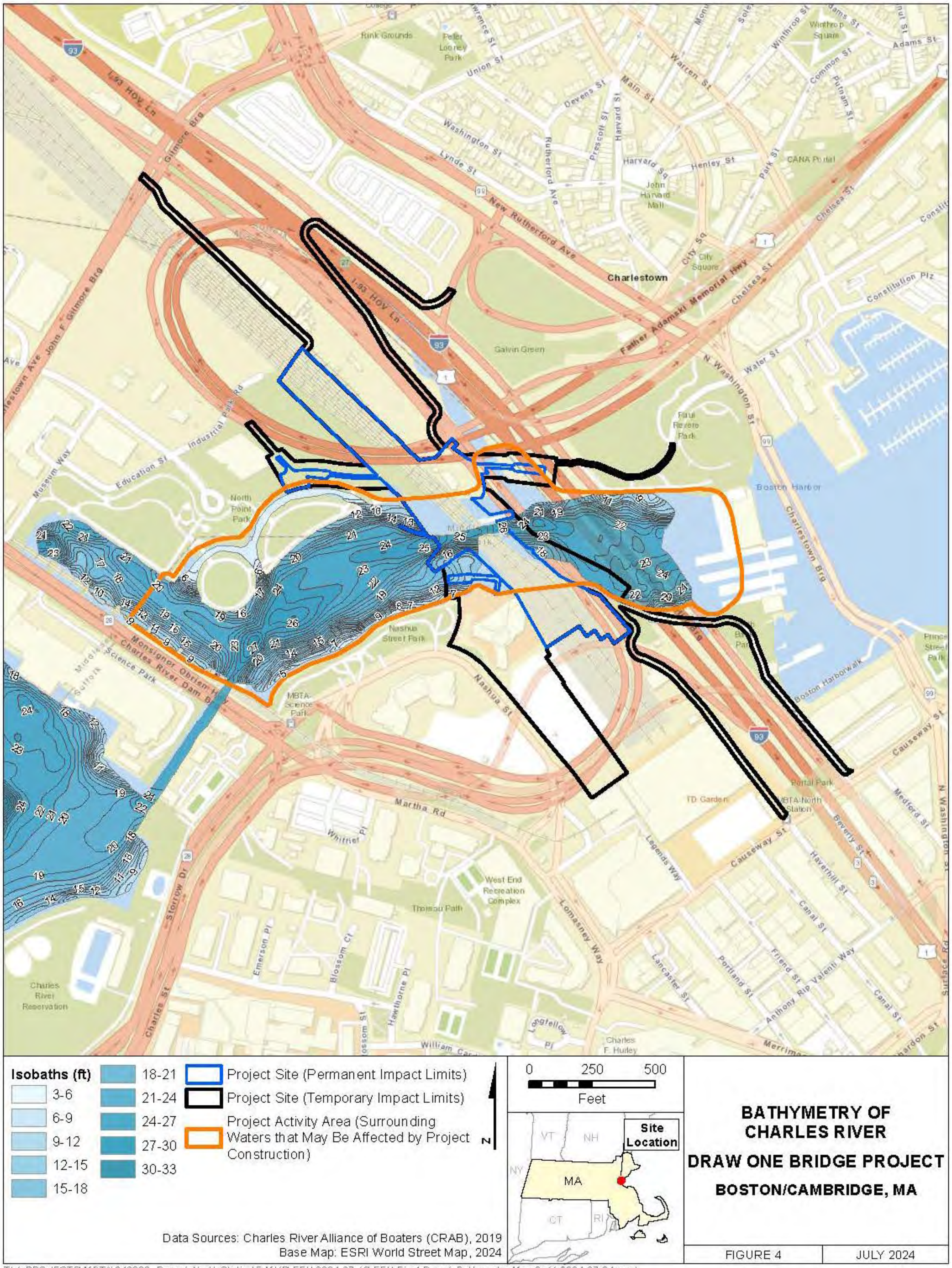
The depth of the Charles River Basin (the pool created by the Charles River Dam and Locks) is generally shallow, with an average water depth of approximately one to 30 feet (9 meters) deep. Water depths in the vicinity of the Project Activity Area range from 7 to 27 feet (2 to 8 meters). The deepest portions in the Project Activity Area are located in the center of the river and portions closer to the northern bank, whereas shallower water areas dominate the portions closer to the southern bank. A bathymetry map of the Charles River and Project Activity Area is provided in **Figure 4** on page 45. The existing and proposed water depths in longitudinal sections are provided in **Figure A9** on page 28 and **Figure A10** on page 23.

The depth of the Charles River at the Project Site is approximately ten feet (3 meters), and the existing 65-foot-wide (20 meter) navigation channel is 25 feet (8 meters) deep (**Figure A9** on page 28 and **Figure A10** on page 23). The Charles River Basin has an average width of approximately 380 feet (116 meters).

4.2.3 Substrates and Sediments

According to the Draw One Bridge Geotechnical Engineering Memorandum, the subsurface conditions within the Project Activity Area consist of historically placed fill overlying organic silt tidal estuary deposits often intermixed with fill material, overlying silty sand, marine clay (Boston Blue Clay), discontinuous strata of glaciomarine deposits and/or glacial till, weathered argillite and argillite bedrock. The substrates on site consist of approximately 70 percent silt/mud, 20 percent sand and ten percent pebble/gravel/cobble. The organic silt stratum primarily comprises very soft to hard, dark gray to black organic silt with up to ten percent shells. Because of the fill dumped atop this layer within the historic mud flats adjacent to the Charles River, the stratum is intermixed with up to 20 percent fine to coarse sand and debris including brick, wood and cinders, and up to ten percent gravel (Pizzi, 2020).

Historic studies indicate that the benthic (bottom of a water body) habitat of the lower Charles River is contaminated by a suite of inorganic and organic constituents, such as lead, polychlorinated biphenyls (PCBs), organochlorine pesticides, and polyaromatic hydrocarbons (PAHs) (Breault et al., 2000). During 2020, TRC collected preliminary sediment samples from the Project Site. Data collected indicates the presence of PCBs, PAHs, and lead, among other organic and inorganic contaminants, above MassDEP and USACE reporting limits.



T:\1-PROJECTS\MBTA\342282_Draw 1 North Station\5-MXD\EFH 2024-07-18\EFH Fig 4 Draw1 Bathymetry Map 8x11 2024-07-24.mxd

4.2.4 Water Quality

There are no tidal flows that reverse the general downstream passage of water from the Charles River upstream of the Charles River Dam Locks, including at the Project Site. However, when the locks are opened, there is an upstream incursion of salt water along the bottom of the river that extends into the lower Charles River Basin to varying degrees. Water salinity varies with the tides and seasonally, depending upon the amount of freshwater outflow from the Charles River. Species with EFH-designated life stages that depend on marine waters with higher salinity levels ranging from approximately 30 to 35 practical salinity units (PSU) may not tolerate the lower salinity levels within the Charles River.

Under the Massachusetts Surface Water Quality Standards (SWQS) (Massachusetts Administrative Code 314 CMR 4.00), inland water is characterized as Class A, Class B, or Class C. The state classifies the waters within the Project Site as Class B warm water, which is designated as suitable as habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth, and other critical functions, and for primary and secondary recreation. Coastal and marine water is characterized as Class SA, Class SB, or SC. Boston Harbor, upstream of the Project Site, is classified by the state as Class SB water, which is designated as suitable for habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth, and other critical functions, and for primary and secondary recreation.

According to the SWQS, the following conditions are associated with Class B waters. Dissolved oxygen is not less than 5.0 mg/l in warm water fisheries. Temperature shall not exceed 85 degrees Fahrenheit (°F) (29 degrees Celsius [°C]). The pH shall be in the range of 6.5 to 8.3 standard units and not more than 0.5 units outside of the natural background range. The water shall be free from floating, suspended and settleable solids; color and turbidity; oil, grease; and taste and odor in concentration or combinations that would impair any use assigned to Class B.

The Massachusetts Water Resources Authority (MWRA) has collected environmental monitoring data in the Charles River since 1989. The closest monitoring station, Station 11, is located approximately 600 feet (183 meters) downstream of the Project Site, but upstream of the Charles River Dam Locks. Currently, phosphorus is the primary cause of impairment throughout the Charles, although the river is also impaired by bacterial pollutants, algal growth, excessive nutrients, and stormwater (EPA 2024a).

Table 8. Charles River Water Quality Monitoring Data, MWRA Station 11[1]

Parameter	Surface			Bottom		
	Min	Max	Average	Min	Max	Average
Temperature (°C)[2]	3.23	28.73	19.14	3.35	25.17	16.7290
Dissolved Oxygen (mg/L)[3]	4.60	13.86	8.59	0.77	12.	5.68
Turbidity (NTU)[4]	0.00	40.90	4.35	0.00	39.54	5.75
Salinity (PSU)[5]	0.22	3.18	0.82	0.27	28.34	15.14
Specific Conductance (mS/cm)[6]	0.46	5.83	1.61	0.55	43.86	24.40

Table 8. Charles River Water Quality Monitoring Data, MWRA Station 11[1]

Parameter	Surface			Bottom		
	Min	Max	Average	Min	Max	Average
pH	6.15	8.69	7.30	5.89	7.96	7.05

[1]Source: MWRA, 2024 Boston Harbor and River Monitoring Data: Charles River
[2]°C = degrees Celsius
[3]mg/L = milligrams per liter
[4]NTU = nephelometric turbidity units
[5]PSU = Practical Salinity Units
[6]mS/cm = millisiemens per centimeter

Table 8 above provides water quality data recorded at MWRA's Station 11 from 2013 to 2023 (note: no data was recorded in 2020) during April to October of each year. Due to the proximity of the Project Site to the marine waters of the Boston Inner Harbor, and reflecting the operation of the locks, Charles River waters experience saltwater intrusion visible in the data collected at Station 11. Data indicates that average surface salinity is 0.82 practical salinity units (PSU), while bottom salinity averages are close to 15.14 PSU, indicating an estuarine environment exists at the Project Site (MWRA, 2024).

Generally, specific conductance measurements are affected by the presence of dissolved solids such as salts (EPA 2024b). At Station 11, bottom specific conductance is high, averaging at 24.40 milisiemens per centimeter (mS/cm), likely due to the close proximity of marine waters. At Station 11, surface pH levels range from 6.15 to 8.69 and bottom pH levels range from 5.89 to 7.96. The bottom dissolved oxygen measurements average at 5.68 milligrams per liter (mg/L), lower than the surface dissolved oxygen measurements which average at 8.59mg/L.

Surface turbidity at Station 11 ranges from 0.00 to 40.90 nephelometric turbidity units (NTU), with an average of 4.35 NTU, while bottom turbidity ranges from 0.00 to 39.54 NTU), with an average of 5.75 NTU. The Charles River has hundreds of stormwater outfalls and therefore the maximum measurements are likely due to very large rain events that discharge stormwater into these outfalls (EPA 2024b).

4.3 Benthic Community

The benthic habitat in the Project Activity Area consists of estuarine/riverine conditions, with both banks of the river consisting of granite block bulkhead walls. Substrate consists of soft bottom sediments with an absence of macroalgae or submerged aquatic vegetation (SAV).

According to the Massachusetts Bureau of Geographic Information (MassGIS), the closest area suitable for shellfish is within the Boston Inner Harbor, more than 2,755 feet (840 meters) away from the Project Site, and occurs within waters classified as prohibited for growing shellfish (MassGIS, 2024). Based on the substrate characteristics, soft bottom, estuarine benthic infauna and epifauna are likely to occur to some extent, but given the extreme range of salinities, ranging at times from essentially freshwater, to a nearly marine saltwater wedge, the benthic community is likely stressed and depauperate.

5.0 EFH DESIGNATED SPECIES AND ESSENTIAL FISH HABITAT

The objectives of this EFH Assessment are to characterize EFH and NOAA Trust Species within the Project Activity Area and assess how the Project may affect those resources. TRC utilized the NOAA Fisheries EFH Mapper (NOAA Fisheries, 2024a) to identify EFH species that could occur in the Charles River or downstream in the Boston Harbor.

The Project Activity Area overlaps with designated EFH near Boston which encompasses Boston Harbor as well as the Charles, Millers, Mystic, and Chelsea rivers. According to the NOAA Fisheries EFH Mapper, the Project Activity Area overlaps with areas designated as EFH for one or more life stages of 26 finfish and shellfish species (**Table 9**). However, of the 26 mapped finfish and shellfish species, this assessment focuses only on those with the potential to occur within the Project Activity Area. This was determined by comparing the Project Activity Area with the suitable aquatic characteristics and habitat conditions for each species (see Section 6.1.1 below). Many of the mapped species are associated with the marine and open water conditions of Boston Harbor within the Project Activity Area rather than the more isolated and estuarine/riverine conditions of the Project Site.

Given its coastal river environment and the presence of the Charles River Dam and Locks immediately downstream, the Project Activity Area largely does not provide appropriate habitat conditions for many of the life stages and species presented in **Table 9** below. In addition to the species listed, the NOAA Fisheries EFH Mapper identified a Habitat Area of Particular Concern (HAPC) for juvenile cod in the Boston Inner Harbor outside the Project Activity Area, past the Charles River Dam Locks (**Figure 5** on page 50). This HAPC is outside of the anticipated habitat impact area (limited to the Project Activity Area) and is not further discussed in this document.

5.1 EFH Species Potential for Occurrence

The life history of each of the 26 EFH species in **Table 9** was researched to determine the habitat requirements and behavioral characteristics for each life stage of species with designated EFH within the Project Site (**Appendix C**).

Based on the findings from *Final Omnibus Essential Fish Habitat Amendment 2. Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts* (NEFMC, 1998), *Distribution and Abundance of Fishes and Invertebrates in North Atlantic Estuaries* (Jury et al., 1994), the likelihood of each EFH species and life stage to occur within Project Activity Area was evaluated. No Project Activity Area-specific habitat assessments were conducted and no other specific reports were found.

Life history characteristics and habitat preferences including depth, salinity, sediment, temperature, and prey requirements were evaluated for all life stages of each EFH species listed in **Table 9** below. Sections 6.1.1 through 6.1.2 provide the details of this evaluation. Based on the likelihood of Project Activity Area occurrence for each life stage of each species, species were separated into three categories:

- **Category I:** Potential for Project Activity Area occurrence of the life stage (in green)
- **Category II**: Unlikely, but possible potential Project Activity Area occurrence of the life stage (in yellow)
- **Category III**: No potential for Project Activity Area occurrence of the life stage (in red)

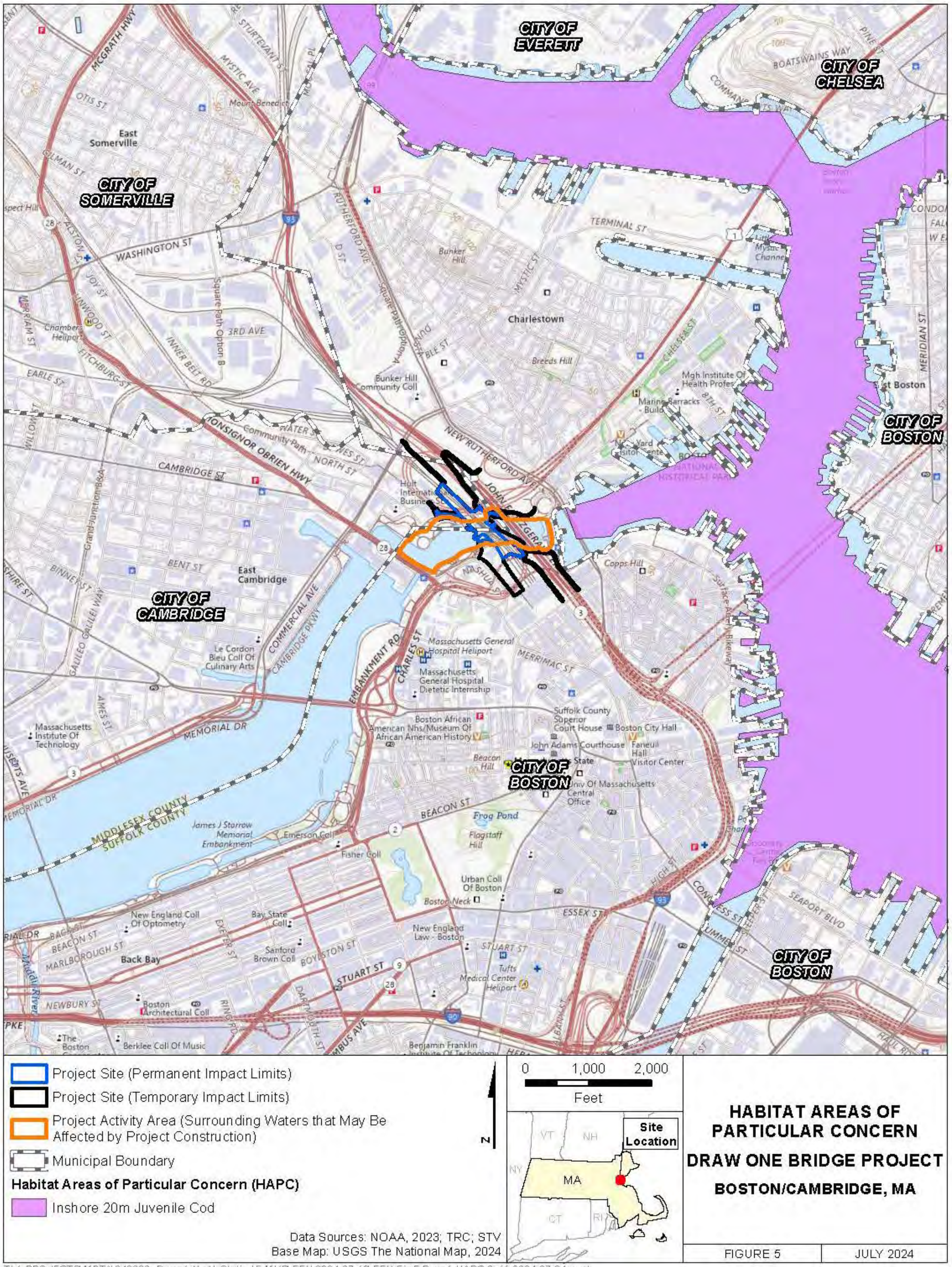


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Table 9. Species and Life Stages with Designated EFH in the Project Activity Area[1]

Species	Eggs	Larvae	Juveniles	Adults	Category (see Section 6.1 below)
Finfish					
American plaice (*Hippoglossoides platessoides)*	X	X	X	X	All Category III
Atlantic bluefin tuna *(Thunnus thynnus)*				X	All Category III
Atlantic butterfish *(Peprilus triacanthus)*	X	X		X	All Category II
Atlantic cod *(Gadus morhua)*	X	X	X	X	Most Category II
Atlantic herring *(Clupea harengus)*		X	X	X	All Category III
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X	All Category III
Atlantic wolffish (*Anarhichas lupus*)	X	X	X	X	All Category III
Black sea bass *(Centropristis striata)*				X	All Category III
Bluefish *(Pomatomus saltatrix)*			X	X	All Category II
Ocean pout *(Macrozoarces americanus)*			X	X	All Category III
Pollock *(Pollachius virens)*	X	X	X		One Category I
Red hake *(Urophycis chuss)*	X	X	X	X	All Category II
Scup *(Stenotomus chrysops)*			X		All Category I
Silver hake *(Merluccius bilinearis)*	X	X		X	All Category III
Spiny dogfish *(Squalus acanthias)*				X (Adults and sub-adult females)	All Category III
Summer flounder *(Paralichthys dentatus)*				X	All Category III
White hake *(Urophycis tenuis)*	X	X	X	X	All Category III
Windowpane flounder (*Scophthalmus aquosus)*	X	X	X	X	All Category I
Winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X	All Category I
Yellowtail flounder *(Limanda ferruginea)*	X	X	X	X	All Category III

Table 9. Species and Life Stages with Designated EFH in the Project Activity Area[1]

Species	Eggs	Larvae	Juveniles	Adults	Category (see Section 6.1 below)
Skates					
Little skate (*Leucoraja erinacea*)			X	X	All Category II
Thorny skate *(Amblyraja radiata)*			X		All Category III
Winter skate *(Leucoraja ocellata)*			X	X	All Category II
Invertebrates					
Atlantic surfclam *(Spisula solidissima)*			X	X	All Category III
Longfin inshore squid (*Doryteuthis pealeii*)			X	X	All Category II
Northern shortfin squid (*Illex illecebrosus*)				X	All Category III

[1] Source: NOAA Fisheries, 2024a
Green shading = Potential for Project Activity Area occurrence of the life stage.
Yellow shading = Unlikely, but possible potential Project Activity Area occurrence of the life stage.
Red shading = No potential for Project Activity Area occurrence of the life stage.

Of the species listed in **Table 7** above**,** four species with EFH designation were determined to have one or more life stages in Category I (Section 6.1.1and 7.1.1), seven species with EFH designation were determined to have one or more life stages in Category II (Section 6.1.2 and 7.1.1), and the remaining 15 species with EFH designation and their respective life stages are listed in Category III (Section 6.1.3).

The Project Site's location upstream of the Charles River Dam and Locks reduces the likelihood that EFH and NOAA Fisheries Resource Trust Resource Species in Boston Harbor would reach the Project Site; to do so, they would need to traverse the fish ladder that was deemed "not passable" in January 2005 by the DMF or enter the locks at the exact time that they're opened for vessel traffic.

5.1.1 Category I

Pollock (*Pollachius virens*)

Pollock juveniles have the potential to occur within the Project Activity Area. Conditions where most pollock juveniles are found include water temperatures below 64°F (18°C), depths ranging from shore to 820 feet (250 meters), and salinities between 29 and 32 ppt (NEFMC, 1998). While the salinity of the Project Activity Area is not consistent with these conditions, its temperature and depths are. Juveniles are also likely to occur in the intertidal zone and shallow-water habitats, which are used as nursery grounds. Juveniles can occur in Boston Harbor at any time of year(Jury et al., 1994). Given the presence of this type of habitat, and their yearlong residency in this portion of the Charles River, juvenile pollock may occur in the Project Activity Area, indicating that this life stage of pollock should be Category I.

Boston Harbor has been designated as EFH for pollock eggs, larvae, and juveniles, but not adults (**Table 9**). Pollock eggs and larvae have been designated in seawater salinity zones of greater than 25 parts per thousand (ppt). Juveniles have been designated in brackish salinity zones of 0.5 to 25 ppt as well as in seawater salinity zones of greater than 25 ppt (NEFMC, 1998). The eggs and larvae are found throughout the water column within Boston Harbor from December to April. However, both are rare in November, and in April only larvae are rare (Jury et al., 1994). Pollock eggs and larvae are unlikely but possible to occur within the Project Activity Area because they are not known to be associated with any specific substrate type and are usually found at depths much deeper than the Project Activity Area, indicating that these life stages of pollock should be Category II.

Because the categories were assigned by species (and not by life stage), pollock are classified as Category I in this assessment.

Scup (*Stenotomus chrysops*)

Boston Harbor has been designated EFH only for scup juveniles (**Table 9**).

Juveniles are found during spring and summer in large estuaries, waters that have an open, sandy bottom, and habitats that are structured with mussel beds, reefs, and/or rock rubble. Scup habitat ranges from Cape Cod to Cape Hatteras (NOAA Fisheries, 1994). Juveniles prefer habitats with muddy/sandy/silty bottoms that include rocky ledges, artificial reefs, mussel beds, sand/silty sand, shells, and eelgrass. They occur at depths from 0 to 124 feet (0 to 38 meters) and salinities greater than 15 ppt (NOAA Fisheries, 1994). According to Jury et al., 1994, scup are most commonly found in Massachusetts Bay from June through September. This reference did not identify any scup occurrences in Boston Harbor. Since depths within the Project Activity Area range from 7 to 27 feet (2 to 8 meters), however, scup juvenile may be present.

Windowpane Flounder (*Scophthalmus aquosus*)

Both the Inner and Outer portions of Boston Harbor have been designated as EFH for all four life stages of the windowpane flounder (**Table 9**).

Eggs and larvae of the windowpane flounder stay at the sea surface in waters less than 68°F (20°C) and 230 feet (70 meters) deep. While the Project Site is not in the sea, it would meet the temperature and depth requirements. Therefore, windowpane flounder eggs and larvae could occur within the Project Activity Area in the spring and fall when spawning takes place.

Juvenile windowpane flounder prefer bottom habitats with mud or fine sand, which is similar to the substrate at the Project Activity Area. Juveniles stay in waters with temperatures of less than 77°F (25°C), depths between 3 and 328 feet (1 to 100 meters), and salinity between 5.5 and 36 ppt (NEFMC, 1998). Conditions near the Project Activity Area are consistent with these preferences, and according to Jury et al., 1994, juveniles are common in Boston Harbor year-round. Therefore, there is potential for them to occur in the Project Activity Area.

Adult windowpane flounder are found in habitats with mud or fine sand, consistent with conditions in the Project Activity Area. However, they prefer depths of 246 feet (75 meters) or less. Windowpane flounder spawn in waters with temperatures under 70°F (21°C), depths of 3 to 246 feet (1 to 75 meters), and salinity between 5.5 to 36 ppt (NEFMC, 1998); therefore, the species may spawn within the Project Activity Area. In Boston Harbor, adults commonly occur from March through December and rarely from January to February (Jury et al., 1994). Therefore, windowpane flounder adults may occur within the Project Activity Area.

While the preferred conditions for all life stages are consistent with conditions in the Project Activity Area, the number of individuals coming up through the Charles River Dam and Locks into the relatively shallow waters of the Charles River is likely to be low based on the fish ladder being deemed “not passable” in January 2005 by the DMF.

Winter Flounder (*Pseudopleuronectes americanus*)

Boston Harbor has been designated as EFH for all four life stages of the winter flounder (**Table 9**). All life stages of the winter flounder are found in bottom habitats with sand, muddy sand, mud and gravel, which are similar to the substrate in the Project Activity Area.

In Boston Harbor, eggs are abundant during the months of February through June and are common in January (Jury et al., 1994). Winter flounder eggs prefer water temperatures of less than 50°F (10°C), water depths of less than 16 feet (5 meters), and salinities between 10 to 30 ppt. The average winter temperature at the bottom of the Project Activity Area is 62°F (17°C), but it can fall as low as 38°F (3.3°C), which aligns with winter flounder egg preferences (NEFMC, 1998). Therefore, winter flounder eggs may occur in the Project Activity Area.

Winter flounder larvae prefer waters with sea surface temperatures of less than 59°F (15°C), water depths of less than 20 feet (6 meters), and salinities between 4 and 30 ppt (NEFMC, 1998). Winter flounder larvae are highly abundant in Boston Harbor from March through May, abundant in February and June, common in July and August, and rare during January (Jury et al., 1994). Because its conditions are consistent with the preferred conditions for winter flounder larvae, they may occur in the Project Activity Area.

YOY juveniles are found in bottom habitats with mud or fine sand, water temperatures of less than 82°F (28°C), depths of 0.3 to 33 feet (.09 to 10 meters), and salinities between 5 to 33 ppt. Winter flounder juveniles are found at water temperatures below 77°F (25 °C), depths between 3 and 164 feet (1 and 50 meters), and salinities between 10 and 30 ppt (NEFMC, 1998). Juvenile winter flounder are highly abundant throughout the year in Boston Harbor (Jury et al., 1994). Adult winter flounder are found in conditions similar to those preferred by juveniles, with bottom habitats of sand, mud and gravel, water temperatures of less than 77°F (25°C), depths of 3 to 328 feet (1 to 100 meters), and salinities between 15 and 33 ppt. The conditions preferred by both juveniles and adults are very similar to the conditions within the Project Activity Area. Therefore, winter flounder at both life stages may occur within the Project Activity Area.

