



Central Street Bridge Replacement and
Central Pond / Sawmill Brook Restoration Project
Manchester-by-the-Sea, Massachusetts

Massachusetts Coastal Zone Management Federal Consistency Review Documentation and Certification Form

Town of Manchester-by-the-Sea

March 2022

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Section 1

Federal Consistency Review Certificate

1.1 Project Name

Town of Manchester-by-the-Sea Central Street Bridge Replacement and Central Pond Sawmill Brook Restoration

1.2 Certificate Signature

This proposed activity complies with the enforceable program policies of the Massachusetts approved coastal management program and will be conducted in a manner consistent with such policies.



03/09/2022

Charles Dam, PE
Director, Department of Public Works
10 Central Street
Manchester-by-the-Sea, Massachusetts

Date

Section 2

Project Summary

The project includes replacement of the Sawmill Brook Center Street bridge, removal of a tide gate structure, upgrading channel walls along Central Pond, and restoration of Sawmill Brook including restoring saltmarsh wetlands and creating living shorelines to stabilize stream banks. The proposed project improvements include widening the bridge for top-side transportation improvements and increasing the span below in conjunction with removal of the existing obsolete tide gate to increase hydraulic capacity and promote fish passage of rainbow smelt, a federal Species of Concern, American eel, and sea run brook trout (recently discovered in Sawmill Brook). Transforming the impoundment created by the tide gate (Central Pond) will allow restoration of the upstream area to tidal wetland. In the event of a culvert failure, there are consequences to transportation and community safety include response times for emergency services as well as impacts to schools, transportation of goods and services and access to government services and loss of utility services.

On the western side of the pond, a natural “living” shoreline is proposed in several areas where bank erosion has occurred – both providing shoreline protection and natural habitat. The Town is proposing to install flexible retaining walls on the eastern side of the pond to stabilize the coastal shoreline, protect existing residences and buildings, including the Town’s Fire Station, from wall collapse and subsidence, and decrease erosion and sedimentation into Sawmill Brook. The combined project elements are designed in concert to improve resilience to natural hazards and promote sustainability with low maintenance and natural solutions to counter the impacts of sea level rise and increased precipitation due to climate change.

The importance of this location has gained the attention of State and Federal agencies, including the Massachusetts Department of Transportation (MassDOT), the Massachusetts Coastal Zone Management (CZM), the Massachusetts Division of Ecological Restoration (DER), the Massachusetts Division of Conservation and Recreation (DCR), the Massachusetts Division of Marine Fisheries (DMF), the National Oceanic and Atmosphere Administration (NOAA) Restoration Center and Federal Emergency Management Agency (FEMA) due to the unique combination of natural hazard risks impacting a busy historic downtown area with vulnerable infrastructural, societal, and environmental community assets.

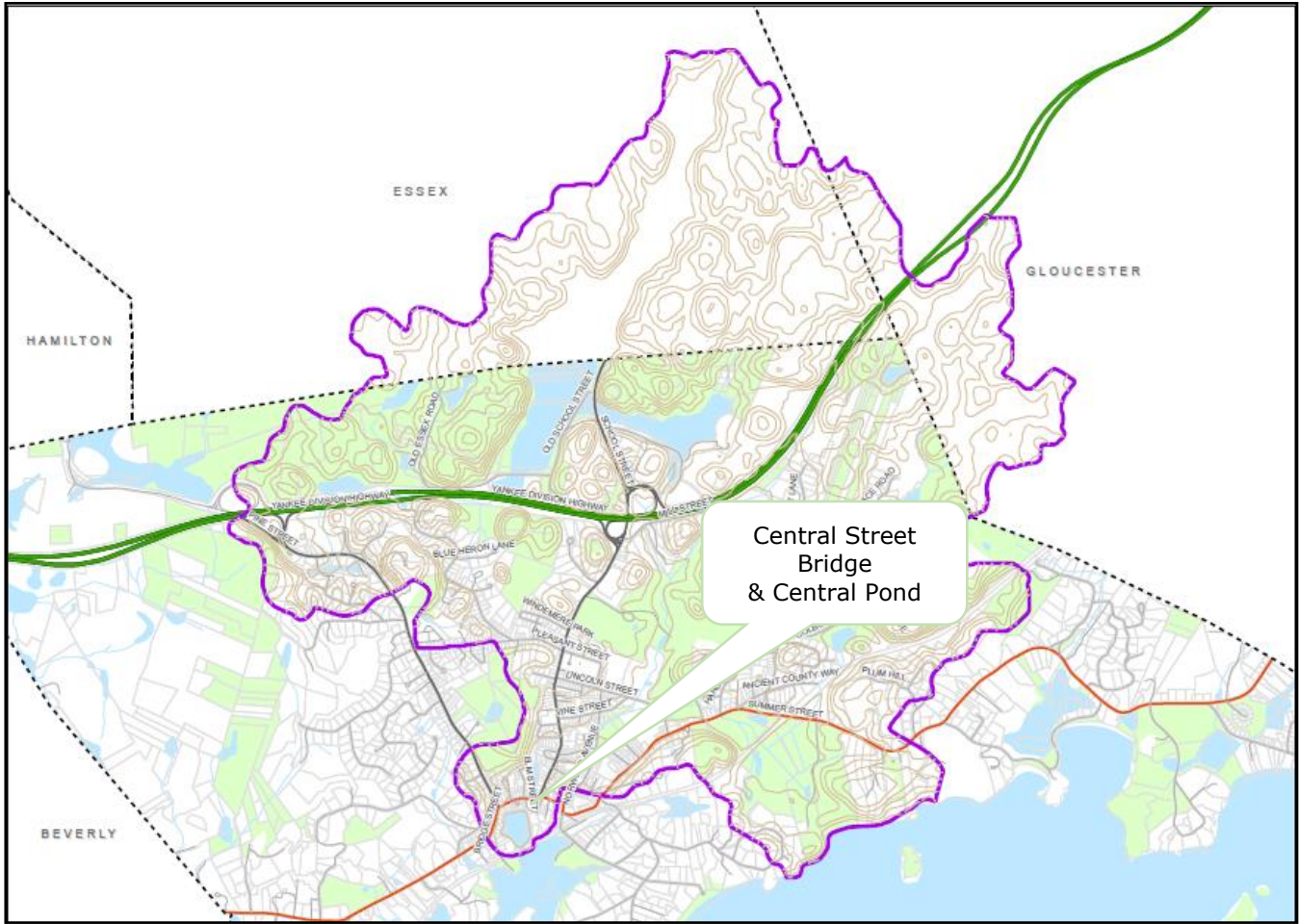


Figure 1 Sawmill Brook Watershed and Project Locus

Section 3

Massachusetts Environmental Policy Act

The MEPA Certificate was received on 1/10/2020 (EEA 16127) and no EIR was required.

The Certification of the Secretary, comment letters and proof of ENF Transmittals are included in **Appendix A**.

Section 4

Detailed Project Description

A detailed description and analysis of the nature, location, type, size, proposed use, and anticipated lifespan of the project, illustrated with map(s) and site plan(s);

The Town of Manchester-by-the-Sea is a vibrant coastal community with an abundance of natural coastal resources, a stable population, and thriving year-round and seasonal businesses. Flooding events have severely impacted these assets in the past, including economic loss from businesses closed due to floods and disrupted utilities, flood related safety concerns due to impassable roadways and restrained access for emergency vehicles, inoperable wastewater and stormwater systems, and environmental concerns due to loss of habitat from tidal restrictions and erosion by flood waters.

Historically and during recent years, property and infrastructure have been damaged, water quality and habitat of inland and coastal waterways have been degraded, and fish passage has been impeded in the watershed. Flooding and water quality problems will be magnified in coming years due to climate change related increased frequency and duration of storms, sea level rise, and the expansion of impervious areas from future development.

Flooding is a particular problem within the Sawmill Brook watershed. Areas adjacent to the Brook have experienced both coastal and inland flooding due to man-made and natural causes. Flooding is most intense in the lower reaches of the Brook. There, undersized culverts and an improperly functioning tide gate have caused stream banks to overtop, leading to stream bank erosion. Based on watershed modeling developed as part of Manchester-by-the-Sea's 2018 Hazard Mitigation Plan, the greatest flood reductions would be accomplished by widening the opening at the Central Street Bridge, removing the tide gate there, restoring marsh and riparian wetlands, and restoring the stream channel within Central Pond. The restoration project must be permitted together with the tide gate removal and bridge improvements to avoid segmentation. Maps and photographs of the project are included in **Appendix B**.

The Central Street tide gate, and related structures are in need of modification to provide better functionality with respect to drainage and fish passage. The tide gate and culvert at Central Street impede drainage from Sawmill Brook, especially during coastal storm events, resulting in localized flooding. The tide gate structure also overtops on spring high tides and storm surge tides. Discussions with the Massachusetts Division of Marine Fisheries (DMF) indicate a preference to remove the tide gate to improve fish passage conditions for rainbow smelt.

The Sawmill Brook culvert under Central Street was observed as part of an in-water walk-through during the planning phases of the project to view existing conditions of the seawall, tide gate structure, culvert, and stream bed/weirs. The inspection report noted corrosion/erosion on the tide gate tracks and safety concerns due to the separation and settlement of culvert arch stones. Significant seepage was observed from the stone wall supporting the south side of Central Street, particularly when the tide gate was closed. The seepage can cause a loss of soils under the street. Repairs made to the wall using pneumatically applied concrete and non-shrink grout repointing have failed, particularly in the tidal zone.

The Central Street Bridge structure currently overtops during extreme storm events and is structurally deficient. Seepage through the seawall, due to hydrostatic pressure from the tide gate, is damaging the roadbed. Culvert arch stones are becoming unstable. The tide gate also obstructs fish passage. Collapsed retaining walls and eroding banks along Central Pond and direct discharge from stormwater outfalls contribute to sedimentation along the stream channels.

The tide gate and weir design at the Central Street Bridge have been identified by the DMF as an impediment to fish passage, notably impacting rainbow smelt (*Osmerus mordax*), a diadromous fish species listed as a federal Species of Concern. Sedimentation from flooding and stream bank erosion also impact spawning areas. Recently, the Sea Run Brook Trout Coalition has contacted the Town to express its interest in restoring trout populations to the Brook. The Massachusetts Division of Ecological Resources (DER) has selected this Sawmill Brook project as a Massachusetts Priority Project, due to the potential restoration benefits and the level of commitment demonstrated by the local community to restore tidal and riparian ecosystems there.

The construction project consists of three general phases:

1. Phase One: Removal of the tide gate structure, demolition of the existing Central Street Bridge and reconstruction with a concrete arch culvert with an approximate span of 20 feet.

- *Remove the tide gate.* This work will include demolition of the concrete tide gate structure, slide gate, catwalk, and associated infrastructure to restore the unrestricted flow of Sawmill Brook into Manchester Harbor.
- *Replacement of the Central Street Bridge.* The existing bridge, including the concrete beam span section on the downstream side and upstream stone arch culvert, will be demolished and replaced with a concrete arch culvert with a span of approximately 20 feet, which will have greater capacity than the existing structure. The visible elements of the replacement structure and street furnishings will have a stone appearance in keeping with the aesthetic of the adjacent stone wall.
- *Central Street roadway improvements.* The roadway portion of this project is an isolated bridge reconstruction and not part of larger corridor improvement. Conscious effort was made to minimize the overall footprint of the work to limit impacts and cost. The existing horizontal and vertical alignments were matched to the extent practicable, roadway function was matched, and drainage patterns were

preserved. Minor improvements were made to curb line geometry to improve overall traffic operation.

The proposed roadway section matches with the objectives of the Town of Manchester-by-the-Sea to have a more pedestrian friendly downtown village environment. The Town has taken a “complete streets” approach to the downtown area including recent corridor improvement studies. The proposed roadway cross-section is consistent with the overall plan for the area and will interface well with future improvements. The design includes new ADA compliant sidewalks and curb ramps to enhance the walkability and accessibility of downtown. The design also includes a curb extension (“bump-out”) on the bridge to enhance pedestrian safety and provide traffic calming along the corridor. Given the limited right-of-way, bicycle accommodation is provided in the travel lane. A “take-the-lane” cycling approach is appropriate through the downtown due to low motor vehicle speeds and ample sight distance.

2. Phase Two: Stream Bank Stabilization along Central Pond/ Sawmill Brook

The proposed restoration design for the Central Pond area of Sawmill Brook includes improvements to the existing retaining walls along the eastern shore and implementing a hybrid of bioengineered solutions to stabilize the western shoreline.

- *Improvements to the stone walls.* The failing slopes along the fringes of Central Pond will be improved through installation of a more resilient “flexible” gravity wall along the eastern shoreline and drainage improvements behind the wall. The upgraded sections of wall will have a stone appearance consistent with the aesthetic of the adjacent walls to the extent possible.
- *Construct living shoreline along Sawmill Brook.* Living shoreline construction will take place a year after Phase One. Proposed bank treatment on the west shoreline consists of living and nonliving plant materials together with natural materials to reduce erosion, establish vegetation that will create stabilization of the shoreline through various runoff and tidal regimes. Native species will be specified providing naturally occurring vegetation while providing access to the resource.

3. Phase Three: Sawmill Brook Restoration Channel improvements and Saltmarsh Restoration.

Sawmill Brook stream restoration will take place a year after Phase One is completed. This final phase includes natural establishment of a channel through the sediments in Central Pond through natural in-stream processes and reestablishing coastal salt marsh within the interior sections of the mud flats. This area will be allowed to self-seed with spartina, and augmented with salt marsh planting. A period of monitoring will follow to adjust vegetation management as needed to restore coastal salt marsh and eradicate any invasive species.

Section 5

Project Objectives and Anticipated Benefits

A detailed description and analysis of the project objectives and anticipated benefits

Flooding has been a particular problem within the Sawmill Brook watershed. Areas adjacent to the Brook have experienced both coastal and inland flooding due to man-made and natural causes. Flooding is most intense in the lower reaches of the Brook. There, undersized culverts and an improperly functioning tide gate have caused stream banks to overtop, leading to stream bank erosion. **As part of the HMP, a watershed HEC-RAS model was developed, accounting for future climate change conditions.** The model was used to evaluate strategies to mitigate flooding, starting at the mouth of Sawmill Brook and working up the watershed. The greatest flood reductions were accomplished by widening the opening at the **Central Street Bridge**, removing the tide gate and restoring marsh areas and the stream channel within **Central Pond**.

The Central Street Bridge structure currently overtops during extreme storm events and is structurally deficient. Seepage through the seawall, due to hydrostatic pressure from the tide gate, is damaging the roadbed. Culvert arch stones are becoming unstable. The bridge also obstructs fish passage. Collapsed retaining walls and eroding banks along Central Pond and direct discharge from stormwater outfalls contribute to sedimentation along the stream channels. All these infrastructure issues must be addressed to minimize flood reduction and maximize habitat benefits upstream.

Based on more detailed survey and extensive hydrologic monitoring, the Sawmill Brook HEC RAS modeling was refined under a Massachusetts Environmental Trust (MET) Grant. The study refined the required dimensions for Central Street Bridge widening to eliminate upstream flooding for low lying adjacent properties for a 50-year storm under projected 2100 sea level rise conditions.

Restoration of Central Pond from an impounded open water area to a stream channel and tidally influenced wetland system, will be designed to withstand future changes in climatic conditions. This is integral to achieving flooding reduction in Lower Sawmill Brook. Stream restoration will also improve fish passage and overall habitat value. The coastal area will benefit from this project because it will fortify stream banks currently overtopping and eroding, provide more flood storage to lessen flood events, and create an aesthetically pleasing new habitat in the downtown area, which will enhance the residents' opportunities to observe natural ecosystems.

This project has been under development for many years. It was listed as a top priority in both the 2019 Manchester HMP and the State Certified Manchester Municipal Vulnerability Preparedness Plan. The basis for engineering design includes consideration of future SLR and storm surge impacts up to 2100. The project is also listed as a priority project by the Massachusetts Department of Ecology Restoration (DER) due to the potential restoration benefits and the level of commitment demonstrated by the local community to restore tidal and riparian ecosystems in the Central Pond area.

Once implemented this project will provide benefits in the following ways:

- Facilitating the ecological restoration of the area as tidal exchange increases following the tide gate removal and Central Street Bridge replacement
- Allowing for natural processes to occur within Central Pond including geomorphic changes in the stream channel width and potential elevation changes through the reach, and for the establishment of native wetland vegetation
- Resiliency for the surrounding built environmental during storm events
- Strengthening the Central Street bridge to maintain transportation and emergency services along a critical transportation corridor
- Increasing culvert width at Central Street to reduce hydraulic restriction occurring with inland storm discharge and reduce upstream stream bank flooding
- Increasing connectivity from Manchester Harbor to Sawmill Brook to improve fish passage through the project area
- Stabilizing stream banks and improving drainage to prevent stream bank collapse and sedimentation of downstream waters
- Establishing living shorelines and saltmarsh restoration as nature-based solutions to mitigate impacts from flooding and improve habitat.

In 2017, the Town formalized a schedule and phased plan for undertaking the extensive climate adaptation actions for the Central Street Culvert and Central Pond Restoration project. Since that time, seven grants have been awarded to the Town that supported development of the Central Street Bridge Improvements and Sawmill Brook/Pond Restoration project:

- Under an FY17 Massachusetts Environmental Trust Grant, the Town completed the physical studies (e.g. water level monitoring, sediment quantity and characterization) needed to demonstrate the technical feasibility of widening the culvert at Central Street, removing the tide gate and restoring Central Pond to a tidal system.
- The Town was designated as a Municipal Vulnerability Preparedness Community under the FY17 MVP grant program. The Central Street/ Sawmill Brook Central Pond Restoration project was listed as a high priority project.
- Manchester-by-the-Sea completed an FY18 MVP Action Grant for the permitting level design to restore Sawmill Brook at Central Pond. Public input was included, and the Board of Selectmen unanimously voted to approve progressing with the design for a full stream restoration.
- A 2018 Massachusetts Department of Transportation (MassDOT) small bridge grant was awarded for the design, permitting, and replacement of the Central Street crossing. As part of that project, Town funding will be used for the removal of the tide gate and any additional costs for replacement of the crossing.
- Manchester-by-the-Sea completed an FY20 MVP Action Grant for permitting and living shoreline design and an FY2021 MVP Action grant to finalize permitting.

- In 2021 Manchester-by-the-Sea was awarded a federal FEMA Grant under the new BRIC program to implement the Central Street Bridge Reconstruction and Central Pond.