5.1.2 Category II

Atlantic Butterfish (*Peprilus triacanthus*)

Boston Harbor has been designated as EFH for Atlantic butterfish eggs, larvae, and adults (**Table 9**).

Eggs occur at depths of 4,921 feet or less with the upper 656 feet (1,500 meters or less with the upper 200 meters) maintaining a temperature range of 45 to 72°F (7 to 22°C) (Mid-Atlantic Fishery Management Council, 2011). They are rarely found in Boston Harbor during June and September, but common throughout July and August (Jury et. al., 1994). It is possible but unlikely that Atlantic butterfish eggs would be found within the Project Activity Area based on the fish ladder within the Charles River Lock and Dan that was deemed “not passable” in January 2005 by the DMF.

Atlantic butterfish larvae have been collected between 39 to 82°F (4 to 28°C), at salinities that range from estuarine to full seawater. They have been collected at night between depths of 3 to

13 feet (1 to 4 meters) and are abundant in the mixing portions of the estuaries (Cross et al., 1999). Atlantic butterfish larvae are generally found over bottom depths between 135 and 1,148 feet (41 and 350 meters) where average temperatures in the upper 656 feet (200 meters) of the water column are 48 to 72°F (9 to 22°C) (Mid-Atlantic Fishery Management Council, 2011). They are common in Boston Harbor from July to October (Jury et al., 1994). It is possible but unlikely that Atlantic butterfish larvae would be found within the Project Activity Area.

Adult Atlantic butterfish have been observed to spawn a few miles offshore near Woods Hole, Massachusetts (Cross et al., 1999), south of the Project Activity Area. Adult butterfish prefer the bottom during the day and disperse upward at night. They prefer sandy rather than rocky or muddy bottoms and generally stay near the surface over depths of 72 to 180 feet (22 to 55 meters) when near the coast in the summer and fall. In the winter and early spring, they tend to stay close to the bottom. Adult butterfish are common in Boston Harbor from June through October (Jury et al., 1994). It is possible but unlikely that Atlantic butterfish adults would be found within the Project Activity Area.

Atlantic Cod (*Gadus morhua*)

Boston Harbor has been designated as EFH for all four life stages of the Atlantic cod (**Table 9**) and an HAPC for juvenile cod (**Figure 5** on page 50).

In Boston Harbor, Atlantic cod eggs and larvae are rare during August through November but common from December to July (Jury et al., 1994). However, Atlantic cod eggs or larvae would not be present within the Project Activity Area given its shallow depth and distance from spawning areas in Massachusetts Bay (NOAA Fisheries, 2022h). Atlantic cod eggs and larvae are pelagic and do not associate with any particular substrate. Eggs occur at water depths below 361 feet (110 meters) and larvae occur at depths from 98 to 230 feet (30 to 70 meters) (NEFMC, 1998). It is possible but unlikely that Atlantic cod eggs and larvae would occur within the Project Activity Area.

Juvenile cod in Massachusetts prefer shallow inlets, rock pools, river mouths, and harbors, yet depart from coastal waters by the middle of June (Hardy, 1978 et al., as cited in Stevenson et al., 2014). Since juvenile cod favor water temperatures below 68°F (20°C), they are likely to leave the area in mid-June and return in the fall once temperatures have cooled (Jury et al., 1994). Occurrences of Atlantic cod juveniles within the Project Activity Area are possible but unlikely due to the fish ladder within the Charles River Lock and Dam that was deemed “not passable” in January 2005 by the DMF.

Atlantic cod adults prefer water temperatures below 50ºF (10°C) and depths ranging from 33 and 492 feet (10 and 150 meters); they tolerate a wide range of oceanic salinities (NEFMC, 1998). In Boston Harbor, Atlantic cod adults are rare between January and March but common from April to December (Jury et al., 1994). The depths of the Project Activity Area range from 7 to 27 feet (2 to 8 meters), which is shallower than Atlantic cod adults’ preferred depth range, so they are unlikely to occur within the Project Activity Area.

Bluefish (*Pomatomus saltatrix*)

Boston Harbor has been designated as EFH for bluefish juveniles and adults (**Table 9**).

Juveniles are pelagic and occur in North Atlantic estuaries and large bays from May through October. Their preferred temperature, water depth, and salinity are unknown (Mid-Atlantic Fishery Management Council, 1998). In Boston Harbor they are rare in May but common from June through October (Jury et al., 1994). The presence of a few incidental juvenile bluefish in the Project Activity Area is possible but unlikely.

Adult bluefish are found inshore, offshore, and in Massachusetts Bay from June through October. Their distribution varies seasonally. They prefer salinities of 25 ppt and temperatures above 61ºF (16°C). The depth preference of bluefish in Massachusetts is unknown. Adults are rare in Boston Harbor in May and common from October through June (Jury et al., 1994). Their presence within the Project Activity Area is possible but unlikely.

Red Hake (*Urophycis chuss*)

Boston Harbor has been designated as EFH for all four life stages of red hake (**Table 9**).

Conditions in EFH for red hake larvae include surface water temperatures of less than 66°F (19°C), salinity greater than 0.5 ppt, and water depths of less than 656 feet (200 meters) (NEFMC, 1998). All three of these conditions can be found in the Project Activity Area. However, because larval red hake associate with floating debris, sargassum and jellyfish, there is no known association between substrate type and the occurrence of red hake eggs and larvae. Little information on red hake eggs is available, but it is known that spawning is concentrated off Massachusetts and Rhode Island. Therefore, it is possible but unlikely that red hake eggs and larvae would be found in the Project Activity Area.

Lazzari and Stone, 2006 (as cited in Stevenson et al., 2014) collected young-of-the-year (YOY) juvenile red hake at depths less than 32.8 feet (<10 meters) along the Maine coast and concluded that shallow-water habitats in the Gulf of Maine are important nursery habitats for red hake. However, in a Massachusetts bottom trawl survey, older juvenile and adult red hake were rarely found in depths less than 32.8 feet (<10 meters) (Packer et al., 2003, as cited in Stevenson et al., 2014). Based on this data and the depths in the Project Activity Area, which range from 7 to 27 feet (2 to 8 meters), the presence of juvenile red hake in the Project Activity Area is possible but unlikely.

In the spring, adult red hake migrate to shallower and warmer waters, where they spawn in late spring and early summer. In the fall, they migrate to the deep basins in the Gulf of Maine and the outer continental shelf, where they stay throughout winter. The species prefers temperatures between 45 to 50°F (7 and 10°C) (NOAA Fisheries, 2024b). According to the 2024 Charles River Buoy, located next to the Museum of Science upstream of the Project Site, water quality readings on October 11, 2023, exhibited 62°F (17°C) (MWRA, 2024). This was the lowest temperature throughout the rest of the spring, summer, and late October, when the buoy went offline for the season. Therefore, because the water temperatures within the Project Activity Area during spring and summer are higher than preferred, adult red hake are possible but unlikely to occur in the Project Activity Area.

Little Skate (*Leucoraja erinacea*)

Boston Harbor has been designated EFH for little skate juveniles and adults (**Table 9**).

Habitat requirements for little skate juveniles and adults are similar. Their preferred benthic habitats, which include sand, gravel, and soft mud, are found in the Project Site. In general, juveniles and adults move to deeper waters in the winter and shallower waters in the spring (Bigelow and Schroeder, 1953; McEachran, 2002 as cited in Packer et al., 2003). Juvenile little skate are typically found at depths between shore and 450 feet (137 meters), and at temperatures from 39 to 59ºF (4 to 15°C). Adult little skate are typically found at depths between shore and 450 feet (137 meters), with the highest abundance from 240 to 299 feet (73 to 91 meters), and at temperatures from 36 to 59ºF (2 to 15°C) (NOAA Fisheries, 2024j). However, salinity requirements for this species are greater than 25 percent ppt, including higher salinity zones in bays and estuaries (NEFMC,1998). These conditions are largely unavailable in the Project Activity Area, with the exception of the small salt wedge within the water column close to the river bottom.

Furthermore, the Charles River Dam and Locks would likely deter most little skates from reaching the Project Site. Although little skate juveniles and adults have the potential to occur in the Project Activity Area during the spring, their occurrence would be rare and transient due to the salinity conditions and the locks. Therefore, it is possible but unlikely that juvenile and adult little skate would be present in the Project Activity Area.

<u>Winter Skate (*Leucoraja ocellata*)</u>

Boston Harbor has been designated as EFH for winter skate juveniles and adults (**Table 9**).

The habitat requirements for juvenile winter skate are gravelly or sandy substrates or mud, which are found in the Project Activity Area. Juvenile winter skate are typically found at depths between shoreline and 1,312 feet (400 meters), and at temperatures from 30 to 70ºF (-1.2 to 21°C), with most found from 39 to 61ºF (4 to 16°C). Adult winter skate are typically found at depths between shore and 1,217 feet (371 meters), but are most abundant at depths less than 364 feet (111 meters). They prefer temperatures from 34 to 68ºF (1.2 to 20°C), with most found from 41 to 59ºF (5 to 15°C) depending on the season (NOAA Fisheries, 2024c). They are generally found offshore in the summer and early fall and inshore in the winter and spring, and they prefer areas with high salinity (NOAA Fisheries, 2024c). Incidental occurrences of juvenile and adult winter skate in the Project Activity Area during the winter and spring are possible but unlikely based on the fish ladder within the Chares River Lock and Dam that was deemed “not passable” in January 2005 by the DMF.

<u>Longfin Inshore Squid (*Doryteuthis pealeii*)</u>

Boston Harbor has been designated as EFH for longfin inshore squid juveniles and adults (**Table 9**).

Juvenile longfin inshore squid prefer water depths from 164 to 492 feet (50 to 150 meters) and will inhabit the upper 33 feet (10 meters) of the water column. During surveys conducted in the Massachusetts coastal waters during the spring and fall, juveniles were primarily found in waters 41 to 62ºF (5 to 17ºC) and depths between 20 to 82 feet (6 and 25 meters) (Jacobson, 2005). Salinity ranges for juvenile longfin inshore squid are from 30 to 37 ppt, with most found at 32 to 33 ppt (Jacobson, 2005).

Most adult squids occur in Boston Harbor in the summer and fall. During this period, they have been observed in shallow waters, with depths between 20 to 92 feet (6 to 28 meters) (Jacobson, 2005). The rest of the year, adults will inhabit much deeper offshore waters along the shelf edge and continental slope. They prefer mud or a combination of mud and sand bottom habitat (NOAA Fisheries, 2024d). Adult longfin inshore squid are found at surface temperatures ranging from 48 to 70ºF (9 to 21ºC) and bottom temperatures ranging from 46 to 59ºF (8 to 15ºC). Salinity ranges for adult longfin inshore squid are from 30 to 36 ppt, with most found at 34 to 35 ppt (Jacobson, 2005).

The depths of the Project Activity Area range from 7 to 27 feet (2 to 8 meters), which is generally unsuitable for adults and juveniles. Therefore, occurrence of juvenile and adult longfin inshore squid in the Project Activity Area from spring through late autumn is possible but unlikely.

5.1.3 Category III

None of the life stages of American plaice ***(Hippoglossoides platessoides),*** Atlantic bluefin tuna (*Thunnus thynnuus*), Atlantic mackerel ***(Scomber scombrus),*** Atlantic herring (*Clupea harengus*), Atlantic wolffish (*Anarhichas lupus*), black sea bass (*Centropristis striata*), ocean pout ***(Macrozoarces americanus),*** spiny dogfish (*Squalus acanthias*), summer flounder ***(Paralichthys dentatus),*** white hake ***(Urophycis tenuis),*** silver hake (*Merluccius bilinearis*), yellowtail flounder (*Limanda ferruginea*), thorny skate (*Amblyraja radiata*), Atlantic surfclam *(Spisula solidissima),* and northern shortfin squid (*Illex illecebrosus*) are likely occur within the Project Activity Area and/or be affected by the Proposed Project based on unsuitable habitat characteristics and species life history characteristics that favor open ocean conditions, higher salinities, or greater water depths than those in the Project Activity Area.

5.2 NOAA Fisheries Trust Resource Species -- Diadromous Species

Diadromous fish are a group of species that rely on both fresh and saltwater environments to survive and reproduce, and are classified as either anadromous or catadromous. Anadromous species spawn in fresh water and mature in marine water, while catadromous species mature in fresh water and return to marine water to spawn. Estuarine systems such as Boston Harbor are used as nursery, feeding, and migration pathways for diadromous fish. The riverine systems that maintain a capacity to support anadromous fish near Boston Harbor are Fore River, Back River, Furnace Brook, Chelsea Creek, Neponset River, Charles River, and Mystic River (NRWA, 2015; Evans et al., 2015). These freshwater systems currently or historically support the diadromous species discussed below.

Anadromous species present in the Charles River include finfish that utilize the Project Activity Area for both spring and fall migration, such as alewife, blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), white perch, (*Morone americana*), and gizzard shad (*Dorosoma cepedianum*) (Brady et al., 2005). In addition, the catadromous species American eel (*Anguilla rostrata*) has the potential to migrate through the Project Activity Area. As stated in Section 4.4 above, the Project Activity Area is not suitable for shellfish. **Table 10** provides habitat information and identifies the potential for occurrence for the NOAA Fisheries Trust Resource diadromous species present in the Charles River.

None of the diadromous species would reside for extended periods of time at the Project Activity Area, as explained in **Table 10** below, and the Project Site is partially in the migratory pathway between the freshwater and marine habitats that these species inhabit during different phases of their lives.

Table 10. NOAA Fisheries Trust Resource Species – Diadromous Species Present in the Charles River

Species (scientific name)	Classification (anadromous or catadromous)	Habitat Preferences	Potential to Occur within the Project Site
Alewife *(Alosa pseudoharengus)*	Anadromous	Will spawn in slow moving rivers and ponds[1]. Females will move back to their native freshwater to spawn and then migrate back to marine[2]. Mature in the ocean and return to spawn in natal streams.	Unlikely, but possible
American Eel (*Anguilla rostrata*)	Catadromous	Live in freshwater rivers, tidal creeks, harbors, salt ponds with muddy or sandy bottoms[1], but returns to the ocean to spawn[3].	Unlikely, but possible
American Shad (*Alosa sapidissima*)	Anadromous	Spawn in shallow areas with sand or gravel along freshwater coasts[1]. After spawning, adults migrate back to marine environments[4].	Unlikely, but possible
Blueback Herring (*Alosa aestivalis*)	Anadromous	Spawn in rocky or gravel streams with swift flowing water[1].	Unlikely, but possible
Gizzard Shad (*Dorosoma cepedianum*)	Anadromous	Shallow areas with soft, muddy bottoms in freshwater rivers and ponds and brackish and coastal waters[5].	Potential
Rainbow Smelt *(Osmerus mordax)*	Anadromous	Overwinter in the upper estuaries and bays then spawn in early spring in pool and riffle areas above the head-of-tide in coastal streams and rivers[6].	Potential
White Perch *(Morone americana)*	Anadromous	Spawn upstream in coastal rivers and begins when water temperatures rise in the spring. After spawning, white perch swim back downstream towards the tidal zone. Fresh, brackish, and coastal waters. Adults tend to be found in areas with mud, silt, or sand bottoms[5].	Potential

[1] Hartel, Halliwell & Launer, 2002
[2] DMF, 2024a
[3] DMF, 2024b
[4] NHESP, 2015
[5] Fuller, Neilson, Hopper, 2022
[6] Enterline et al, 2012

6.0 EFFECTS ANALYSIS

In-water construction has the potential to add stressors and impact aquatic species. Stress from construction noise, sediment disturbance, vessel traffic, and changes in the physical habitat can affect species in the Project Activity Area and nearby waters. The extent of these stressors and their potential effects are described below.

6.1 Impacts to EFH and EFH Species

The construction associated with the Project will have direct and indirect temporary effects on the EFH within the Project Activity Area, resulting in temporary impacts to EFH species. The temporary impacts may include: 1) temporary habitat disturbance resulting from dredging and pile driving/removal and 2) temporary changes in water quality resulting from construction-related disturbance of bottom sediments. Minor permanent EFH modifications will also occur from replacement of bridge elements in the river. Overall, the effects of the Proposed Project would not alter the ability of EFH species to use the lower portion of the Charles River or the quality of the aquatic habitat over the long term. The temporary construction activities could deter use of the river by EFH species, such as through general disturbance, human presence, and increases in noise, but the generally low quality of the aquatic habitat in the Project Activity Area likely already precludes most species from using the river.

6.1.1 Habitat Modification

Habitat modification associated with the Proposed Project would be limited to the Project Site. Demolition activities will temporarily disturb approximately 0.5 acre (24,000 square feet) of the riverbed, and other construction activities will temporarily disturb approximately 0.1 acre (5,300 square feet) and permanently modify approximately 0.3 acre (11,400 square feet) of the riverbed. Dredging would take place along the riverbed to maintain the bottom elevation of the navigable channel to meet USCG requirements. Pile driving is proposed for installation of new bridge elements, and some disturbance and excavation along the riverbed would be required for removal of cables and other demolition activities.

Subsurface conditions within the Project Site consist of historically placed fill overlying organic silt tidal estuary deposits often intermixed with fill material, overlying silty sand, marine clay (Boston Blue Clay), discontinuous strata of glaciomarine deposits and/or glacial till, weathered argillite and argillite bedrock. The substrates on site consist of approximately 70 percent silt/mud, 20 percent sand, and ten percent pebble/gravel/cobble. The organic silt stratum primarily comprises very soft to hard, dark gray to black organic silt with up to ten percent shells. Because of the fill dumped atop this layer within the historic mud flats adjacent to the Charles River, the stratum is intermixed with up to 20 percent fine to coarse sand and debris including brick, wood and cinders, and up to ten percent gravel (Pizzi, 2020). Because the dredging activities will occur within a silt curtain, sand and gravels will largely remain in place, with mainly the fines (including a portion of the fine sand) having the potential to remain in suspension and be transported beyond the silt curtain.

The dredging, pile driving/removal, and cable removal activities associated with the Project will disturb sediment infauna, removing suitable cover, and may result in loss of submerged aquatic vegetation, benthic infauna, and sedentary epifauna. Dredging and other riverbed disturbance could also remove suitable cover, homogenize bottom substrates, and reduce the structural complexity of habitats for fish. This will result in the temporary loss of prey and cover within EFH for some species until the bottom habitat is recolonized. These modifications to the riverbed could affect EFH specifically for juvenile and adult windowpane flounder, all life stages of winter flounder, and juvenile scup and are less likely to affect adult butterfish, eggs and larvae and possibly juveniles of pollock, juvenile and adult little and winter skates, and possibly juvenile and adult squid. Disturbance to breeding habitat for winter flounder and pollock would be adverse, but not considered substantial because of the unlikely potential for eggs and larvae to be found in the affected portion of the river. Other lifestages or species are not expected to use riverbed habitat and would primarily be affected by water quality-type effects, as discussed below.

Benthic organisms removed by dredging activities in shallow mud and sand bottom areas typically have rapid recolonization rates through reproductive mechanisms, however, thereby minimizing the loss of benthic prey. There is also abundant similar habitat throughout the Charles River that provides comparable feeding opportunities, and juvenile and adult fish and squids would be expected to avoid the Project Site during construction and return when the disturbance is complete. Where dredging and excavating mixes sediment types, similar heterogeneity based on current conditions will return after completion. When dredging activities are completed, the excavated sediment will be loaded onto containment barges for proper disposal, most likely at a contained landfill suitable for receipt of contaminated soils as to cause no additional changes to the habitat.

The removal of existing bridge elements, including timber piles and caissons from the bridge structures in use and the remnants of those not currently in use, will temporarily disturb EFH but would not modify the habitat as the construction of replacement bridge elements, drilled shafts, and piles will provide similar replacement habitat. Overall the square footage of habitat loss would be negligible within the context of available lower Charles River Basin and Boston Harbor habitat.

Underwater noise and increased turbidity, as well as changes to the area with new/modified bridge components, may deter EFH species from using the habitat in the Project Activity Area; however, the construction noise and turbidity will be temporary and recolonization by prey species will draw the EFH species back into the area.

With the use of silt curtains, the avoidance of major silt-producing activities during TOY restrictions, stormwater BMPs , and the rapid recolonization rates of prey species, it is anticipated that the effects on EFH and EFH species would be minor.

6.1.2 Water Quality

Construction activities for the Proposed Project, such as dredging, pile driving, and drilled shaft installation, may have a direct effect on water quality by elevating levels total suspended solids (TSS), which have been shown to have adverse effects on benthic communities at 390mg/l, in the water column. These activities have the potential to create short periods with a very small amount of localized turbidity within the soft bottom sediments in the riverbed, which could reduce dissolved oxygen and cause stress for marine species. Increased turbidity could affect EFH for species that are found in the water channel, including eggs of windowpane flounder and juvenile pollock (shallow water in particular). Although less likely to occur, EFH for eggs and larvae of butterfish, juvenile cod, juvenile and adult bluefish, eggs and larvae of pollock, red hake, and squid (shallow water in particular) could also be affected by degradation of water quality.

The construction activities would not be undertaken all at once, rather they would occur over a long period, spreading the magnitude of impact over time. Multiple periods of dredging are planned to be spread out over several years of construction; therefore, no single dredging event is likely to generate a substantial amount of sediment due to the size of the piles being driven.

The impact of this increased turbidity would be temporary and short-term, with sediment settling out shortly after activities are completed. Additionally, an option for the contractor to further lower TSS during removal of the existing caissons could be to complete the work within cofferdams. A Project-specific NPDES SWPPP and a SPCC Plan will describe BMPs to be implemented during construction, such as sediment reduction and spill cleanup measures. In addition, TOY restrictions will be implemented to avoid dredging and major silt-producing activities during peak periods of fish movement in spring and fall, and silt curtains will be used outside these periods. Should minor silt-producing activities occur during TOY restrictions, silt curtains will be used to mitigate water quality impacts from turbidity to all the life stages of EFH and EFH species. The TOY restrictions would help minimize the extent of water quality impacts, although EFH could still be affected outside of these periods. The disturbance to water quality, TSS, and prey species would be temporary and occur in a relatively small area, which is expected to result in negligible reductions in EFH.

6.2 Impacts to NOAA Fisheries Trust Resource Species

Project construction may have direct and indirect temporary effects on the NOAA Fisheries Trust Resource Species within the Project Activity Area. The temporary impacts to NOAA Fisheries Trust Resource Species are identified in the sections below. As described in **Tables 6 and 7** above, the Spring TOY Restrictions for alewife, blueback herring, American shad, rainbow smelt, white perch, and the American eel (February 15 to July 15) will be implemented for all major activities, including pile driving/removal and dredging. Additionally, downstream passage will be maintained during Fall out-migration from September 1 to November 15 (Fall TOY Restriction for alewife, blueback herring, American shad, and American eel) for all major activities. For all minor activities, silt curtains will be required if performed from February 15 to July 15 or September 1 to November 15. The implementation of these TOYs will be written into contract specifications to prevent impacts to some of the trust species by keeping construction activities from occurring within these sensitive windows.

6.2.1 Habitat Disturbance

Habitat disturbance resulting from construction activities, including dredging, pile driving/removal, and cable removal, will directly impact the benthic community by reducing submerged aquatic vegetation, benthic infauna, and sedentary epifauna, including food sources; removing suitable cover; homogenizing bottom substrates; and reducing the structural complexity of habitats on the floor of the Charles River. This will result in a temporary loss of bottom habitat, including cover and foraging for NOAA Fisheries Trust Resource Species such as the white perch, rainbow smelt, and gizzard shad that may use the Project Activity Area, as described in **Table 10** above. There is, however, abundant similar habitat throughout the Charles River that provides comparable feeding opportunities. Further, benthic organisms removed by dredging activities in shallow mud and sand bottom areas typically have rapid recolonization rates through reproductive mechanisms, thereby minimizing the long-term loss of benthic prey. The impacts to white perch, rainbow smelt, and gizzard shad would be temporary, short-term, and insignificant. Alewife, American eel, blueback herring, and American shad are not likely to use the Project Activity Area for these purposes and will not be impacted by these construction activities.

The construction of temporary cofferdams and trestles, dredging, and location of equipment within the Charles River may delay migrating fish, such as alewife, American eel, blueback herring, American shad, gizzard shad, white perch, and rainbow smelt from moving through the Project Activity Area; however, construction activity is limited to 8 hours per day, which leaves 16 hours of a 24-hour period for species to use and travel through the Project Activity Area without pile driving noise and other construction activity. These impacts would be temporary, short-term, and insignificant.

6.2.2 Vessel Transits

While the location of potential staging areas for barges and other vessels that may be used to support the Proposed Project are not known at this time, it is anticipated that there is sufficient capacity in the East Boston or Quincy/Weymouth waterfronts. Barges moved by tugs, supply vessels, and work boats would likely operate from one or more of these locations. Project barges moving to and from home ports would travel at relatively slow speeds, generally less than 10 miles per hour (mph). Construction-related vessel traffic would represent a small percentage of the annual commercial and recreational vessel traffic within the Project Activity Area.

The movement of vessels serving the Proposed Project would be intermittent, temporary, and restricted to a small portion of the Project Activity Area on any given day. TOY restrictions do not apply to vessel transit because NOAA Fisheries Trust Resource Species have a startle response such that they sense approaching vessels and rapidly move out of harm's way; the response is especially protective given the slower speeds typical of construction vessels. Alewife, American eel, blueback herring, American shad, rainbow smelt, gizzard shad, and white perch prefer the middle or bottom of the water column and are not expected to be directly impacted by vessel transit on the water surface; however, there is a very low potential for fish mortality by vessel transit. Any loss of individuals would have a negligible effect on any species population.

Potential indirect impacts to alewife, American eel, blueback herring, American shad, rainbow smelt, gizzard shad, and white perch from vessel transits in the Project Activity Area include general stress and disruption of regular daily activities. It is likely that the baseline vessel activity surrounding the Project Activity Area between potential home ports and/or staging areas in Weymouth/Quincy and Boston/East Boston and the Charles River is well in excess of several thousand transits per year. It is estimated that Project-related construction vessel transits would number in the hundreds during the construction period. These impacts would be temporary and short-term and would occur only while the vessels are moving. When added to the baseline vessel traffic, the traffic associated with construction vessels in the Project Activity Area would be insignificant.

6.2.3 Hydroacoustics

Construction activities within the Charles River would generate a variety of intermittent noise, resulting from the operation of diesel-powered equipment, such as dredges, pile drivers, vibratory hammers, boat motors, and generators. Noise levels from these sources will vary and some of them may have the potential to impact behavior and, in the case of in-water pile driving, they could have physiologically harmful effects on American eel, blueback herring, American shad, rainbow smelt, gizzard shad, and white perch.

Pile-driving activities and other underwater construction may generate intense underwater sound pressure waves that can adversely affect nearby aquatic organisms. Studies of the effects of pile driving have found that there is substantial variation in a species' response to sound, as intense sound pressure waves can change fish behavior or injure/kill fish through rupturing swim bladders or causing internal hemorrhaging. The degree to which an individual fish that is exposed to sound waves would be affected depends on variables such as the peak sound pressure level, frequency, cumulative sound exposure levels (cSEL), and distance from the source, as well as the species, size, auditory physiology, and condition of a fish (e.g., small fish are more prone to injury by intense sound waves than are larger fish of the same species) (NOAA Fisheries, 2016).

In addition, the intensity of the sound pressure levels produced during sheet and pile driving depends on a variety of factors, including but not limited to the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, and the type and size of the pile-driving hammer. To reduce impacts to American eel, blueback herring, American shad, rainbow smelt, gizzard shad, and white perch from underwater noise, a "soft start" will be implemented for pile driving, which is expected to direct species away from the area before full-energy pile driving occurs. Fish species would avoid the area before they accumulate enough sound energy to be injured. Further, pile driving is limited to 8 hours per day, which leaves 16 hours of a 24-hour period for species to use and travel through the Project Activity Area without pile driving noise. Vessel activity will also create underwater noise; however, when added to baseline vessel noise conditions, the underwater noise associated with construction vessels in the Project Activity Area would be insignificant.

6.2.4 Water Quality

Disturbance of bottom sediments during dredging and pile driving/removal can increase suspended sediment or TSS concentrations and down-current deposition of re-suspended sediments. Increased levels of suspended sediments can result in reduced fish egg and larvae development, abrasion of sensitive gill epithelial tissue, reduced feeding and growth of filter-feeding benthic organisms, and mortality to American eel, blueback herring, American shad, rainbow smelt, gizzard shad, and white perch. Depending on the species, episodic increases in suspended sediments can create an avoidance behavior, whereby mobile life stages would move out of or away from areas of higher concentrations, which could interrupt foraging or cause them to move into less optimal habitat. The effects of elevated suspended sediments will depend on the volume of water and distance of a plume associated with different concentrations that cause a range of potential affects, from avoidance behavior to harm.

The use of silt curtains for minor silt-producing activities during TOY restriction periods and for major silt-producing activities outside the TOY restrictions will be included as requirements in contract specifications, and the removal of the existing caissons within the cofferdams to reduce TSS will be listed as an option for the contractor. Additionally, TOY restrictions will apply to the dredging, pile driving, and drilled shaft installation to minimize impacts to fish species.

Over the course of the construction sequence, it is anticipated that multiple dredging events, spread out over the construction period, will occur. Therefore, it is expected that no single dredging event would remove a substantial amount of sediment, reducing the amount of sediments that may go into suspension at any one time. Impacts to American eel, blueback herring, American shad, rainbow smelt, gizzard shad, and white perch within the Project Activity Area are expected to be minimal, temporary, and insignificant.

7.0 Conclusions

As discussed above, the Proposed Project will have temporary and permanent effects on the EFH within the Project Activity Area and on NOAA Fisheries Trust Resource Species that could occur in the Project Activity Area. Though construction activities, like most anthropogenic development activities, are known to have an adverse effect on EFH and fish species, they will be minimized by the employment of various conservation measures. Furthermore, the physical barrier of the Charles River Dam and Locks reduces the likelihood that EFH species would be present at the Project Site, and the slow water speed allows the suspended solids to drop from the water and continually build up upstream of the dam, which would not allow vegetative habitats to develop. The conclusion of this EFH Assessment is that the Proposed Project may have adverse, but not substantial, effects on EFH species, because the impacts will be avoided, minimized, and offset.

For NOAA Fisheries Trust Resource Species, a similar conclusion can be drawn, since the Project will implement various measures to minimize the effects of major silt producing activities or high noise levels. The passage past the work site will not be more than 25 percent restricted to allow upstream and downstream migrating fish sufficient room to move through the work site. Work activities that produce potentially harmful effects on migrating fish will be intermittent over the course of any given day, and the days of a week; for example, nighttime work would occur on a very limited basis, if at all.

The Proposed Project has been designed, and construction methods selected, to minimize impacts. For example, drilled casings would be used to limit sediment disturbance, and existing piles that do not need to be removed below the mudline would be cut at the mudline to limit sediment disturbance.

Therefore, the conclusion of this assessment is that the Proposed Project will likely have only a minor adverse impact on EFH and fish species, as well as NOAA Fisheries Trust Resource Species, which is not substantial enough to measurably affect population levels of any species. Measures to minimize and mitigate impacts will be implemented, further reducing the impacts to these species.

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Appendix A

EFH Worksheet

EFH Assessment Worksheet rev. August 2021

Please read and follow all of the directions provided when filling out this form.

1. General Project Information

Date Submitted:

Project/Application Number:

Project Name: MBTA Draw One Bridge Replacement Project

Project Sponsor/Applicant: Massachusetts Bay Transit Authority (MBTA)

Federal Action Agency (or state agency if the federal agency has provided written notice delegating the authority[1]): Federal Transit Administration

Fast-41: Yes ☐ No ☑

Action Agency Contact Name: Jonathan Schmidt

Contact Phone: 617-494-4742 Contact Email: Jonathan.Schmidt@dot.gov

Address, City/Town, State:

220 Binney Street Suite 940, Cambridge, MA 02142-1093

2. Project Description

[2]Latitude: 42.369250°N Longitude: 71.065508°W

Body of Water (e.g., HUC 6 name): Charles River

Project Purpose:

The Massachusetts Bay Transit Authority (MBTA) is replacing its Draw One Bridge No. B-16-479 and performing associated track and signal upgrades.

Project Description:

The Project consists of the replacement of the Draw One Bridges No. B-16-479 over the Charles River including the north and south approach trestles and demolition and replacement of the building housing the operating system for the drawbridges (Signal Tower A). The bridges are located above the Charles River and support commuter rail service between communities north of Boston and Boston, located immediately adjacent to and northwest of MBTA's North Station. Several other upgrades within the bridge construction limits will also be addressed including signals, communications, and drainage.

Anticipated Duration of In-Water Work including planned Start/End Dates and any seasonal restrictions proposed to be included in the schedule:

The entire Proposed Project is expected to take eight years to complete. In-water work will be necessary throughout the entire eight years without seasonal shut downs.

[1] A federal agency may designate a non-Federal representative to conduct an EFH consultation by giving written notice of such designation to NMFS. If a non-federal representative is used, the Federal action agency remains ultimately responsible for compliance with sections 305(b)(2) and 305(b)(4)(B) of the Magnuson-Stevens Act. [2] Provide the decimal, or the degrees, minutes, seconds values for latitude and longitude using the World Geodetic System 1984 (WGS84) and negative degree values where applicable.

3. Site Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[3]?	☑ Yes	☐ No
Is the project in designated HAPC?	☐ Yes	☑ No
Does the project contain any Special Aquatic Sites[4]?	☐ Yes	☑ No
Is this coordination under FWCA only?	☐ Yes	☑ No

Total area of impact to EFH (indicate sq ft or acres): 46,555 SF

Total area of impact to HAPC (indicate sq ft or acres): None

Current range of water depths at MLW	Salinity range (PPT):	Water temperature range (°F):
10 - 20 feet	0.8 (surface) - 14.0 (bottom)	37.8 - 83.1°F

[3]Use the tables in Sections 5 and 6 to list species within designated EFH or the type of designated HAPC present. See the worksheet instructions to find out where EFH and HAPC designations can be found. [4] Special aquatic sites (SAS) are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region. They include sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes (40 CFR Subpart E). If the project area contains SAS (i.e. sanctuaries and refuges, wetlands, mudflats, vegetated shallows/SAV, coral reefs, and/or riffle and pool complexes, describe the SAS, species or habitat present, and area of impact.

4. Habitat Types

In the table below, select the location and type(s) for each habitat your project overlaps. For each habitat type selected, indicate the total area of expected impacts, then what portion of the total is expected to be temporary (less than 12 months) and what portion is expected to be permanent (habitat conversion), and if the portion of temporary impacts will be actively restored to pre- construction conditions by the project proponent or not. A project may overlap with multiple habitat types.

Habitat Location	Habitat Type	Total impacts (lf/ft^2/ft^3)	Temporary impacts (lf/ft^2/ft^3)	Permanent impacts (lf/ft^2/ft^3)	Restored to pre-existing conditions?*
Estuarine	Substrate (silt/mud)	46,555 SF/10,716 CF	30,912 SF/4,827 CF (+10%)	11,411 SF/4,915 CF (+10%)	Yes
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one

*Restored to pre-existing conditions means that as part of the project, the temporary impacts will be actively restored,such as restoring the project elevations to pre-existing conditions and replanting. It does not include natural restoration or compensatory mitigation.

Submerged Aquatic Vegetation (SAV) Present?:

Yes: ☐ No: ☑

If the project area contains SAV, or has historically contained SAV, list SAV species and provide survey results including plans showing its location, years present and densities if available. Refer to Section 12 below to determine if local SAV mapping resources are available for your project area.

Sediment Characteristics:

The level of detail required is dependent on your project – e.g., a grain size analysis may be necessary for dredging. In addition, if the project area contains rocky/hard bottom habitat [6](pebble, cobble, boulder, bedrock outcrop/ledge) identified as Rocky (coral/rock), Substrate (cobble/gravel), or Substrate (rock) above, describe the composition of the habitat using the following table.

Substrate Type* (grain size)	Present at Site? (Y/N)	Approximate Percentage of Total Substrate on Site
Silt/Mud (<0.063mm)	Yes	70
Sand (0.063-2mm)	Yes	20
Rocky: Pebble/Gravel /Cobble(2-256mm)**	Yes	10
Rocky: Boulder (256-4096mm)**	No	
Rocky: Coral	No	
Bedrock**	No	

[6]The type(s) of rocky habitat will help you determine if the area is cod HAPC.

* Grain sizes are based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders.

** Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.

If no grain size analysis has been conducted, please provide a general description of the composition of the sediment. If available please attach images of the substrate.

According to the Geotechnical Engineering Memorandum, the few feet of sediment in the Project area primarily consists of organic silt and fill. The organic silt stratum primarily comprises very soft to hard, dark gray to black organic silt with up to 10 percent shells. Because of the fill dumped atop this layer within the historic mud flats adjacent to the Charles River, the stratum is intermixed with up to 20 percent fine to coarse sand and debris including brick, wood, and cinders, and up to 10 percent gravel (STV, 2020).

Diadromous Fish (migratory or spawning habitat- identify species under Section 10 below):

Yes: ☑ No: ☐

5. EFH and HAPC Designations

Within the Greater Atlantic Region, EFH has been designated by the New England, Mid-Atlantic, and South Atlantic Fisheries Management Councils and NOAA Fisheries. Use the EFH mapper to determine if EFH may be present in the project area and enter all species and life stages that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present at your project site. If the habitat characteristics described in the text descriptions do not exist at your site, you may be able to exclude some species or life stages from additional consideration. For example, the water depths at your site are shallower that those described in the text description for a particular species or life stage. We recommend this for larger projects to help you determine what your impacts are.

Species Present	**EFH is designated/mapped for:**				**What is the source of the EFH information included?**
	EFH: eggs	**EFH: larvae**	**EFH: juvenile**	**EFH: adults/ spawning adults**	
American plaice	☑	☑	☑	☑	EFH Mapper c
bluefin tuna	☐	☐	☐	☑	EFH Mapper c
Atlantic butterfish	☑	☑	☐	☑	EFH Mapper c
Atlantic cod	☑	☑	☑	☑	EFH Mapper c
Atlantic mackerel	☑	☑	☑	☑	EFH Mapper c
Atlantic herring	☐	☑	☑	☑	EFH Mapper c
Atlantic wolffish	☑	☑	☑	☑	EFH Mapper c
Black sea bass	☐	☐	☐	☑	EFH Mapper c
bluefish	☐	☐	☑	☑	EFH Mapper c
ocean pout	☐	☐	☑	☑	EFH Mapper c
pollock	☑	☑	☑	☐	EFH Mapper c

Species Present	EFH is designated/mapped for:				What is the source of the EFH information included?
	EFH: eggs	EFH: larvae	EFH: juvenile	EFH: adults/ spawning adults	
red hake	✓	✓	✓	✓	EFH Mapper c
scup			✓		EFH Mapper c
spiny dogfish				✓	EFH Mapper c
summer flounder				✓	EFH Mapper c
white hake	✓	✓	✓	✓	EFH Mapper c
silver hake	✓	✓		✓	EFH Mapper c
windowpane flounder	✓	✓	✓	✓	EFH Mapper c
winter flounder	✓	✓	✓	✓	EFH Mapper c
yellowtale flounder	✓	✓	✓	✓	EFH Mapper c
little skate			✓	✓	EFH Mapper c
thorny skate			✓		EFH Mapper c
Atlantic surf clam			✓	✓	EFH Mapper c
long-finned squid			✓	✓	EFH Mapper c
northern shortfin squid				✓	EFH Mapper c
winter skate			✓	✓	EFH Mapper c

6. Habitat Areas of Particular Concern (HAPCs)

HAPCs are subsets of EFH that are important for long-term productivity of federally managed species. HAPCs merit special consideration based their ecological function (current or historic), sensitivity to human-induced degradation, stresses from development, and/or rarity of the habitat.While many HAPC designations have geographic boundaries, there are also habitat specific HAPC designations for certain species, see note below. Use the EFH mapper to identify HAPCs within your project area. Select all that apply.

☐	Summer flounder: SAV[7]	☐	Alvin & Atlantis Canyons
☐	Sandbar shark	☐	Baltimore Canyon
☐	Sand Tiger Shark (Delaware Bay)	☐	Bear Seamount
☐	Sand Tiger Shark (Plymouth-Duxbury-Kingston Bay)	☐	Heezen Canyon
☐	Inshore 20m Juvenile Cod[8]	☐	Hudson Canyon
☐	Great South Channel Juvenile Cod	☐	Hydrographer Canyon
☐	Northern Edge Juvenile Cod	☐	Jeffreys & Stellwagen
☐	Lydonia Canyon	☐	Lydonia, Gilbert & Oceanographer Canyons
☐	Norfolk Canyon (Mid-Atlantic)	☐	Norfolk Canyon (New England)
☐	Oceanographer Canyon	☐	Retriever Seamount
☐	Veatch Canyon (Mid-Atlantic)	☐	Toms, Middle Toms & Hendrickson Canyons
☐	Veatch Canyon (New England)	☐	Washington Canyon
☐	Cashes Ledge	☐	Wilmington Canyon
☐	Atlantic Salmon		

[7] Summer flounder HAPC is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, then exotic species are included. Use local information to determine the locations of HAPC.

[8] The purpose of this HAPC is to recognize the importance of inshore areas to juvenile Atlantic cod. The coastal areas of the Gulf of Maine and Southern New England contain structurally complex rocky-bottom habitat that supports a wide variety of emergent epifauna and benthic invertebrates. Although this habitat type is not rare in the coastal Gulf of Maine, it provides two key ecological functions for juvenile cod: protection from predation, and readily available prey. See EFH mapper for links to text descriptions for HAPCs.

7. Activity Details

Select all that apply	Project Type/Category
☐	Agriculture
☐	Aquaculture - List species here:
☑	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Beach renourishment
☑	Dredging/excavation
☐	Energy development/use e.g., hydropower, oil and gas, pipeline, transmission line, tidal or wave power, wind
☑	Fill
☐	Forestry
☑	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port, railroad)
☑	Intake/outfall
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☐	Overboard dredged material placement
☑	Piers, ramps, floats, and other structures
☐	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, mitigation bank/ILF creation)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☑	Water quality (e.g., storm water drainage, NPDES, TMDL, wastewater, sediment remediation)
☐	Other:

8. Effects Evaluation

Select all that apply	Potential Stressors Caused by the Activity
☑	Underwater noise
☑	Water quality/turbidity/ contaminant release
☑	Vessel traffic/barge grounding
☐	Impingement/entrainment
☐	Prevent fish passage/spawning
☑	Benthic community disturbance
☐	Impacts to prey species

Select all that apply and if temporary[9] or permanent		Habitat alterations caused by the activity
Temp	Perm	
☐	☐	Water depth change
☐	☐	Tidal flow change
☑	☑	Fill
☑	☑	Habitat type conversion
☐	☐	Other:
☐	☐	Other:

[9] Temporary in this instance means during construction. [10] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

Details - project impacts and mitigation

Briefly describe how the project would impact each of the habitat types selected above and the amount (i.e., acreage or sf) of each habitat impacted. Include temporary and permanent impact descriptions and direct and indirect impacts. For example, dredging has a direct impact on bottom sediments and associated benthic communities. The turbidity generated can result in a temporary impact to water quality which may have an indirect effect on some species and habitats such as winter flounder eggs, SAV or rocky habitats. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

The Project will begin with the demolition/removal of existing structures remaining from the bridges partially removed including the demolition of existing caissons, pile extraction of the existing fender system, and submarine cable removal west of the existing bridges. This portion of work will result in a temporary impact of 24,012 SF. These impacts on the estuarine silt/mud habitat are due to dredging that is required for the removal of the cable, fender system, and 11 of the caissons. This will disrupt the bottom sediment and impact benthic communities as the sediment will be removed and disposed of off-site since some of the sediment at the Project Site is contaminated. Turbidity would increase from this work, but would likely only increase within 100 feet of the Project Site. Timber piles and a portion of the caissons that will be removed will be cut at the mudline so that the river bottom is not impacted and there's no resulting increase in turbidity.

After the initial demolition work, the proposed structure construction will include riverbed dredging and constructing drill shafts, trestles, temporary trestles, fender piles, and a king pile abutment in front of the existing seawall. This work will result in a temporary impact of 30,912 SF and a permanent impact of 11,411 SF. Dredging will disrupt the bottom sediment and impact benthic communities, and turbidity would increase from this work, but would likely only increase within 100 feet of the Project area.

After construction of the new structures is complete, additional demolition will be needed which involves extracting the temporary work trestle piles. This work would result in a temporary impact of 0 SF. Dredging will disrupt the bottom sediment and impact benthic communities, and turbidity would increase from this work, but would likely only increase within 100 feet of the Project area.

See EFH Assessment Narrative for additional details.

What specific measures will be used to avoid and minimize impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided or minimized, why not?

Turbidity and sediment controls will be implemented during construction which may include cofferdams and silt curtains. Existing timber piles will be cut and removed at the mudline to reduce disturbance to the river bottom. Based on the hydroacoustic modeling, the effects from the pile driving noise are expected to extend out approximately 5.5 miles from the Project Site; however, the model is unable to take into account the effects the Charles River Dam and Locks would have on the sound. It is believed that the sound would dampen when the dam is encountered and would not continue into Boston Harbor or reach 5.5 miles. However, as a fish protection best practice, a single cautionary blow will be made with the barge mounted impact hammer as a soft start prior to initiating the daily pile driving activities. As per email recommendation from Kaitlyn Shaw (NOAA Fisheries) dated May 4, 2021, time of year restrictions for diadromous species will be employed and would follow the spring TOY for upstream passage for spawning and migratory fish trust species would be as follows – Spring from February 15 to July 15 and downstream passage maintained during the Fall out migration from September 1 to November 15), as per the DMF Technical Report TR-47 (Evans et al. 2015). During these time of year restrictions, turbidity and sediment controls will not extend more than 25% from the ordinary high water mark of the river to allow for fish passage. Additional guidance from NOAA is expected during the consultation process.

Is compensatory mitigation proposed? Yes ☑ No ☐

If compensatory mitigation is not proposed, why not? If yes, describe plans for compensatory mitigation (e.g. permittee responsible, mitigation bank, in-lieu fee) and how this will offset impacts to EFH and other aquatic resources. Include a proposed compensatory mitigation and monitoring plan as applicable.

Throughout permitting process we will determine the extent of compensatory mitigation required for this work (e.g. in-lieu fee assessment).

9. Effects of Climate Change

Effects of climate change should be included in the EFH assessment if the effects of climate change may amplify or exacerbate the adverse effects of the proposed action on EFH. Use the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) 8.5/high greenhouse gas emission scenario (IPCC 2014), at a minimum, to evaluate the future effects of climate change on the proposed projections. For sea level rise effects, use the intermediate-high and extreme scenario projections as defined in Sweet et al. (2017). For more information on climate change effects to species and habitats relative to NMFS trust resources, see Guidance for Integrating Climate Change Information in Greater Atlantic Region Habitat Conservation Division Consultation Processes.

1. Could species or habitats be adversely affected by the proposed action due to projected changes in the climate?If yes, please describe how:

   No

2. Is the expected lifespan of the action greater than 10 years? If yes, please describe project lifespan:

   Yes, the lifespan of the Project is expected to be 75 years.

3. Is climate change currently affecting vulnerable species or habitats, and would the effects of a proposed action be amplified by climate change? If yes, please describe how:

   No

4. Do the results of the assessment indicate the effects of the action on habitats and species will be amplified by climate change? If yes, please describe how:

   No

5. Can adaptive management strategies (AMS) be integrated into the action to avoid or minimize adverse effects of the proposed action as a result of climate? If yes, please describe how:

   No

10. Federal Agency Determination

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA only request.
☑	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA documents, if applicable.

[7] An adverse effect is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

11. Fish and Wildlife Coordination Act

Under the FWCA, federal agencies are required to consult with us if actions that the authorize, fund, or undertake will result in modifications to a natural stream or body of water. Federal agencies are required to consider the effects these modifications may have on fish and wildlife resources, as well as provide for the improvement of those resources. Under this authority, we consider the effects of actions on NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats, that are not managed under a federal fisheries management plan. Some examples of other NOAA-trust resources are listed below. Some of these species, including diadromous fishes, serve as prey for a number of federally-managed species and are therefore considered a component of EFH pursuant to the MSA. We will be considering the effects of your project on these species and their habitats as part of the EFH/FWCA consultation process and may make recommendations to avoid, minimize or offset and adverse effects concurrently with our EFH conservation recommendations.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or species listed under the Endangered Species Act and the appropriate consultation procedures.

Fish and Wildlife Coordination Act Resources

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Alewife are anadromous and adults migrate up rivers from marine waters to spawn. They typically spawn in slow-moving rivers and ponds. After spawning, adults migrate back to sea and juveniles will migrate to marine waters after they hatch. Alewife would not be inhibited from passing through the project area and would likely not spawn at the Project site.
American eel	American eels are catadromous and some juveniles migrate up rivers to live in fresh or brackish water for multiple years before they mature and migrate back out to sea to spawn. Juvenile American eels spend typically live in freshwater rivers, tidal creeks, harbors, and salt ponds with muddy bottoms. American eels can traverse dams and fish ladders, so they could potentially pass through the Gridley Locks and through the Project site. The project could take place in juvenile American eel habitat, but eels migrating up stream would not be inhibited from passing through the Project area.
American shad	American shad are anadromous and migrate up rivers from marine waters to spawn in shallow areas with sand or gravel. After spawning, adults migrate back to sea, and juveniles will eventually migrate to marine waters. American shad could potentially migrate through the Project and would not be inhibited from passing, but likely wouldn't stay in that type of habitat.
Atlantic menhaden	
blue crab	
blue mussel	
blueback herring	Blueback herring are anadromous and adults migrate upstream to spawn in rocky or gravely areas of swiftly flowing sections of streams. Blueback herring could potentially get through the Gridley Locks and could migrate through the Project area, but they would not be inhibited from passing through the Project area is not their preferred habitat. After spawning, adults migrate back out to sea and newly hatched juveniles will follow soon after where they spend most of their lives.
Eastern oyster	
horseshoe crab	
quahog	
soft-shell clams	
striped bass	
other species:	Rainbow smelt are anadromous and adults migrate to the lower edge of freshwater to spawn in areas of swiftly flowing sections of water with gravel or boulder substrate. Rainbow smelt do not typically pass over dams more than two feet tall, but could potentially get through the Gridley Locks and migrate through the Project site, but they would not stay in the Project area since it's not their preferred habitat.
other species:	White perch live in fresh, brackish, and coastal waters. Adults tend to be found in areas with mud, silt, or sand. Adults living in marine waters migrate to freshwater areas to spawn. They could potentially get through the Gridley Locks and could be found in the Project area, but they would not be inhibited from passing through the Project area.
other species:	Gizzard Shad are found in freshwater rivers and ponds and brackish and coastal waters. They prefer shallow water with soft, muddy bottoms. Adults spawn near the surface of slow-moving water. They could potentially get through the Gridley Locks and could be found in the Project area, but they would not be inhibited from passing through the Project area.

TRC

Appendix B

Interagency Consultation Meeting Minutes and Agency Correspondence

USACE Interagency Consultation Meeting #1
Meeting Minutes

Meeting Date:	May 7, 2020
Client:	MBTA
Project Name:	Draw 1 North Station Bridge Replacement
Designer:	STV Incorporated
Meeting Place:	Virtual
Prepared by:	Colin Duncan (CD) and Sam Moffett (SM), TRC
Attendees:	Amelia Croteau (AC), Boston ConCom Nick Moreno (NM), Boston ConCom Jennifer Letourneau (JL), Cambridge ConCom Eric Papetti (EP), FTA Leah Sirmin (LS), FTA Kristin Wood (KW), FTA Michelle Muhlanger (MM), FRA Alan Anachecka-Naseman (A A-N), ACOE Ed Reiner (ER), EPA Mike Johnson (MJ), NOAA fisheries Jeff Stieb (JS), USCG Sean Casey (SC), DCR Rob Lowell (RL), DCR Bill Gode (BG), DCR Daniel Padien (DP), DEP Chapter 91 Phil DiPietro (PD), DEP Tay Evans (TE), DMF Holly Palmgren (HP), MBTA Karl Eckstrom (KE), MBTA Kris Kretch (KK), MBTA Mark Ennis (ME), STV Tamia Burkett (TB), STV Diane Stallings (DS), TRC

Introduction – HP and SM

- *MBTA Environmental informed the group that the project has been recently federalized and the Design Team will be working with FTA on MEPA. MBTA also informed the team that there have been preliminary meetings with historic agencies as well to introduce the project.*

Discussion Items/Topics – ME presented project slides to group

- **Project Overview**
  - *Overview using presentation provided by STV Design Team ME & SM*
  - Continuity of Rail Operations throughout Construction

- Type Study – June 2020
  - *This document will provide a recommendation on the best structure type & recommend best configuration of tracks that provides a long-term solution for MBTA ridership in & out of North Station*
- **Bridge Components and Type Study**
  - Spans
  - North and South Trestles
  - Control Tower
  - Rail System/North Station Platforms
  - Channel width change
  - Pedestrian Bridge, *DCR to weigh in*
  - Stormwater
  - Climate Resilience
- **Project Location and Jurisdictional Resource Areas**
  - Charles River and Millers River
  - Filled/Flowed Tidelands
  - Floodplain
  - Historical Structures
- **Likely Permit/Review Programs –** Presented by Colin Duncan, TRC
  - FTA – NEPA – CoA TBD
    - Section 106 NHPA
  - USACE – Section 404/10/14 (no 408)
    - Consultation: EPA, NOAA NMSF, FWS, DMF, DFW NHESP
    - BUAR
  - US Coast Guard – Navigation Impact Report and Preliminary Navigation Determination
    - *Bridge Permit TBD*
    - *Design team informed agencies that DCR has primary control at the project site location in collaboration with the Coast Guard*
    - *Navigation impact report produced by the Design Team will lead to preliminary navigation determination*
      - *USCG confirmed that they will lean on DCRs input for changes to vertical and horizontal clearance, including closed vertical clearance*
  - DCR – Project Consultation
  - MEPA – ENF
  - MassDEP – Chapter 91 License Modification
  - MassDEP – Section 401 Water Quality Certification
  - Boston and Cambridge Conservation Commissions – MWPA NOIs
  - MWRA - 8(m)
  - TBD: MA CZM CD; Others
- **Project Schedule**
- **Permitting Data Needs**
- **Permitting Timeline**
  - Individual Agency Pre-Application Consultations
  - Application Filings

Future Agency Meetings/Consultations

The next meetings will be by either permit or topic area. Might need another full agency meeting in the future.