Section 6

Project Site Existing and Proposed Conditions

A detailed description of the physical, biological, chemical, economic, and social conditions of the project site, surroundings, and affected environment, including resource area delineations, illustrated with map(s) and site plan(s) depicting both existing and proposed conditions; Maps and plans should be of adequate size, scale, and detail to completely and accurately describe the site, existing resources and uses, and the proposed project and its associated changes. The project description should also include a presentation of adequate and accurate technical data (e.g., calculations, modeling) to support the certification of consistency with coastal policies

6.1 Project Area Conditions

Sawmill Brook and associated tributaries provide drainage for the central portion of the Town of Manchester-by-the-Sea. Sawmill Brook and its tributaries drain rocky uplands, expansive wetlands, and developed impervious areas, before discharging to Manchester Harbor through a narrow tide gate. Many areas of the Town are subject to flooding during extreme storm events due to the combination of storm surge, hydraulic restrictions from undersized culverts and the tide gate, stormwater runoff from impervious areas, the channelized stream system in the lower portion of the watershed, and poor infiltration conditions. The Fire Station and several residential and business properties surrounding Central Pond are periodically impacted by minor property flooding.

The mouth of Sawmill Brook drains through a narrow culvert and tide gate under Central Street. This location was originally salt marsh. Early settlers redirected Sawmill Brook from a location to the east to its present location to support industry such as sawmills, grist mills, and furniture-making, documented as early as 1790. As downtown Manchester-by-the-Sea continued to develop, the area around Sawmill Brook was filled and altered to support development. The current tide gate structure was added around 1900 for a grist mill and to impound Central Pond to create a fire reservoir and provide a winter skating pond. The tide gate and culvert are currently not functioning properly, creating a hydraulic restriction during storm events and impeding the passage of fish such as rainbow smelt (*Osmerus mordax*), a federal Species of Special Concern. The project area is limited to the Central Street Bridge, Central Pond and Sawmill Brook starting from Central Street at the Manchester Harbor and extending along Sawmill Brook to School Street (See **Appendix B** for site location and photographs).

6.2 Central Street Bridge and Tide Gate Detail

The Central Street Bridge spans the Sawmill Brook at the mouth of Manchester Harbor on Central Street (Route 127). The crossing is constructed of three integrated parts including a bridge, tide gate and coastal wingwall. The bridge consists of a 16-foot span mortared stone masonry circular arch tidal bridge with stone masonry wingwalls and headwalls. Timber cribs functioning as weirs are imbedded into the bottom of the stream bed. A concrete and iron tide gate abuts the bridge to the south. The bridge was rebuilt around the mid 1900's and a tide gate was installed to control the Brook and create Central Pond

just upstream. A stone and masonry wingwall abuts the bridge in the southwest quadrant, functioning as a seawall.

Tighe & Bond evaluated the bridge, tide gate, and seawall in June 2015 (the full report is available to download from the Feasibility Assessment Reference List in **Appendix C4**, item 15, "Sawmill Brook Central Street Seawall, Tide Gate & Culvert Observations"). The passage under the bridge discharges flow from Sawmill Brook via a narrow, channelized reach, with 12-foot high granite walls and buildings abutting either side. The bridge has historically suffered due to the tide gate impounding water upstream of the bridge, causing seepage and loss of backfill material when large precipitation events and high tide elevations are concurrent. Multiple hydrologic and hydraulic models of the watershed and bridge indicate that the bridge opening is undersized to pass current design storm events without over-topping with concurrent tail water impacts due to storm surge.

In June of 2016, the bridge underwent interim repairs intended to temporarily stabilize the structure. The open joints were grouted using a pressure injection method and the void below the footing was formed and filled with cast-in-place concrete. An August 13, 2018 site visit confirmed the conditions observed in the 2015 site visit had not improved, including observed water seepage paths, damming conditions caused by the tide gate, separation and settlement of culvert arch stones, and concrete degradation.

The bridge is referenced in the Manchester Village National Register of Historic Places registration form as appearing to be of modern construction and marks the entrance to downtown Manchester-by-the-Sea. Water, drainage, sewer, electric, telephone, and gas utilities are located within the roadbed over the arch bridge.

Downstream of the Central Street Bridge is the tide gate that consists of a concrete gravity weir surrounding the Sawmill Brook outlet. Sawmill Brook passes through an opening in the weir restricted by a 6.5 by 5.5-foot cast iron slide gate controlled with an electric actuator. The actuator is located on a modern galvanized catwalk above the gate. The tide gate serves as a major hydraulic restriction for Sawmill Brook. When closed, it reduces tidal fluctuations within Sawmill Brook and Central Pond, although it is overtopped during very high tides. During rainstorms, it causes flooding of low-lying properties abutting Central Pond.

The existing tide gate structure has a top of wall elevation just above mean higher high-water level (MHHW), making this a significant obstruction to rainbow smelt passage on many high tides. Tidal water levels will rise over these walls on spring high tides (full moon or new moon) and during higher than predicted tides associated with atmospheric low pressure or wind setup, and such conditions will periodically allow rainbow smelt to swim over the walls when the tide gate is closed. This tide gate wall overtopping on spring high tides and storm surge tides does indicate that the tide gate is not effective in preventing seawater flooding.

Recent topographic survey indicates Central Street at this location is within about 1 foot of tidal flooding, based on recorded high tides from the storm of 1978 (NOAA Boston tide record at 93% height correction for Manchester). This was confirmed during the January 4, 2018 record high tide event during Winter Storm Grayson. (see hydrographs from 2019 H&H in Appendix C) The frequency of tidal flooding of the roadway will be increasing based on the current mean sea level rise relative to land (including land subsidence) of 0.92 feet

per 100 years recorded in Boston (NOAA), and also based on forecast predictions of an increasing rate of relative sea level rise (IPCC).

This tide gate is a bottom opening gate that is not suitable to partial opening for smelt passage due to the head pressure and high flow velocities associated with a limited gate opening needed to maintain the impoundment pond. Full opening of the gate during smelt migration is feasible, though velocities during rainfall events would need to be checked relative to smelt swimming speeds. Even with the tide gate open to allow for fish passage, there are two more weirs inside the stone arch culvert. Since the smelt are not able to jump up weirs, the tide will need to rise to at least 2/3 of mean high tide to allow smelt to swim upstream past these weirs. The DER has selected this area as a provisional Massachusetts Priority Project due to the potential restoration benefits that can be realized in this location, and the level of commitment demonstrated by the community to accomplish these goals.

6.3 Central Pond / Sawmill Brook Detail

The main area known as Central Pond extends upstream from Central Street Bridge to Knights Circle. The Pond is relatively flat, with a shallow gradient from ranging from 3 feet NAVD88 where Sawmill Brook enters Central Pond to 0.2 feet at the Central Street culvert inlet. Two main "islands" are present at low tide; one triangular feature at the entrance to the pond and one kidney shaped feature in the approximate center.

Historically, the flow of water through Central Pond has been restricted by the closed tide gate for significant portions of the year. The tide gate has been routinely opened during the spring to allow for fish passage and also during the winter and spring seasons to alleviate upstream flooding during periods of peak runoff. When the tide gate is closed the pond fluctuates an average of 4.25 to 4.90 feet from low to high tide. When the tide gate is open the depth ranges from 1.01 to 5.04 feet from low to high tide.

Sediment accumulation has been noted along the shoreline on the western bank of the Pond and to the north of the Pond, and eroded banks have been observed predominantly along the town-owned eastern bank of the pond, due to collapse of retaining walls. Granite block, poured concrete, brick, field stone and shale revetment and combinations of the above are the dominant structures found around Central Pond. The eastern shoreline is cut sharply into the Pond, with the wall defining the eastern bank boundary. The eastern shoreline is completely lined with wall structures ranging from 3-5 feet in height, with the tallest walls adjacent to Central Street along the channel that parallels Elm Street, and the lowest walls found on the south eastern shoreline including two privately owned properties.

The western shoreline has a more gradual slope, and includes several shoals formed from finer sediments deposited as Sawmill Brook flows under low water flow, gathering in pockets along the shore. Several stormwater discharge outfalls along the western shore are also a source of sediment. Walls along the western shoreline vary from loose cobbles and revetment to low fieldstone. The western shoreline is almost entirely under private ownership with the exception of a Town-owned parcel and a narrow easement on Elm Street.

Based on a field survey conducted on April 18, 2018, the worst wall conditions were observed in the south-eastern section of the Pond, extending from behind 19 Central

Street to the Fire Station, where two wall sections have entirely collapsed, and approximately 400 feet is in need of extensive repair. Other areas of concern due to land subsidence behind the wall, erosion, lack of vegetation, and public access include the wall sections above the Fire Station to Knights Circle (approximately 400 feet), sections along the western shore, and the transition between the wall structure on a Town owned parcel on Elm Street to the rock rubble on the adjacent privately owned parcel, which is a high velocity location where the wider channel narrows to the channel above Central Street.

Section 7

Project Construction and Maintenance

A timetable, approximate cost, and the methods and timing of construction and operation of the project (including types of equipment, temporary impacts associated with construction, monitoring and maintenance plans, proposed reporting schedule);

7.1. Project Schedule

The following is a typical construction sequence for a project of this nature. The sequence may vary depending on the contractor's proposed schedule and means and methods.

For Both the Pond and Bridge Project:

- Notify pertinent regulatory agencies of the construction schedule
- Post MassDEP File Number sign at the entrance to the work areas
- Install erosion and sedimentation controls and establish work areas
- Schedule and conduct site walks with pertinent regulatory agencies to inspect construction-phase BMPs

For Pond:

- Complete site preparation on east and west sides of the pond prior to initiating in-pond work, including temporary and permanent access routes
- Install apex jam, utilizing approved matting
- Install coffer dams, turbidity curtain, and oil booms for water control
- Perform grading and install bank habitat features as shown in the plans while removing the existing upstream bank
- Construct wood structures in main channel as shown in plans
- Restore and rebuild the wall in segments
- Remove coffer dam, temporary stream access points and in-channel BMPs
- Restore disturbed areas in-kind and revegetate areas with plantings as described above and depicted on the plantings plan
- Remove erosion and sedimentation controls pending approval from the Manchester-by-the-Sea Conservation Commission
- Manual planting of tidal marsh grasses on tidal flat beginning with test plots

For the Bridge:

- Contractor design of cofferdams, support of excavation, utility support, building monitoring
-
- Install coffer dams, turbidity curtain, and oil booms for water control
- Install traffic control devices and establish detours and road closures

- Provide temporary utilities and utility support as necessary for demolition
- Remove tide gate and existing bridge structure with demolition shielding
- Reconstruct Central Street bridge with roadway improvements
- Remove coffer dam, temporary stream access points and in-channel BMPs
- Restore disturbed areas in-kind

7.1.1. Time of Year Restrictions and Work Windows

The Massachusetts Division of Marine Fisheries (DMF) requested in their comment letter on the ENF (dated December 30, 2019) that no in-water work be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel (*Anguilla rostrata*). Work will be conducted accordingly within this recommended timeframe. Work will occur behind coffer dams as much as possible to limit unconfined in-water work.

Central Street closure may not occur between Memorial Day and Labor Day.

A time table for the project is included in **Appendix D**

7.2. Opinion of Probable Construction Cost (OPCC)

The OPCC is included in **Appendix D**

7.3. Construction Methods Erosion & Sedimentation Control

The proposed project will be performed with measures to minimize potential construction disturbances. As noted below, in some instances specific construction means and methods will be determined by the contractor. Due to construction safety concerns, the contractor will be responsible for providing public safety protection measures, including safety signage and observation to ensure that the public stays at a safe distance from active equipment and does not enter potentially unsafe active work areas.

Best Management Practices (BMPs) will be implemented for the project to limit the footprint of project disturbance. BMPs will include:

- Sediment filter bags at pump discharges to collect sediment if sediment is mobilized by pumping, should pumping be necessary
- Erosion control barriers, such as compost filter tubes, or silt fence and straw bale barriers, between upland limits of work and sensitive resource areas
- Limiting footprints of work to the minimum necessary to meet project goals
- Project contractors will be required to maintain reserve supplies of erosion control barriers on-site to make repairs as necessary

Supplemental and/or alternative construction BMPs may be required during work, depending on site and weather conditions.

7.3.1 Site Access and Construction Staging

For the bridge reconstruction, access to the proposed work area will be from Central Street. Staging of equipment and materials will likely be handled in the municipal parking lot along Church Street, behind the VFW, or at the DPW yard at 35R Pleasant Street. Should this happen, existing parking on Church Street will be impacted temporarily. Final location of staging and material handling will be further defined during later stages of design development. The site access and staging areas are shown in Appendix D.

For the pond project, access to the retaining wall and pond bottom will occur generally from the east side of the pond via existing paved parking areas and town-owned parcels along the bank. Plantings in the pond bottom will be performed by hand. Streambank stabilization measures required along the western portion of the pond may be installed by heavy machinery operating from anchored timber or composite mats in the pond bottom. Areas disturbed for construction access will be restored to pre-construction conditions.

7.3.2 Site Stabilization

The areas of construction will remain in a stable condition at the close of each construction day via the use of appropriate erosion and sedimentation control measures. Erosion control measures will be inspected at the close of each construction day and maintained or reinforced as necessary. All erosion and sedimentation control measures will be inspected, cleaned, or replaced during construction and will remain in place until such time as stabilization of all areas that may impact jurisdictional areas is permanent. Upon completion of construction, the impoundment level will recover naturally when pumping ceased and disturbed upland areas will be loamed and seeded and mulched, paved, or otherwise stabilized as required to match pre-construction conditions.

7.4 Monitoring and Maintenance Plan

Appendix D includes a **general maintenance plan and schedule for the Bridge and Pond** and a detailed wetland monitoring and restoration maintenance plan prepared for the Manchester-by-the-Sea Conservation Commission as part of the Order of Conditions and the USACOE as part of the Section 10/404 license.

The Monitoring and Maintenance Plan is included in **Appendix D**.

Section 8

Coastal Impacts

A detailed description and assessment of the negative and positive potential coastal effects of the project including direct and indirect resource and use impacts from all aspects of the project, short-term and long-term impacts for all phases of the project (e.g., acquisition, development, construction, and operation), and cumulative impacts of the project;

8.1 Positive Potential Coastal Effects

The Central Street Bridge replacement and Central Pond/Sawmill Brook restoration is a combined infrastructure retrofit and ecological restoration project. The project will include principals of green infrastructure and natural flood protection. The anticipated restoration will include a mixture of hard and soft design approaches, but in all cases, the restoration design will consider the climate change modeling completed under the HMP, to accommodate sea level rise and extreme precipitation and the anticipated life span of hard structures (50-75 years). Each potential restoration element is described below, with a focus on how either ecologically-based solutions or new standards will be incorporated.

- **Tide Gate Removal will restore natural ecosystems-** Historically, Central Pond impounds fresh water behind the tide gate at Central Street. As designed, the tide gate does not offer flood protection, restricts fish passage, and impedes drainage when Sawmill Brook floods from high precipitation events. Removal of the tide gate will restore a natural tidal regime to the Central Pond area, restore marsh and riparian habitat, and facilitate the passage of fish to suitable upstream spawning areas.
- **Improved Hydraulic Conductivity** – Removal of the tide gate and widening of the bridge will improve hydraulic connectivity between Manchester Harbor and Sawmill Brook. Completion of this project will improve fish passage and reduce flooding upstream of the bridge by alleviating the existing hydraulic restriction.
- **Marsh Restoration will enhance habitat value-** The options for marsh restoration include phased instream channel modifications and restoration of streamside vegetation. Planting will stabilize areas with sediment accumulation, create wildlife habitat, and encourage fish spawning. In water apex jams and rock riffles will be used to create additional water movement, aeration and scour pools, improving habitat value.
- **Retaining Wall Redesign and Repair will reduce streambank erosion and preserve flood storage-** Areas along the eastern bank of the Pond are completely retained by block retaining walls in various conditions. The results of geotechnical studies and engineering principals was utilized to design a flexible block wall that will withstand future geologic and hydrologic conditions.
- **Soft approaches for Streambank Stabilization can enhance property values-** Areas along the western banks, which are privately owned, have eroded in places. Soft engineering approaches will be used to stabilize stream banks,

discourage pedestrian access where access is the source of erosion, and enhance wildlife. The Town provides ongoing public education about creating stream buffers to property owners along Sawmill Brook to encourage appropriate stream bank plantings and avoiding the introduction of invasive species.

8.2 Negative Potential Coastal Effects

Negative coastal effects from the project are primarily temporary in nature due to construction. These impacts include ground disturbance along the banks and roadway, stockpiling and access issues related to materials and equipment, construction impacts related to installation of coffer dams, drilling bedrock for bridge footings, and traffic detours that are unavoidable during construction of the bridge.

The project will involve ground disturbance associated with the installation of the living shoreline on the west shore (10,050 sf Permanent), retaining wall replacement on the east shore (5,000 SF), apex jams for pond restoration (up to 8 jams at 850 SF/each) and the bridge replacement (350 SF).

Temporary disturbance within the High Tide Line (8.2 feet) includes installation of coffer dams plus fish pipes for the tide gate removal and bridge replacement (4,000SF) and cofferdams for the wall construction (10,500)

The Basis of Design Memo for the Bridge Design goes into detail regarding constraints of the project imposed by the approach roadway, Sawmill Brook, Utilities, Environmentally Sensitive Areas and Cultural Resource Areas.

Mitigation to minimize these negative impacts are detailed in the Project Manual Technical Specifications including: sediment and erosion controls methods, the bidder to comply with

The complete Basis of Design Memo dated 8/13/2019 is available for download in **Appendix C**, Resource Downloads, Engineering Design Reference Report #29.

Section 9

Project Alternatives

A detailed description of alternatives considered, analysis of the impacts on the resource areas, and explanation and justification as to why the preferred alternative was selected;

An alternatives analysis was completed as part of the development of the Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form (ENF). Factors considered in the evaluation of alternatives include environmental impacts, public safety, climate change resiliency, and rainbow smelt spawning condition improvements.

As the existing Central Street bridge is in deteriorating condition and is physically associated with the tide gate and adjacent Central Pond / Sawmill Brook, off-site alternatives would not meet project goals and were therefore not considered. On-site alternatives considered for the project included a no action alternative, repair or replacement of the Central Street culvert/bridge in conjunction with tide gate removal. Alternatives for Central Pond included different methods for bank stabilization and restoration alternatives for the of Central Pond /Sawmill Brook. The preferred alternatives were selected based on a comparison of benefits and impacts. The Board of Selectmen (BOS) discussed and approved the recommended preferred alternatives including replacement of the culver with a larger span, removal of the tide gate and full restoration of Central Pond/Sawmill Brook.

The alternatives section of the ENF, Alternatives Memo along with the BOS meeting minutes voting to implement the preferred alternative is included **in Appendix E**

Section 10

MEPA review

A description detailing any changes made to the project during MEPA review, if applicable

No changes were made *during* MEPA review, however more details to the Central Street Bridge Improvements and Central Pond Restoration Plan were made *after* MEPA review as part of the final design process. The concepts and fundamental elements remained the same, but provided more detail. No notice of project change was required.

Section 11

Permit Performance Standards to Mitigate Adverse Coastal Effects

A description of measures taken to avoid, minimize, and mitigate adverse coastal effects and a description of how the project meets performance standards under the applicable regulations are provided in this section.

Issued Permits are included in **Appendix F**

11.1 Wetlands Protection Act

The project required an Order of Conditions from the Town of Manchester-by-the-Sea Conservation Commission pursuant to the MA WPA and the Manchester-by-the-Sea Wetlands Bylaw and Regulations (Article 17) for both the Pond Restoration and the Bridge Reconstruction. The Orders of Condition are included in Appendix F.

The goals of the design include:

- Facilitating the ecological restoration of the area as tidal exchange increases following the tide gate removal and Central Street Bridge replacement
- Allowing for natural processes to occur within Central Pond including geomorphic changes in the stream channel width and potential elevation changes through the reach, and for the establishment of native wetland vegetation
- Resiliency for the surrounding built environment during storm events

Construction-Period Best Management Practices will be employed to avoid, minimize and mitigate adverse coastal effects. BMP's are indicated on the Project Plans in Appendix C:

- Defining limits of work
- Providing catch basin protection
- Installing erosion control barriers
- Construction mats/ ground protection
- Installing cofferdams,
- Spill Prevention and Control
- Dewatering
- Stockpile Management of construction materials, sediment or soil
- Site Stabilization
- Restoration
- Invasive Species Control

The WPA performance standards for impacted wetland resource areas is described in detail in the NOI application.

Tables 11-1 through 11-3 presents a summary of the resource area impacts from the proposed project. It should be noted that updated resource area impacts were calculated for the Bridge for the USACOE Section 10 Permit and are included in Appendix G Pending Permits- ACOE Section 404.

Table 11-1

Summary of Temporary and Permanent Impacts to Wetland Resource Areas for Pond Renovation

Resource Area	Activity	Temporary Impacts (sf)	Permanent Impacts (sf)	Total Disturbance
Coastal Bank ¹	Wall Replacement	95	730	
	Living Shoreline		700	1,525
Land Under Ocean	Wall Replacement	0	30	
	Living Shoreline	750	1,250	2,030
	Dredging ²		3,047	
Coastal Beach	Wall Replacement		4,195	
	Living Shoreline	10,247	10,050	24,492
Riverfront Area – Inner 100 ft	Construction Access	12,746	10,848	25,062
Riverfront Area – Outer 200 ft ³	Construction Access	1,468	--	
LSCSF ⁴	Construction Access	39,000	--	39,000
Total⁵		64,211	26,373	90,584

Table 11-1

Summary of Temporary and Permanent Impacts to Wetland Resource Areas for Bridge Reconstruction

Resource Area	Activity	Temporary Impacts (sf)	Permanent Impacts (sf)	Total Disturbance (sf)
Coastal Bank ^a	Bridge Replacement	80 lf	10 lf	90 lf
Land Under Ocean	Tide gate removal	0	+353	353
Coastal Beach	Temporary cofferdam area	900	0	900
Riverfront Area – Inner 100 ft	Limits-of-work	4,414	0	4,414
LSCSF ^b	Tide gate removal, limits-of-work	6,058	0	6,058
Total ^c		7,372	353	7,725

Table 11-1
Summary of Temporary and Permanent Impacts to Wetland Resource Areas -Combined

Resource Area	Temporary Impacts (sf)		Permanent Impacts (sf)		Total Disturbance
	Central Pond Bridge Reconstruction	Central Pond / Sawmill Brook Restoration	Central Pond Bridge Reconstruction	Central Pond / Sawmill Brook Restoration	
Coastal Bank ¹	80 lf	95 lf	10 lf	1430	1,615
Land Under Ocean	0	750	+353	5077	6,180
Coastal Beach	900	10,247	0	14,245	25,392
Riverfront Area – Inner 100 ft	4,414	14,241	0	10,848	29,503
Riverfront Area – Outer 200 ft ²		1,468	0	0	1,468
LSCSF ³	6,058	39,000	0	0-	45,058
Total⁴	7,372	64,211	353	26,373	98,309

¹ Coastal Bank impacts are given in linear feet (lf), not square feet (sf)

² Riverfront Area – Outer 200 ft impacts are inclusive of inner 100 ft impacts

³ LSCSF is located within the 200 ft Riverfront Area

⁴ Total impacts are in sf and therefore do not include Coastal Bank

Wetland resource area impacts are primarily associated with temporary construction-period impacts during the bridge reconstruction and pond / brook restoration. Construction-period impacts to existing, disturbed buffer zone to Coastal Bank will result from all phases of the proposed project; the Coastal Bank buffer zone is located within LSCSF and Riverfront Area.

As the proposed bridge reconstruction is located within the overall footprint of the existing bridge and roadway, there are no anticipated permanent impacts associated with that phase of the project.

Temporary impacts to Land Under Water associated with the pond / brook restoration include impacts associated with plantings, and dredging for retaining wall repairs and reconstruction, with permanent impacts to Land Under Water associated with the installation of rip-rap wall erosion protection.

As the proposed bridge reconstruction is located within the overall footprint of the existing bridge and roadway there are minimal anticipated permanent impacts associated with that phase of the project. The permanent impacts associated with the tide gate removal result in a net increase in resource area size for LUO and Coastal Beach.

The following applicable performance standards are addressed:

Land Under Ocean

The proposed wall replacement and living shoreline will result in both temporary and permanent impacts to LUO, totaling approximately 2,030 square feet (sf). Approximately 30 sf of LUO will be temporarily impacted as a result of the wall replacement. Approximately 1,250 sf of LUO will be permanently impacted from the bioengineering construction. The performance standards for LUO are set forth at 310 CMR 10.25(2), and a discussion of how the proposed project complies with these standards follows. Performance standards at 10.25(3) and (4) address navigation dredging and are not applicable to this project.

(5) Projects not included in 310 CMR 10.25(3) or (4) which affect nearshore areas of land under the ocean shall not cause adverse effects by altering the bottom topography so as to increase storm damage or erosion of coastal beaches, coastal banks, coastal dunes, or salt marshes.

The proposed project is designed to minimize alterations of the LUO topography, only altering the areas necessary to improve resiliency for storm damage and to remove the existing tide gate and to install the footings for the replacement bridge. The project involves the excavation of material to replace the existing wall in-kind and the installation rootwads for the bioengineering elements, and to replace the existing bridge. The stone blocks of the existing wall may be installed within the Pond to protect the proposed plantings. This impact will help stabilize the plantings and minimize future erosion along the eastern wall. The project involves the excavation of material to replace the existing bridge. These temporary impacts are necessary in order to reduce storm damage within the project area and within the riverine system. In addition, the bottom topography will be restored following the completion of construction.

(6) Projects not included in 310 CMR 10.25(3) which affect land under the ocean shall if water-dependent be designed and constructed, using best available measures, so as to minimize adverse effects, and if non-water-dependent, have no adverse effects, on marine fisheries habitat or wildlife habitat caused by:

*(a) alterations in water circulation; (b) destruction of eelgrass (*Zostera marina*) or widgeon grass (*Rupia maritima*) beds; (c) alterations in the distribution of sediment grain size; (d) changes in water quality, including, but not limited to, other than natural fluctuations in the level of dissolved oxygen, temperature or turbidity, or the addition of pollutants; or (e) alterations of shallow submerged lands with high densities of polychaetes, mollusks or macrophytic algae.*

The project is water dependent due to the placement of the existing infrastructure for the wall replacement and the nature of the bioengineering project. The goal of the project is to improve natural tidal flow conditions in the project area. Construction period impacts the conditions and resources listed in this performance standard will be minimized by limiting the open work area and by isolating in water work from stream and tidal flows. Best management practices will be utilized during construction to minimize impacting the resource areas.

(7) Notwithstanding the provisions of 310 CMR 10.25(3) through (6), no project may be permitted which will have any adverse effect on specified habitat sites of

rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

For the bridge, the proposed project is intended to improve the existing habitat and fish passage within Sawmill Brook by removing the existing tide gate and restoring the tidal flow within the Brook. The impacts to the resource area are temporary and necessary to accomplish this goal. In addition, this area is not located within *Estimated Habitat of Rare Wildlife* or *Priority Habitat of Rare Species*.

For the pond restoration, the proposed project is intended to improve the existing habitat of Central Pond. The impacts to the resource area are necessary to accomplish this goal. In addition, this area is not located within *Estimated Habitat of Rare Wildlife* or *Priority Habitat of Rare Species*.

Coastal Beach

The proposed bioengineering slope stabilization and wall replacement will result in both temporary and permanent impacts to Coastal Beach, totaling approximately 24,492 sf. Approximately 4,195 sf of Coastal Beach will be permanently impacted as a result of the wall replacement. Approximately 10,247 sf of Coastal Beach will be permanently impacted from construction of bioengineering elements. The performance standards for Coastal Beach are set forth at 310 CMR 10.27(2), and a discussion of how the proposed project complies with these standards follows.

(3) Any project on a coastal beach, except any project permitted under 310 CMR 10.30(3)(a), shall not have an adverse effect by increasing erosion, decreasing the volume or changing the form of any such coastal beach or an adjacent or downdrift coastal beach.

The goal of the project is to allow for natural processes to occur in the existing tidal flat (regulated as Coastal Beach) in the project area. This may include shifting position, width, and depth of the thalweg (channel) of Sawmill Brook through Central Pond and the growth of salt marsh vegetation on the tidal flat if favorable conditions remain following the tide gate removal. The project's alteration of Coastal Beach is limited and seek to promote natural processes in Central Pond while protecting surrounding developed areas. The planting proposed will help minimize erosion within the area.

Coastal Bank

The Coastal Bank at the project site is a structural bank and does not serve as a source of sediment supply to an adjacent Coastal Beach, Coastal Dune, or Barrier Beach. The proposed eastern wall replacement will modify the existing Coastal Bank, with the replacement of the existing retaining wall. This will include 730 lf of work at Coastal Bank, with restoration to similar conditions as proposed following construction. On the west of the Pond an additional 700 lf of Coastal Bank will be altered by the installation bioengineering slope stabilization measures and planting. The total work in Coastal Bank will be 1,525 lf, work will not result in the net loss of Coastal Bank. The performance standards for structural Coastal Bank are set forth at 310 CMR 10.30(6) through (8) and are addressed below.

The regulations at 310 CMR 10.30 state, "When a Coastal Bank is determined to be significant to storm damage prevention or flood control because it is a vertical buffer to storm waters, 310 CMR 10.30(6) through (8) shall apply:"

(6) Any project on such a coastal bank or within 100 feet landward of the top of such coastal bank shall have no adverse effects on the stability of the coastal bank.

The Coastal Bank is armored around Central Pond. Currently the eastern wall is failing, and the stability of the Coastal Bank is threatened. The proposed work will protect physical stability of the bank within these areas through the replacement of the existing wall at the Pond, installing coir logs and plants to reinforce and stabilize these sections of bank at the Pond, and maintaining the channel walls above and below the Central Street Bridge. The plantings at the wall for the Pond restoration should serve as further scour protection. The bank stability within the project area is not anticipated to be adversely affected by the bioengineering or the wall replacement, bridge replacement or tide gate removal.

(7) Bulkheads, revetments, seawalls, groins or other coastal engineering structures may be permitted on such a coastal bank except when such bank is significant to storm damage prevention or flood control because it supplies sediment to coastal beaches, coastal dunes, and barrier beaches.

The Coastal Bank within the project area is classified as a structural bank as it serves as a vertical buffer to tidal water. The bank does abut a regulatory Coastal Beach, but it is not a significant supplier of sediment to those resource areas as the existing Coastal Bank is armored. The proposed project is not anticipated to interfere with the bank's function in terms of flood control and/or storm damage protection. The expansion of the existing hydraulic opening of the bridge is intended to improve the flood conditions within the area. As this Coastal Bank is not a sediment supply to beach and is a structural bank, the placement of coir logs along the toe of the bank or the replacement of the bridge and the tide gate removal, is not anticipated to adversely affect the functions of this bank relative to sediment supply.

(8) Notwithstanding the provisions of 310 CMR 10.30(3) through (7), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

The proposed project will not adversely affect the quality or degree of habitat on-site. One of the project's goals is to improve the existing habitat within the Pond. The temporary impacts to this area will be restored following the completion of construction. As mentioned above, this area is not located within *Estimated Habitat of Rare Wildlife* or *Priority Habitat of Rare Species*.

The issued **Wetland Act Permits and OCCs for the Bridge and Pond are included in Appendix F.**

Please also see the detailed wetland monitoring and restoration maintenance plan prepared for the Manchester-by-the-Sea Conservation Commission as part of the Order of Conditions and the USACOE as part of the Section 10/404 authorization in Appendix D.

11.2 Mass DEP 401 Water Quality Certification

A Section 401 Water Quality Certification was triggered by the filing of a federal permit if the project results in a loss of 5,000 square feet cumulatively of Bordering or Isolated Vegetated Wetlands and Land Under Water, the amount of any proposed dredging is greater than 100 cubic yards (cy), or if any of the other thresholds listed in 314 CMR 9.04 are met. The proposed project is expected to result in more than 100 cy of dredging, and therefore a 401 Water Quality Certification will be submitted to MassDEP for review and approval.

The results of a sediment characterization study performed in the spring of 2018 as part of the Sawmill Brook Culvert Tide Gate Removal and Stream Restoration Feasibility funded by the MET (included in Appendix E) found that approximately 5,350 cubic yards of sediment are present within the Central Pond area. The sediment depth was found to range from 1 to over 6 feet in depth (beyond the limit of the probe used in the study). Based on grain size sampling results, the material in the pond area is predominantly dark brown silty sand. The channel below the Pond, for 100 -200 feet upstream of the Central Street Bridge, has a stony bottom, with cobbles, boulders and areas of gravel.

Laboratory analysis of three composite sediment samples collected in January 2018 in upstream, downstream, and pond locations during low tide conditions indicated the presence of low levels of metals, Polycyclic Aromatic Hydrocarbons (PAHs), and Polychlorinated Biphenyls (PCBs). With the exception of benzo(a)pyrene (2.10 mg/kg) and lead (167 mg/kg) in the downstream sediment sample, the detected concentrations of metals, PCBs, and PAH concentrations in the sediment samples collected in support of this feasibility evaluation were below the MassDEP Reportable Concentration (RCS-1) values in 310 CMR 40.000. The maximum concentration of total PCBs is below the RCS-1 values and Threshold Effects Concentration values (TECs). In sediment samples collected from the Downstream and Pond sediment samples, lead, mercury, and several PAHs were detected at concentrations above the established TEC.

Based on the preliminary sediment sampling results, since there were detections of benzo(a)pyrene above the MCP Method 1 soil standard in sediment samples collected from the Downstream location, upland reuse of sediment from this area would not be permitted in accordance with 314 CMR 9.07(9). It is anticipated that the reuse of sediment from other areas in the project site for salt-marsh restoration would be acceptable, since contaminant levels would potentially be below the Method 1 S1 soil standards, and consistent with the concentrations identified in the "Pond" sample, collected from the area of accumulated sediment in the eastern portion of Central Pond that is exposed during low tide when the Central Street tide gate remains open.

The preferred restoration alternative would minimize mechanical dredging of sediment deposits within Central Pond, and instead allow for restoration of a more natural sediment transport regime. Dredging will be limited to the footing excavations required for the replacement of the retaining wall. The flow of water through Central Pond has been

restricted by the closed tide gate for significant portions of the year, with routine opening during the spring to allow for fish passage, and also during the winter and spring seasons to alleviate upstream flooding during periods of peak runoff. During these periods of unrestricted flow conditions, sediment transport is occurring, with the ultimate discharge location in Central Harbor. Planting of the pond bottom as part of the project will help stabilize sediment in-place, naturalizing the transport rate.

Based on a review of analytical data collected in 2012 in support of a harbor dredging project (NAE-2012-322 – Bulk Chemical Analysis – Town of Manchester, Manchester Harbor – Tier III Sediment Evaluation), the nature of sediment quality upstream of the Central Street tide gate is not significantly different with regard to the presence of heavy metals, notably lead and mercury. Levels of total PCBs were slightly higher in the Central Harbor sediment samples, while levels of PAHs were slightly higher in the upstream Central Pond samples.

When closed, the existing tide gate has created a condition where fine sediments settle during large flow events during both low and high tides, instead of allowing sediment to travel downstream during low tides as would have occurred if the tide gate was not in place. The existing system is in disequilibrium while the prevalence of fine-grained sediment within Central Pond is also indicative of a supply of fine sediment within the watershed. The proposed bridge replacement and tide gate removal at Central Street would restore a tidal ebb-and-flow similar to existing conditions observed during periods when the tide gate is left open. A review of data collected to date indicates that the restoration of natural flow conditions and sediment transport from Sawmill Brook into Central Harbor is unlikely to result in a deterioration of conditions with regard to concentrations of contaminants present in the sediment.

The following applicable performance standards are addressed:

Dredging Performance Standards Compliance

Dredging includes the repositioning of sediment or other material from below the mean MHW mark for coastal waters. Dredging will be conducted to minimize short-term, long-term, and cumulative impacts on the aquatic ecosystem and to provide protection to infrastructure. Dredging performance standards are outlined at 314 CMR 9.07. The project meets the performance standards as set forth at 314 CMR 9.07(3) as summarized below.

- a) *The re-suspension of silt, clay, oil and grease and other fine particulate matter shall be minimized to protect aquatic life and other existing and designated uses of waters of the Commonwealth.*

The re-suspension of fine particulate matter will be minimized by completing excavation activities within a cofferdam. Repositioning and removal of sediment below the MHW mark will occur only after the cofferdams are installed to avoid suspension of such materials within the pond.

- b) *Improvement dredging activities shall minimize, and, to the maximum extent possible, avoid affecting areas of ecological importance including but not limited to vegetated wetlands, shellfish habitat, spawning habitat, habitat of state-listed rare wildlife, salt marsh, intertidal zone, riffles and pools, and vegetated shallows.*

The dredging for the proposed project is limited to the replacement of the existing retaining wall and the installation of the bioengineering structures. The intended purpose is to improve the existing area habitat and stability, and to promote natural stream geomorphologic processes and native tidal wetland plants. The project incorporates specific design elements to avoid or minimize impacts to resource areas including maintaining the existing footprint of the wall, limit the construction footprint to extent practicable, conduct construction from the land to the extent practicable, and incorporate best management practices.

In addition, per the most recent edition of the NHESP Natural Heritage Atlas the project is not located within designated *Priority Habitats of Rare Species* and *Estimated Habitats of Rare Wildlife*. According to MassGIS, Central Pond is not in any shellfish suitability or growing areas.

- c) *Where feasible, a minimum of 25-feet shall remain unaltered between the edge of vegetated wetlands, salt marsh, or vegetated shallows, and waterward edge of the top of the slope of the dredging area.*

This performance standard is not applicable. The proposed dredging areas are not located adjacent to vegetated wetlands, salt marsh, or vegetated shallows. The dredging area bisects Central Pond and abuts banks on both sides.