Other Issues

- *If any construction in floodplain/way – it was suggested to the Design Team to review Section 60.3 of the National Insurance Program Regulations*

Q&A

BG – Is sidewalk on downstream side of project?
ME replied the depiction on the slide is an old. Discussions have advanced and walkways along the trestle are no longer planned.

Tower A still in place?
ME – Yes, and demo might be first step in the project.
SM, conclusion that there is not a track configuration that will allow tower A to be retained, but STV cannot be said with certainty.
ME, tower A structure and condition is more relevant.
KE also said current ops being done in temporary structure. Tower A mostly houses old equipment at this point and building had essentially been abandoned

PD –Are we in flood way of Charles River?
CD – We believe so

PD - Any dredging?
CD, yes in terms of removing old timber and associated with drilling

A A-N – Don't we also need USCG input?
SM, yes and Coast Guard is present at this meeting
Above Charles river DAM DCR is primary moderator with some USCG. Need Navigational Impact Study report for this

JS – yes report will lead to preliminary nav determination and horizontal and vertical clearances. In mid permit stage a CG permit will be required

AC – MEPA process in the future. Questions regarding floodplain, is Tower A only building to be removed?
SM – Tower A only Building but south trestle and bridge spans will also be removed and replaced. North Trestle will be altered. Will require disturbance of river bed.

AC- Are buildings considered historic?

SM - We are in active discussions currently to decide on trajectory for an MOA to allow this to proceed.

AC – Fill in floodway urge Section 60.3 regulations review.

SM Physical constraints make grading options difficult to revise. Not much option to change heights, etc.

DP from DEP waterways – Slide indicate Chapter 91 license mod. Are we going to ask for a mod or new license?

SM – not sure yet, dependent on how design evolves. Idea or MBTA is to seek mod of existing license. We think this will be suitable for Chapter 91 licensing. Waterways is ready to assist with this project and MBTA. Mod will be dependent on what alternative is selected. Dan confident we will get to a license.

A A-N needs to leave meeting – we are on right track and need to look at alternatives He is confident that project will have least amount of environmental impacts. Is he or FTA Lead applicant?

HP – thinking to federalize, FTA will be lead agency for this.

FTA – good presentation – can team talk about track work on North side?

ME – challenge to project tracks from the west and North come into North Station, need to access the BET for storage and maintenance. Tracks cross a lot to the north and looking at optimal configuration of track

FTA - Is there the potential for track and switch replacement?

ME- 90% of track work will happen will be within MBTA ROW in that area

FTA – how will to the north affect service north of project area? There could be interception of future projects to the north. Do we know plans of other projects?

ME- we do know that NH RR there is a design project to replace that bridge future expansion for areas is under discussion with RR ops

KE. – MBTA is revamping signal system from analog to programable, this will be done before and is in place before Draw 1 project is design. Part of phase project.

SM – Any fisheries?

MJ to everyone:

I have another call at 11, so need to drop off. But wanted to mention that the River is important for diadromous fish (river herring, shad, rainbow smelt, American eel) migratory and spawning. A winter-spring TOY restriction will likely be necessary, and potentially a fall restriction, as well. Also, interested in seeing how projected sea level rise is being addressed, especially the vertical clearance from the river for new bridge height. Thanks for presentation.

HP to everyone:
thanks Mike we will be in touch to discuss further

ER – corps dam regulates water levels at this site at about MSL. He is confused about flood plain and sea level rise. Is Corps dam going to regulate sea level rise?

> *SM – team engaged with DCR we developed better understanding of how WL is managed by DCR. Scenario is where dam is overtopped rather than day-to-day.*

How is flood plain defined on both sides of Dam? How does that work?

> *SM – we are looking at options for an approach to this and will work with the team as design advances*

ER – kayakers go through opening in trestle – in future, will this be improved? This should be taken into consideration? Is there section 10 or 404 Corps work?

PD – did not understand P bridge in vicinity of Spaulding rehab

> *HP – DCR has proposed bridge. A 3rd pedestrian bridge spanning entire river, details being discussed with DCR.*

BG – good presentation – comments will be e-mailed to HP. On permitting with DCR construction access permit required. HP – they will be in touch

USACE Interagency Consultation Meeting #2
Meeting Minutes

Meeting Date:	April 15, 2021
Client:	MBTA
Project Name:	Draw 1 North Station Bridge Replacement
Designer:	STV Incorporated
Meeting Place:	Virtual - Webex
Prepared by:	Colin Duncan and Diane Stallings, TRC
Attendees:	Alan Anachecka-Naseman, USACE Jennifer Letourneau, Cambridge Conservation Commission Rachel Croy, EPA Ed Reiner, EPA Ryan Bartlett, FTA Leah Sirmin, FTA Kristin Wood, FTA Karl Eckstrom, MBTA Holly Palmgren, MBTA Tess Paganelli, MBTA Erikk Hokenson, MassDEP David Wong, MassDEP Kaitlyn Shaw, NOAA Mark Ennis, STV Preethi Sreeraj, STV Karol Szaro, STV Diane Stallings, TRC Annie Cornell, TRC

Safety Moment – TRC, Distracted Driving

Introductions

HP, USCG not in attendance today but have been involved to date.

Discussion Items/Topics

Presentation provided by Mark Ennis, STV, Sam Moffett, TRC and Colin Duncan, TRC

- Project Overview and Status
- Project Schedule
- Anticipated Construction Approach and Impacts

- Pedestrian Bridge Considerations
- Anticipated Permits/Reviews and Schedule
- Consultation and Data Needs

Future Agency Meetings/Consultations

Discussion, Q&A

Ed Reiner, EPA:

- Cutting piles at/above mudline is not standard approach for bridge replacement. SM: comment acknowledged; approach advantages to be fully discussed.
  - David Wong concurs with EPA's assessment.
  - STV and MBTA design based on functionality but some adjustments can be made later in the design process.
  -
- What is the minimum vertical clearance under fixed trestles, for boat passage? SM: clearance will be very close to existing.
- Proposed bridge looks ugly. ME: function and longevity are primary concerns for design. MBTA seeking inputs from multiple stakeholders including historical agencies.
- Will new wider area of bridge & trestles increase shading of river? SM: area will be larger but waterway will maintain same water column for fish passage. MBTA will be conducting EFH & Fisheries studies & consult with NOAA & DMF for fisheries issues.
- Will cutting piles at mudline vs. removing altogether interfere with new piles? Could old piles, which contain creosote, be removed? ME: new piles will be offset from existing so that they will not interfere below mudline. Approximate ratio of old piles to new will be 1:3. Removing piles altogether could cause issues with settlement of sediments that is more problematic. Piles for fender system will be pulled altogether.
- Will small vessels such as kayaks be able to pass under trestles? ME: the existing passage is very tight even for small vessels and there will not be an appreciable difference.

David Wong, MassDEP Ch. 91

- For new bridge design, Charles River represents Massachusetts, which should be considered for appearance.
- DEP considers removal of all materials below mudline in tidal waters as fill and part of dredging calculation under Section 401. SM: acknowledged. ER: everybody knows that

Charles is dammed with constant water level and no longer considered tidal. (Also see Alan A-N comment)

- A WQC must be tied to a MEPA filing (ENF and/or EIR).

Alan Anachecka-Naseman, USACE

- Piles in waterway are considered as structures under 404, not fill.
- Permitting: As lead federal agency, FTA will coordinate fisheries ESA review with NMFS and DMF, etc. Also, Section 106, consulting Tribes will be Aquinnah Wampanoags, Mashpee Wampanoags, and Narragansetts.
- Alternatives to be considered appear to be No Action and proposed replacement, which seems to be acceptable.
- Mitigation will likely be In Lieu Fee.

Kaitlyn Shaw, NOAA

- Appreciates the presentation; will review presentation for impacts including fish passage.

Stallings, Diane

From: Palmgren, Holly <HPalmgren@MBTA.com>
Sent: Tuesday, May 4, 2021 9:41 AM
To: Moffett, Samuel; Duncan, Colin; Stallings, Diane
Cc: Eckstrom, Karl; Paganelli, Tess; John M. Ennis
Subject: [EXTERNAL] Fwd: MBTA Draw 1 and Tower A Interagency Coordination Meeting #2

FYI

617-875-3807
Sent from my iPhone

Begin forwarded message:

> **From:** Kaitlyn Shaw - NOAA Federal <Kaitlyn.shaw@noaa.gov>
> **Date:** May 4, 2021 at 9:11:18 AM EDT
> **To:** "Palmgren, Holly" <HPalmgren@mbta.com>
> **Subject: Re: MBTA Draw 1 and Tower A Interagency Coordination Meeting #2**
>
> Hi Holly,
> I wanted to circle back on this. While I can provide pre-app technical assistance, an EFH assessment will still need to be provided by FTA. Because adverse effects associated with removal will be minimized through the preferred method of cutting at the mudline, we would not have major concerns with cutting the pilings at the mudline rather than below. I would anticipate a TOY under FWCA for diadromous species; ie. controls (e.g., cofferdams) should not encroach: >25% from OHW during the TOY restriction. We would refer to the TOY restrictions in Mass DMF TR-47 in this instance for trust species (Spring: Feb 15 to July 15 and downstream passage maintained during the Fall out migration from September 1 to November 15). Of course I understand this project has many overlapping requirements, so additional coordination on timing can be discussed during the consultation process. Please let me know if you have any questions.
> Best,
> **Kaitlyn Shaw**
> Marine Resources Management Specialist
> Habitat and Ecosystem Services Division
> NOAA/ National Marine Fisheries Service
> Gloucester, MA
> Office: 978-282-8457
> Pronouns: she/her/hers
> kaitlyn.shaw@noaa.gov
> www.nmfs.noaa.gov
>
> On Thu, Apr 22, 2021 at 2:23 PM Palmgren, Holly <HPalmgren@mbta.com> wrote:

Attached are the slides from the interagency coordination meeting on North Station Draw which was held on 4/15/2021. Please feel free to send any questions or comments along to me.

Thanks

Holly

-----Original Appointment-----
From: Duncan, Colin <CDuncan@trccompanies.com>
Sent: Wednesday, March 17, 2021 5:00 PM
To: Duncan, Colin; 'Alan.R.Anacheka-nasemann@nae02.usace.army.mil'; Padien, Daniel (DEP); Grafe, Jerome (DEP); Worrall, Eric (DEP); Wong, David W (DEP); Bartlett, Ryan (FTA); Nicholas Moreno; Letourneau, Jennifer; Reiner.Ed@epa.gov; Boeri, Robert (EEA); Evans, Tay (FWE); 'Sirmin, Leah (FTA)'; Wood, Kristin (FTA); Hopps, Christine (DEP); kaitlyn.shaw@noaa.gov; james.l.rousseau2@uscg.mil; Palmgren, Holly; Eckstrom, Karl; Paganelli, Tess; Ennis, John M.; Moffett, Samuel; Stallings, Diane; jeffrey.d.stieb@uscg.mil; Cornell, Annie
Cc: Anacheka-Nasemann, Alan R CIV USARMY CENAE (USA); Hokenson, Erikk (ENV)
Subject: MBTA Draw 1 and Tower A Interagency Coordination Meeting #2
When: Thursday, April 15, 2021 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Webex Virtual Meeting

All,

Due to a change in project topics on Alan's interagency call, we are changing the Draw 1 meeting date to April 15, same time. Sorry for any inconvenience and we hope to see you there. Thank you.

Greetings,

On behalf of MBTA, TRC is inviting you to participate in the next virtual interagency coordination meeting for the MBTA's North Station Draw and Tower A project. The initial meeting was held in May 2020.

This project is intending to use federal funding, and MBTA has begun coordinating with the FTA as the lead federal agency.

We would like to use this meeting to update the scope of the project and discuss permitting requirements and any concerns or issues the agencies might have.

Thank you and we hope you can join us on April 1, 2021 at 11 am.

Colin Duncan

TRC Environmental

617-549-8506

-- Do not delete or change any of the following text. --

Colin Duncan is inviting you to a Webex Personal Room meeting.

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Interagency Consultation Meeting #3
Meeting Minutes

Meeting Date: February 25, 2022
Client: MBTA
Project Name: Draw 1 North Station Bridge Replacement
Designer: STV Incorporated
Meeting Place: Virtual - Webex
Prepared by: Colin Duncan and Diane Stallings, TRC
Attendees:
Alex Hammond, FTA
Chrissy Hopps, MassDEP Ch. 91
Christina Szczepanski, TRC
Cindy Martin, TRC
Dan Driscoll, DCR
David Wong, MassDEP
Eric Papetti, FTA
Jeff Parenti, DCR
Jeffrey Stieb, USCG
Jennifer Letourneau, Cambridge Conservation Commission
Kaitlin Shaw, NOAA
Karl Eckstrom, MBTA
Karol Szaro, STV
Katelyn Rainville, USACE
Kyle Lally, MassDEP
Marissa Murphy, TRC
Mark Ennis, STV
Meg Langley, City Point Partners
Michael Stroman, MassDEP
Nicholas Moreno, Boston Conservation Commission
Page Czepiga, MEPA
Bob Boeri, MA CZM
Ruth Helfeld, DCR
Ryan Bartlett, FTA
Sean Barry, STV
Sean Casey, DCR
Sam Moffett, TRC
Tamia Burkett, STV
Tess Paganelli, MBTA
Tori Kim, MEPA

Safety Moment – TRC, Safety during Snow Events

Introductions
Karl Eckstrom.

Discussion Items/Topics

Presentation provided by Sam Moffett, TRC and Colin Duncan, TRC

- Introductions
- Project Overview/Tour
- Project Schedule
- Project Approach
- Footbridges
- Schedule
- Q&A

Future Agency Meetings/Consultations
To be set up as individual Agency meetings in the near future.

Discussion, Q&A

Dan Driscoll (DD), DCR

- DD expressed concerns about the viability of the South Bank Bridge construction. There is concern that construction of the South Bank Bridge will not be possible. Suggests the team think of alternatives to allow for pedestrian and bike travel in the vicinity of Causeway or Nashua streets
- Add DCR Construction Access Permit to permit list because bridge dismantling will need a permit and will trigger other issues.

Eric Papetti, FTA

- Once the Annotated Outline (AO) of the Environmental Assessment (EA) is approved, the project will be on NEPA dashboard and EA will need to be completed in 1-year.
- The AO should provide details documenting the coordination between MBTA and MassDCR relative to the footbridges and how this pertains to Section 4(f). The FTA will want to understand to understand all processes, etc. of the bridges before there is an approval. The footbridge is on a critical path and FTA will want to see details regarding MBTA engagement with MassDCR on the footbridge

Mark Ennis, STV

- Over a year ago, the design team presented concepts of the footbridge conflict to DCR, and understands the stress that the idea has generated. All feedback is being considered. A new plan is being developed to move and relocate the footbridge bridge so the period of closure will be greatly reduced.

Karl Eckstrom, MBTA

- MBTA looks forward to having more opportunities to meet with DCR in the near future

Kaitlyn Shaw NOAA Fisheries

- An email was sent to MBTA (May 4, 2021 at 9:11 am) agreeing that the preferred method of cutting piles at the mudline is ok

- The presence of winter flounder triggers time of year restrictions from Jan 15 to July 15 for diadromous resources. Any filling activities should be done outside of time of year restrictions

Nick Moreno, Boston Conservation Commission

- For resource areas on the figures, add Area Subject to Flooding which occurs on the trestle and North Station platform.

David Wong, MASSDEP

- Suggest an e-mail or letter from MA DMF for time of year restrictions to get the 401 approved.

- This project falls into a major dredging category due to the volume of dredging/disturbance shown on the matrix of >5,000 CY. DW suggests be WW-08, not a WW-07. Dredging includes all sediment removal and repositioning of sediment that occurs below the Mean High Tide line

- Quantification should include any material repositioned below the mean high tide line, inclusive of existing piles would be considered dredged material, cassions, etc.

- SAMP needs to be submitted to DEP for reviewed and approval prior to submittal of 401 application.

Page Czepiga, MEPA

- MEPA regulations were recently revised on January 1, 2022. This project will be required to file a mandatory EIR because the project is located within a mile of an EJ area.
- All MEPA meetings are remote and TRC can set a meeting online.

Mike Stroman, MassDEP

- Has anyone considered Article 97 for changing use of public properties?
  - Sam Moffett, design team understands need to look at Article 97 but it might not fit the project.
  - Dan Driscoll, does not anticipate Article 97 review since no land currently under Art. 97 jurisdiction is proposed to be taken or impacted for D1. If footbridge impacted (location, etc.), Art. 97 could be triggered.

Comments received via e-mail following the meeting

Jeffrey Stieb, USCG

Today's project update was very helpful. The next step for the CG would be the submission of a Project Initiation letter for the replacement bridges. Guidance regarding the Initiation Letter is in the Bridge Program Application Guide (BPAG) The initiation letter need not be exhaustive, a page or two with a project timeline and a conceptual drawing should work.

An additional important next step is to address the removal requirements the navigation centric agencies (CG, Army Corps, State Police Marine Unit and DCR) have for the removal of pilings, etc. of the old bridge. Removal "to the mudline" should work for water under elevated RR tracks which vessels cannot transit over. However below the mudline might be required for parts of the old bridge that vessels can transit over. From my perspective the best approach is for the MBTA to develop a proposal then get the agencies concerned with vessel transits and water bottoms on a Teams meeting to discuss. Seems this needs to be done before approaching the resource agencies.

After the Initiation letter is the development of a set of CG plans to precede or accompany the CG permit application. Attached is a guide to preparing the CG plans, a CG permit application template, and a recent plan sheet prepared for an Amtrak bridge in CT as an example. We should schedule a short meeting before the MBTA starts completing the CG permit application template.

William Gode, DCR

… a next step is to seek input from relevant agencies regarding work to remove pilings. Among these agencies are DCR and the MSP Marine Unit. For DCR I expect a Construction Access Permit (CAP) will be

the appropriate path with review coming to me and others inside the agency. A CAP can be applied for online here.

The MSP Marine Unit is commanded by Det. Lt. David Twomey, cc'd hereto. I suggest reaching out to him regarding plans as they are devolved so he may provide relevant feedback.

Katelyn Rainville, USACE

Prior to the meeting on Thursday February 24, 2022, KR requested TRC provide the project location, to help confirm if a 408 is needed or not. Based on the information USACE concluded " *the project is located outside any USACE projects".*

PRESENTATION

MBTA CONTRACT NO. H32PS01

ENGINEERING SERVICES FOR

NORTH STATION DRAW 1 BRIDGE REPLACEMENT

AND ASSOCIATED TRACK AND SIGNALS UPGRADES

Interagency Consultation Meeting

February 25, 2022

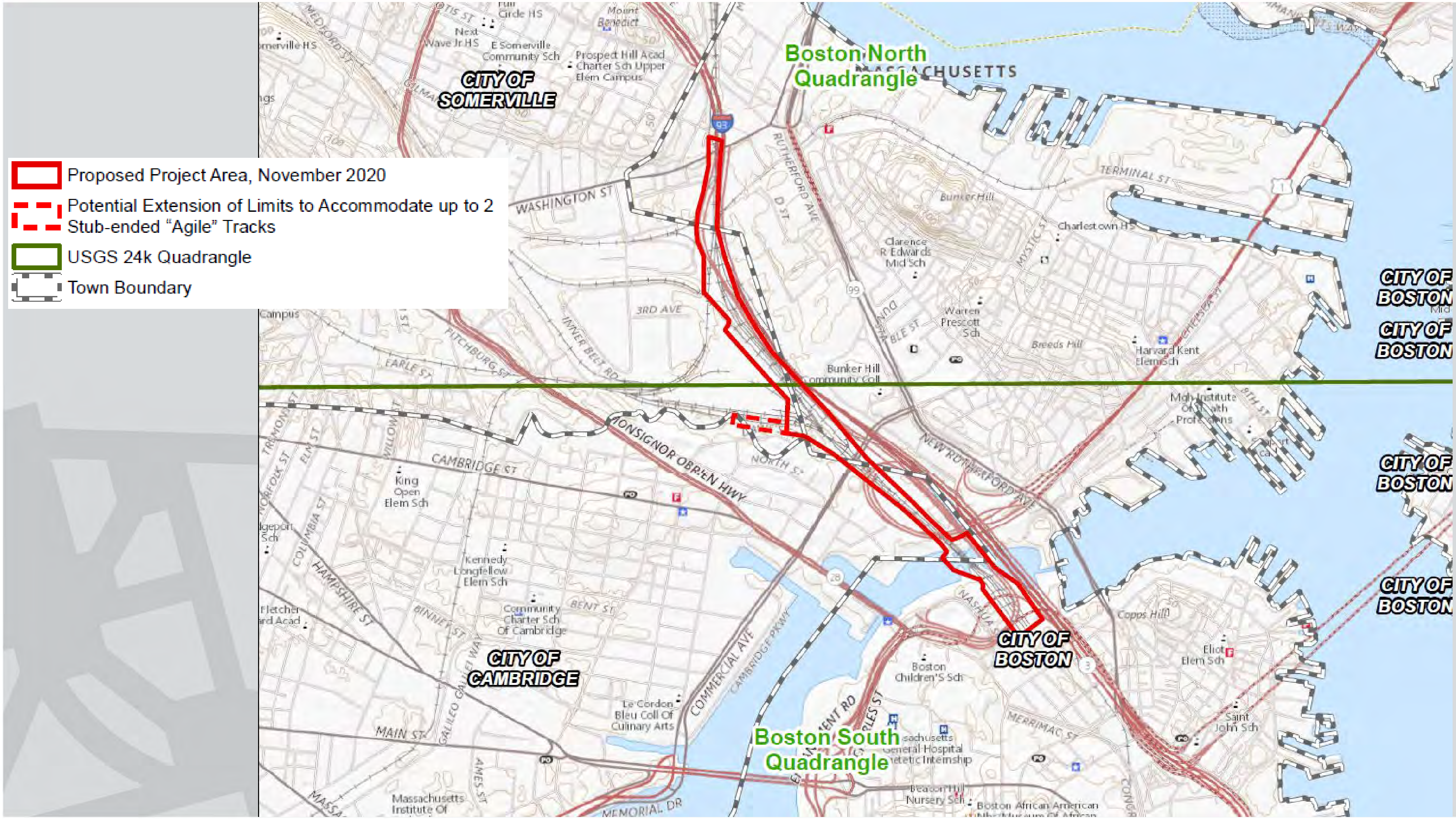
STV 100 Years

AGENDA

- INTRODUCTIONS
- PROJECT OVERVIEW/TOUR
- PROJECT SCHEDULE
- PROJECT APPROACH/PLANS
  - *Demolition Approach (Removal of In-water Structures)*
  - *Dredge and Fill (Fisheries Considerations)*
  - *Riverbank Sheetpile/Tremie Pour*
- FOOTBRIDGES
- PERMITTING
- SCHEDULE
- Q&A

PROJECT OVERVIEW

PROJECT AREA



Existing Site Overview

DCR PARK A

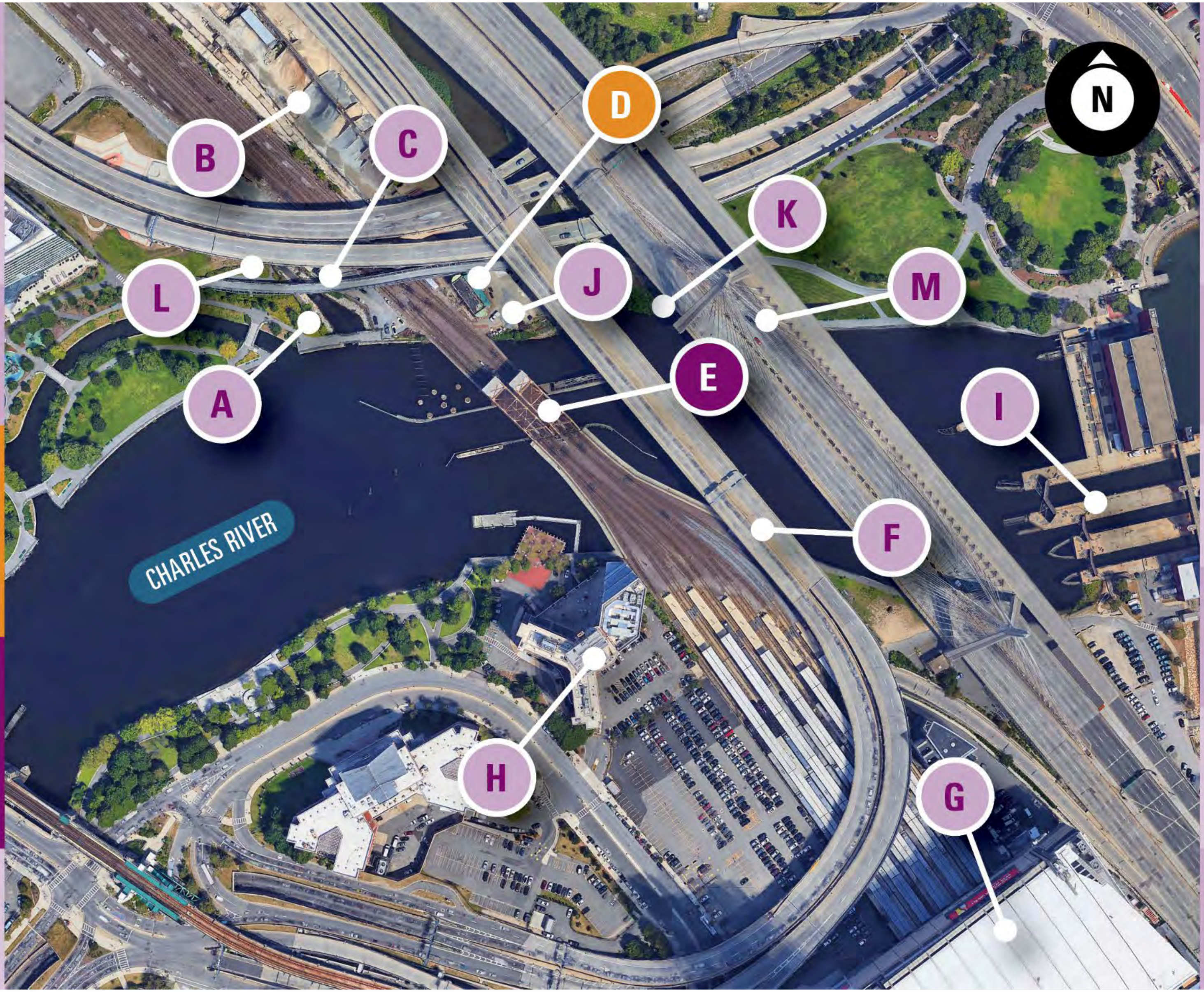
BOSTON SAND & GRAVEL B

NORTH BANK BRIDGE C

TOWER A D

DRAW 1 BRIDGES E

LEVERETT CIRCLE CONNECTOR BRIDGE F



G NORTH STATION

H MGH BUILDING (FORMERLY SPAULDING REHAB)