- d) *Dredging shall not be undertaken during migration, spawning or juvenile development periods of finfish, shellfish, crustaceans or merostomatans in locations where such organisms may be affected, except as specifically approved by the Department. Restricted time periods for dredging, or in-water sediment management, will be established by the Department after consultation with Massachusetts Division of Marine Fisheries or Division of Fisheries and Wildlife...(etc.)*

The DMF requested that no in-water work should be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel (*Anguilla rostrata*). Work will be conducted accordingly within this time restriction. Further coordination with DMF is ongoing and any time frame restrictions will be incorporated into the construction schedule.

- e) *In evaluating the potential effects of suspension of contaminated sediment on aquatic organisms, the Department may compare the bulk sediment chemistry with recognized guideline values (e.g., Long et al (1995), Ingersoll et al. (2000), etc.). The Department reserves the right to request additional sampling and analyses to evaluate the effects of suspension of contaminated sediment on aquatic organisms and/or water quality.*

Sediment sampling was completed in accordance with the procedures outlined in 314 CMR 9.07 (2)(b)(4). **The issued WQC Permits is included in Appendix F.**

11.3 US Army Corp of Engineers Section 10/404 Project Notification Form

The proposed project is subject to jurisdiction under the United States Army Corps of Engineers (Corps) authorization under Section 404 of the Clean Water Act, due to work within Waters of the United States. Corps Authorization is also required under Section 10 of the Rivers and Harbors Act due to work within waters subject to the ebb and flow of the tide. **The submitted USACE PCN is included in Appendix G including revisions.**

11.3.1 Quantification of Impacts

The project has been designed to avoid and minimize impacts to WoUS. The permanent impacts are necessary to protect and improve existing infrastructure, improve the stability of the shoreline of Central Pond and Sawmill Brook, enhance both ecological conditions and coastal resiliency, and remove the tide gate. The temporary impacts are associated with the installation of temporary erosion and sedimentation control measures and construction access.

11.3.2 Section 404/10 Compliance

The project is requesting Pre-Construction Notification (PCN) authorization under multiple GP categories. Section 404/10 compliance requirements not addressed in the following sections are addressed elsewhere in this permit application.

Time of Year Work Window

The Division of Marine Fisheries requested in their comment letter on the ENF that no in-water work be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel. Work will be conducted accordingly within the recommended timeframe.

Section 106 of the National Historic Preservation Act

The bridge is referenced in the Manchester Village National Register of Historic Places registration form as appearing to be of modern construction, and marks the entrance to downtown Manchester-by-the-Sea. Water, drainage, sewer, electric, and gas utilities are located within the roadbed over the arch bridge.

A Project Notification Form (PNF) was distributed to the Massachusetts State Historic Preservation Officer (SHPO) and Massachusetts Board of Underwater Archaeological Resources (MA BUAR) during the initial design phase of this project. Copies were also sent to the Wampanoag Tribe (Aquinnah) and the Mashpee Wampanoag Tribal Historic Preservation Officers (THPOs) in anticipation of the preparation and submittal of this PCN to initiate their review early in this process.

The MHC responded on February 7, 2018 requesting project plans and comments from Manchester-by-the-Sea Historic District Commission. The Manchester-by-the-Sea Historic Commission wrote a letter of support on April 4, 2019. Coordination with the Manchester-by-the-Sea Historic Commission is ongoing for the aesthetics of the bridge. The Environmental Notification Form, dated December 2, 2019, was also distributed to the Massachusetts State Historic Preservation Officer (SHPO) and Massachusetts Board of

Underwater Archaeological Resources (MA BUAR), Wampanoag Tribe (Aquinnah) and the Mashpee Wampanoag Tribal Historic Preservation Officers (THPOs).

Navigation

Due to the nature of the project and the location of the existing infrastructure, potential temporary impacts to navigation are possible but unavoidable and have been reduced to the extent practicable. Due to existing location of the tide gate, navigation through this portion of Sawmill Brook is not feasible. During construction, cofferdams will be installed along with a pipe, or combination of pipes to allow for fish passage through the work area without the need for flumes or pumps. The public will be able to pass around the project area, outside of the active work zone.

Federally-Listed Endangered Species

There are two federally-listed endangered or threatened species potentially present in the project area, the Northern Long-Eared Bat (NLEB) and Small Whorled Pogonia. There are no known hibernacula or maternity roost trees for the NLEB located in Manchester-by-the-Sea. The nearest hibernaculum and maternity roost tree are 15.6 and 59.6 miles away, respectively, from the project site. In addition, the proposed project does not involve any tree removal. Therefore, the NLEB should not be impacted by the project in accordance with the Northern Long-eared Bat Consultation and 4(d) Rule Consistency.

The Small Whorled Pogonia generally grows in areas with sparse to moderate ground cover. The project site generally consists of disturbed areas (*i.e.* paved parking areas roadway and maintained residential lawns). Given the existing habitat within the project area, it is unlikely that the pogonia is present within the area. In addition, the Small Whorled Pogonia is listed as a Massachusetts Endangered Species. The project site nor the surrounding area is not mapped as *Priority Habitats of Rare Species* or *Estimated Habitats of Rare Wildlife* by the Massachusetts NHESP Atlas. Therefore, no state-listed species are anticipated to be present at this site.

Federal Species of Concern

The project site has been identified as a potential spawning location for native rainbow smelt, a diadromous fish listed as a Federal Species of Concern by the National Oceanic and Atmospheric Administration (NOAA). The project has been designed to address flood-related sedimentation within the area.

Essential Fish Habitat

According to a data query of the NOAA Habitat Conservation Essential Fish Habitat (EFH) mapper, there is EFH within Sawmill Brook and Central Pond. No Habitat Areas of Particular Concern (HAPC) or EFH Areas Protected from Fishing (EFHA) were identified. Coordination with DMF has been ongoing through the permitting process.

Construction Equipment

Access to the proposed work area will be primarily from Central Street and some access from Elm Street. Staging of equipment and materials will likely be handled in the municipal parking lot along Church Street. Should this happen, existing parking on Church Street will be impacted temporarily. Staging areas will be surrounded with compost filter tube erosion barriers on the downhill side. During and after construction, all paved road and driveway surfaces are to be scraped and swept free of excavated materials on a daily

basis. Final location of staging and material handling will be further defined during later stages of design development.

Invasive Species Management Plan

In compliance with General Condition 25, invasive species management elements have been incorporated into the project plans to reduce the potential for introduction of invasive plants into the project area. Measures will include the following:

- Construction equipment, including machinery and construction matting, will be cleaned of loose soils and plant matter before mobilization to the site.
- On-site soils, which are likely to carry non-native/invasive species seed, will not be used for grading and restoration activities.
- Work materials which enter the pond, including the containment system and cofferdam materials, will be checked for aquatic invasive plants and cleaned prior to placement in the pond. Any aquatic plants on construction equipment should be removed, bagged, and disposed of in an appropriate off-site location.

This plan will seek to limit the establishment of invasive species following construction. There is the potential for the establishment of common reed (*Phragmites australis*) in the disturbed areas of the project site. The increase of tidal flushing and planting of native plants will help minimize potential establishment of *Phragmites* in the project area

The Application is under final review by the USACE. **The Permit Application and revisions are included in Appendix G.**

Please also see the detailed wetland monitoring and restoration maintenance plan prepared for the Manchester-by-the-Sea Conservation Commission as part of the Order of Conditions and the USACOE as part of the Section 10/404 license in Appendix D.

11.4 MassDEP Chapter 91 Public Access

The existing and proposed coastal engineering structures qualify as water-dependent uses pursuant to 310 CMR 9.12(2)(a)(12) as flood, water level, or tidal control facilities (tide gate and bridge). The proposed improvements to tidal flows within Sawmill Brook include the replacement of existing bridge and the removal of the existing tide gate. The replacement of the bridge will not preclude public access to Sawmill Brook.

In accordance with the Engineering and Construction Standards described in 310 CMR 9.37(3), the extent of the bridge that extends beyond the high-water mark is necessary to provide the structural support required to maintain the integrity footings.

Compliance with the License and Permit Requirements described in 310 CMR 9.31 is summarized below.

- (1) *Basic Requirements.* No license or permit shall be issued by the Department for any project subject to 310 CMR 9.03 through 9.05 and 9.09 unless said project:

- (a) includes only fill and structures for uses that have been categorically determined to be eligible for a license, according to the provisions of 310 CMR 9.32;*

The proposed project includes replacement of the existing bridge and removal of a tide gate (fill and structures) for water-dependent use per 310 CMR 9.12(2)(a)(12) as tidal and flood control structures.

As described in the existing conditions section, the project area is not located within a Designated Port Area, Area of Critical Environmental Concern, or Ocean Sanctuary.

- (b) complies with applicable environmental regulatory programs of the Commonwealth, according to the provisions of 310 CMR 9.33;*

As described in the following sections, the Town submitted a Notice of Intent to the Town of Manchester-by-the-Sea Conservation Commission on September 15, 2020, and the Order of Conditions was received on November 18, 2020. The Secretary of Energy and Environmental Affairs issued a Certificate on the Environmental Notification Form on January 10, 2020. The proponent is currently applying to the U.S. Army Corps of Engineers for a Pre-Construction Notification Authorization per Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

- (c) conforms to applicable provisions of a municipal harbor plan, if any, and local zoning law, according to the provisions of 310 CMR 9.34;*

The Town of Manchester-by-the-Sea does not have a Municipal Harbor Plan. The project will adhere to all permit approvals and conditions. The project area parcel is located within the General Area zoning district and no new structures are proposed. The proposed project will assist in protecting existing infrastructure from flood events.

- (d) complies with applicable standards governing the preservation of water-related public rights, according to the provisions of 310 CMR 9.35;*

The proposed replacement and removal project will not extend seaward of the state harbor line, is not within a Designated Port Area, and will not extend into any existing channels. The replacement of the existing bridge will not impair navigation line of sight, require the alteration of an established course of vessels, or permanently interfere with access to adjoining areas.

The goal of the tide gate removal and bridge replacement design is to restore the tidal influence within Sawmill Brook and Central Pond. The existing conditions with the tide gate blocking the bridge inhibit navigation of vessels. Navigation should not be negatively impaired as a result of the project and should improve with the removal of the tide gate and widening of the bridge span. Water-borne traffic is not expected to be generated as part of the project, and the project does not include berthing facilities.

- (e) complies with applicable standards governing the protection of water-dependent uses, according to the provisions of 310 CMR 9.36;*

The existing and proposed coastal engineering structures qualify as water-dependent uses pursuant to 310 CMR 9.12(2)(a)(12) as flood, water level, or tidal control facilities (tide gate and bridge). Private and public access to this area is limited given the existing infrastructure. There are no stairs or public access points within the proposed project area. Due to the current location of the infrastructure, the project cannot be moved to a different location away from property lines.

- (f) *complies with applicable standards governing engineering and construction of structures, according to the provisions of 310 CMR 9.37;*

The proposed project includes replacing an existing bridge, removal of a tide gate, and roadway improvements. The proposed project does not involve the construction of a coastal engineering structure.

- (g) *complies with applicable standards governing use and design of boating facilities for recreational or commercial vessels, according to the provisions of 310 CMR 9.38 and 9.39;*

The proposed project does not involve any changes to berths, marinas, boatyards, or boat launching ramps.

- (h) *complies with applicable standards governing dredging and disposal of dredge materials, according to the provisions of 310 CMR 9.40;*

Dredging for the proposed project includes dredging associated with the replacement of the existing bridge and the removal of the tide gate. Compliance with the 310 CMR 9.40 Standards for Dredging and Dredged Material Disposal 310 CMR are summarized below.

(1) Limitations on Dredging and Disposal Activity

- (a) The project shall not include any dredging of channels, mooring basins, or turnaround basins to a mean low water depth greater than 20 feet, unless said project:*

- 1. is located within a Designated Port Area; or*
- 2. serves a commercial navigation purpose of state, regional, or federal significance, and cannot reasonably be located in a Designated Port Area.*

The proposed project does not include dredging of channels, mooring basins, or turnaround basins.

- (b) If the project is located in an ACEC, the project shall not include any of the following activities:*

- 1. improvement dredging, unless the dredging is: for the sole purpose of fisheries or wildlife enhancement; part of an Ecological Restoration Project; or conducted by a public entity for the sole purpose of the maintenance or restoration of historic, safe navigation channels or turnaround basins of a minimum length, width and depth consistent with a Resource*

Management Plan adopted by the municipality(ies) and approved by the Secretary.

2. *dredged material disposal, except for the sole purpose of beach nourishment, dune construction, reconstruction or stabilization with proper vegetative cover, the enhancement of fishery or wildlife resources, or unless the dredged material disposal is part of an Ecological Restoration Project in accordance with 314 CMR 9.07(1)(c) and 310 CMR 10.11(6)(b) and 310 CMR 40.000: Massachusetts Contingency Plan, if applicable, provided that any fill or dredged material used in an Ecological Restoration Project may not contain a chemical above the RCS-1 concentration, as defined in 310 CMR 40.000: Massachusetts Contingency Plan.*

The Central Street Bridge Replacement project area is not located within an ACEC.

(2) Resource Protection Requirements.

- (a) The design and timing of dredging and dredged material disposal activity shall be such as to avoid interference with anadromous/catadromous fish runs. At a minimum, no such activity shall occur in such areas between March 15 and June 15 of any year, except upon a determination by the Division of Marine Fisheries, pursuant to M.G.L. c. 130, § 19, that such an activity will not obstruct or hinder the passage of fish.*

The DMF requested that no in-water or silt-producing work be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel (*Anguilla rostrata*). Work will be conducted in accordance this time restriction. Further coordination with DMF is ongoing and any addition time frame restrictions will be incorporated into the construction schedule.

- (b) The design and timing of dredging and dredged material disposal activity shall be such as to minimize adverse impacts on shellfish beds, fishery resource areas, and submerged aquatic vegetation. The Department may consult with the Department of Fish and Game or the natural resource officer of the municipality regarding the assessment of such impacts.*

Tighe & Bond observed areas below the MHW during low tide conditions. No shellfish or other submergent aquatic vegetation were observed. The Project incorporates specific design elements to avoid or minimize impacts to resource areas including maintaining existing footprints and employing best management practices.

(3) Operational Requirements for Dredging.

- (a) *The extent of dredging shall not exceed that reasonably necessary to accommodate the navigational requirements of the project and provide adequate water circulation.*

The proposed dredging will occur within temporary coffer dams that will isolate the work area from normal flows. The cofferdams will include dual 4.5-foot diameter CMP pipes to maintain tidal flushing conditions that are approximately the same as existing conditions with tide gate open. Adequate water circulation and navigation outside of active work zones will be maintained during construction.

- (b) *The shoreward extent of dredging shall be a sufficient distance from the edge of adjacent marshes to avoid slumping. In general, for improvement dredging projects the edge of the dredging footprint, including any side cuts, should be at least 25 feet from any marsh boundary. In areas where significant wake or wash will be generated by vessel traffic, increased setbacks may be incorporated based on appropriate design calculations.*

Dredging for the proposed project is associated with the removal of the tide gate and the existing bridge abutments. None of the proposed dredging areas include delineated salt marsh. In addition, the overall proposed project aims to restore the tidal influence within Sawmill Brook.

- (c) *In general, no basin, canal, or channel shall be dredged deeper than the main channel to which it is connected.*
- (d) *To the maximum reasonable extent, basins shall have wide openings and short entrance channels to promote tidal exchange within the basin.*

The proposed project does not include dredging of basins, canals, or channels.

- (e) *In general, hydraulic dredging shall be favored over mechanical methods, except when open water disposal of fine-grained material is proposed.*

The proposed dredging will occur within cofferdams for the bridge replacement and removal of the tidal gate. This does not include open water dredging or disposal, mechanical dredging methods are proposed in part because dredge material may include bedrock.

- (i) *does not deny access to its services and facilities to any person in a discriminatory manner, as determined in accordance with the constitution of the Commonwealth of Massachusetts, of the United States of America, or with any statute, regulation, or executive order governing the prevention of discrimination.*

The proposed project includes removal of a tide gate, replacement of a bridge, and roadway improvements. The proposed infrastructure will improve the coastal resiliency within the area and help protect the existing infrastructure. In

addition, the proposed roadway improvements include new ADA compliant sidewalks and curb ramps to enhance the walkability and accessibility of downtown. The proposed project elements will not impede access nor discriminate against individuals.

Chapter 91 license applications has been submitted to MassDEP for review and approval for the restoration of Central Pond, retaining wall rehabilitation, bridge replacement, and tide gate removal.

The Application is under final review by MassDEP. **The Permit Application and revisions are included in Appendix H.**

Section 12

CZM Program Policies Consistency Review

The project is subject to Federal Consistency Review (MA Federal Consistency Rules, 301 CMR 20.00 and Coastal Zone Management Act, 16 U.S.C. § 14560) because it is being conducted by a non-federal entity within the Coastal Zone and requires a permit from a Federal Agency (Army Corps of Engineers). The proposed project complies with the CZM Policies¹ as follows:

12.1 Coastal Hazard Policy #1

Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage (LSCSF), salt marshes, and land under the ocean.

The proposed project will not affect the beneficial functions of storm damage prevention and flood control provided by LSCSF and Coastal Bank. Within the project area, LSCSF and Coastal Bank are located adjacent to Sawmill Brook and Central Pond. Proposed project impacts to Coastal Bank and LSCSF are limited to retaining wall improvements and temporary construction period impacts for project access.

12.2 Coastal Hazard Policy #2

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

As described in Section 4.5, the proposed reconstruction and restoration project will utilize erosion and sediment control BMPs such as careful site planning, and nonstructural measures to minimize impacts on resource areas and sediment transport during construction. The feasibility study performed under the FY 17 MET Grant indicated that Central Street Bridge can be widened, and the tide gate can be removed without causing adverse upstream impacts, and will likely result in additional flushing, which will improve water quality and reduce the rate of sedimentation.

12.3 Coastal Hazard Policy #3

Ensure that state and federal funded public works projects proposed for location within the coastal zone will:

- *Not exacerbate existing hazards or damage natural buffers or other natural resources*
- *Be reasonably safe from flood and erosion-related damage*
- *Not promote growth and development in hazard-prone or buffer areas, especially in velocity zones and Area of Critical Environmental Concern.*

¹ <https://www.mass.gov/files/documents/2016/08/qc/czm-policy-guide-october2011.pdf>

- *Not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvement Acts.*

The project will not exacerbate existing hazards or cause additional damage to buffer zones or natural resources, and the project area is not located within an Area of Critical Environmental Concern. The work area has been limited to the extent feasible and does not promote growth and development in hazard-prone areas. The project is anticipated to enhance the functions and values of natural resources and their buffers in this area.

12.4 Coastal Hazard Policy #4

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

Not applicable

12.5 Energy Policy #1, & #2

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

Encourage energy conservation and use of renewable sources such as solar and wind power in order to assist in meeting energy needs of Commonwealth.

Not applicable.

12.6 Growth Management Policy #1, #2 and #3

Encourage sustainable development that is consistent with state, regional, and local plans and supports the quality and character of the community.