I CHARLES RIVER DAM

J TEMPORARY STEEL FRAME CONTROL TOWER

K MILLERS RIVER

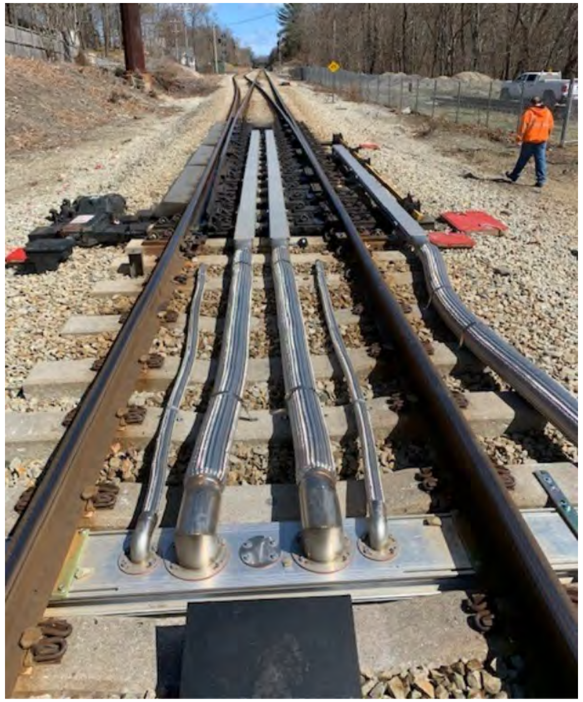
L DUCK BOAT RAMP

M ZAKIM BRIDGE

Project Scope – Additional Considerations

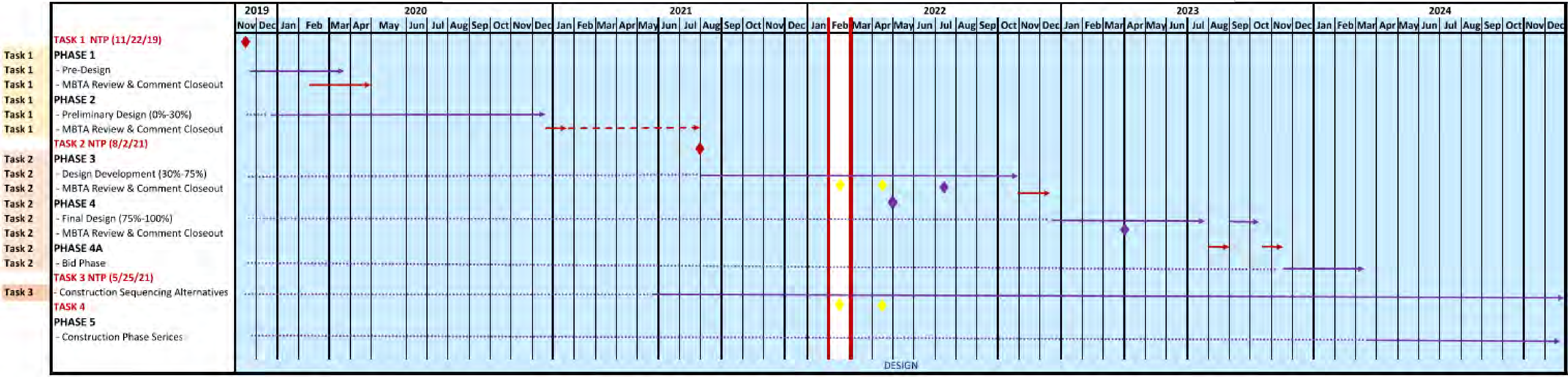
- **A minimum of four active tracks over the river during construction**
- **A minimum of ten active tracks at North Station during construction (six on weekends)**
- Signal control system upgrade using new microprocessor technology
- Local manned bridge control structure with provision for remote operation
- Pedestrian connection to walkways on each bank of the Charles River
- Environmental approvals & permits
- Agency & stakeholder coordination & public outreach
- Provisions for future electrification

Switch Heaters



Current Project Status – Schedule at Start of Task 2 & 3

	Milestone	Duration	Cumulative	Date	
	Task 1 NTP (11/22/2019)			*11/22/2019*	
Task 1	*Phase 1 Including MBTA Review*	*5.0 Mo*	*5.0 Mo*	*4/12/2020*	
Task 1	*Phase 2 Including MBTA Review*	*9.0 Mo*	*14.0 Mo*	*1/22/2021*	All Phase 1 and Phase 2 Deliverables submitted
	Task 2 NTP (8/2/2021)			*8/2/2021*	
Task 2	*Phase 3*	*15.0 Mo*	*15.0 Mo*	*11/1/2022*	
Task 2	*Phase 3 MBTA Review*	*1.5 Mo*	*16.5 Mo*	*12/16/2022*	
Task 2	*Phase 4*	*10.0 Mo*	*26.5 Mo*	*10/17/2023*	
Task 2	*Phase 4 MBTA Review*	*1.0 Mo*	*27.5 Mo*	*11/16/2023*	
Task 2	*Phase 4A (previously termed Phase 5)*	*4.0 Mo*	*31.5 Mo*	*3/17/2024*	
	Task 3 NTP (5/25/2021)			*5/25/2021*	
Task 3	*Construction Sequencing Alternative*	*concurrent with Phases 3, 4, and 5*		*11/11/2026*	
	Task 4				
	Phase 5	*72.0 Mo*	*103.5 Mo*	*11/11/2026*	



Legend

- Notice-to-Proceed Milestone
- Constructability Charettes (tentative dates

Draw 1 - Project Status

Project Timeline

- Effort on Design commenced in November 2019
- 30% Design submitted for MBTA review in December 2020 (Task 1 Complete)
- 75% Design to be submitted in November 2022
- PS&E submission to be submitted in Fall 2023
- Construction begins Spring 2024
- Construction Duration 72 months +/-

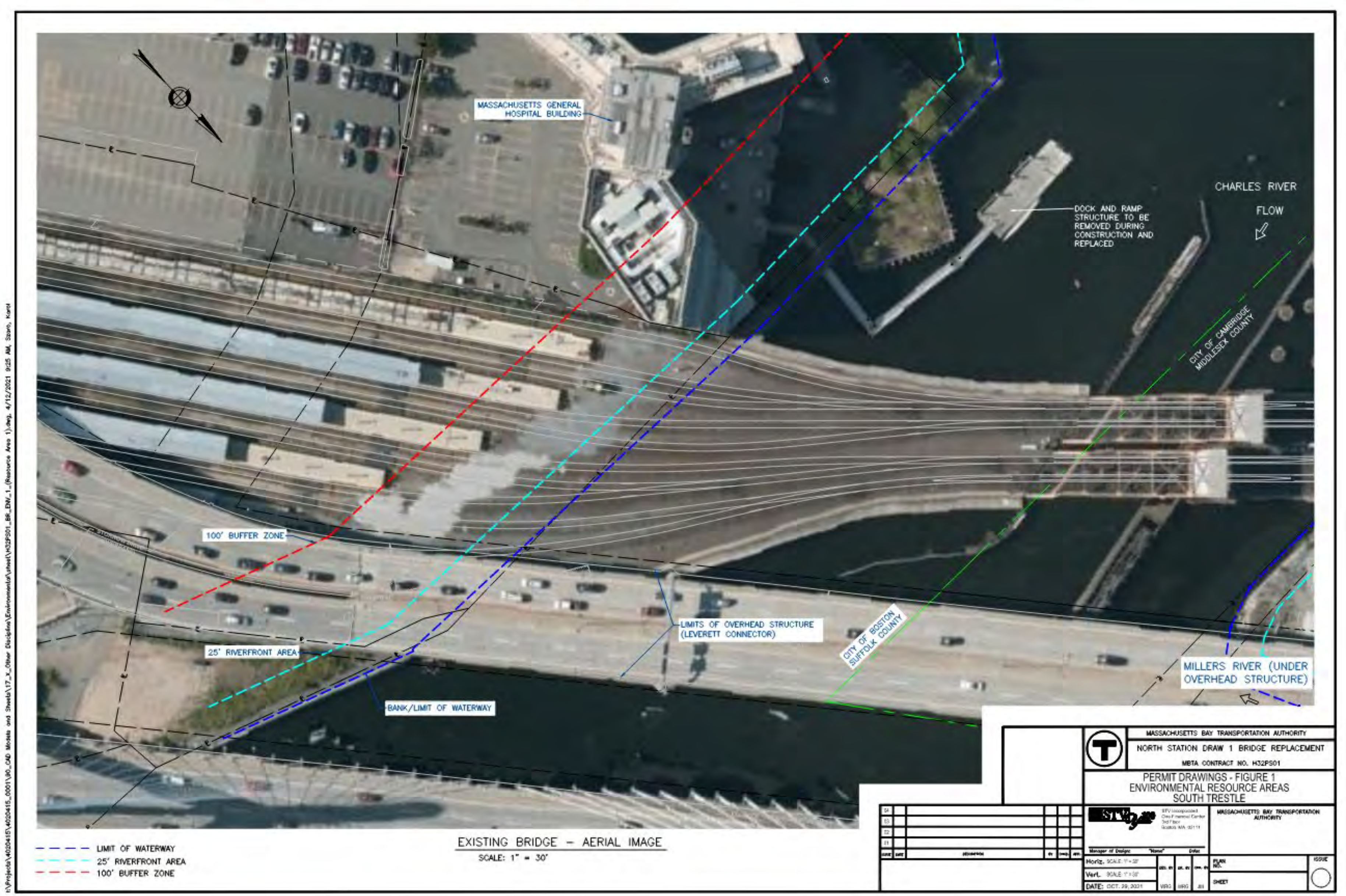
Project Drivers

- Bridge Deterioration
- Accommodation for Electrification
- Construction Staging

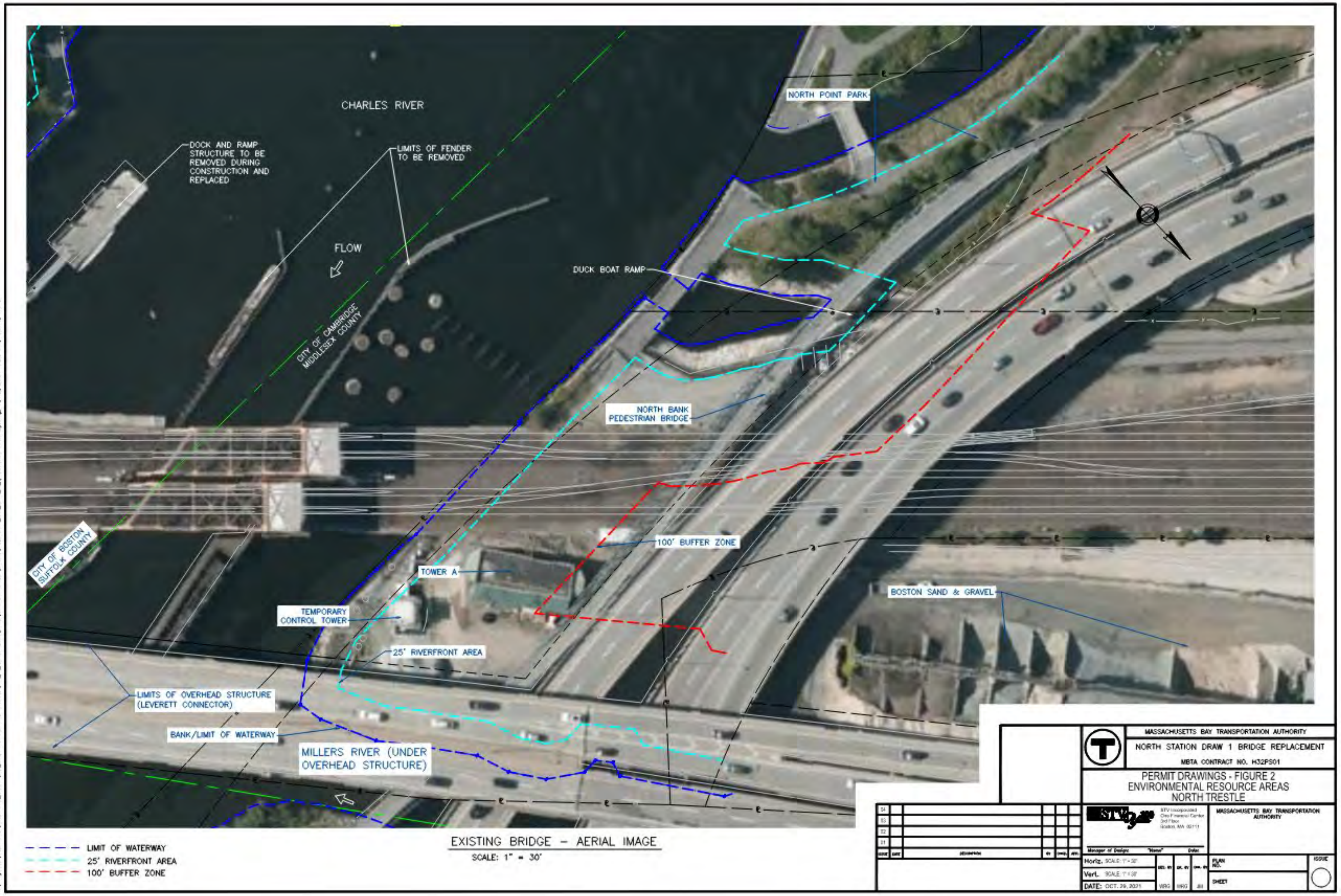
Rendered Model – Design Team Update

North Station Rail Bridge - Virtual Tour (123bim.com)

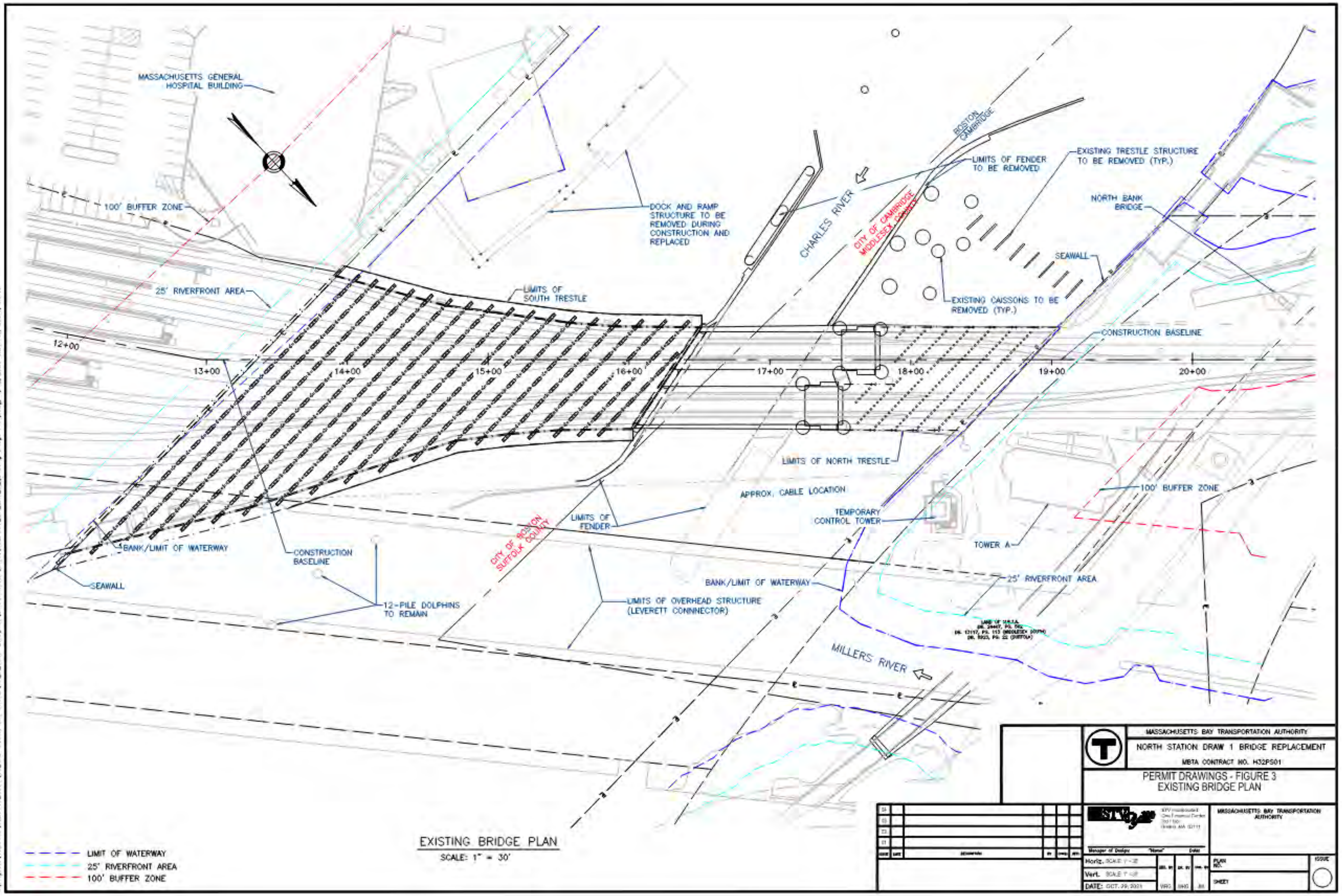
ENVIRONMENTAL RESOURCE AREAS – SOUTH TRESTLE



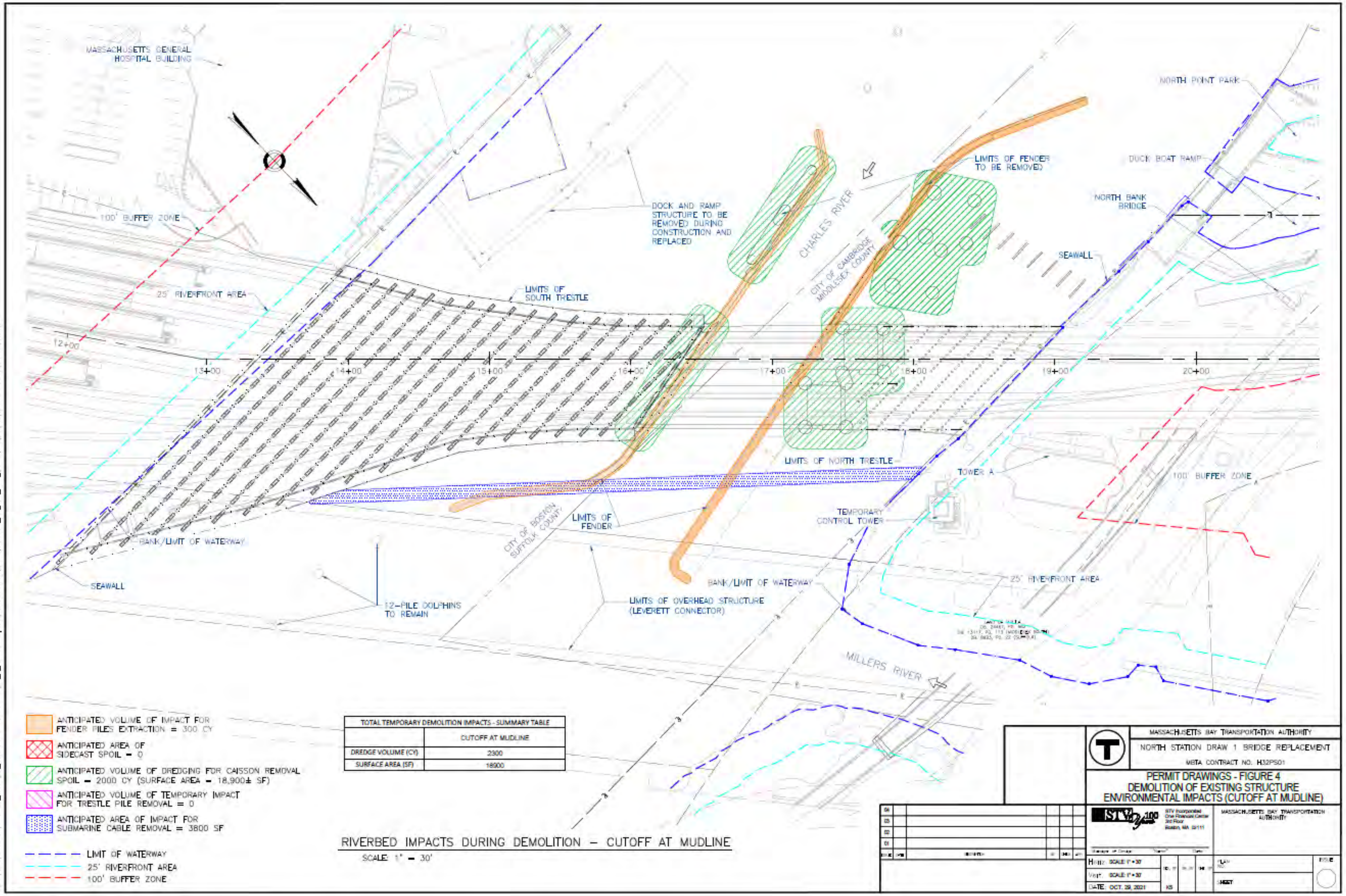
ENVIRONMENTAL RESOURCE AREAS – NORTH TRESTLE



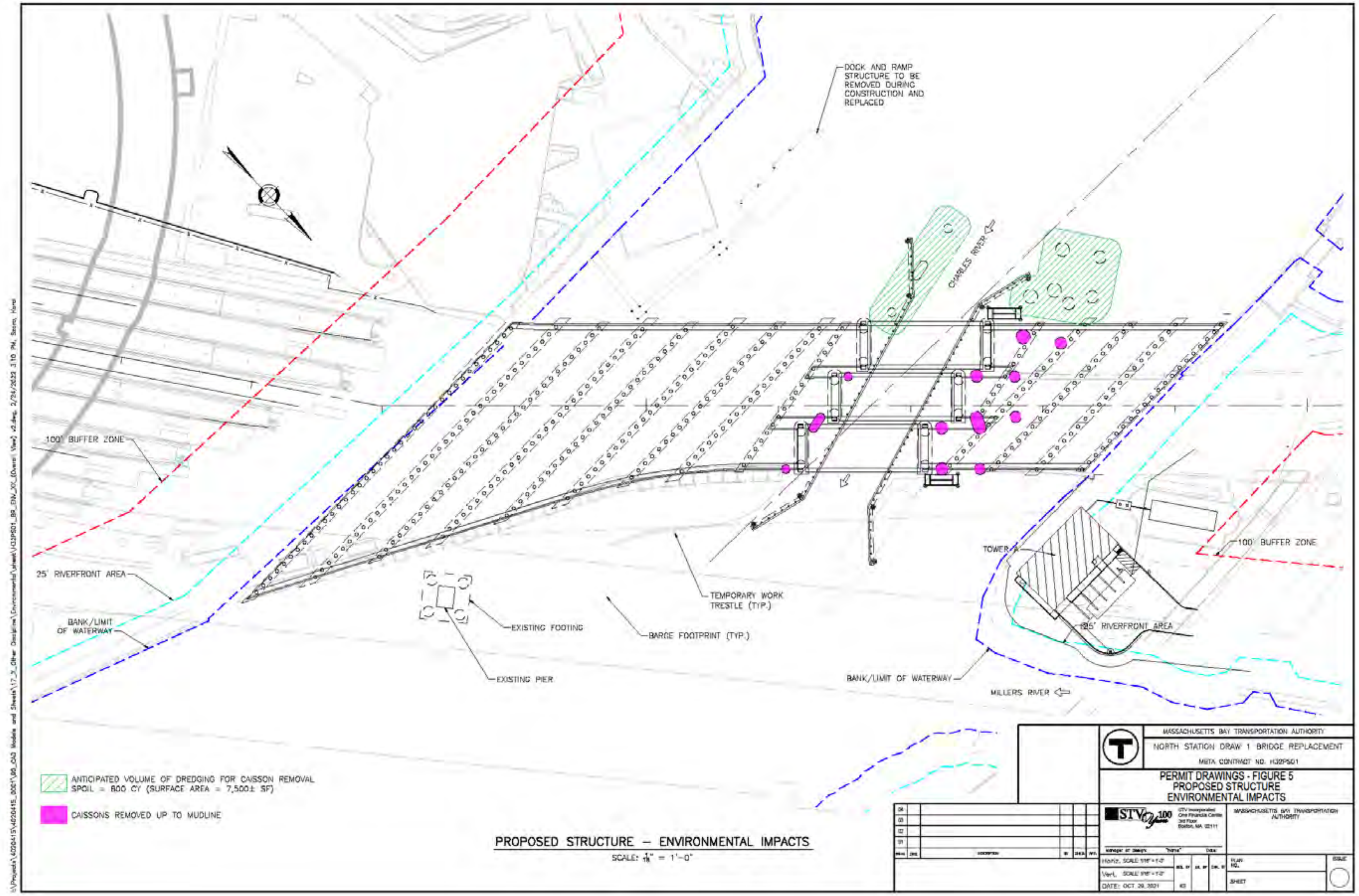
PERMIT DRAWINGS – EXISTING BRIDGE PLAN



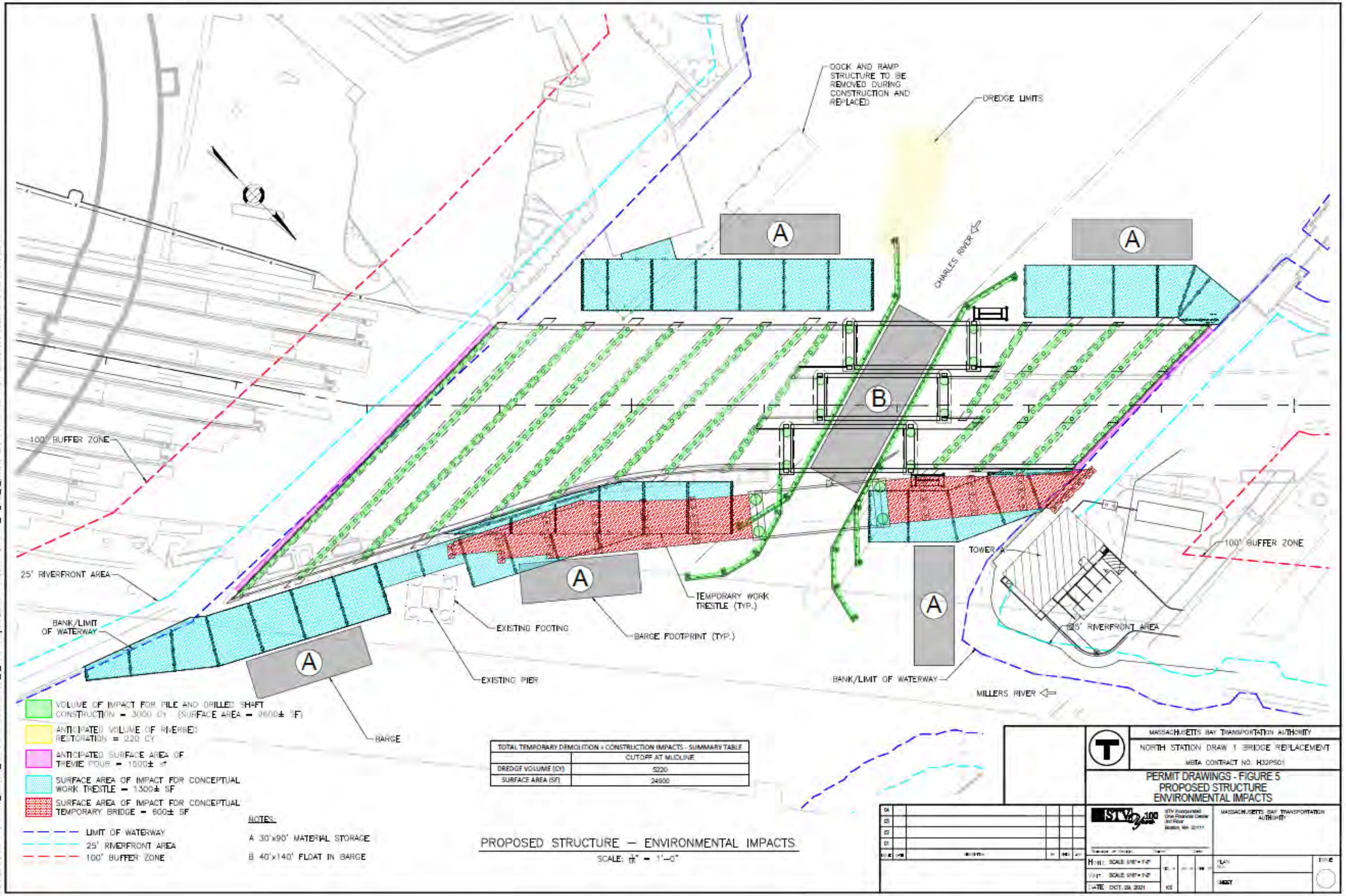
PERMIT DRAWINGS – DEMOLITION OF EXISTING STRUCTURE (CUTOFF AT MUDLINE)