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

Encourage revitalization and enhancement of existing development centers in coastal zone through technical assistance and financial support for residential, commercial, and industrial development.

The proposed project is located in an existing developed area of Manchester-by-the-Sea near the Manchester Harbor, with adjacent land uses including high density residential, commercial uses, and municipal uses such as the Fire Department, Police Station, and Town Hall. Replacing the failing infrastructure of the Central Street bridge, removing the tide gate, and restoring Central Pond will benefit the existing development center by improving safety, increasing the ability of rainbow smelt to utilize the spawning area, and improving the resiliency of existing infrastructure to storm events and sea level rise.

12.7 Habitat Policy #1 & 2

Protect coastal, estuarine, and marine habitats (including...), and coastal freshwater streams, ponds, and wetlands to preserve critical wildlife habitat and other important functions and services including nutrient and sediment attenuation, wave and storm damage protection, and landform movement and process.

Advance the restoration of degraded or former habitats in coastal and marine areas

Coastal and coastal freshwater habitats will be protected by the proposed project. The project will comply with the Wetlands Protection Act, Chapter 91 Waterways Regulations, and Section 401 Water Quality Certification requirements. The proposed project includes removal of a tide gate to improve potential rainbow smelt spawning conditions, and restoration of Sawmill Brook.

12.8 Ocean Resources Policy #1, #2, & #3

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

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

Accommodate offshore sand and gravel extraction needs in areas and in ways that will not adversely affect marine resources, navigation, or shoreline areas due to alteration of wave direction and dynamics. Extraction of sand and gravel, when and where permitted, will be primarily for purpose of beach nourishment or shoreline stabilization.

Not applicable.

12.9 Ports and Harbors Policy #1, #2, #3, #4, & #5

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

Obtain widest possible public benefit from channel dredging; ensure that Designated Port Areas (DPAs) and developed harbors are given highest priority in allocation of resources.

Preserve and enhance capacity of DPAs to accommodate water-dependent industrial uses and prevent exclusion of such uses from tidelands and any other DPA lands over which an EEA agency exerts control by virtue of ownership or other legal authority.

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

Encourage, through technical and financial assistance, expansion of water-dependent uses in DPAs and developed harbors, re-development of urban waterfronts, and expansion of physical and visual access.

Not applicable.

12.10 Protected Area Policy #1 & #2

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

Protect state designated scenic rivers in coastal zone.

Not applicable.

12.11 Protected Area Policy #3

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

The Central Street Bridge is located within the Manchester Village Historic District, and is described on the National Register of Historic Places nomination form for the District as seeming to be of modern vintage. The Proponent will continue to coordinate with MHC and the Manchester HDC regarding aesthetic consistency.

12.6 Public Access Policy #1

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

The Central Street bridge and Pond are located within flowed and filled tidelands subject to Chapter 91, the Massachusetts Public Waterfront Act, and the Public Trust Doctrine. The proposed bridge replacement, culvert removal, and pond restoration project is anticipated to result in improved public access through replacement of failing public infrastructure and improvements to the roadway that will occur during the bridge replacement that will enhance bicycle and pedestrian use of the roadway.

12.7 Public Access Policy #2 & #3

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

Expand existing recreation facilities and acquire and develop new public areas for coastal recreational activities, giving highest priority to regions of high need or limited site availability. Provide technical assistance to developers of both public and private recreation facilities and sites that increase public

access to shoreline to ensure that both transportation access and recreation facilities are compatible with social and environmental characteristics of surrounding communities.

Not applicable.

12.8 Water Quality Policy #1

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

The proposed amount of roadway widening associated with the bridge reconstruction is considered redevelopment under the MassDEP Stormwater Management Standards, and the design will comply with the MassDEP Stormwater Management Standards to the extent practicable. The overall proposed bridge reconstruction and pond improvements project will not include creation of additional impervious area, addition of any new point source discharges, or expansion of a drainage system for increased collection.

12.9 Water Quality Policy #2 & #3

Ensure the implementation of nonpoint source pollution controls to promote the attainment of water quality standards and protect designated uses and other interests.

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

Erosion and sedimentation controls will be incorporated into the construction practices to minimize impacts to resource areas during the construction process and in compliance with the Massachusetts Stormwater Management Policy and Wetlands Protection Act Regulations.

Tighe&Bond

APPENDIX A

APPENDIX A1

MEPA Signed Certificate



The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
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January 10, 2020

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME : Central Street Bridge Reconstruction and Central Pond/
Sawmill Brook Restoration Project
PROJECT MUNICIPALITY : Manchester-by-the-Sea
PROJECT WATERSHED : North Coastal
EEA NUMBER : 16127
PROJECT PROPONENT : Town of Manchester-by-the-Sea
DATE NOTICED IN MONITOR : December 12, 2019

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **does not require** an Environmental Impact Report (EIR).

Project Description

The purpose of the project is to repair the Central Street Bridge, restore natural tidal flow and ecological conditions to Sawmill Brook and enhance the resiliency of Sawmill Brook from flooding under current and future conditions. As noted below, the project is the recipient of grant funding through the Municipal Vulnerability Preparedness program, through these bridge upgrades were identified as a top priority to promote resiliency in municipal infrastructure to prepare for climate change. As described in the ENF, the project includes the following components:

- Replacement of the existing Central Street Bridge with a new bridge with a 20-ft wide span;
- Reconstruction of the surface roadway over the bridge to accommodate two 11-ft travel lanes, two 1-ft wide shoulders, a 5.5-ft wide sidewalk on the north side of the bridge and a 5.5-ft to 11.5-ft wide sidewalk on the south side;

- Removal of the concrete tide gate structure and associated infrastructure on the south side of the bridge;
- Repair/reconstruction of stone walls along the east bank of the Sawmill Brook impoundment (Central Pond) upstream of the bridge; and,
- Restoration of the natural stream channel, vegetated bank and salt marsh in Sawmill Brook; if necessary, based on monitoring of natural restoration processes expected to occur with the removal of the tide gate and construction of a bridge with a wider span.

According to the ENF, removal of the tide gate and widening of the bridge span is not expected to cause a significant net of mobilization of sediment into or out of Sawmill Brook. An equilibrium is expected to be established by sediment moving into the brook under high tide conditions and out of the brook at low tides and periods of high stream flow. The tide gate has been left open for the last year to relieve hydraulic stress on the bridge. During this time, Sawmill Brook has been subject to daily tidal action and stream flows that would have transported fine sediments in a manner similar to that expected by the unrestricted tidal flows proposed as a result of the project.

Project Site

The 2.92-acre project site includes the bridge, the Central Pond/Sawmill Brook impoundment and land immediately adjacent to the bridge and impoundment. The bridge carries Central Street (Route 127) in an east-west direction over the mouth of Sawmill Brook where it meets Manchester Harbor. The bridge includes a 16-ft span mortared stone masonry circular arch with stone masonry wingwalls and headwalls. The bridge is built upon a ledge outcropping and is not constructed on pilings. According to the ENF, the condition of the bridge is deteriorating due to overtopping of the bridge during extreme storm events, seepage through the wingwalls and loss of backfill material. A concrete and iron tide gate is located at the south (downstream) side of the bridge. The tide gate does not enclose the entire bridge span and under high tide conditions, water from Manchester Harbor flows around and over the tide gate upstream through the bridge arch and into Sawmill Brook. The tide gate has been left open for the past year, allowing tidal exchange through the bridge arch under all tidal conditions; however, the narrow opening and bottom components of the tide gate structure serve to constrict flow into the harbor and maintain the impoundment.

Sawmill Brook enters the Central Pond impoundment from the north. Sawmill Brook and its tributaries receive drainage from approximately 75 percent of the land area of the Town of Manchester-by-the-Sea (Town). Central Pond is an approximately 1.5-acre impoundment of Sawmill Brook and is located north (upstream) of the bridge. According to the ENF, when the tide gate is closed, the depth of water in the pond ranges from 4.25 ft at low tide to 4.9 ft at high tide; when tide gate is open, the water depth in the impoundment ranges from 1.01 ft at low tide to 5.04 ft at high tide. At low tide, two large areas of mudflats are exposed within the impounded area. The eastern shoreline of the pond is comprised of a stone wall that has collapsed in places due to erosion of its foundation, overtopping of the wall under flood conditions and surface drainage. The western shoreline of the pond has a more gradual slope. Stream and tidal flows and stormwater discharges from outfalls on the west bank have caused both sediment deposition and erosion in sections of the shoreline.

As shown on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) (number 25009C0434G, effective date July 16, 2014), the project site is located within the 100-year floodplain (Zone AE) with a Base Flood Elevation (BFE) of 311 ft North American Vertical Datum of 1988 (NAVD 88). According to the Division of Marine Fisheries (DMF), Sawmill Brook includes habitat for migratory rainbow smelt (*Osmerus mordax*) and habitat for American eel (*Anguilla rostrata*).

Environmental Impacts and Mitigation

Potential environmental impacts associated with the project include alteration of 2,055 linear feet (lf) of Coastal Bank, 52,190 square feet (sf) of Riverfront Area, 50,635 sf of Land Subject to Coastal Storm Flowage (LSCSF) and 72,405 sf of Land Under the Ocean (LUO), including 7,600 sf that will be permanently impacted by the placement of riprap along the edge of the reconstructed seawall. Activities to restore ecological conditions in Sawmill Brook may include dredging to facilitate formation of a new channel, construction of instream rock grade-control structures, installation of a living shoreline to stabilize the bank on the west side of the pond and planting of salt marsh in intertidal areas. These activities would occur within areas that will be altered as a result of changing the impoundment to a tidal stream; however, the ENF did not provide detailed designs of these potential restoration measures and described potential impacts at a conceptual level.

As noted, the purpose of the project is to repair the Central Street Bridge, restore natural tidal flow and ecological conditions to Sawmill Brook and enhance the resiliency of Sawmill Brook from flooding under current and future conditions. Measures to minimize construction period impacts include using a temporary cofferdam or turbidity curtain during dredging; working at low tide to the extent feasible; implementing sedimentation and erosion controls for work in upland areas; and stabilizing work areas upon completion of construction.

The Town has also conceptually identified potential future measures that may be needed, including in-stream modifications, bank stabilization and salt marsh planting, in order to facilitate restoration of Sawmill Brook. Future restoration measures are not currently anticipated to meet or exceed mandatory thresholds for the preparation of an EIR, but the Town should consult with the MEPA Office to determine whether a Notice of Project Change (NPC) should be filed prior to the final design and construction of such future restoration measures. Implementation of additional restoration measures may require further MEPA review and/or additional permits in order to identify impacts and mitigation. Comments from the Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Office of Coastal Zone Management (CZM) support the reevaluation of restoration options based on monitoring of conditions after the bridge has been reconstructed and tide gate removed.

Permitting and Jurisdiction

This project is subject to MEPA review and preparation of an ENF pursuant to 301 CMR 11.03(3)(b)(1)(a) and 301 CMR 11.03(3)(b)(1)(f) because it requires State Agency Actions and, involves an alteration of a coastal bank and alteration of one half or more acres of any other wetlands (including Riverfront Area, LSCSF and LUO). The project requires a Chapter 91 (c. 91) License and 401 Water Quality Certification (WQC) from the Massachusetts Department of

Environmental Protection (MassDEP) and Chapter 85 Review from the Massachusetts Department of Transportation (MassDOT).

The project requires an Order of Conditions from the Manchester-by-the-Sea Conservation Commissions (or Superseding Orders of Conditions from MassDEP in the event the Order is appealed). The project requires the submittal of a Pre-Construction Notification pursuant to Army Corps of Engineers' (ACOE) General Permits for Massachusetts, a National Pollutant Discharge Elimination System Construction General Permit (NPDES CGP) from the Environmental Protection Agency (EPA), and may require review by the Massachusetts Historical Commission (MHC) acting as the State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The project has received State Financial Assistance through the Office of Coastal Zone Management (CZM) Coastal Resilience Grant program, the Massachusetts Environmental Trust, the Municipal Vulnerability Preparedness (MVP) grant program and the MassDOT Small Bridge Grant program. Therefore, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment, as defined in the MEPA regulations.

Review of the ENF

The ENF included a description and plans of existing and proposed conditions and an alternatives analysis. It provided an analysis of the chemical and physical properties of sediment in the pond and a sediment transport analysis for existing and proposed conditions. The ENF identified the project's environmental impacts and proposed mitigation measures.

Alternatives Analysis

The ENF included an evaluation of alternatives for the replacement of the bridge and tide gate, techniques for stabilizing the banks of the impoundment and ecological restoration of Sawmill Brook.

Alternatives to address the condition of the bridge include No Action, Bridge Rehabilitation and Bridge Replacement with Wider Span (Preferred Alternative). The No Action alternative is not feasible due to the poor structural condition of the bridge and lack of pedestrian facilities on the roadway. The Bridge Rehabilitation alternative would include removal of the tide gate and repairing the existing bridge to minimize seepage and to add physical support to its structure. The Bridge Rehabilitation and Preferred Alternative would both impact approximately 15,195 sf of wetland resource areas, including Coastal Bank, LUO and Riverfront Area during the construction period. However, the Bridge Rehabilitation alternative would maintain the existing 16-ft span of the bridge span and would not restore full tidal flow to Sawmill Brook and facilitate its ecological restoration. The Preferred Alternative includes removing the existing tide gate, bridge and culvert and constructing a new bridge with a 20-ft wide span; in addition, the surface of the bridge would be slightly widened to provide sidewalks on both side of the bridge.

The ENF reviewed three alternatives for stabilizing the banks of Sawmill Brook upon replacement of the bridge: Living Shoreline, Segmental Block Wall and Green Gabions. The Living Shoreline alternative would include the use bioengineering techniques such as fiber rolls and plantings to stabilize the shoreline and minimize erosion. This alternative would minimize

structures that would interfere with public access to the shoreline, have the lowest cost and provide long-term habitat benefits, but would not protect the shoreline under severe storm conditions. The Segmental Block Wall alternative would provide limited access to the shoreline and is the costliest alternative, but would provide long-term stability of the shoreline under all storm conditions. It would impact approximately 1,925 lf of Coastal Bank and 39,000 sf of LSCSF. The Green Gabion alternative would involve the use of stone-filled gabions with vegetated faces to replace the existing stone wall on the east side of Central Pond. Compared to the Segmental Block Wall alternative, green gabions would provide a similar level of limited access to the shoreline, would cost less to construct and would have similar impacts to Coastal Bank and LSCSF, but would require greater maintenance to provide long-term stability to the bank. The Preferred Alternative includes the use of a Living Shoreline to stabilize the western shoreline and a Segmental Block Wall to match the existing condition of the eastern shoreline.

Alternatives for the final condition of Sawmill Brook north of the bridge include the maintenance of a Low-Level Impoundment, Creation of Low-Level Pools and Riffles and Restoration of Sawmill Brook to an Unrestricted Tidal Stream (Preferred Alternative). The Low-Level Impoundment alternative would maintain an impoundment similar to the existing Central Pond by constructing a cross-channel berm upstream of the bridge to maintain the water level in the impoundment. According to the ENF, this alternative would not provide the ecological benefits of restoring full tidal flow to the stream. The Low-Level Pools and Riffles alternative would include placement of low-level riffle structures in the stream channel upstream of the bridge to maintain areas of ponding and stream riffles. This alternative would restore fish passage and provide good habitat features, but would be costly to construct and difficult to maintain. The Preferred Alternative will restore the natural tidal stream condition to Sawmill Brook, provide fish passage to upstream sections of the brook and, if necessary, facilitate habitat restoration along the brook through native plantings. The Town intends to monitor conditions along Sawmill Brook after the bridge replacement and tide gate removal are completed to determine whether active restoration measures, such as plantings or a living shoreline are necessary. Comments from MassDEP, CZM and DMF include recommendations for habitat features, such as in-stream riffles, shoreline plantings and bank stabilization measures that the Town should consider implementing as part of its final restoration plan.

Wetlands and Water Quality

The bridge replacement/tide gate removal component of the project will temporarily impact 130 lf of Coastal Bank, 2,005 sf of LUO, 13,190 sf of Riverfront Area and 11,635 sf of LSCSF. These impacts are associated with removal of the existing structures and construction of the new bridge. The new bridge will have a similar footprint as the existing structure and will not cause new permanent impacts to wetlands resource areas. Removal of the tide gate will restore the natural ledge benthic condition that is present throughout the mouth of Sawmill Brook.

A new channel is anticipated to be formed naturally in Sawmill Brook upon removal of the tide gate and reconstruction of the bridge. The ENF included an analysis of the physical and chemical characteristics of sediment in the impoundment. The analysis was intended to provide a preliminary characterization of sediment that will be dredged to reconstruct the wall on the east side of the impoundment and that could be mobilized upon removal of the tide gate and reconstruction of the bridge. Approximately 5,350 cy of sediment is located in the

impoundment, ranging from one foot to six feet in depth. According to the analysis, sediments in the impoundment are generally fine-grained silt. Coarser cobble, sand and gravel form the substrate upstream of the impoundment and cobbles, boulders and gravel form the bottom between the impoundment and the bridge. With the exception of benzo(a)pyrene, concentrations of contaminants are below the MassDEP Reportable Concentration (RCS-1) standards applicable for upland reuse of sediment. According to the ENF, sediments in the impoundment, including those to be dredged in connection with the block wall are suitable for on-site reuse for establishing suitable substrate for salt marsh planting adjacent to Sawmill Brook. The Town will be required to collect additional sediment samples for its 401 WQC application and MassDEP will determine the suitability of sediments for reuse or disposal.

According to the ENF, the wall along the east bank of the impoundment is collapsing due to overtopping of the wall during flood conditions and drainage through the wall from adjacent upland areas. The ENF provided a conceptual design of a segmental block wall that would replace the existing wall on the east side of the impoundment. Based on the conceptual design, construction of the new wall would impact 1,925 lf of Coastal bank, 39,000 sf of Riverfront Area and 7,600 sf of LUO. Impacts to LUO include dredging of approximately 1,000 cubic yards (cy) of sediment from a 750 ft by 4 ft area (3,000 sf) to provide a base for the blocks and placement of riprap over an area of approximately 4,600 sf along the base of the wall for wall stabilization and scour protection. Dredging and construction of the wall will take place behind either a temporary cofferdam or turbidity curtain to minimize sedimentation of the water column during construction activities. The ENF did not identify measures that could be implemented to minimize potential erosion of the bank adjacent to the wall from upland drainage sources that could cause the wall to collapse. The final design of the wall replacement should include measures to manage stormwater and floodwater flows to minimize future erosion of the bank.