PERMIT DRAWINGS – PROPOSED STRUCTURE AND EXISTING CAISSONS

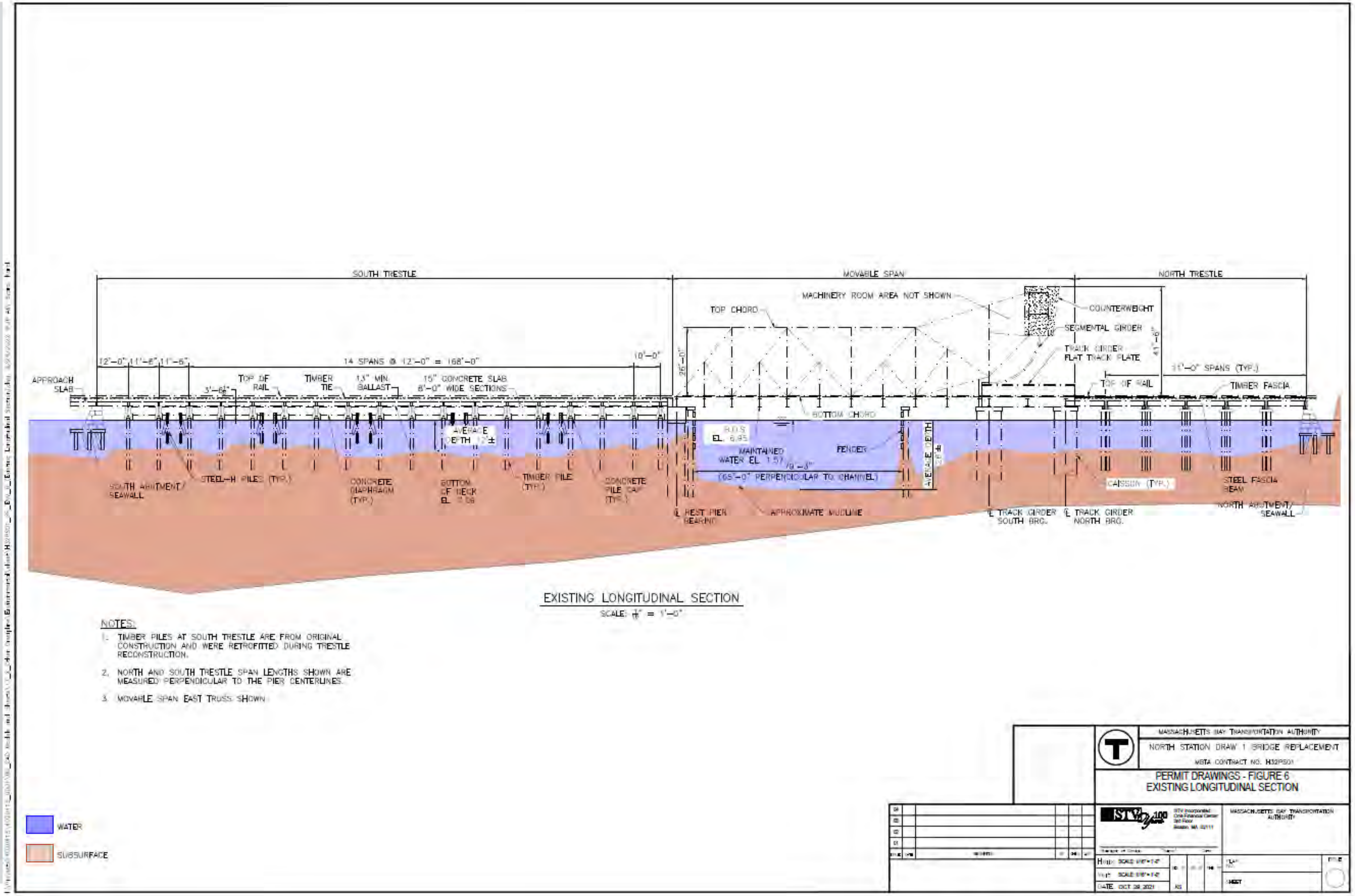


PERMIT DRAWINGS – CONSTRUCTION AND PERMANENT ENVIRONMENTAL IMPACTS

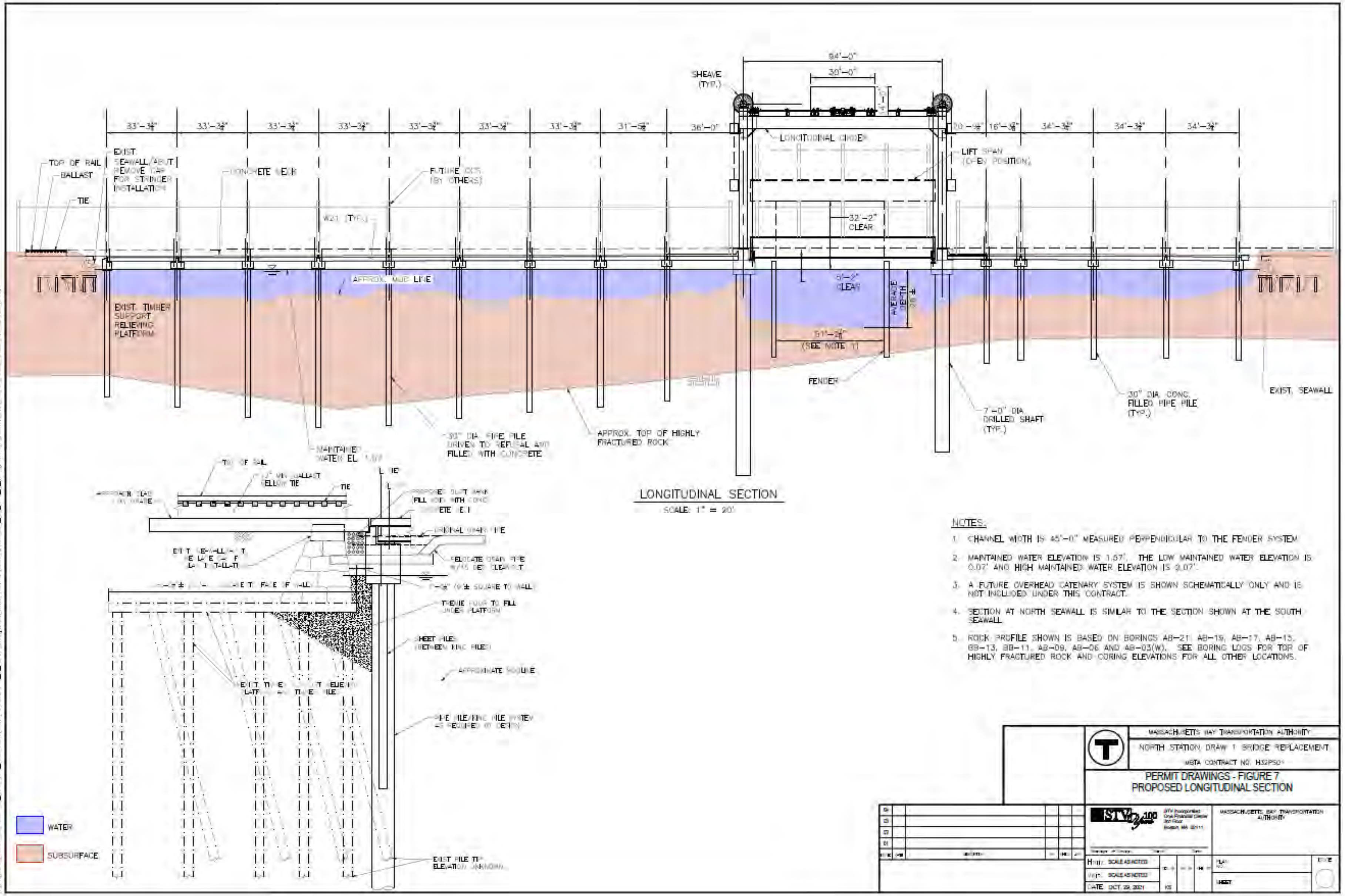


TOTAL TEMPORARY DEMOLITION + CONSTRUCTION IMPACTS - SUMMARY TABLE	
	CUTOFF AT MUDLINE
DREDGE VOLUME (CY)	5220
SURFACE AREA (SF)	24900

PERMIT DRAWINGS – EXISTING LONGITUDINAL SECTION

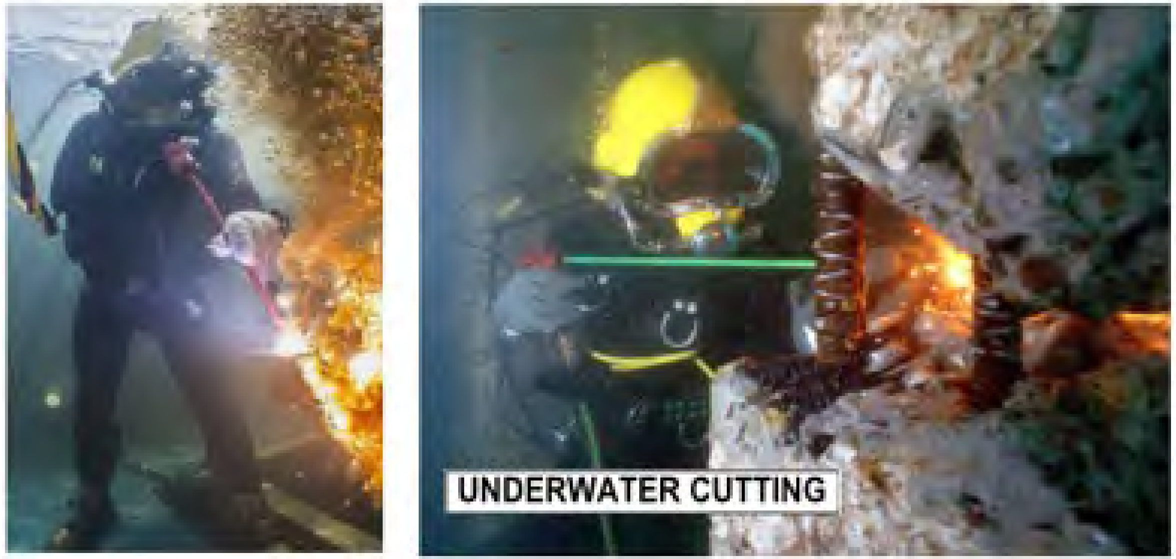


PERMIT DRAWINGS – PROPOSED LONGITUDINAL SECTION



Construction Activities & Equipment

TIMBER PILES



STEEL PILES

Pedestrian Bridge Discussion

Environmental Permitting – Federal

Agency	Permit/Review Program	Trigger	Relevant Project Impacts	Likely Permit Required (w/Thresholds)
Federal				
US Army Corps of Engineers	Section 10/404 Permit Individual Permit or General Permit 10	Discharge of Dredged or Fill to WOUS	Construct with Piles Cut At Mudline: TEMP + PERM: 24,900 SF (0.57 AC)	General Permit 10 (5,000 SF – 1 AC)
Federal Transit Administration	NEPA Categorical Exclusion or Env. Assess.	Action using federal funding (initiated 4/20)	Federal Action	Environmental Assessment
FTA, State Historic Preservation Office (Massachusetts Historical Commission), BLC, CHC, and BUAR	Section 106 and 4(f) reviews or Finding of Adverse Impact; Inter-agency Memorandum of Agreement	Finding of Adverse Effect on NRHP-eligible structures	Potential Adverse Effect	MOA
Massachusetts Division of Marine Fisheries, US Fish and Wildlife Service, and US EPA	Section 7 Fisheries and Wildlife Consultations, Federal Permit Review Consultation	CWA Sections 10/404 and 401 permitting	Work in Waterway	Section 7 Consultation submittals
US Environmental Protection Agency	National Pollutant Discharge Elimination System – Construction General Permit	Disturbance of 1 or more acres of land	>1 AC total land disturbance	NPDES CGP via NOI and preparation of Stormwater Pollution Prevention Plan

Environmental Permitting – State and Local

Agency	Permit/Review Program	Trigger	Relevant Project Impacts	Likely Filing/Permit Required
State				
Massachusetts Department of Environmental Protection	Section 401 Water Quality Certification	Dredging	Construct with Piles Cut At Mudline: 5,520 CY	WQC Major WW07 (>5,000 CY)
		Fill/Excavation	Pile & Drilled Shafts; Tremie pour bulkhead stabilization in riverbed: PERM: 4,100 SF TEMP & PERM: 24,900 SF	WQC Minor WW11 (<5,000 SF) or Major WW10 (>5,000 SF)
Executive Office of Environmental Affairs/ MEPA Unit	MEPA Review	Construction in Wetlands, Waterways, and Tidelands requiring state permits <1 mile from EJ Community	Expansion Solid Fill Structure: 4,100 SF Alteration of Bank: 517 LF	Environmental Notification Form (Expanded) (>1,000 SF structure; >500 LF bank); Environmental Impact Report?
MassDEP	Chapter 91 Waterways License/Modification	Construction and occupation of Commonwealth Waterway	Bridge and Trestle crossing with existing license(s)	Chapter 91 License or Modification
Massachusetts Water Resources Authority	8(m) Permit	Crossing of MWRA facilities	Track modifications over MWRA facilities	8(m) Permit
Local				
Boston and Cambridge Conservation Commission	Wetlands Protection Act Notices of Intent	Construction in Areas Subject to Jurisdiction under Wetlands Protection Act	Alteration of Land Under Waterway: PERM: 4,100 SF TEMP + PERM: 24,900 SF Alteration of Bank: 517 LF Alteration Riverfront Area: TBD SF Alteration of Buffer Zone: TBD SF	Order of Conditions >5,000 SF LUW >50 LF Bank Work in RA Work in Buffer Zone

Other Environmental Considerations

Environmental Site Assessment

To identify soil and groundwater management constraints and approach/specs for construction

Building and Hazardous Materials Assessment

To identify building and hazardous materials constraints and approach/specs for construction

Environmental Permitting – Current Schedule

Permitting Schedule		
Permit Agency/Program	Activity	Approximate Timeframe*
FTA - NEPA Environmental Assessment	Prepare Annotated Outline/Section 106 & Section 7 Consultations	Winter - Spring 2022
	Submit EA	Summer 2022
USACE - Section 10/404 General Permit	Inter-Agency Consultations – MDFW, NOAA NMFS, US EPA, US FWS	Spring 2022 - Ongoing
	Submit General Permit	Summer 2022
MassDEP – Section 401 Water Quality Certification WW08 Dredging and WW11 or WW10 Fill	Review of Sediment & Water Sampling Program	Spring 2022- Ongoing
	Pre-application Consultation	Spring 2022
	Submit 401 WQC Applications	Summer 2022
MassDEP – Chapter 91 Waterways License	Pre-application Consultation	Spring 2022
	Submit Ch. 91 Application	Summer 2022
MEPA	Pre-Submittal Consultation	Spring 2022
	Submit MEPA Filing	Summer 2022
Boston and Cambridge Conservation Commissions	Submit Notice of Intent Applications	Fall 2022
MWRA 8(M) Permit	Pre-application Consultation	Summer 2022
	Submit Application	Fall 2022
NPDES Construction General Permit NOI	Prepare SWPPP and Submit eNOI	14 days prior to construction
*Based on current Project design timeline		

PRESENTATION

MBTA CONTRACT NO. H32PS01

QUESTIONS & ANSWERS

THANK YOU

STV 100 Years

Conclusion and Key Issue for Discussion

Dredging and Riverbed Impacts

- *Proposed cutting of piles above mudline will significantly reduce riverbed dredging volumes and area impacts*

Appendix C

EFH Species Life Histories

Finfish EFH Species Life Histories

American Pliace (Hippoglossoides platessoides)

Primary reference: Johnson, 2005

Boston Harbor has been designated EFH for all life stages of American plaice (*Hippoglossoides platessoides)*, including spawning adults in the seawater salinity zone of greater than 25.0 parts per thousand (ppt) (NEFMC, 1998b). The American plaice is a commercially important flatfish found in the western North Atlantic from Labrador south to Cape Cod and Narragansett Bay, Rhode Island (Collette and Klein-MacPhee, 2002). With the exception of witch flounder, plaice is considered the most abundant of all flatfish in the Gulf of Maine at depths between 177 to 295 feet (54 to 90 meters) (Klein-MacPhee, 2002, as cited in Johnson, 2005). Generally, American plaice from southern Labrador to Rhode Island are found in deep water from 295 to 590 feet (90 to 180 meters) and do not normally occur in water less than 82 to 114 feet (25 to 35 meters) (O'Brien, 2000, Dery, 1998, as cited in Johnson, 2005).

American plaice eggs are pelagic. NEFMC (1998b) describes EFH for American plaice eggs as surface waters of the Gulf of Maine and Georges Bank. Conditions where most American plaice eggs are found include the following: sea surface temperatures below 54 °F (<12 °C), water depths between 98 and 295 feet (30 and 90 meters) and a wide range of salinities up to 32 ppt (NEFMC, 1998b, NMFS Northeast Regional Office, Habitat Conservation Division Table). Since eggs are pelagic, there is no recorded substrate preference for egg habitat. American plaice eggs are in Boston Harbor are rare in February but common March through June (Jury et al., 1994).

American plaice larvae are pelagic. NEFMC (1998b) describes EFH for American plaice larvae as surface waters off of the Gulf of Maine, Georges Bank, and southern England. Conditions where most American plaice larvae are found include the following: sea surface temperatures below 57 °F (14 °C), water depths between 98 and 427 feet (30 and 130 meters) and a wide range of salinities (NEFMC, 1998b). American plaice eggs are in Boston Harbor are rare in February but common March through June (Jury et al., 1994). Since larvae are pelagic, there is no recorded substrate preference for larval habitat. Larvae feed on plankton, diatoms and copepods found in upper water layers.

NEFMC (1998b) describes EFH for American plaice juveniles and adults as bottom habitats with fine-grained sediments, gravel or sand substrate in the Gulf of Maine and Georges Bank. Conditions where most American plaice juveniles and adults are found include the following: water temperatures below 63 °F (17 °C), depths ranging between 148 and 492 feet (45 and 150 meters) and a wide range of salinities (NEFMC, 1998b). Juveniles feed on small crustaceans, cumaceans and polychaetes prior to settling. After settling the juvenile diet changes with growth and mouth gape size and can include ophiuroids, mysids, amphipods and polychaetes. Bowman and Michaels (1984, as cited in Cross et al., 1999) reported that polychaetes were especially important prey of plaice < 20 cm and noted that the largest fish fed mostly on echinoderms. Juvenile and adult American plaice are abundant year-round in Boston Harbor (see Appendix F of Jury et al., 1994).

EFH for adults is similar to that for juveniles except that water depths range from 148 and 574 feet (45 to 175 meters). The age and length at which fifty percent of female American plaice reach maturity in the Gulf of Maine has been documented at approximately 3.80 and 3.60 years and at 29.70 and 26.80 centimeters. American plaice are opportunistic feeders, flexible in their dietary habits, and will take whatever is most abundant or accessible, but the diet of adults consists primarily of echinoderms, chiefly sand dollars, sea urchins, and brittle stars, in their normal habitat at or near the ocean floor. Plaice are categorized as a predator whose diet composition consists of a combination of small benthic crustaceans, echinoderms, cnidarians, and polychaetes

NEFMC (1998b) describes EFH for American plaice spawning adults as bottom habitats of all substrate types in the Gulf of Maine and Georges Bank. Spawning American plaice adults, in Boston Harbor, are rare in February, but common but common April through July (Jury et al., 1994).

Spawning adults migrate from deeper depths into shallower grounds before spawning which occurs at depths, less than 295 feet (< 90 meters) and spawning (Bigelow and Schroeder, 1953, as cited in Johnson, 2005).

Atlantic Bluefin Tuna (Thunnus thynnus)

Primary reference: Collette and Klein-MacPhee, 2002

Within this quadrant of Massachusetts Bay which encompasses the Project area, EFH has been designated for adult life stages of Atlantic bluefin tuna (*Thunnus thynnus*). The Atlantic bluefin tuna is a large, pelagic, highly migratory, piscivorous sport fish that can be found throughout the western Atlantic from Gulf of St. Lawrence to Florida and occurs in the Gulf of Maine in the summer and fall.

Adults inhabit temperate surface waters, but frequently dive to depths of 1,640 to 3,281 feet (500 to 1,000 meters). Adults have no strong association with any substrate. EFH for adults in the Gulf of Maine includes the area from the 164 feet (50 meter) isobath to the exclusive economic zone (EEZ) boundary (NEFMC, 1998b). Spawning has been noted to occur in two primary locations including the Mediterranean Sea and the Gulf of Mexico (Collette and Klein-MacPhee, 2002). Within Massachusetts Bay, no presence/absence data is presented in Jury *et al*. 1994 for this species.

Atlantic Butterfish (Peprilus triacanthus)

Primary reference: Cross et al., 1999

Boston Harbor has been designated EFH for eggs, larvae, and adult Atlantic butterfish *(Peprilus triacanthus)* in the seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b). Atlantic butterfish range from Newfoundland to Florida but are most abundant from the Gulf of Maine to Cape. Atlantic butterfish winter near the edge of the continental shelf in the Middle Atlantic Bight and migrate inshore in the spring into southern New England and Gulf of Maine waters. During the summer, butterfish occur over the entire mid-Atlantic shelf from sheltered bays and estuaries out to about 656 feet (200 meters).

In Boston Harbor, Atlantic butterfish eggs are rare during June and September but common throughout July and August (Jury et al., 1994). Atlantic butterfish eggs have been collected between 55.0 and 72.5 °F (12.8 – 22.5 °C) at salinities that range from estuarine to full strength seawater. Atlantic butterfish eggs are buoyant and have an incubation period of 2 to 3 days at 59 °F (15 °C). Although butterfish are usually reported to spawn offshore, butterfish may spawn a few miles offshore in Massachusetts near Woods Hole and then return inshore when they are spent (Klein-MacPhee, in review, as cited in Cross et al., 1999). Butterfish may spawn in the upper part of the water column during the evening more as more eggs have been collected between than during the day (Kendall and Naplin, 1981, as cited in Cross et al., 1999).

Atlantic butterfish larvae are common from July to October. (Jury et al., 1994). Larvae have been collected between 4-28°C at salinities that range from estuarine to full strength seawater. Larvae are free-swimming and may undertake diel vertical migrations; more butterfish larvae have been collected at night between depths of approximately 3 to 13 feet (0 to 4 meters) than during the day (Kendall and Naplin 1981, as cited in Cross et al., 1999). Larvae are abundant in the mixing portions of estuaries along the Atlantic coast. Generally, butterfish larvae are collected at depths between 33 and 5,906 feet (10 and 1,800 meters) and temperatures between 48 and 66 °F (9 and 19 °C). Metamorphosis is gradual as the larvae progressively assume juvenile characters (Able and Fahay, 1998, as cited in Stevenson et al., 2014) tending to remain in shallow waters at night and descending into relatively food-depleted depths during the day (Cross et al., 1999).

Butterfish feed mainly on planktonic prey including thaliaceans, mollusks (primarily squids), crustaceans (copepods, amphipods, and decapods), coelenterates (primarily hydrozoans), polychaetes, small fishes, and ctenophores. During bottom trawl surveys arthropods dominated the identifiable items of stomach contents, followed by urochordates (thaliaceans and larvaceans), unidentified plankton, annelids (probably polychaetes), chaetognaths (arrowworms), mollusks (probably squids), cnidarians (coelenterates, probably jellyfish), and fishes. Butterfish are preyed on by many species including haddock, silver hake, goosefish, weakfish, bluefish, swordfish, sharks (hammerhead), and longfin inshore squid (Bigelow and Schroeder, 1953, Scott and Tibbo, 1968, Horn, 1970a, Maurer and Bowman, 1975, Tibbets, 1977, Stillwell and Kohler, 1985, Brodziak, 1995, Klein- MacPhee, in review, as cited in Cross et al., 1999).

Similar to the larvae, adult butterfish prefer the bottom during the day and disperse upwards at night. In addition, adults prefer sandy rather than rocky or muddy bottoms, and generally keep near the surface over depths of 72 to 180 feet (22 to 55 meters) when near the coast in the summer and fall. In the winter and early spring, they tend to stay close to the bottom. Adult butterfish are common in Boston Harbor from June through October (Jury et al., 1994).

Atlantic butterfish are broadcast spawners and do so annually primarily in the evening or at night as they migrate north and inshore on their annual migration in association with seasonal warming of waters on the northeast shelf (Cross et al., 1999). Generally, adult butterfish are collected at depths between 33 and 1,198 feet (10 and 365 meters) and temperatures between 37 and 82 °F (3 and 28 °C). Butterfish are pelagic fishes that form loose schools, often near the surface (Schreiber, 1973, Dery, 1988, Brodziak, 1995, as cited in Cross et al., 1999). They winter near the edge of the continental shelf in the Middle Atlantic Bight and migrate inshore in the spring into southern New England and Gulf of Maine waters. During the summer, butterfish occur over the entire Mid-Atlantic shelf from sheltered bays and estuaries out to about 656 feet (200 meters). In late fall, butterfish move southward and offshore in response to falling water temperatures (Fritz, 1965, Horn, 1970a, Schreiber, 1973, Waring, 1975, Azarovitz et al., 1980, Klein-MacPhee, in review, as cited in Cross et al., 1999).

Atlantic Cod (Gadus morhua)

Primary reference: Lough, 2004

Boston Harbor has been designated EFH for Atlantic cod (*Gadus morhua*) eggs, larvae, juveniles, and adults in seawater salinity zones of greater than 25.0 ppt and for juveniles and adults for brackish salinity zones of 0.5 to 25.0, as well as seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b).

Atlantic cod eggs found in surface waters around the perimeter of the Gulf of Maine, Georges Bank, and the eastern portion of the continental shelf off southern New England. Cod eggs are pelagic, buoyant, spherical, and transparent. NEFMC (1998b) describes EFH for Atlantic cod eggs where sea surface conditions are below 54 °F (12 °C), water depths are less than 361 feet (110 meters) and a salinity ranges from 32 to 33 ppt. Cod eggs are most often observed beginning in the fall, with peaks in the winter and spring. In Boston Harbor, Atlantic cod eggs are rare during July and November but common from December to June (Jury et al., 1994).

Atlantic cod larvae are pelagic. NEFMC (1998b) describes EFH for Atlantic cod larvae as pelagic waters of the Gulf of Maine, Georges Bank and also the eastern portion of the continental shelf off southern New England. Conditions where most Atlantic cod larvae are found include, sea surface temperatures below 50 °F (10 °C), water depths between 98 and 230 feet (30 and 70 meters) and salinities ranging from 32 to 33 ppt (NEFMC, 1998b). Since larvae are pelagic, there is no recorded substrate preference for larvae habitat. In Boston Harbor, Atlantic cod larvae are rare during August and November but common from December to July (Jury et al., 1994).