Climate Change

The Town is a participant in the Commonwealth's Municipal Vulnerability Preparedness (MVP) program. The MVP program is a community-driven process to define natural and climate-related hazards, identify existing and future vulnerabilities and strengths of infrastructure, environmental resources and vulnerable populations, and develop, prioritize and implement specific actions the Town can take to reduce risk and build resilience. The Town conducted Community Resilience Building Workshops in 2018 that identified the Central Street Bridge as vulnerable transportation infrastructure due to its poor structural condition and location in a flood-prone area and included the replacement of the bridge as a top recommendation for improving the Town's resilience. The ENF included a summary of a hydrologic and hydraulic (H&H) analysis of the proposed design of the new bridge under future storm events. During the review period, the Proponent provided supplemental information that clarified that the bridge was designed on the basis of a projected two-foot increase in sea level rise by the year 2100.¹ A two-foot increase in sea level was based on sea level rise projections by the Northeast Climate Science Center at the University of Massachusetts at Amherst, which indicate a 66 percent probability that sea level will rise between 2.0 and 4.0 feet by 2100 under a high greenhouse gas (GHG) emissions scenario and by 1.5 to 3.1 feet under a medium GHG emissions scenario.² This

¹ Email dated January 9, 2020 from Emily Tully of Tighe & Bond to Alex Strysky, MEPA Office.

² This data is available through the Climate Change Clearinghouse for the Commonwealth at www.resilientMA.org.

increase in sea level used to design the build exceeds the approximately one-foot increase recommended for use by MassDOT's Load and Resistance Factor Design (LRFD) Bridge Manual (2013). The enlarged bridge is not expected to be overtopped during storm events up to the 50-year design storm based on the mean higher high water elevation and higher sea levels. The proposed bridge design will reduce surface water elevations upstream of the bridge for the modeled storm events compared to the existing bridge structure, which will reduce the extent and duration of flooding along Sawmill Brook and its tributaries and make the bridge more resilient by reducing overtopping events and the potential for damage to the bridge from flood flows.

Waterways

According to ENF, the tide gate and bridge have been authorized by c. 91 Licenses No. 197 (issued in 1922) and No. 650 (issued in 1926). The project will require a new c. 91 license as a water-dependent use pursuant to the Waterways Regulations at 310 CMR 9.12(2). The Town should consult MassDEP's comment letter for guidance on information and analyses that must be submitted with the license application.

Construction Period

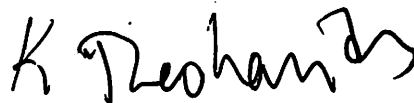
The Town will implement sedimentation and erosion control measures to minimize water quality impacts. Due to the proximity of the project site to residences and commercial uses, the project should include measures to prevent nuisance conditions such as dust, noise, and odors during construction and reduce emissions of air pollutants from construction equipment, including anti-idling measures in accordance with the Air Quality regulations (310 CMR 7.11). I encourage the Proponent to require that its contractors use construction equipment with engines manufactured to Tier 4 federal emission standards, or select project contractors that have installed retrofit emissions control devices or vehicles that use alternative fuels to reduce emissions of volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment. Off-road vehicles are required to use ultra-low sulfur diesel fuel (ULSD). All construction activities should be undertaken in compliance with the conditions of all State and local permits. I encourage the Proponent to reuse or recycle construction and demolition (C&D) debris to the maximum extent.

Conclusion

The ENF has adequately described and analyzed the project and its alternatives, and assessed its potential environmental impacts and mitigation measures. Based on review of the ENF and comments received on it, and in consultation with State Agencies, I have determined that an EIR is not required. Outstanding issues may be addressed during permitting.

January 10, 2020

Date



Kathleen A. Theoharides

Comments received:

- 12/30/2019 Office of Coastal Zone Management (CZM)
- 12/30/2019 Massachusetts Department of Environmental Protection (MassDEP)/Waterways Regulation Program (WRP)
- 12/30/2019 Division of Marine Fisheries (DMF)
- 12/31/2019 Massachusetts Department of Environmental Protection (MassDEP)/Northeast Regional Office (NERO)

KAT/AJS/ajs



THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
251 Causeway Street, Suite 800, Boston, MA 02114-2136
(617) 626-1200 FAX: (617) 626-1240

MEMORANDUM

TO: Kathleen A. Theoharides, Secretary, EEA
ATTN: Alex Strycky, MEPA Office
FROM: Lisa Berry Engler, Director, CZM
DATE: December 30, 2019
RE: EEA-16128, Central Street Bridge Reconstruction and Central Pond/Sawmill Brook Restoration Project; Manchester-by-the-Sea

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the above-referenced Environmental Notification Form (ENF), noticed in the *Environmental Monitor* dated December 11, 2019, and offers the following comments.

Project Description

The proposed project includes replacement of the Sawmill Brook/Route 127 bridge, removal of an existing tide gate structure on the ocean side of the bridge culvert, replacement of channel walls along Central Pond upstream of the bridge, and restoration activities for Sawmill Brook and Central Pond. Work on the tide gate removal will include demolition of the concrete tide gate structure, slide gate, cat walk, and associated tide gate infrastructure to reduce the existing tidal restriction. The existing bridge, with a span of 16 feet, will be demolished and replaced with a concrete arch culvert with a span of approximately 20 feet to further improve tidal flushing and reduce impacts of inland flooding events caused by the existing restriction. Existing deteriorated walls along the east bank of Central Pond will be repaired or replaced, and west bank areas experiencing erosion will be stabilized with a living shoreline. Restoration activities proposed for Central Pond include allowing the changing hydrologic processes to naturally create a new stream channel through the sediment deposits, adjusting the stream channel location if necessary to minimize shoreline impacts, and planting of vegetation where appropriate.

Project Comments

As stated in the ENF, much of the planning and design work for the proposed project has been supported through funding from numerous state grant programs, with the goals of improving resilience to flooding associated with inland storms, restoration of more natural hydrology, and ecological restoration for fish migration. CZM supports the goals of the proposed project and offers these recommendations and comments to ensure that these goals can be met while avoiding or minimizing impacts to existing coastal resources.

CZM notes that the resource area within Central Pond is identified as Land Under Water in the ENF. This area is tidally influenced and should therefore be delineated as Land Under Ocean (LUO) for areas below mean low water (MLW) in the channel bed or Coastal Beach (CB) for areas between MLW and mean high water (MHW). Impacts to each of these resource areas should be calculated and provided.



The ENF includes some information about bank stabilization alternatives, however more detail for the preferred alternative will be needed to assess whether the impacts are minimized by the chosen alternative. As described in the ENF and evident at the MEPA site visit, many areas of the existing retaining walls along the eastern bank of Central Pond are in disrepair, and in some areas are failing and collapsing into the intertidal area. The ENF proposes to repair these walls in place with either a segmental block wall or gabion baskets, with riprap to be installed in front of the wall. Discussion with the consultant at the MEPA site visit indicate that the segmental wall option is preferred, while noting that the plan details provided in the ENF are generic and intended as examples of the types of riprap and wall modification that are under consideration. Once the town has approved a preferred alternative, specific details on appropriately scaled plan views and cross-sections will be needed to assess the potential impacts to adjacent resource areas. These plans should include the proposed structures, details of any dredging, excavation or fill required within the coastal bank, riverfront, LUO or coastal beach resource areas, with these areas clearly delineated. The plans should also include MHW, MLW, and flood elevations. Details of how any excavated/dredged material will be disposed of or reused should also be included.

The ENF states that the preferred alternative for stabilization of eroding areas of the western shore of Central Pond is a living shoreline. The appropriate final design for these areas will be dependent on the physical environment of the pond resulting from changes that are likely to occur as a result of the tide gate structure removal and the bridge span replacement. As changes may occur to hydrology, scour characteristics, stream velocity, and water and soil salinity, CZM recommends that these designs not be completed until the system has had a chance to equilibrate after the bridge/tide gate project is complete. In addition, according to the ENF, most of the eastern bank of Central Pond is privately owned, therefore the town will need to work with the property owners of these parcels to ensure that these designs can be incorporated and maintained over time to ensure their success.

The restoration component of the project primarily focuses on adaptive management that allows the ecosystem to adapt over time and find equilibrium with the new hydrology afforded by the removal of the tide gate system and enlargement of the bridge span. CZM supports this approach. Currently, with the tide gate structure in place and the tide gate open, there has been some evidence of establishment of *Spartina alterniflora* on the mudflat (coastal beach) in Central Pond. It is possible that a portion of the fine sediments deposited in Central Pond, as a result of the historic tide gate installation and associated hydrologic impacts, will flush out toward Manchester Harbor once the tide gate structure has been removed and the existing partially obstructed span is increased to twenty feet, resulting in changes to both elevation and morphology of the Central Pond substrate. Additionally, the balance of freshwater discharge from the watershed and increased tidal flushing may change the salinity regime of this reach of the waterway. While the ENF describes a specific planting plan for certain locations within the project site based on existing conditions, CZM recommends that a final planting and restoration plan not be developed and approved until the changes in hydrology, salinity, elevation and morphology have had time to naturally equilibrate. Monitoring these parameters as well as vegetation during the transition will be helpful in determining the appropriate restoration and living shoreline approaches. Specific vegetation planting plans should be developed and proposed once these new conditions are well understood to ensure the success of the restoration.

An evaluation of soil aggradation versus degradation in the Central Pond area is included in the ENF, comparing existing conditions with the tide gate open and closed to the proposed conditions. The evaluation concludes that deposition is likely to occur when a bankfull inland flooding event occurs under existing conditions when the tide gate is closed, or during a mean higher high water (MHHW) tide under existing (tide gate open) or proposed conditions, as the backwater slows the stream velocities in this area. The ENF concludes that soil mobilization (loss) is likely to occur similarly at mean lower low water (MLLW) tides under the existing (tide gate open) and proposed conditions. However, the existing tide gate structure is a solid concrete weir with a top of wall elevation just above MHHW, with a 6.5 by 5.5-foot cast iron slide gate. For most tides, the outlet is limited by this dimension even with the tide gate open, so while the full tidal flushing does occur, there is a lag in the timing of the outgoing (and incoming tide). With an unobstructed twenty-foot span at the bridge after the reconstruction, the hydrology is likely to result in changes to the deposition/mobilization rates and characteristics for fine sediments in Central Pond because the outflow velocities will not be reduced. The extent to which these sediments may be mobilized should be characterized before the project is undertaken, to understand the likelihood of sediments moving out toward Manchester Harbor. The ENF states that the sediment sampling activities conducted during the feasibility evaluation were limited in scope, and additional sediment sampling will be necessary to support a 301 Water Quality Certification permit application. The town should analyze the sediment in the pond to ensure that the receiving area in Manchester Harbor is not impacted by any possible contaminant concentrations from the released sediment.

Federal Consistency Review

The proposed project may be subject to CZM federal consistency review and if so must be found to be consistent with CZM's enforceable program policies. For further information on this process, please contact Robert Boeri, Project Review Coordinator, at 617-626-1050, or visit the CZM web site at www.mass.gov/czm.

LE/kg

cc: Kathryn Glenn, CZM
Chrissy Hopps, DEP Waterways
Rachel Freed, DEP NERO
Georgeann Keer, DER
Chris Bertoni, Manchester-by-the-Sea Conservation Administrator

APPENDIX A2
ENF Comment Letters



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

December 31, 2019

Kathleen A. Theoharides, Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

Attn: MEPA Unit

RE: Manchester-by-the-Sea
Central Street Bridge Reconstruction and
Central Pond/Sawmill Brook Restoration
Project
Central Street, east of Elm Street
EEA # 16127

Dear Secretary Theoharides:

The Massachusetts Department of Environmental Protection Northeast Regional Office (MassDEP-NERO) has reviewed the Environmental Notification Form (ENF) submitted by Tighe & Bond, Inc. on behalf of Town of Manchester-by-the-Sea for the proposed replacement of the Sawmill Brook Bridge, removal of the tide gate structure, repair and replacement of channel walls along Central Pond, and restoration of Sawmill Brook located in Manchester-by-the-Sea. DEP provides the following comments.

Project Description

The proposed project includes replacement of the Sawmill Brook/Route 127 bridge, removal of an existing tide gate structure on the ocean side of the bridge culvert, replacement of channel walls along Central Pond upstream of the bridge, and restoration activities for Sawmill Brook and Central Pond. Work on the tide gate removal will include demolition of the concrete tide gate structure, slide gate, cat walk, and associated tide gate infrastructure to reduce the existing tidal restriction. The existing bridge, with a span of 16 feet, will be demolished and replaced with a concrete arch culvert with a span of approximately 20 feet to further improve tidal flushing and reduce impacts of inland flooding events caused by the existing restriction. Existing deteriorated walls along the east bank of Central Pond will be repaired or replaced, and west bank areas experiencing erosion will be stabilized with a living shoreline. Restoration activities proposed for Central Pond include allowing

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-5751.

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MassDEP Website: www.mass.gov/dep

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the changing hydrologic processes to naturally create a new stream channel through the sediment deposits, adjusting the stream channel location, if necessary, to minimize shoreline impacts, and planting of vegetation where appropriate.

Project Comments

The ENF notes that there is approximately 400 feet of existing wall along Central Pond/Sawmill Brook that is need of extensive repair. It is proposed that this wall, located on the east bank, be repaired and that installation of a living shoreline be used for stabilization along the west bank. There should be more information provided on the causes of bank instability. Page 4-7 notes that poor wall drainage is likely one of the factors contributing to the failure of the existing wall and that improved drainage features will be included in the selected alternative. Does overland sheet flow also contribute to failure of the existing wall? Would increasing the vegetated buffer along the eastern bank reduce overland flow and increase the life of the wall?

Section 2.5 of the Technical Memorandum, Streambank Survey, notes that sections along the western shore could be improved to prevent continued soil erosion and could benefit from soft erosion solutions including establishing vegetation, controlling public access and potential stormwater outfall improvements. Though the living shoreline proposal is discussed within the ENF, controlling public access and potential stormwater outfall improvements are not; these options should be explored more fully in future filings. In addition, consideration should be given to increasing the vegetated buffer along the western bank as part of the living shoreline proposal.

Section 3 of the Technical Memorandum, Sediment Transport, notes that the existing system is in disequilibrium and that degradation of the existing fine-grained sediments are anticipated. The existing fine-grained sediments and organic muck are certainly susceptible to stream channel incision once the tide-gate is removed and this process should be anticipated. Section 4, Sediment Management for Restoration, notes that in-stream modifications may include dredging, rock veins or other forms of flow augmentation. It is unclear without careful monitoring of sediment transport whether flow augmentation is necessary. Dredging would certainly increase incision of the stream channel so it is unclear why this is a consideration. Ineffective sediment transport would be better addressed by adjusting stream channel dimensions to that appropriate for a stream with a 5.4 square-mile watershed. A carefully-designed rock cross-vane may be effective for grade control within a stream channel.

As there is an existing smelt run in the Central Pond/Sawmill Brook system, there should be consideration given to the construction of riffle areas within the stream channel to introduce stream bed diversity and smelt spawning habitat.

Future filings should include an invasive species control and management program.

The MassDEP appreciates the opportunity to comment on this proposed project. Please contact Rachel.Freed@mass.gov at (978) 694-3258 for further information on wetland issues. If you have any general questions regarding these comments, please contact me at John.D.Viola@mass.gov or at (978) 694-3304.

Sincerely,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

John D. Viola
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission
Eric Worrall, Rachel Freed, MassDEP-NERO



Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

Memorandum

To: Alex Strysky, MEPA

From: Daniel Padien, Waterways Program Chief, MassDEP/Boston

Re: **Comments from the Chapter 91 Waterways Regulation Program** — EEA #16127
Environmental Notification Form – Central Street Bridge Reconstruction and Central Pond
/ Sawmill Brook Restoration Project, Manchester-by-the-Sea, Essex County

Date: December 30, 2019

Project Description

The Department of Environmental Protection Waterways Regulation Program (the “WRP” or the “Program”) has reviewed the referenced Environmental Notification Form (ENF) (EEA #16127), submitted by Tighe & Bond on behalf of the Town of Manchester-by-the-Sea (“Proponent”) for the proposed work within geographic areas subject to M.G.L. Chapter 91 and as further described in 310 CMR 9.04:

- Removal of the existing tide gate separating Sawmill Brook and Manchester Harbor;
- Demolition and removal of the 16-foot Central Street Bridge and replacement with a new 20± foot span;
- Repair, replacement and stabilization of existing stone retaining walls along Central Pond a former tidal inlet (Sawmill Brook), now a man-made impoundment, and
- Restoration of Central Pond / Sawmill Brook to an unrestricted tidal stream, planned to bio-stabilization of stream banks and salt marsh;

Water Dependency

Based on the WRP’s review of the ENF, descriptions and plans contained therein, and relevant licensing and cartographic records maintained by MassDEP, the Program understands the project

would be deemed water dependent under 310 CMR 9.12(2) because the work “*requires direct access to or location in tidal waters*”. Furthermore, upon confirmation that the project is determined by the Manchester By-the-Sea Conservation Commission (of MassDEP upon appeal) to meet the definition of “*Ecological Restoration Project*” as stipulated in 310 CMR 10.24(8) and 310 CMR 9.02, the project also meet the water dependency requirements stipulated in 310 CMR 9.12(a)15.

Chapter 91 Jurisdiction and Licensing Requirements

Based on a review of maps, aerial photographs, site photographs and plans accompanying the ENF as supplemented by licensing and cartographic records maintained by MassDEP, we conclude that the project includes activities subject to licensing and permitting as stipulated by 310 CMR 9.05(1) and (2). The existing tide gate and bridge appear to have been authorized by one or more prior waterways licenses.

While the ENF includes DRAFT 25% design plans, it does not include a description of the project’s compliance with applicable provisions of the Waterways Regulations. However, we note that the project appears to comply with the limitations stipulated at 310 CMR 9.32 – *Categorical Restrictions on Fill and Structures* - and 310 CMR 9.31(2) – *Proper Public Purpose Requirements* – and is eligible for licensing under Chapter 91.

WRP staff did not identify any substantive concerns related to the proposed project that would prevent issuance of a waterways license under Chapter 91. The WRP looks forward to receipt of a completed Waterways License Application which meets the minimum filing standards as set forth in 310 CMR 9.11(3) including the Secretary’s Certificate concluding the MEPA review process and the proof of the filing of a Notice of Intent under the Massachusetts Wetlands Protection Act.

If you have any questions regarding the WRP comments, please contact Daniel Padien at Daniel.Padien@mass.gov at (617) 292-5615.



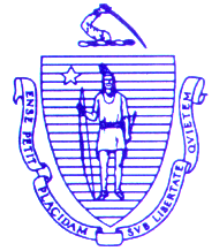
Daniel J. McKiernan
Acting Director

Commonwealth of Massachusetts

Division of Marine Fisheries

251 Causeway Street, Suite 400
Boston, Massachusetts 02114

(617)626-1520
fax (617)626-1509



Charles D. Baker
Governor
Karyn E. Polito
Lieutenant Governor
Kathleen Theoharides
Secretary
Ronald S. Amidon
Commissioner
Mary-Lee King
Deputy Commissioner

December 30, 2019

Kathleen Theoharides, Secretary
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, Alex Strycky
100 Cambridge Street, suite 900
Boston, MA 02114

RE: EEA# 16127 Environmental Notification Form

Dear Secretary Theoharides:

Division of Marine Fisheries (MA DMF) staff have reviewed the ENF for the Central Street Bridge Reconstruction and Central Pond and Sawmill Brook restoration project. MA DMF has been involved with the development of this project and we will continue to provide technical support where needed.

The Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordax*), and habitat for American eel (*Anguilla rostrata*) (Chase 2006). The proposed work may impact passage and a time of year restriction is recommended to avoid in-water and silt-producing work from March 1 to June 30 of any year (Evans et al. 2011). We recommend designing upstream substrate improvements to enhance smelt spawning riffles. Expanding the present spawning riffle to encompass a larger area upstream will be important if the tidal intrusion reaches further upstream with the removal of the tidegate. Overall, MA DMF expects this project will be a positive improvement to the ecology, stormwater management and resiliency of the Sawmill Brook.

Thank you for considering our comments. Please contact Tay Evans at 978-282-0308 x168 or tay.evans@state.ma.us if you have any questions about this review.

Sincerely,

Daniel J. McKiernan
Acting Director

cc. R. Lehan, DFG
K. Ford, DMF
B. Gahegan, DMF
E. Tully, Tighe&Bond
C. Bertoni, Manchester
B. Boeri, CZM
D. Wong, DEP

DM/TE/sd

References:

- Chase, BC (2006) Rainbow smelt (*Osmerus mordax*) spawning habitat on the Gulf of Maine coast of Massachusetts. Massachusetts Division of Marine Fisheries Technical Report, 2006. Tr-30: p. 1-173.
- Evans, NT, KH Ford, BC Chase and JJ Sheppard (2011) Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts Technical Report [DMF TR-47](#).

APPENDIX A3
ENF Transmittals

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Board of Underwater Archaeological Resources
Attn. Victor Mastone, Director
251 Causeway Street, Suite 800
Boston, MA 02114

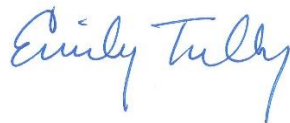
FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.




Emily R. Tully
Environmental Planner

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Emily R. Tully

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Ship To:	Victor Mastone, Director Board of Underwater Archae. Res. 251 CAUSEWAY ST BOSTON, MA 02114 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	2.0 LBS
Delivery Location:	MAIL ROOM SKARSKI
Reference Number 1:	221476011-01-06
Reference Number 2:	E. Tully
Reference Number 3:	D. Brennan

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

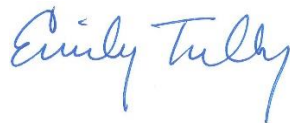
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Environmental Planner

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Tracking Number:	<u>1Z0244590356986141</u>
Ship To:	Tribal Historic Preser. Officer Wampanoag Tribe of Gay Head 20 BLACK BROOK RD AQUINNAH, MA 02535 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	2.0 LBS
Delivery Location:	OFFICE CHRISSY
Reference Number 1:	221476011-01
Reference Number 2:	E. Tully
Reference Number 3:	D. Brennan

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Tribal Historic Preservation Officer
Mashpee-Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

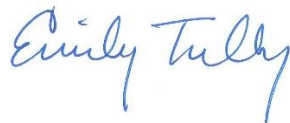
FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.




Emily R. Tully
Environmental Planner

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Delivery Time: 01:53 PM

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Shipment Detail

Tracking Number:	<u>1Z0244590355639152</u>
Ship To:	Tribal Historic Preserv. Officer Mashpee Wampanoag Tribe 483 GREAT NECK RD S MASHPEE, MA 02649 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	2.0 LBS
Delivery Location:	RECEIVER MARTENEZ
Reference Number 1:	221476011-01-06
Reference Number 2:	E. Tully
Reference Number 3:	D. Brennan

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APPENDIX B

APPENDIX B1

Site Figures



Legend

 Limit of Work

Tighe & Bond
Engineers | Environmental Specialists

Based on USGS Topographic Map for
Marblehead North, MA Revised 1985.
Contour Interval Equals 3-Meters
Circles indicate 500-foot and half-mile radii

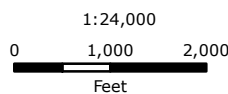
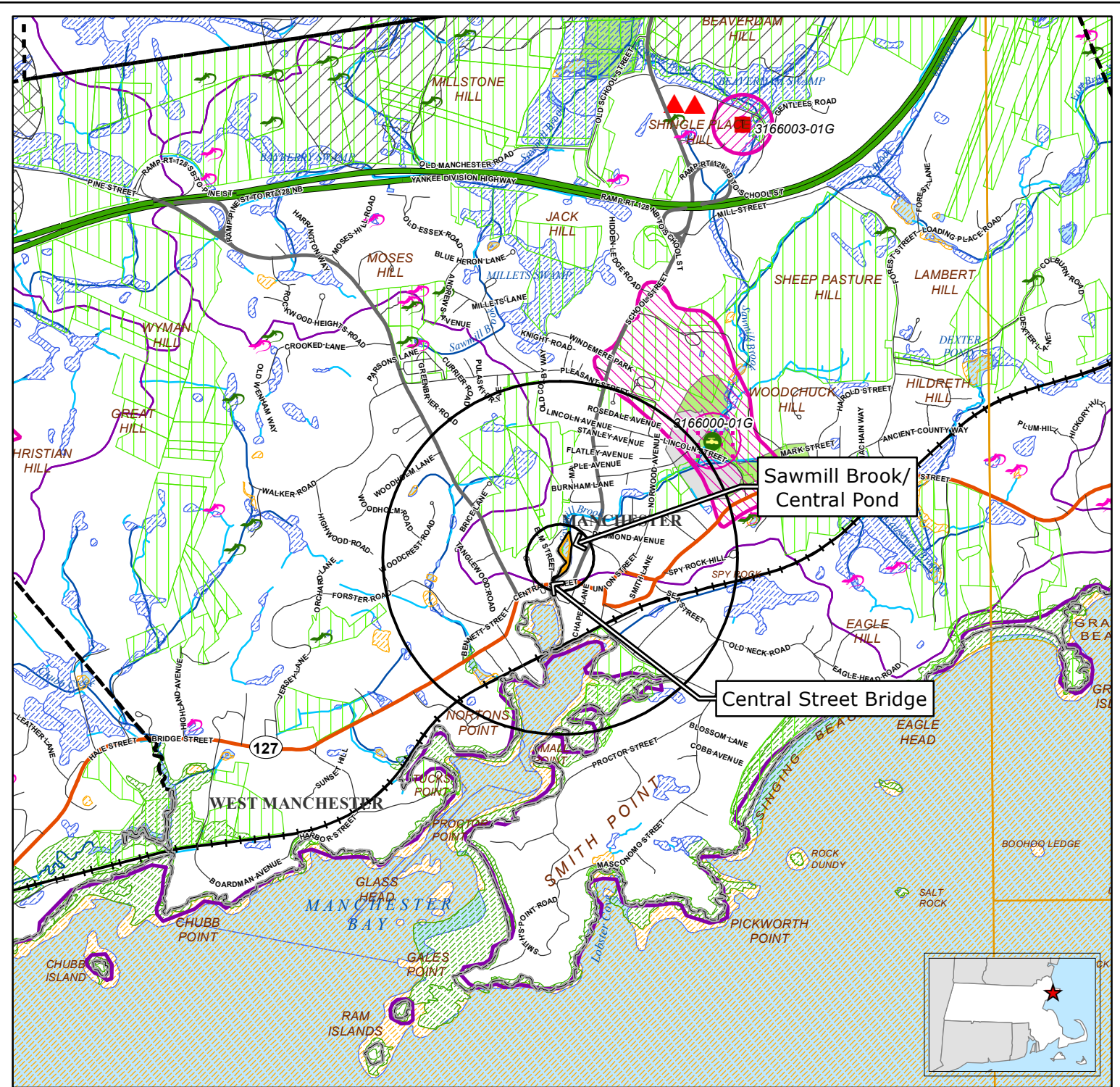


FIGURE 1 SITE LOCATION

Central Street Bridge Replacement/
Sawmill Brook Restoration Project
Manchester-by-the-Sea, Massachusetts

September 2019



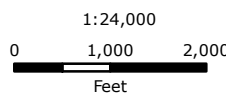
Legend

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> NHESP Certified Vernal Pools NHESP Potential Vernal Pools Non-Landfill Solid Waste Sites Proposed Well Emergency Surface Water Community Public Water Supply - Surface Water Community Public Water Supply - Groundwater Non-Community Non-Transient Public Water Supply Non-Community Transient Public Water Supply Limited Access Highway Multi-Lane Highway, NOT Limited Access Other Numbered Highway Major Road - Collector Minor Street or Road | <ul style="list-style-type: none"> Aquaducts Hydrologic Connections Stream/Intermittent Stream Powerline Pipeline Track or Trail Trains Public Surface Water Supply Protection Area (Zone A) DEP Approved Wellhead Protection Area (Zone I) DEP Approved Wellhead Protection Area (Zone II) DEP Interim Wellhead Protection Area (IWPA) Protected and Recreational Open Space Solid Waste Landfill Area of Critical Environmental Concern (ACEC) NHESP Priority Habitats for Rare Species NHESP Estimated Habitats for Rare Wildlife EPA Designated Sole Source Aquifer Major Drainage Basin Sub Drainage Basin | <ul style="list-style-type: none"> MassDEP Open Water MassDEP Inland Wetlands MassDEP Coastal Wetlands MassDEP Not Interpreted Wetlands Public Surface Water Supply (PSWS) Water Bodies Non-Potential Drinking Water Source Area - High Yield Non-Potential Drinking Water Source Area - Medium Yield Potentially Productive Medium Yield Aquifer Potentially Productive High Yield Aquifer County Boundary Town Boundary USGS Quadrangle Sheet Boundary Limit of Work |
|--|---|--|

FIGURE 2 PRIORITY RESOURCES

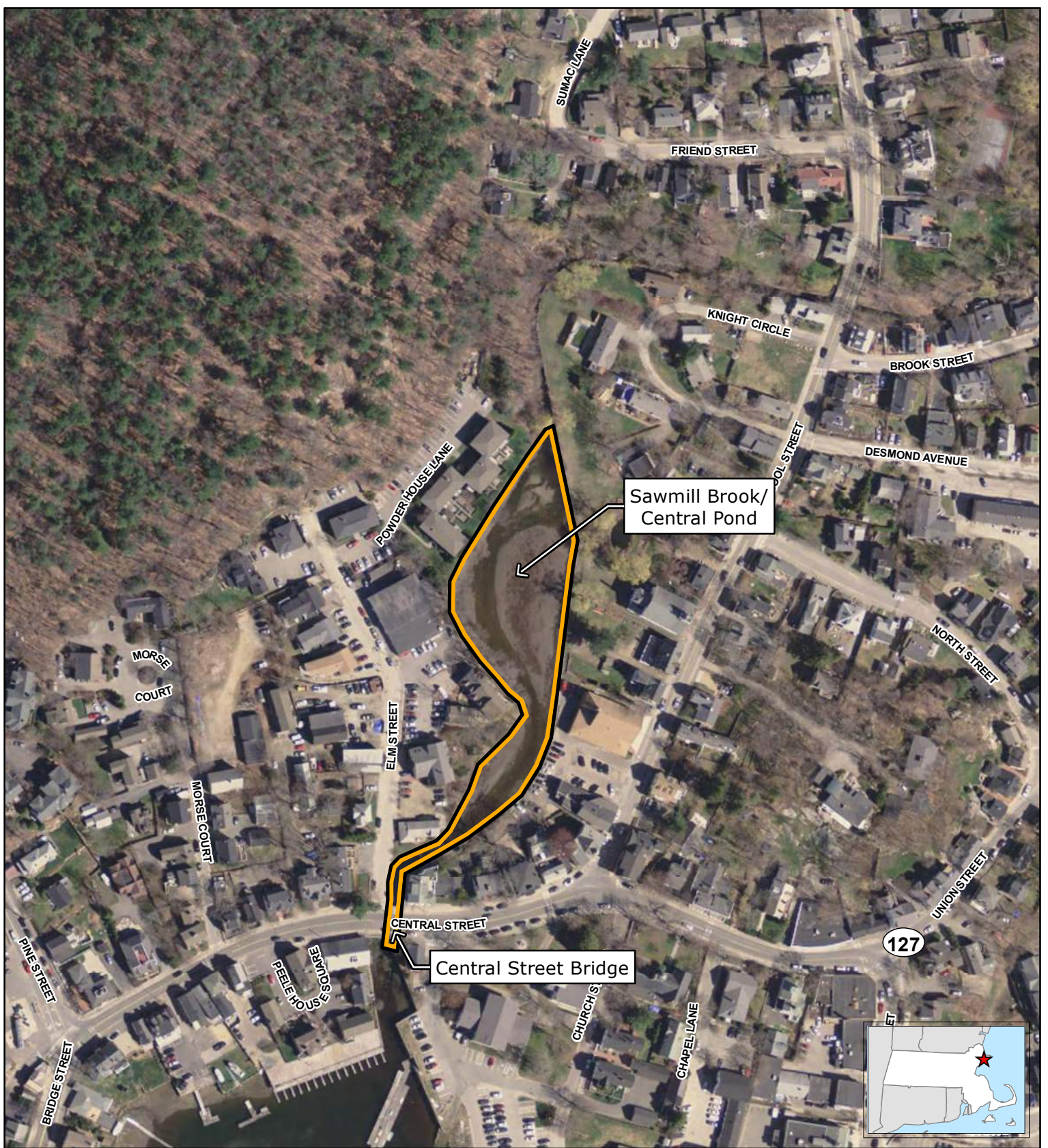
Central Street Bridge Replacement/
Sawmill Brook Restoration Project
Manchester-by-the-Sea, Massachusetts

Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology
Circles indicate 500-foot and half-mile radii.
Data valid as of September 2019.




September 2019

Tighe & Bond
Engineers | Environmental Specialists

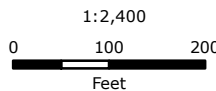


Legend

 Limit of Work

Tighe & Bond
 Engineers | Environmental Specialists

Based on MassGIS Color Orthophotography (2013)



**FIGURE 3
 ORTHOPHOTOGRAPH**

Central Street Bridge Replacement/
 Sawmill Brook Restoration Project
 Manchester-by-the-Sea, Massachusetts

September 2019

APPENDIX B2
Site Photos

SITE PHOTOGRAPHS

CENTRAL STREET BRIDGE AND POND (MANCHESTER-BY-THE-SEA)

Tighe&Bond



Photo 1: View of Central Street Bridge and tide gate from the north / downstream.



Photo 2: Seepage at the seawall from downstream.



Photo 3: Central Street Bridge and tide gate from downstream.



Photo 4: View of the existing tide gate from southwest.



Photo 5: View of tide gate outlet from interior of tide gate chamber.



Photo 6: View of Central Street Bridge and approach channel walls from the south / upstream.



Photo 7: Sawmill Brook approaching Central Street looking upstream.



Photo 8: Segment of precast wall along Sawmill Brook between Central Street Bridge and Central Pond.



Photo 9: Transition from wall to riprap slope along Central Pond. Note collapsed wall on opposite bank.



Photo 10: West slope of Central Pond, looking toward Powder House Lane apartments.



Photo 11: Deteriorated section of wall on the eastern side of Sawmill Brook / Central Pond, looking toward the Manchester Fire Department building.



Photo 12: View of Central Street bridge, looking east (upstream is on the left side of the photo).



Photo 13: View of Central Street bridge, looking north / upstream toward Elm Street.



Photo 14: View looking upstream from the downstream side of the culvert toward the tide gate structure.

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APPENDIX C

APPENDIX C1

Pages from Hydrologic and Hydraulic Memo

Central Street Bridge Replacement Hydrologic and Hydraulic Analysis

TO: Massachusetts Department of Transportation (MassDOT)
FROM: David Azinheira, PE (Tighe & Bond)
COPY: Vinod Kalikiri, PE, PTOE; David Loring, PE, LEED AP (Tighe & Bond)
DATE: August 22, 2019

A hydrologic and hydraulic (H&H) analysis was performed by Tighe & Bond as part of the engineering design and permitting for the Central Street Bridge Reconstruction Project located on Sawmill Brook at the mouth of Manchester Harbor in Manchester-by-the-Sea. The primary reasons for performing the H&H analysis were to:

- Evaluate the hydraulics (e.g., capacity, freeboard, and velocities) for the existing culvert.
- Develop alternative design concepts for culvert.
- Provide recommendations based on the H&H analysis as to the preferred alternative replacement design approach.

The H&H analysis and subsequent recommendations are summarized in this report and builds on the "Task 2: Hydrologic Monitoring and Flushing Studies Sawmill Brook Flood Mitigation and Restoration Project" prepared for Manchester-by-the-Sea by Tighe & Bond in June 2018.

Based on the analysis we recommend the installation of a 20-foot span open bottom concrete arch culvert to meet the Massachusetts Department of Transportation (MassDOT) Municipal Bridge Projects MGL Chapter 85 Section 35 review requirements for the 25-year flood frequency hydraulic design. Note that the MassDOT Bridge Manual (2013) indicates that the hydraulic design flood return frequency for an Urban Minor Arterial or Rural Major Collector is the 25-year return frequency storm event. The proposed culvert has capacity to pass the 25-year frequency storm event with 0.4 feet of freeboard for MHHW conditions (compared to the low chord), and 4.2 of freeboard feet for MSL condition. Both of these scenarios assume MassDOT recommended increases in sea level due to climate change although the MHHW value is approximately the same with and without adding the MassDOT sea level rise. This alternative would also pass the 25-year flood frequency storm event during an annual storm surge with the water level 1.8 feet below the top of road at Central Street.

A Scour analysis for the preferred design alternative shows potential for scour up to existing bedrock located approximately 0 to 2 feet below the channel bottom upstream of Central Street Bridge. During the geotechnical boring investigation, the bedrock was found to be very hard to hard granite, and is therefore not anticipated to scour. Due to the tidal nature of Manchester Harbor and Central Pond it is anticipated that in general sediment aggradation will be anticipated when storms occur during higher tides (due to backwater) while sediment degradation will be anticipated when storms occur during lower tides.

Attachment A contains figures depicting an aerial overview of Central Street Bridge (Figure 1), a topographic map of the drainage-area (Figure 2), and the geometry used to define the cross-sections in the HEC-RAS model (Figure 3). Attachment B contains the 2016 Report with a description of the HEC-HMS model. Attachment C contains the HEC-RAS model

output for the existing and proposed alternative conditions. Attachment D contains the scour analysis calculations.