Juvenile Atlantic cod are demersal and prefer cobble compared to finer grain sediment and use vegetation to avoid predation. NEFMC (1998b) describes EFH for Atlantic cod juveniles as bottom habitats with a substrate of cobble or gravel in the Gulf of Maine, Georges Bank, and eastern portions of the continental shelf off southern New England. Conditions where most Atlantic cod juveniles are found include the following: water temperatures that are below 68 °F (20 °C), depths ranging from 82 and 246 feet (25 and 75 meters) and salinities ranging from 30 to 35 ppt (NEFMC, 1998b). In Boston Harbor, Atlantic cod juveniles are common throughout the year (Jury et al., 1994). In addition, Stevenson et al., (2014) rank gravel cobble and eelgrass as habitats most often utilized by juvenile cod, followed by mud, sand, boulder and ledge.

Juvenile nursery grounds for Atlantic cod include nearshore mud, sand, gravel/cobble, and vegetated habitats (Hardy, 1978, Keats, 1990, Dalley and Anderson, 1997, Linehan et al., 2001, Cote et al., 2004, Lough, 2005, Lazzari and Stone, 2006, as cited in Stevenson et al., 2014). Without the risk predation, juvenile Atlantic cod are common over unvegetated fine-grained sediments and forage over sandy substrates at night yet seek shelter from predators during the day in more diverse bottom habitats. Recent juveniles often seek refuge from predators in shallow cobble bottom habitats. The survival value of the gravel/cobble habitat for juveniles is high, yet they also prefer eelgrass beds for refuge. Once settled, juveniles often select eelgrass habitats for refuge over gravel/cobble habitats (Stevenson et al., 2014). This is largely an effort to evade predators (Borg et al., 1997, Linehan et al., 2001, as cited in Stevenson et al., 2014). Older juvenile cod, up to three years of age, are more common in boulder and kelp habitats (Stevenson et al., 2014).

Seasonal movements of juveniles in coastal Massachusetts trend towards shallows in the spring and deep (>52.4 feet [>16 meters]) in the fall (Lough, 2005, as cited in Stevenson et al., 2014). Young-of-the-year juveniles have been found to prefer shallow inlets, rock pools, river mouths and harbors in Massachusetts, yet depart from coastal waters by the middle of June (Hardy, 1978, as cited in Stevenson et al., 2014).

NEFMC (1998b) describes EFH for Atlantic cod adults as bottom habitats with a substrates of rocks, pebbles or gravel in the Gulf of Maine, Georges Bank, southern New England, and middle Atlantic south to Delaware Bay. Conditions where most Atlantic cod adults are found include the following: water temperatures that are below 50 ºF 10 °C, depths ranging from 33 and 492 feet (10 and 150 meters) and a wide range of oceanic salinities (NEFMC, 1998b). Atlantic cod are opportunistic feeders. Food items include Atlantic sand lance (*Ammodytes americanus*), *Cancer* crabs and herring. In Boston Harbor, Atlantic cod adults are rare between January and March but common from March (Jury et al., 1994).

The majority of spawning occurs in the Georges Bank area although reproduction also occurs in nearshore areas, where eggs are found November through July (with a peak in April) at temperatures between -2 and 20°C (Elliott et al., 1979, as cited in Lough 2004). In Boston Harbor, Atlantic cod spawning adults are rare during June and November, but common from December to May (Jury et al., 1994).

Atlantic Mackerel (Scomber scombrus)

Primary reference: Studholme et al., 1999

Boston Harbor has been designated EFH for Atlantic mackerel (*Scomber scombrus*) eggs, larvae, juveniles and adults in brackish salinity zones of 0.5 to 25.0, as well as seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b). The Atlantic mackerel is a pelagic schooling species that is found in the northwest Atlantic from the Gulf of St. Lawrence to Cape Lookout, North Carolina.

The eggs are spherical and pelagic and are typically found above the thermocline or in the upper 33 to 49 feet (10 to 15 meters) of the water column. Eggs have been collected over depths ranging from 33 to 1,066 feet (10 to 325 meters). Atlantic mackerel eggs are free floating and have no known association with any particular substrate. Eggs are abundant during June and July in Boston Harbor and are common during May and August (Jury et al., 1994).

Atlantic mackerel larvae are distributed at depths from 33 to 427 feet (10 to 130 meters) and are usually found at depths less than 164 feet (50 meters). Larval Atlantic mackerel are pelagic and have no known association with any particular substrate. Larvae are abundant during June and July in Boston Harbor and are common during May and August (Jury et al., 1994).

Depending on the TOY, juveniles may be found almost anywhere in the water column. Juvenile Atlantic mackerel that occur in Boston Harbor are common from June through October and rare during May (Jury et al., 1994).

Adult Atlantic mackerel are highly mobile and undergo extensive migrations generally from the deep-water outer continental shelf toward inshore areas in the spring and summer. Juvenile Atlantic mackerel feed primarily on invertebrates including copepods, amphipods, mysids, and squid, while adults are more piscivorous. Prey items for adults include hakes, herring, sand lance, sculpins and squid. Because adults are pelagic, there is no known association with any particular substrate. All life stages of Atlantic mackerel are independent from benthic habitats. Collete and Klein-MacPhee (2002) state: "*Neither are they directly dependent either on the coastline or on the bottom in any way at any stage in their lives*." Adult Atlantic mackerel that occur in Boston Harbor are common from June through September and rare during May (Jury et al., 1994).

Atlantic Herring (Clupea harengus)

Primary reference: Stevenson and Scott, 2005

Boston Harbor has been designated EFH for Atlantic herring (*Clupea harengus*), larvae in seawater salinity zones of greater than 25.0 ppt and for juveniles and adults for brackish salinity zones of 0.5 to 25.0, as well as seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b). Atlantic herring is a pelagic schooling species that is found in the northwest Atlantic from Labrador to Cape Hatteras, North Carolina.

Atlantic herring larvae are pelagic. NEFMC (1998b) describes EFH for Atlantic herring larvae as surface waters of the Gulf of Maine and Georges Bank. Conditions where most Atlantic herring larvae are found include the following: sea surface temperatures below 61 °F (16 °C), water depths from 164 to 295 feet (50 to 90 meters) and salinities around 32 ppt (NEFMC, 1998b). Larvae feed on plankton, diatoms and copepods found in upper water layers. In Boston Harbor, larvae are abundant from November to January, and are common February through May and in October (Jury et al., 1994).

NEFMC (1998b) describes EFH for Atlantic herring juveniles as pelagic waters and bottom habitats in the Gulf of Maine and Georges Bank. Conditions where most Atlantic herring juveniles are found include the following: water temperatures below 50 °F (10 °C), depths ranging between 49 and 443 feet (15 and 135 meters) and a salinity range from 26 to 32 ppt (NEFMC, 1998b). Juveniles feed on up to 15 different groups of zooplankton; the most common are copepods, decapod larvae, barnacle larvae, cladocerans, and molluscan larvae. Juvenile Atlantic herring in Boston Harbor are present year-round, abundant September through May, and common June through August (Jury et al., 1994).

NEFMC (1998b) describes EFH for Atlantic herring adults as pelagic waters and bottom habitats in the Gulf of Maine and Georges Bank. Conditions where most Atlantic herring adults are found include the following: water temperatures below 50 °F (10 °C), depths ranging between 67 and 427 feet (20 and 130 meters) and salinities above 28 ppt (NEFMC, 1998b). Adult Atlantic herring feed mainly on euphausiids, chaetognaths, and copepods. Adult Atlantic herring are abundant in Boston Harbor from December through May, and common September through November, and rare in June through August (Jury et al., 1994).

Atlantic Wolffish (Anarhichas lupus)

Primary reference: NEFMC, 2017

EFH has been designated for all four life stages of Atlantic wolffish within the quadrant of Massachusetts Bay encompassing the Project area.

Eggs are found in sub-tidal benthic habitats, typically under rocks and boulders in nests at depths less than 328 feet. Atlantic wolffish larvae are pelagic and found in sub-tidal benthic habitats. Larvae stay at the bottom for approximately six days before becoming more buoyant as the yolk sac is absorbed (NEFMC, 2017).

Juveniles, approximately <65 cm total length, are found in sub-tidal benthic habitats. They stay at depths of 196 to 603 feet and do not tend to have a strong substrate association (NEFMC, 2017).

Adult wolffish, approximately >65 cm total length, are also found in sub-tidal benthic habitats. They stay at depths less than 567 feet and have been observed spawning in boulder reef habitats in the Gulf of Maine at depths of 164 feet to 328 feet (NEFMC, 2017). After spawning, adults are distributed over sand and gravel substrates, and are rarely found over a muddy bottom.

Black Sea Bass (Centropristis striata)

Primary references: Drohan et al., 2007 and Steimle et al., 1999a

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated for only the adult life stage of black sea bass (*Centropristis striata*). Jury *et al*. (1994) does not include information on temporal distribution and relative abundance of any life stages of Atlantic halibut in Massachusetts Bay.

However, the egg stage has been given a designation of "n/a" in Massachusetts Bay indicating there is no data available on the designated life stages, or those life stages are not present in the species' reproductive cycle. The black sea bass is a warm temperate species that ranges southern Nova Scotia and the Bay of Fundy to southern Florida and into the Gulf of Mexico.

Although black sea bass has been reported on the Grand Banks of Canada they are generally uncommon in cooler waters north of Cape Cod. Black sea bass are typically found on the continental shelf and are strongly associated with structurally complex habitats, including rocky reefs, cobble and rock fields, stone coral patches, exposed stiff clay, reefs and shipwrecks.

Adult black sea bass are found in various locations according to the season of the year, where they distributed primarily offshore during the winter (November to April) south of New York to North Carolina and found primarily inshore during warmer months (May to October) in estuaries and bays with structured habitats of sand and shell fragments and water depths of approximately 65 to 164 feet (20 to 50 meters) (NMFS 1994). During the spring (1978-2003) inshore trawl surveys revealed, adults were mostly found south of Cape Cod, around the islands, and in Buzzards Bay, with the highest numbers near Nantucket Island and south of the Cape in Nantucket Sound. Distributions were similar in the fall, with the highest numbers occurring in Nantucket Sound and in Buzzards Bay. Black sea bass adults feed on a wide variety of crustaceans, fishes, mollusks, and worms (Collette and Klein-MacPhee, 2002). Spawning generally occurs from April to June in coastal habitats, aggregating on sand bottoms by broken ledges (Steimle *et al.,* 1999a) but not in estuaries (NMFS 1994). Drohan *et al.,* 2007 stated that black sea bass are generally uncommon in cooler waters north of Cape Cod.

Bluefish (Pomatomus saltatrix)

Primary reference: Shepard and Packer, 2006

Boston Harbor has been designated EFH for bluefish (*Pomatomus saltatrix*), juveniles and adults in brackish salinity zones of 0.5 to 25.0 ppt, as well as seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b).

Bluefish are highly migratory, recreationally important sportfish ranging from Nova Scotia to Argentina, but within the United States are found along the Atlantic coast from Maine to Florida. According to Jury et al., (1994), bluefish eggs and larvae are not present in Boston Harbor any time of the year.

Juvenile bluefish are pelagic and generally occur in North Atlantic estuaries from May through October within mixing zones. Shepherd and Packer (2006) reported that juvenile bluefish have been recorded from all estuaries and large bays across the entire continental shelf furthermore they state that it remains unknown if juvenile bluefish are in fact "estuarine dependent". Juveniles apparently prey on available items, ranging from crustaceans to polychaetes to fish. They are not known to be associated with any other particular substrate. Juvenile bluefish are rare in Boston Harbor in May and common from June through October (Jury et al., 1994).

Adult bluefish are oceanic, found both inshore and offshore, and in Massachusetts Bay during the same months as juveniles. In shore trawl surveys during spring and autumn in Massachusetts coastal waters revealed that adult bluefish occurred in the spring were found in a temperature ranges of 50 to 57 °F (10 to 14 °C), at depth ranges of 20 to 82 feet (6 to 25 meters). In the fall, adult bluefish occurred at temperature ranges between 50 to 72 °F (10 to 22 °C), with most between 63 and 68 °F (17 and 20 °C). Their depth range during that season was from about 20 to 131 feet (6 to 40 meters), with the majority at 20 to 49 feet (6 to 15 meters). Adult bluefish are not known to be associated with any particular substrate and are almost completely piscivorous. Adult bluefish are highly migratory, and distribution varies seasonally; however, they can be found in North Atlantic estuaries from June through October, preferring salinities of 25 ppt and temperatures greater than 61 °F (16 °C). Adult bluefish are rare in Boston Harbor in May and common from June through October (Jury et al., 1994).

Ocean Pout (Macrozoarces americanus)

Primary reference: Steimle et al., 1999b

Boston Harbor has been designated EFH for ocean pout (*Macrozoarces americanus*), juveniles and adults in seawater salinity zones of greater than 25.0 ppt (NEFMC, 1998b). The ocean pout is a cool-temperate species found in marine waters, across the continental shelf and on the upper continental slope from Labrador to south of Cape Hatteras, North Carolina. The ocean pout is a benthic, non-migratory fish that prefers cool waters 35.6 to 50 °F (2 to 10 °C) and hard substrates. This species is generally found from Cape Hatteras north into Nova Scotia. Adult ocean pout range from the intertidal zone out to the upper continental slope and are often collected at depths less than 328 feet (100 meters). Juveniles occur in shallow coastal waters in rocky substrates, algae and shellfish beds. Adults and juveniles are abundant in Massachusetts Bay, with adults being less abundant in summer and fall. Ocean pout spawn over nests located in protected areas such as rocky crevices and artificial debris. Larvae remain near the bottom and as juveniles they disperse (Steimle et al., 1999b).

Ocean pout will utilize a variety of substrates depending on the season and water temperature. They tend to occupy rocky areas in the summer and fall and sand/gravel habitats in the winter/spring. They feed on benthic prey, sorting through mouthfuls of sediment to consume copepods, amphipods, polychaetes, crustaceans, mollusks and sand dollars (Steimle et al., 1999b).

NEFMC (1998b) describes EFH for ocean pout juveniles as bottom habitats, often smooth bottom near rocks or algae in the Gulf of Maine and Georges Bank. Conditions where most ocean pout juveniles are found include the following: water temperatures below 57 °F (14 °C) and depths less than 262 feet (80 meters), and salinities greater than 25 ppt (NEFMC, 1998b). Juvenile ocean pout are common year-round in Boston Harbor (Jury et al., 1994).

NEFMC (1998b) describes EFH for ocean pout adults as bottom habitats in the Gulf of Maine and Georges Bank. Conditions where most ocean pout adults are found include the following: water temperatures below 59 °F (15 °C), depths less than 361 feet (110 meters) and a salinity range from 32 to 34 ppt (NEFMC, 1998b). In the waters of coastal Maine and George’s Bank, sand dollars are a primary prey, but brittlestars and mollusks were also eaten. In the northern Gulf of Maine, ocean pout switch from crustaceans during the spring to mollusks and polychaetes during the summer and fall. Adult ocean pout in Boston Harbor are common November through June and rare July through October (Jury et al., 1994).

Pollock (Pollachius virens)

Primary reference: Cargnelli et al., 1999a

Boston Harbor has been designated EFH for pollock (*Pollachius virens*), eggs and larvae in seawater salinity zones of greater than 25.0 ppt and for juveniles in brackish salinity zones of 0.5 to 25.0, as well as in seawater salinity zones of greater than 25.0 ppt (NEFMC, 1998b). Pollock is a commercially important groundfish ranging in the northwest Atlantic from the Hudson and Davis straits to North Carolina, although they are rare at the extreme ends of their range.

(Collette and Klein-MacPhee 2002). Pollock are active, schooling fish that use the entire water column. In the spring, older juvenile, pollock are abundant in inshore Gulf of Maine waters. By the end of June, they have moved out of the southern section of Massachusetts Bay due to elevated water temperatures, only to return again in the fall. Juvenile pollock are abundant throughout the summer and fall in harbors and bays along the Gulf of Maine coast (Klein-MacPhee 2002c, as cited in Stevenson et al., 2014). On the Maine coast, one-year-old pollock were a common catch in the rocky subtidal zone in depths <75 feet (23 meters) and were classified as summer-fall residents (Ojeda and Dearborn 1990, as cited in Stevenson et al., 2014). Juvenile pollock are present, though not common, in unvegetated intertidal and subtidal creeks and channels of salt marsh estuaries in the Gulf of Maine (Dionne et al., 1999).

In a survey of shallow-water habitats along the Maine coast, YOY juvenile pollock were common in eelgrass beds and to a lesser extent in kelp dominated habitats. The study concluded that shallow-water habitats in the Gulf of Maine are key nursery habitats for pollock. When in algae, especially rockweed, they preferred dense algal habitat (>50 percent algal cover) over sparse (<50 percent cover). Young-of-the-year juveniles use this habitat extensively. They may also be present around boulders and ledges as well. On falling tides, they schooled in the open habitat in down shore intertidal and subtidal zones. These findings suggest that pollock were using both refuging and schooling antipredator tactics during intertidal zone movements, and that rocky shores in the Gulf of Maine are important nurseries for juvenile pollock.

Pollock eggs and larvae are pelagic and buoyant but not known to be associated with any specific substrate type. EFH for eggs is pelagic waters of the Gulf of Maine and Georges Bank, at water depths from 90 to 886 feet (30 to 270 meters) with temperatures less than 67 °F (17 °C). In Boston Harbor, eggs and larvae generally occur in the water column from December through April and are rare in November. Larvae are also rare in April. (Jury et al., 1994).

Juvenile pollock inhabit the water column, feed primarily on pelagic prey. NEFMC (1998b) describes EFH for pollock juveniles as bottom habitats with aquatic vegetation or a substrate of sand, mud or rocks in the Gulf of Maine and Georges Bank. Conditions where most pollock juveniles are found include the following: water temperatures below 64 °F (18 °C) and depths ranging from shore to 820 feet (250 meters), and salinities between 29 and 32 ppt (NEFMC, 1998b). Juvenile pollock feed mainly on crustaceans and fish and mollusks make up a smaller proportion of their diet. Juvenile pollock can occur in Boston Harbor any month of the year but are rare June through August (Jury et al., 1994).

Red Hake (Urophysis chuss)

Primary reference: Steimle et al., 1999c

Boston Harbor has been designated EFH for red hake (*Urophysis chuss*) eggs, larvae, juveniles, and adults in seawater salinity zones of greater than 25.0 ppt (NEFMC, 1998b). Red hake is a demersal fish that occurs from southern Newfoundland to North Carolina. This species is most abundant between Georges Bank and New Jersey. Juvenile and adult red hake are fish found in close association with the substrate.

Understanding of the environmental associations of red hake eggs is poor because they co-occur north of Cape Hatteras and are not readily separable to species in plankton collections (Steimle et al., 1999c). Some characteristics were identified based on eggs taken from spawning red hake. From this, it was determined that the eggs are approximately 0.6 – 1.0 mm in diameter, buoyant, and float near the surface. Hatching occurs within 3 – 7 days at typical spawning temperatures, which range from between 5 – 10°C from April to November (Steimle et al., 1999c).

EFH for red hake larvae includes conditions of surface water temperatures less than 66 °F (19 °C), salinity greater than 0.5 ppt, and water depths less than 656 feet (200 meters) (NEFMC, 1998b). Since larval red hake associate with floating debris, sargassum and jellyfish, there is no known association between substrate type and the occurrence of red hake eggs and larvae. Red hake larvae are pelagic, common in the Middle Atlantic Bight and less so in the Gulf of Maine, suggesting that spawning in the Mid-Atlantic produces the majority of recruits to the Gulf of Maine stock. Red hake larvae in Boston Harbor are common from July through October and rare during November (Jury et al., 1994).

Red hake juveniles that are recently metamorphosed stay pelagic until they reach a length of 0.9 to 1.2 inches (25 to 30 millimeters). Demersal settlement usually occurs between September and December when juveniles reach lengths of 1.4 to 1.6 inches (35 to 40 millimeters). NEFMC (1998b) describes EFH for red hake juveniles as bottom habitats with a substrate of shell fragments, including areas with abundant live scallops, in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Conditions where red hake juveniles are generally found include the following: water temperatures below 61 °F (16 °C), water depths less than 328 feet (100 meters) and salinities ranging from 31 to 33 ppt (NEFMC, 1998b). Juvenile red hake leave shelter at night and prey on small benthic and pelagic crustaceans. Juvenile red hake in Boston Harbor occur November through April and are rare during June through August (Jury et al., 1994).

Along the Maine coast the presence of YOY juvenile red hake was significantly linked to one or more of three types of vegetated habitats: eelgrass, kelp and macroalgae. They utilize these habitats for refuge from predators (Stevenson et al., 2014). Young-of-the-year juveniles may utilize unvegetated soft bottom habitats as well (Lazzari and Stone 2006, as cited in Stevenson et al., 2014). In deeper water, red hake are found on sand and mud bottoms with few being caught on gravelly, shelly, or rocky grounds (Klein-MacPhee 2002d, as cited in Stevenson et al., 2014). Juveniles are frequently found inside live scallops and inside or under mollusk shells and shell structure appears to be crucial for their survival (Able and Fahay 1998, Klein-MacPhee 2002d, as cited in Stevenson et al., 2014). A similar symbiotic association has not been observed with blue mussels, the most common shellfish species that forms beds in shallow Gulf of Maine coastal waters. Although red hake were collected in a tidal salt marsh creek in the lower Kennebec River in Maine, they were not collected in six other Gulf of Maine salt marsh systems (Dionne et al., 1999, as cited in Stevenson et al., 2014).

Lazzari and Stone (2006, as cited in Stevenson et al., 2014) collected YOY juvenile red hake at depths <32.8 feet (<10 meters) along the Maine coast and concluded that shallow-water habitats in the Gulf of Maine are important nursery habitats for red hake. Older juvenile and adult red hake are rarely caught in depths <32.8 feet <10 m in the Massachusetts bottom trawl survey (Packer et al., 2004, as cited in Stevenson et al., 2014). Klein-McPhee (2002d, as cited in Stevenson et al., 2014) concludes that adult red hake are found in relatively deep water in the Gulf of Maine, which is likely true of the older juveniles as well.

NEFMC (1998b) describes EFH for red hake adults as bottom habitats in depressions that have a substrate of sand and mud in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the middle Atlantic south to Cape Hatteras. Conditions where red hake adults are generally found include the following: sea water temperatures below 54 °F (12 °C), water depths ranging from 33 to 427 feet (10 to 130 meters) and salinities ranging from 33 to 34 ppt (NEFMC, 1998b). Food of red hake adults is similar to that of juveniles but also includes various demersal and pelagic fish and squid. Adult red hake in Boston Harbor are common April through November and rare December through March (Jury et al., 1994).

Scup (Stenotomus chrysops)

Primary reference: Steimle, 1999d

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated EFH for juvenile scup *(Stenotomus chrysops)*. However, the egg and larval life stages have been given a designation of "n/a" in Massachusetts Bay indicating there is no data available on the designated life stages, or those life stages are not present in the species' reproductive cycle. Scup are temperate species and are most common south and west of Cape Cod and north of Cape Hatteras (NMFS, 1994). They undertake extensive migrations between coastal waters in summer and offshore waters in winter, moving north and inshore to spawn in spring.

Juvenile scup prefer estuaries and bays from Massachusetts to Virginia with various sands, mud, mussel and eelgrass substrates, temperatures greater than 45 °F (7 °C), and salinities greater than 15 ppt. Juvenile and scup prey on invertebrates such as polychaetes, epibenthic amphipods, and other small crustaceans. NMFS EFH tables (NMFS, 1994) indicate that juvenile scup occur at depths from 0 to 124 feet (0 to 38 meters) during spring and summer in both estuaries and bays. In Massachusetts Bay, juvenile scup are common during June through September and rare during June and October (Jury *et al.,* 1994).

Spiny Dogfish (Squalus acanthias)

Primary reference: MAFMC, 2014

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated for sub-adult female and adult life stages of spiny dogfish (*Squalus acanthias*). However, the egg and larval life stages have been given a designation of "n/a" in Massachusetts Bay indicating there is no data available on the designated life stages, or those life stages are not present in the species' reproductive cycle. Spiny dogfish are most common between Nova Scotia and Cape Hatteras. They undertake extensive migrations between northern waters in spring and summer and southern waters in fall and winter (MAFMC, 2014).

Female sub-adult spiny dogfish prefer pelagic and epibenthic habitats throughout a wide range of depths with temperatures between 45 to 59 °F (7 to 15 □C) and salinities from 32 to 35 ppt (MAFMC, 2014). Jury *et al*. (1994) does not include information on temporal distribution and relative abundance of sub-adult spiny dogfish in Massachusetts Bay.

Adult spiny dogfish prefer pelagic and epibenthic habitats throughout a wide range of depths with temperatures between 45 to 59 °F (7 to 15 □C) and salinities from 32 to 35 ppt (MAFMC, 2014). Adult spiny dogfish in Boston Harbor are rare from May through November and in Massachusetts Bay they are common in June and October and abundant from July through September (Jury et al., 1994).

Summer Flounder (Paralichthys dentatus)

Primary reference: Packer et al., 1999

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated for adult life stages of summer flounder *(Paralichthys dentatus)*. Jury *et al*. (1994) does not include information on temporal distribution and relative abundance of any life stages of Atlantic halibut in Massachusetts Bay.

Summer flounder are distributed from the southern Gulf of Maine to South Carolina but are rare north of Cape Cod and migrate into the Gulf of Maine in the summer from southern waters (Collette and Klein-MacPhee, 2002).

Adults are concentrated in estuaries and bays during warmer months from late spring through early fall and undertake migrations to the outer continental shelf at depths of 492 feet (150 meters) in colder months. The majority of the population lies farther offshore even in the warmer months in depths of 230 to 509 feet (70 to 155 meters) (Collette and Klein-MacPhee, 2002). Adult summer flounder are opportunistic feeders, and diet appears to consist of whatever suitable fish and crustaceans are available. Summer flounder are found on a variety of substrates but appear to prefer sandy substrate. They are also found on muddy substrates and can use vegetation for cover. Spawning occurs during autumn and early winter (Terceiro, 2006). Massachusetts Bay is designated as EFH for adult summer flounder.

White Hake (Urophysis tenuis)

Primary reference: Chang et al., 1999a

Boston Harbor has been designated EFH for all life stages of white hake (*Urophysis tenuis*), with the exception of spawning adults in the seawater salinity zone of greater than 25.0 parts per thousand (ppt) (NEFMC, 1998b). White hake have a range in the northwest Atlantic from the Gulf of St. Lawrence to Cape Hatteras, North Carolina. They occur from estuaries across the continental shelf to submarine canyons along the upper continental slope and deep, muddy basins in the Gulf of Maine.

EFH for white hake eggs and larvae are the surface waters of the Gulf of Maine, Georges Bank, and southern New England. White hake eggs and larvae cannot be distinguished from the closely related red hake. White hake eggs are buoyant and remain near the surface, being most often observed in Boston Harbor May through October (Jury et al., 1994).

EFH for white hake larvae are the surface waters of the Gulf of Maine, Georges Bank, and southern New England, with larvae being most common in the Gulf of Maine and Georges Bank during May through October (Jury et al., 1994). Larval white hake are difficult to distinguish from red hake but are pelagic and have no known association with a specific substrate. White hake larvae in Boston Harbor are common May through November and rare in December (Jury et al., 1994).

Early juvenile white hake are pelagic and older juveniles become demersal when they are about 2.0 to 2.3 inches (50 to 60 millimeters) in total length. NEFMC (1998b) describes EFH for white hake pelagic stage juveniles as pelagic waters of the Gulf of Maine, southern edge of Georges Bank, and southern New England to the middle Atlantic. EFH for the demersal stage is described as bottom habitats with seagrass beds or substrates of mud or fine-grained sand in the Gulf of Maine, southern edge of Georges Bank, or southern New England to the middle Atlantic.

Larger demersal juvenile white hake have been collected offshore at a wide range of temperatures between 39 and 66 °F (4 and 19 °C) and at depths ranging between 16 and 1,066 feet (5 and 325 meters). Smaller juveniles collected in Massachusetts inshore trawl surveys were most abundant at temperatures of 39 to 57 °F (4 to 14 °C) in spring and 46 to 66 °F (8 to 19 °C) in autumn, at depths less than 246 feet (75 meters). Eelgrass is an important habitat for demersal juveniles and younger fish are spatially segregated from older year classes by occupying shallow areas, but they are not tied to eelgrass, other vegetation, or structured habitats. Demersal juvenile white hake mostly feed on shrimp and other crustaceans and polychaetes. Juvenile white hake in Boston Harbor are common March through November and rare December (Jury et al., 1994).

On the coast of Maine, YOY juvenile white hake presence has been significantly linked to eelgrass habitats (Lazzari and Stone, 2006, as cited in Stevenson et al., 2014). A prior study showed that juveniles were common in eelgrass and unvegetated soft bottom habitats but did not prefer one over the other (Lazzari, 2002, as cited in Stevenson et al., 2014). A long term survey of shallow-water habitats in three zones along the Maine coast concluded the presence of YOY juvenile white hake was significantly related to one or more of three types of vegetated habitats: eelgrass, kelp, and algae (Lazzari and Stone, 2006, as cited in Stevenson et al., 2014). Young-of-the-year juveniles use shallow macroalgal habitats in the Gulf of Maine as important nursery grounds. White hake are also common in unvegetated salt marsh creeks and channels in addition to eelgrass meadows in Gulf of Maine coastal waters (Heck et al., 1989, Dionne et al., 1999, as cited in Stevenson et al., 2014).

Along the Maine coast, juvenile white hake were common in catches from shallow-water ((<19.6 feet [<6 meters]) habitats (Lazzari, 2002, as cited in Stevenson et al., 2014). Depth preference for YOY juveniles in Massachusetts coastal areas is likely similar to those in Maine, in addition to their preference for vegetated nursery grounds.

White hake adults are demersal. NEFMC (1998b) describes EFH for white hake adults as bottom habitats with a substrate of mud or fine-grained sand in the Gulf of Maine, the southern edge of Georges Bank, and southern New England to the middle Atlantic. Conditions where white hake adults are generally found include the following: water temperatures below 57 °F (14 °C) and water depths ranging from 16 to 1,066 feet (5 to 325 meters) (NEFMC, 1998b). Adult white hake feed on shrimp and other crustaceans. They also prey on fish that may include juveniles of their own species. Adult white hake in Boston Harbor are common March through October and are rare in November (Jury et al., 1994).

Whiting (Silver Hake) (Merluccius bilinearis)

Primary reference: Lock and Packer, 2004

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated for egg, larvae, and adult life stages of whiting *(Merluccius bilinearis)*. Whiting, also known as silver hake, are distributed on the continental shelf of the northwest Atlantic from the Gulf of St. Lawrence to Cape Fear, North Carolina.

Whiting eggs are pelagic and there is no known association between substrate characteristics and occurrence of eggs, which occur in Massachusetts Bay all year, with peak numbers from June through October (NEFMC, 1998b). NEFMC (1998b) defines EFH for whiting eggs as water depths from 164 to 427 feet (50 to 130 meters) with temperatures less than 68 °F (20 °C). In Massachusetts Bay, whiting eggs are common during May through October and absent during the remainder of the year (Jury *et al.,* 1994).

Whiting larvae are initially pelagic but become benthic at about 17 to 20 millimeters in length. There is no proven correlation between substrate characteristics and occurrence of silver hake larvae, which are observed all year, with peaks from July through September (NEFMC, 1998b). EFH for whiting larvae has the same temperature criterion as eggs (less than 68 °F [less than 20 °C]) within similar depth ranges as the eggs (164 to 427 feet [approximately 50 to 130 meters)] (NEFMC, 1998b). In Massachusetts Bay, whiting larvae are common during May through October and absent during the remainder of the year (Jury *et al.,* 1994).

NEFMC (1998b) describes EFH for whiting adults as bottom habitats of all substrate types in the Gulf of Maine, on Georges Bank, the continental shelf off southern New England, and the middle Atlantic to Cape Hatteras. Conditions where white hake adults are generally found include the following: water temperatures below 72 °F (22 °C) and water depths ranging from 98 to 1,066 feet (30 to 325 meters) (NEFMC, 1998b). Adults are nocturnal feeders with a diet consisting of fish, crustaceans, and squid. In Massachusetts Bay, adult whiting are common during April through July, October and November rare during August September and December and absent during the remainder of the year (Jury *et al.,* 1994).

Windowpane Flounder (Scopthalmus aquosus)

Primary reference: Chang et al., 1999b

Boston Harbor has been designated EFH for all life stages of windowpane flounder (*Scopthalmus aquosus*), including spawning adults in brackish salinity zones of 0.5 to 25.0, as well as seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b). Windowpane is a coastal flatfish distributed from the Gulf of St. Lawrence to Cape Hatteras, North Carolina. This species is most common south of Nova Scotia. Windowpane flounder are very common on sandy bottoms in southern New England and further south, but they also occupy muddy bottoms in the Gulf of Maine (Klein-MacPhee, 2002g, as cited in Stevenson et al., 2014). These flounder are common as YOY juveniles, older juveniles, and adults in featureless sand habitat.

Windowpane flounder eggs are buoyant and pelagic and are most common at depths less than 230 feet (70 meters). The conditions where windowpane flounder eggs are mainly found are as follows: sea surface temperatures less than 68 °F (20 °C) and water depths less than 230 feet (70 meters) (NEFMC, 1998b). Windowpane flounder eggs in Boston Harbor are common May through September and are rare December through February (Jury et al., 1994).

Windowpane flounder larvae are pelagic. NEFMC (1998b) describes EFH for windowpane flounder larvae as pelagic waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. The conditions where windowpane flounder larvae are mainly found are as follows: sea surface temperatures less than 68 °F (20 °C) and water depths less than 230 feet (70 meters) (NEFMC, 1998b). Windowpane flounder larvae in Boston Harbor are common May through October and are rare in April (Jury et al., 1994).

NEFMC (1998b) describes EFH for juvenile windowpane flounder as bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. The conditions where juvenile windowpane flounder are mainly found are as follows: water temperatures less than 77 °F (25 °C) and depths from 3 to 328 feet (1 to 100 meters), and salinities between 5.5 and 36 ppt (NEFMC, 1998b). Juvenile windowpane feed exclusively on mysid shrimps in Johns Bay, Maine. Juvenile windowpane flounder in Boston Harbor are common throughout the year (Jury et al., 1994).

Young-of-the-year juveniles may inhabit five benthic habitats: mud, sand, eelgrass, macroalgae and saltmarsh (Stevenson et al., 2014). In the Gulf of Maine, juvenile and adult windowpane flounder are common in shallow-water habitats and prefer sand over mud. Laboratory experiments have illustrated that transitional and larger juveniles favor sand to mud (Klein-MacPhee 2002g, as cited in Stevenson et al., 2014), perhaps because it is a more useful substrate for burial or because their prey are more common over sandy bottom.

Windowpane flounder inhabit the intertidal zone and shallow-water Gulf of Maine habitats as juveniles and adults. The young flounder settle in shallow inshore waters and generally relocate into deeper, offshore waters as they develop (Klein-MacPhee, 2002g, as cited in Stevenson et al., 2014). Juveniles (<22 centimeters) and adults (>22 centimeters) are common in bottom trawl harvests between 19 to 32 feet (6 to 10) meters in Massachusetts (NEFSC, 2004, as cited in Stevenson, 2014, 2014). They feed entirely on swimming prey such as mysids, decapod shrimp, and fish larvae (Chang et al., 1999, Klein-MacPhee, 2002g, as cited in Stevenson et al., 2014).

Adult windowpane flounder occur at depths less than 246 feet (75 meters). NEFMC (1998b) describes EFH for windowpane flounder adults as bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Adult windowpane flounder in Boston Harbor are common March through December and are rare during December through February (Jury et al., 1994).

The conditions where windowpane flounder spawn are generally in water temperatures less than 70 °F (21 °C) at depths from 3 to 246 feet (1 to 75 meters), and with salinities between 5.5 and 36 ppt (NEFMC, 1998b). Spawning adult windowpane flounder in Boston Harbor are common May through September and are rare during April and October (Jury et al., 1994).

Winter Flounder (Pleuronectes americanus)

Primary reference: Pereira et al., 1999

Boston Harbor has been designated EFH for all life stages of winter flounder (*Pleuronectes americanus*), including spawning adults in brackish salinity zones of 0.5 to 25.0, as well as seawater salinity zone of greater than 25.0 ppt (NEFMC, 1998b).

Winter flounder is an economically important demersal flatfish occurring in coastal waters from Labrador to Georgia. This species is managed as three separate stocks: Gulf of Maine, southern New England/Middle Atlantic, and Georges Bank. Adult winter flounder migrate inshore during the fall/early winter and spawn during late winter/early spring throughout most of the range. After spawning, adults usually leave the inshore areas though some remain in the inshore areas year-round.

Winter flounder eggs are demersal and adhesive. NEFMC (1998b) describes EFH for winter flounder eggs as bottom habitats with substrates of sand, muddy sand, mud and gravel on Georges Bank, inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to Delaware Bay. Conditions where winter flounder eggs are found include the following: water temperatures less than 50 °F (10 °C), water depths of less than 16 feet (5 meters), and salinities between 10-30 ppt (NEFMC, 1998b). Winter flounder eggs in Boston Harbor are abundant February and June and are common during January and June (Jury et al., 1994).

Winter flounder larvae do not disperse far from egg habitat and remain in close association with the bottom. NEFMC (1998b) describes EFH for winter flounder larvae as pelagic and bottom waters of Georges Bank, inshore areas of the Gulf of Maine, southern New England, and the middle Atlantic south to Delaware Bay. Conditions where winter flounder larvae are found include the following: sea surface temperatures less than 59°F (15°C), water depths of less than 20 feet (6 meters), and salinities between 4-30 ppt (NEFMC, 1998b). Winter flounder larvae in Boston Harbor are highly abundant March through May, abundant February and June, common June and August and rare during January (Jury et al., 1994).

NEFMC (1998b) describe the EFH of the YOY winter flounder as bottom habitats with a substrate of mud or fine-grained sand on Georges Bank, the inshore of the Gulf of Maine, southern New England and the middle Atlantic south to Delaware Bay. Existing conditions where winter flounder YOY are found are water temperatures below 82 °F (28 °C), depths from 0.3 to 33 feet (0.1 to 10 meters), and salinities between 5 and 33 ppt. The EFH of juveniles (age 1+) is bottom habitats with a substrate of mud or fine-grained sand on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle Atlantic south to Delaware Bay. Winter flounder juveniles are found at water temperatures below 77 °F (25 °C), depths between 3 and 164 feet (1-50 meters), and salinities between 10 and 30 ppt (NEFMC, 1998b). Amphipods and polychaetes are important parts of the YOY and yearling flounder's diet. Juvenile winter flounder in Boston Harbor are highly abundant throughout the year (Jury et al., 1994).

In southern New England and the Mid-Atlantic, winter flounder spawn in the winter and early spring in nearshore, marine and estuarine habitats in areas less than five meters deep (Pereira et al., 1999, Klein-MacPhee 2002h, Able and Fahay 2010, as cited in Stevenson et al., 2014). Their adhesive eggs are deposited in groups on sand, muddy sand, and mud and gravel, with sand being the most common (Pereira et al., 1999, as cited in Stevenson et al., 2014). Tagging studies in the southwestern Gulf of Maine have illustrated that winter flounder tend to spawn in deeper coastal waters more than in shallow nearshore waters (DeCelles and Cadrin, 2010, E. Fairchild, pers. comm., as cited in Stevenson et al., 2014). Adults may holdover in spawning areas following spawning before transitioning into deeper water as water temperatures increase (McCracken, 1963, as cited in Stevenson et al., 2014). Although winter flounder in the Gulf of Maine spawn primarily in deeper coastal waters, shallow nearshore benthic habitats are vital nursery areas because the planktonic larvae are transported shoreward before metamorphosing into juveniles and settling to the bottom. Shallow, nearshore habitats and the intertidal zone (Tyler, 1971, as cited in Stevenson et al., 2014) also provide an abundance of shelter and food resources for juvenile winter flounder. Organisms that are found in soft sediments, such as polychaetes and amphipods, are primary prey of juvenile winter flounder (Stevenson et al., 2014).

Field research has demonstrated that recently metamorphosed juvenile winter flounder are most likely to settle on the bottom in areas of fine sediments with low current velocity, yet older YOY juveniles may inhabit a variety of substrates (Curran and Able, 2002, Chant et al., 2000, Stoner et al., 2001, as cited in Stevenson, 2014, 2014). Juvenile winter flounder spend most of their first year of life in shallow-water habitats, migrating into deeper water during the fall when water temperatures decrease (Able and Fahay, 2010, as cited in Stevenson et al., 2014). Field and laboratory studies have demonstrated that in different areas of the eastern seaboard and New England, YOY juveniles may utilize coarse sand or mud with debris present, depending on the size of the individual (Howell, et al., 1999; Phelan et al., 2001, as cited in Stevenson et al., 2014).

NEFMC (1998b) describe the EFH of the adult winter flounder as bottom habitats including estuaries with a substrate of mud, sand, and gravel on Georges Bank, the inshore of the Gulf of Maine, southern New England and the middle Atlantic south to Delaware Bay. Existing conditions where winter flounder adults are found are water temperatures below 77 °F (25 °C), depths from 3 to 328 feet (1 to 100 meters), and salinities between 15 and 33 ppt (NEFMC, 1998b). Polychaetes and crustaceans (mostly amphipods) generally make up the bulk of the adult winter flounder diet. Adult winter flounder in Boston Harbor are highly abundant throughout the year (Jury et al., 1994).

The EFH of spawning adult winter flounder is bottom habitats including estuaries with a substrate of sand, muddy sand, mud, and gravel on Georges Bank, the inshore areas of the Gulf of Maine, southern New England and the middle

Atlantic south to the Delaware Bay. The following conditions generally exist where the spawning adults are found: water temperatures below 77 °F (25 °C), depths less than 20 feet (6 meters), except on Georges Bank where they spawn as deep as 262 feet (80 meters), and salinities between 5.5 and 36 ppt (NEFMC, 1998b). Spawning most commonly occurs during February through June. Spawning adult winter flounder in Boston Harbor are abundant February through May and common during June, July, December and January (Jury et al., 1994).

Yellowtail Flounder (Pleuronectes ferruginea)

Primary reference: Johnson et al., 1999

Boston Harbor has been designated EFH for all life stages of yellowtail flounder (*Pleuronectes ferruginea*), including spawning adults in the seawater salinity zone of greater than 25.0 parts per thousand (ppt) (NEFMC, 1998b). The range of the yellowtail flounder along the Atlantic coast of North America is from the Gulf of St. Lawrence, Labrador and Newfoundland south to the Chesapeake Bay. Yellowtail flounder are common on the offshore shoals such as George’s Bank and Stellwagen Bank, as well as eastern Cape Cod and the western Gulf of Maine and are typically found in depths greater than 66 feet (20 meters), up to 4,101 feet (1,250 meters) offshore. Although, this species is typically rare in most North Atlantic estuaries and rivers and generally do not inhabit estuaries or rivers, they are known to be common in Boston Harbor (Johnson et al., 1999).

Yellowtail flounder eggs are pelagic and occur near the surface where water depths range from 33 to 2,475 feet (10 to 750 meters). Most occurrences are where water depths range from 99 to 297 feet (30 to 90 meters). Eggs are deposited at depths from 98 to 295 feet (30 to 90 meters) between March and May (Johnson et al., 1999). The nursery area for this species’ eggs is described as mostly oceanic rather than estuarine. NEFMC (1998b) describes EFH for yellowtail flounder as surface waters of Georges Bank, Massachusetts Bay, Cape Cod Bay, and the southern New England continental shelf south to Delaware Bay. Conditions where yellowtail flounder eggs are generally found include the following: sea surface temperatures below 59 °F (15 °C), water depths ranging from 99 to 295 feet (30 to 90 meters) and salinities ranging from 32.4 to 33.5 ppt (NEFMC, 1998b). Yellowtail flounder eggs in Boston Harbor are abundant from May through July and are common during August, September and April (Jury et al., 1994).

Yellowtail flounder larvae are pelagic and occur in the water column where water depths range from 33 to 4,101 feet (10 to 1250 meters). Most occurrences are where water depths range from 33 to 297 feet (10 to 90 meters). Larvae settle between 32.8 to 295 feet (10 to 90 meters) depth, and juveniles occupy between 16 to 246 feet (5 to 75 meters) (Johnson et al., 1999). The nursery area for this species’ larvae is described as mostly oceanic rather than estuarine. NEFMC (1998b) describes EFH for yellowtail flounder larvae as surface waters of Georges Bank, Massachusetts Bay, Cape Cod Bay, and throughout the middle Atlantic south to Chesapeake Bay. Conditions where yellowtail flounder larvae are generally found include the following: sea surface temperatures below 63 °F (17 °C), water depths ranging from 33 to 297 feet (10 to 90 meters) and salinities ranging from 32.4 to 33.5 ppt (NEFMC, 1998b). Yellowtail flounder larvae in Boston Harbor are abundant from May through August, are common in September and April and are rare in October (Jury et al., 1994).

Juvenile yellowtail flounder become demersal at lengths of 11.6 to 16 millimeters (standard length). EFH for juveniles in the Gulf of Maine, Georges Bank and the southern New England shelf is bottom habitat with sand or sand and mud substrates at water depths ranging from 66 to 164 feet (20 to 50 meters) with temperatures below 59 °F (15 □C) and salinities from 32.4 to 33.5 ppt (NEFMC, 1998b). Prey for juvenile yellowtail flounder include benthic macrofauna such as amphipods, polychaetes, and sand dollars. Juvenile yellowtail flounder in Boston Harbor are abundant from throughout the year (Jury et al., 1994).

Adult yellowtail flounder have substrate and depth preferences similar to juvenile fish. Adult yellowtail flounder prefer to inhabit sand and sandy mud substrates at 66 - 164 feet (20 – 50 meters), where they forage on amphipods and polychaetes (Johnson et al., 1999). Adult yellowtail flounder in Boston Harbor are abundant throughout the year (Jury et al., 1994).

EFH for spawning adults is similar to that for juveniles and adults except that water depths range from 33 to 410 feet (10 to 125 meters) with temperatures below 59 °F (15 °C) (NEFMC 1998b). Spawning adult yellowtail flounder in Boston Harbor are abundant April through August and rare in September (Jury et al., 1994).

Skate EFH Species Life Histories

Little Skate (Leucoraja erinacea)

Primary reference: Packer at al., 2003a

Boston Harbor has been designated EFH for juveniles and adult little skate (*Leucoraja erinacea*) (NEFMC, 1998b). The little skate is distributed from Nova Scotia south to Cape Hatteras, North Carolina. They are a benthic and typically nocturnal species, tending to remain buried in depressions on the seafloor during the day and becoming more active at night. Little skate occur along the entire inshore coastline of the Gulf of Maine (McEachran and Musick, 1975, McEachran, 2002, as cited in Stevenson et al., 2014). Little skate are generally found on sandy or gravel bottoms, but also occur on mud (McEachran, 2002, as cited in Stevenson et al., 2014). Individuals on the Maine coast were found in the rocky subtidal zone, and in sandy areas further south in New Hampshire.

Juvenile little skate EFH includes gravelly or sandy substrates or mud and water temperatures between 41 and 59 °F (5 and 15 °C). During spring and fall most juveniles were found at water depths less than 230 feet (70 meters). Jury et al., (1994) does not provide temporal abundance data for juvenile little skate, in Boston Harbor.

Over sandy bottom habitat, little skate are common at all five life stages and also use this habitat for spawning (Stevenson et al., 2014). Shallow gravel and cobble habitat is commonly inhabited by juvenile and adult little skate as they grow and mature. Shallow unvegetated mud habitats may be inhabited by YOY juveniles, older juveniles and adults (Stevenson et al., 2014).

Adult little skate are found to occur on gravelly or sandy substrates or mud, from shore to 449 feet (137 meters) offshore and most commonly at water depths less than 240 to 299 feet (73 to 91 meters). However, EFH for adults includes temperatures from 36 to 59 °F (2 to 15 °C) (NEFMC, 2009). There is no salinity data available for little skate in Massachusetts Bay. Prey items for adults include decapod crustaceans and amphipods, with isopods, bivalves, and fishes also playing a minor role in their diet. Jury et al., (1994) does not provide temporal abundance data for adult little skate, in Boston Harbor.

Thorny Skate (Amblyraja radiata)

Primary reference: Packer et al., 2003b

Boston Harbor has been designated EFH for juvenile thorny skate (*Amblyraja radiata*) (NEFMC, 1998b). The thorny skate is a benthic species that can be found in the western Atlantic Ocean from western Greenland south to North Carolina. Thorny skates are one of the most abundant skate species in the Gulf of Maine, widespread from Gulf of St. Lawrence to Cape Hatteras.

Thorny skates occupy a variety of substrates, including sand, gravel, shell hash, pebbles and soft mud. Some studies have identified seasonal migrations of this species, while others suggest they are more sedentary and reside year-round. In Massachusetts surveys, juveniles tend to prefer depths from 19.5 to 279 feet (6 to 85 meters) in the spring and fall, and temperatures of 39.2 to 42.8 °F (4 to 6 °C) in the spring and 42.8 to 48.2 °F (6 to 9 °C) in the fall. Juvenile thorny skate generally outcompete the smooth skate, as they are opportunistic feeders described as "demersal", "crab" and "shrimp/amphipod" predators. They feed on hydrozoans, polychaetes, octopus, copepods, isopods, amphipods, crabs and shrimp. Throughout their range they prefer temperatures between 39.2 to 48.2 °F (4 to 9 °C) and depths from 59 to 3937 feet (18 to 1200 meters). Jury et al., (1994) does not provide temporal abundance data for juvenile thorny skate, in Boston Harbor.

Winter Skate (Leucoraja ocellata)

Primary reference: Packer et al., 2003c

Boston Harbor has been designated EFH for juvenile and adult winter skate (*Leucoraja ocellata*) (NEFMC, 1998b). The winter skate can be found from south coast of Newfoundland to Cape Hatteras, North Carolina. It is a nocturnal, benthic species, often remaining buried in depressions in the seafloor during the day and becoming active at night. Winter skate are the second most common skate in the Gulf of Maine, next to the little skate. They are common throughout the Gulf of Maine including the coast of Massachusetts and Massachusetts Bay.

Juvenile winter skate EFH includes gravelly or sandy substrates or mud, water temperatures between 30 and 70 °F (-1 and 21ºC), with most found from 39 to 61 °F (4 to 16ºC) and are found from shoreline to 1,312 feet (400 meters) offshore and at water depths less than 364 feet (111 meters) (NEFMC, 2009). Prey items for juvenile winter skate includes polychaetes and amphipods, with decapods, isopods, bivalves, and fish also playing a minor role in their diet. Jury et al., (1994) does not provide temporal abundance data for juvenile winter skate, in Boston Harbor.

Adult winter skate are distributed around Cape Cod and Massachusetts Bays. They exhibit a seasonal movement towards the shore in autumn and offshore in the summer. During surveys it has been observed that juvenile winter skate are much more common in the spring and fall versus the abundance of adults. Eggs are deposited from the fall through January in southern New England, and mating activity may take place all year. Adults typically inhabit sandy and gravelly bottoms but will forage in muddy substrates as well. Prey includes polychaetes, amphipods, decapods, isopods and bivalves (Parker et al., 2003, as cited in Stevenson et al., 2014). In Massachusetts, adult winter skate is most often found in depths from 19 - 82 feet (6 - 25 meters) and are found in waters ranging from 6 – 12 ºC in the spring and 5 - 19 ºC in the fall (Packer et al., 2003c).

Invertebrate EFH Species Life Histories

Atlantic Surfclam (Spisula solidissima)

Primary reference: NEFMC, 2017

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated juvenile and adult Atlantic surfclam (*Spisula solidissima*). However, the egg and larval life stages have been given a designation of "n/a" in Massachusetts Bay indicating there is no data available on the designated life stages, or those life stages are not present in the species' reproductive cycle. The Atlantic surfclam bivalve mollusks found in continental shelf waters ranging from the Gulf of St. Lawrence and Newfoundland to Cape Hatteras (NEFMC, 2017).

Juvenile and adult Atlantic surfclam are most commonly found in depths ranging from 32 to 131 feet (10-40 meters) in water with medium or fine grain sand or silty fine sand (NEFMC, 2017). They are found within the top 3 feet (1 meter) of substrate (MAFMC, 1998).

Longfin Inshore Squid (Loligo pealeii)

Primary reference: Jacobson, 2005

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated juvenile and adult longfin inshore squid (*Loligo pealeii*). The longfin inshore squid is a schooling species mollusk that occurs in slope waters near the continental shelf from Newfoundland to the Gulf of Venezuela and occurs in commercial abundance from southern Georges Bank to Cape Hatteras.

Juveniles inhabit the upper 33 feet (10 meters) of the water column in areas with water depths of 164 to 492 feet (50 to 150 meters). During spring surveys and autumn surveys in Massachusetts coastal waters, juveniles have been found in temperatures ranging from 41 to 62 °F (5 to 17 °C), with most at 50 to 57 °F (10 to 14 °C) and at depths between

20 and 213 feet (6 and 65 meters), with most being within 20 feet to 82 feet (6 to 25 meters). During fall they have been found in temperatures ranging from 41 to 72 °F (5 to 22 °C) and at depths between 3 and 279 feet (1 and 85 meters), with most being within 20 to 82 feet (6 to 25 meters).

Adult longfin inshore squid inhabit the continental shelf and upper continental slope to depths of 1312 feet (400 meters), but depth varies seasonally. In spring they occur at depths of 361 to 656 feet (110 to 200 meters) in summer and autumn they inhabit inshore waters as shallow as 20 to 92 feet (6 to 28 meters), and in winter they inhabit offshore waters to depths of 1198 feet (365 meters). They are found on mud or sand/mud substrate, at surface temperatures ranging from 48 to 70 °F (9 to 21 °C), and bottom temperatures ranging from 46 to 61 °F (8 to16 °C). Adults, like juveniles, migrate up and down in the water column in response to light conditions and the importance of off-bottom habitat is unknown. Longfin inshore squid can spawn year-round, but usually occur from May to August in New England waters (Cargnelli *et al.,* 1999b).

Northern Shortfin Squid (Illex illecebrosus)

Primary reference: Hendrickson and Holmes, 2004

Within the quadrant of Massachusetts Bay encompassing the Project area, EFH has been designated for adult life stages of northern shortfin squid (*Illex illecebrosus*).

During the spring, adults are most common between 394 to 1,312 feet (120 to 400 meters). During the fall they were most common between 98 and 459 feet (30 and 140 meters) and also between 656 and 984 feet (200 and 300 meters).

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