A summary of the proposed geometry is provided below, with elevations referencing the North American Vertical Datum of 1988 (NAVD88):

Item	Description
Bridge Size and Type	20-foot wide open bottom Arch
Low Chord Elevation	6.0 feet NAVD88
Top of Road Elevation	10.6 feet NAVD88 (+/-)
Upstream Stream Bed Elevation	-0.2 feet NAVD88
Downstream Stream Bed Elevation	-5.3 feet NAVD88 (culvert invert at -4.0 feet NAVD88)
Skew	12 degrees*
Design Scour Elevation	-2 feet NAVD88 (+/-)

*The culvert will be installed at a 12-degree angle; however, since it will be a culvert and not a bridge the full width of the culvert will be available for flow. For traditional bridges the upstream and downstream cross sections control flow under a bridge deck so the skew must be incorporated; however, for an open bottom arch culvert tied into to the walls of an existing channel the geometry of the culvert limits flow and not the upstream cross section. A skew angle was therefore excluded from hydraulic modeling.

1 Project Site Description

The Central Street Bridge spans the Sawmill Brook at the mouth of Manchester Harbor on Central Street (Route 127). The Town-owned crossing is constructed of three integrated parts, a bridge, tide gate and coastal wingwall. The bridge consists of a 13-foot span mortared stone masonry circular arch tidal bridge with stone masonry wingwalls and headwalls. Timber cribs functioning as weirs are imbedded into the bottom of the stream bed. A concrete and iron tide gate abuts the bridge to the south. The bridge was rebuilt around the mid 1900's and a tide gate was installed to control the Brook and create Central Pond just upstream. A stone and masonry wingwall abuts the bridge in the southwest quadrant, functioning as a seawall. The passage under the bridge discharges flow from Sawmill Brook via a narrow, channelized reach, with 12-foot- high granite walls and buildings abutting either side. Tidal flow from Manchester Harbor passes under the bridge, depending on the setting of the tide gate and tide height. When the tide gate is closed and water is impounded underneath the bridge, the hydrostatic pressure of water forces seepage through the wingwall. The gate and bridge design have been identified as contributing factor to upstream flooding, due to significant hydraulic restriction when large precipitation events and high tide elevations are concurrent.

The tide gate and weir design have been identified by the Massachusetts Division of Marine Fisheries (DMF) as an impediment to fish passage, notably impacting state-listed species, rainbow smelt (*Osmerus mordax*). The Town plans to remove the tide gate during the reconstruction of the Central Street Bridge.

2 Methodology

Tighe & Bond updated existing a hydrologic and hydraulic (H&H) models of the Central Street (Route 127) bridge watershed along Sawmill Brook as part of the bridge replacement alternatives analysis. The H&H model was developed by updating existing HEC-HMS (version 5.2.1) and HEC-RAS (version 5.0.3) models, both available from the U.S. Army Corps of Engineers. The hydrologic analysis was performed using HEC-HMS (version 5.2.1). The HEC-HMS model output was subsequently used to develop a steady-state HEC-RAS model to evaluate the hydraulic conditions for the existing and proposed structures. The methods used to develop both the hydrologic and hydraulic analysis are documented in the following sections.

2.1 Hydrologic Analysis

A detailed hydrologic analysis was performed using HEC-HMS as part of the February 2016 "Sawmill Brook Culvert and Green Infrastructure Analysis Task 4 Final Report: Evaluation of Locations for Flood Mitigation" prepared by Tighe & Bond. The 2016 study included 25-, 50-, and 100-year flow estimates for the present, 2025, 2050, and 2100 while incorporating multiple energy use climate change projections for rainfall, as well as sea level rise, and storm surge. The 2016 HEC-HMS model was developed using the runoff curve number and time of concentration methodologies outlined in the United States Department of Agriculture's (USDA) Technical Release 55 (TR-55)¹. The drainage area upstream of Central Street (Route 127) was computed to be approximately 5 square miles, and was modeled using 23 sub-drainage areas. The computed runoff curve numbers ranged from 60 to 75, and the lag times (defined as 0.6 times the time of concentration) ranged from approximately 20 minutes to 70 minutes. The 2016 model developed inflow hydrographs using the 24-hour rainfall depths from the Northeast Regional Climate Center (NRCC) at Cornell University. Five storage areas were also included in the HEC-HMS model at culverts. The 2016 study is included as Attachment B of this memorandum.

Tighe & Bond updated the 2016 HEC-HMS model to include the 2-, 10-, and 500-year frequency storm event as recommended by the MassDOT LFRD Bridge Manual². The 24-hour precipitation for the 2-, 10-, 25-, 50-, 100-, and 500-year frequency storms were estimated using the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 point precipitation frequency tool. Table 2-1 provides the precipitation amounts from NOAA Atlas 14, as well as the NRCC precipitation amounts used as part of the 2016 study. The NOAA Atlas 14 and NRCC values are approximately the same for the 25-year frequency storm event (the depths are within less than 1-percent), whereas the NRCC 24-hour rainfall depths are 4-percent and 10-percent larger than the NOAA Atlas 14 depths for the 50-year and 100-year frequency storm events, respectively. NOAA Atlas 14 was published after the 2016 study was performed and is more current than the NRCC values; however, the NRCC rainfall depths will be used at this time for the 25-, 50-, and 100-year frequency storm events for consistency with the previous recent hydrologic and hydraulic studies performed and because the NRCC depths are either similar to or more conservative than the NOAA Atlas 14 rainfall depths.

¹ Cronshey, R. G., R. T. Roberts, and N. Miller. "Urban hydrology for small watersheds (TR-55 Rev.)." *Hydraulics and Hydrology in the Small Computer Age*. ASCE, 1985.

² MassDOT (Massachusetts Dept. of Transportation. "LFRD bridge manual. Part I." (2013).

TABLE 2-1

24-hr Precipitation Values from the National Oceanic and Atmospheric Administration NOAA Atlas 14 and the Northeast Regional Climate Center (NRCC)

Storm Return Frequency	Precipitation Values from NOAA Atlas 14 (inches)	Precipitation Values from NRCC Used for Previous Modeling (inches)
2-year	3.20	
10-year	5.04	
25-year	6.20	6.16 ¹
50-year	7.08	7.34 ¹
100-year	7.97	8.77 ¹
500-year	11.1	

¹The NRCC rainfall depths will be used for the 25-, 50-, and 100-year frequency storm events for consistency with the previous recent hydrologic and hydraulic studies performed and because the NRCC depths are either similar to or more conservative than the NOAA Atlas 14 rainfall depths

Peak flows were also calculated through regression analysis using the Zarriello 2017³ approach available in the USGS Streamstats program⁴. These flow estimates were used as a basis for comparison with the computed design storm flow rates.

2.2 Hydraulic Analysis

A hydraulic analysis of Sawmill Brook was prepared using HEC-RAS, a hydraulic modeling program available from the U.S. Army Corps of Engineers. This model updates the previous planning level modeling performed as part of the "Sawmill Brook Culvert and Green Infrastructure Analysis Task 4 Final Report: Evaluation of Locations for Flood Mitigation" prepared by Tighe & Bond in February 2016, with updates based on the November 2017 survey by Doucet Survey Inc., and surface water level monitoring. The updated model includes Sawmill Brook from approximately 50 feet upstream of Norwood Avenue to approximately 100 feet downstream of Central Street.

To update the model, Tighe & Bond first created a Triangular Irregular Network (TIN) elevation surface using the 2017 survey and MassGIS LiDAR topographic data for overbank areas beyond the extent of the surveyed cross sections. A geometric representation of the channel, banks, and cross-sections was created using the HEC-GeoRAS tool to extract cross sections from the TIN. Sawmill Brook was modeled using 30 cross sections, culverts at Norwood Avenue, School Street, and Central Street, as well as the existing tide gate structure immediately downstream of Central Street. The Manning's roughness coefficients were estimated to be 0.04 in the upstream area of the reach and 0.03 toward the downstream area based on the survey and orthographic imagery. The overbank area Manning's n varied from 0.035 (commercial/industrial land use) to 0.1 (forest cover). The overbank Manning's n varied horizontally along the cross sections and were calculated using the MassGIS 2015 land use dataset.

³ Zarriello, P.J., 2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016-5156, 99 p.

⁴ U.S. Geological Survey, 2016, The StreamStats program, online at <http://streamstats.usgs.gov>, accessed August 21, 2018.

Model geometry scenarios were developed for:

1. Existing Conditions with the Tide Gate Open/Closed
2. Proposed Alternatives

The downstream boundary conditions for the design storm hydraulic modeling were the Mean Higher High Water (MHHW) and the annual storm surge elevation. The modeled MHHW elevation was 4.77 feet NAVD88 based on the NOAA Long Term Tide Water Level Monitoring Station ID: 8443970. The annual storm surge elevation was provided in the February 2016 study as approximately 8.2 feet NAVD88. The 2016 study estimated that the annual storm surge elevation in 2100 would overtop Central Street so future storm surge scenarios were not modeled. For reference, the Mean Sea Level (MSL) is -0.3 feet NAVD88 at the NOAA Long Term Tide Water Level Monitoring Station ID: 8443970.

The sea level rise increase in 2100 used for this study is 2 feet. This value falls within the 66% probability range provided in the Northeast Climate Science Center (NECSC) sea level rise projections for the Boston area for the two emissions scenarios evaluated⁵. The MHHW elevation accounting for sea level rise was therefore 6.77 feet NAVD88. This sea level rise increase is more conservative than the 0.012 feet/year increase recommended in the LFRD Bridge Manual that corresponds with a 0.98-foot increase by 2100. This would correspond with a sea level rise MHHW of 5.75 feet NAVD88, and a MSL of 0.68 feet NAVD88.

Following the development of the geometric parameterization of the cross-sections along Sawmill Brook, flows from the updated HEC-HMS model were assigned by cross-section for both the existing and proposed condition. Water surface elevations and channel velocities were evaluated for the 2-, 10-, 25-, 50-, 100-, and 500-year storms.

MassDOT classifies Central Street (Route 127) as an Urban Minor Arterial or Rural Major Collector. The LFRD Bridge Manual suggests a hydraulic design storm as a 25-year frequency storm event, the scour design storm as the 50-year frequency storm event, and the scour design check storm as the 100-year frequency storm event. Freeboard is defined as the distance from the peak water surface elevation upstream of the culvert to the top of the culvert opening, which was evaluated across the range of storms.

2.3 Alternative Design Analysis

Three alternative designs were evaluated to replace the existing Central Street Bridge. All of the alternative designs included removing the existing tide gate. The first alternative (Alternative 1) was designed to pass the 50-year frequency storm event for predicted climate change rainfall and sea level rise conditions exceeding MassDOT requirements. The minimum hydraulic capacity structure was determined to be an open-bottomed concrete arch-culvert structure with a clear span width of 20-feet and a continuous low chord elevation at 6 feet NAVD88. The second alternative (Alternative 2) was sized to provide a span that could pass the 25-year frequency storm event with the MassDOT recommended sea level rise for 2100 using the tidal MHHW boundary condition, which was determined to be a structure with the geometry of Alternative 1 but with a span width of 12 feet. The third alternative (Alternative 3) is an in-kind replacement of the existing culvert.

1. Proposed Alternative 1 with 20-foot wide arch culvert with Tide Gate Removed
2. Proposed Alternative 2 with 12-foot wide arch culvert with Tide Gate Removed

⁵ Northeast Climate Science Center (NECSC) "Massachusetts Climate Change Projections - Statewide and for Major River Basins" for the Massachusetts Executive Office of Energy and Environmental Affairs, January 2018. Available from <http://www.massclimatechange.org/>.

3. Proposed Alternative 3 with Culvert Replaced in-kind with Tide Gate Removed

2.4 Scour Analysis

Scour at the Central Street Bridge was evaluated in a manner consistent with the general guidelines set forth in the FHWA Hydraulic Engineering Circular Nos. 18 (HEC-18), HEC-20, and the MassDOT LRFD Bridge Manual section 1.3.3.4 Scour/Stability Analysis. The HEC-RAS model was used to estimate the hydraulic parameters required to compute the total scour potential. The scour design and scour check flood return frequencies were the 50-year and 100-year frequency storm event, based on Table 1.3.4-1 in the LRFD Bridge Manual for an Urban Minor Arterial or Rural Major Collector.

Total scour consists of the summation of contraction scour, abutment scour, pier scour, and long-term aggregation and degradation. Contraction scour is calculated using the Modified Laursen's equation (1960) and the Laursen's equation (1963) as outlined in HEC-18. Abutment scour was calculated using the National Cooperative Highway Research Program (NCHRP) methodology as outlined in HEC-18 that provides a peaking factor to contraction scour to estimate the sum scour anticipated from contraction and abutment scour. Scour was also calculated using the Clear-Water Scour Equation for Open-Bottom Culverts that incorporate both contraction and abutment scour. There are no piers proposed, so pier scour was not evaluated. Long-term aggregation and degradation were evaluated based on qualitative approaches outlined in HEC-20. Scour calculations did not include any potential scour countermeasures. The sediment transport analysis performed in "Task 3: Sediment Characterization and Flushing Studies - Sawmill Brook Flood Mitigation and Restoration Project" completed in June 2018 by Tighe & Bond was also reviewed as part of the scour analysis.

3 Analysis Results and Alternatives Discussion

The H&H model was evaluated for the existing and proposed alternatives using the above described methodology. The model results for existing and proposed conditions are presented in the following sections.

3.1 Hydrologic Analysis

Table 3-1 shows the peak flow results from the HEC-HMS model as well as the prediction interval from the regression analysis.

TABLE 3-1

Design Storm Peak Flow Rates from HEC-HMS Hydrologic Model with associated Downstream Boundary Condition for HEC-RAS hydraulic model.

Model Scenario	Downstream Boundary Condition¹	Flow to Norwood Avenue (ft³/s)	Flow to Central Pond (ft³/s)	Regression Analysis Prediction Interval at Central Pond² (ft³/s)
Present (2018) 2-Year	MHHW	232	254	63 to 242
Present (2018) 10-Year	MHHW	845	924	129 to 535
Present (2018) 25-Year	MHHW	1,228	1,363	167 to 739
Present (2018) 50-year	MHHW	1,565	1,772	195 to 920
Present (2018) 100-year	MHHW	2,000	2,267	223 to 1,120
Present (2018) 500-year	MHHW	2,671	3,078	303 to 1,610
Present (2018) 25-year with MassDOT recommended SLR	MHHW + MassDOT SLR	1,228	1,363	167 to 739
Present (2018) 25-year MSL with MassDOT recommended SLR	MSL + SLR	1,228	1,363	167 to 739
Future (2100) 25-Year	MHHW + SLR	1,706	1,930	N/A
Future (2100) 50-Year	MHHW + SLR	1,717	1,946	N/A
Future (2100) 100-Year	MHHW + SLR	2,562	2,943	N/A
Present (2018) 25-Year with Storm Surge	Annual Storm Surge	1,228	1,363	N/A
Present (2018) 50-year with Storm Surge	Annual Storm Surge	1,565	1,772	N/A

¹ MHHW = Mean Higher High Water, SLR = Sea Level Rise, MSL = Mean Sea Level

² Regression analysis completed using Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016-5156 (Zarriello 2017)

In general, the peak flows estimated using HEC-HMS are larger than the values predicted by the regression analysis though within the same order of magnitude. Based on this comparison, the HEC-HMS model was considered to provide reasonable conservative estimate for the storms of interest at the Central Street (Route 127) culvert and the values from this model were used as the peak inflow values for the steady-state HEC-RAS hydraulic model.

3.2 Hydraulic Analysis

Peak flows evaluated in the hydrologic analysis were subsequently used as input to the HEC-RAS model to evaluate hydraulics at Central Street Bridge for existing and proposed alternative conditions. Results from this analysis, which include peak water surface elevations, distance from the peak water surface elevation to the top of the road, freeboard to low chord, and velocities within the structure are included in Tables 3-2 through 3-5. HEC-RAS model output for the existing and proposed alternative conditions are provided in Attachment C.

TABLE 3-2

HEC-RAS Results for Existing Conditions at Central Street Bridge (assuming tide gate closed)

Model Scenario	Peak Water Surface Elevation (NAVD88)	Freeboard (feet)	Distance to Top of Road (feet)	Average Velocity Upstream Inside Culvert (ft/s)	Average Velocity Downstream Inside Culvert (ft/s)
Present (2018) 2-Year	6.4	-0.4	4.2	4.0	4.0
Present (2018) 10- Year	11.2	-5.2	-0.6	12.1	12.1
Present (2018) 25-Year	11.8	-5.8	-1.2	12.2	12.2
Present (2018) 50-year	12.4	-6.4	-1.8	8.5	8.5
Present (2018) 100-year	12.5	-6.5	-1.9	9.9	9.9
Present (2018) 500-year	12.6	-6.6	-2.0	9.5	9.5
Present (2018) 25- year with MassDOT recommended SLR	11.9	-5.9	-1.3	12.3	12.3
Present (2018) 25- year MSL with MassDOT recommended SLR	11.8	-5.8	-1.2	12.2	12.2
Future (2100) 25-Year	12.2	-6.2	-1.6	12.9	12.9
Future (2100) 50-Year	12.1	-6.1	-1.5	12.9	12.9
Future (2100) 100-Year	12.6	-6.6	-2.0	9.5	9.5
Present (2018) 25-Year with Storm Surge	11.9	-5.9	-1.3	12.2	12.2
Present (2018) 50-year with Storm Surge	12.4	-6.4	-1.8	8.5	8.5

TABLE 3-3

HEC-RAS Results for Alternative 1 at Central Street Bridge (replace culvert with 20-foot wide open-bottom arch culvert)

Model Scenario	Peak Water Surface Elevation (NAVD88)	Freeboard (feet)	Distance to Top of Road (feet)	Average Velocity Upstream Inside Culvert (ft/s)	Average Velocity Downstream Inside Culvert (ft/s)
Present (2018) 2-Year	4.7	1.3	5.9	1.5	1.5
Present (2018) 10-Year	4.8	1.2	5.8	5.4	5.4
Present (2018) 25-Year	5.6	0.4	5.0	8.0	8.0
Present (2018) 50-year	6.6	-0.6	4.0	10.4	10.5
Present (2018) 100-year	7.7	-1.7	2.9	13.4	13.6
Present (2018) 500-year	10.9	-4.9	-0.3	16.9	16.9
Present (2018) 25-year with MassDOT recommended SLR	5.7	0.3	4.94	7.4	7.5
Present (2018) 25-year MSL with MassDOT recommended SLR	1.8	4.2	8.8	11.7	13.0
Future (2100) 25-Year	6.9	-0.9	3.7	10.5	10.5
Future (2100) 50-Year	7.0	-1.0	3.6	10.5	10.5
Future (2100) 100-Year	10.6	-4.6	-0.01	13.8	13.8
Present (2018) 25-Year with Storm Surge	8.8	-2.8	1.8	7.4	7.4
Present (2018) 50-year with Storm Surge	10.6	-4.6	-0.01	9.6	9.6

TABLE 3-4

HEC-RAS Results for Alternative 2 at Central Street Bridge (replace culvert with 12-foot wide open-bottom arch culvert)

Model Scenario	Peak Water Surface Elevation (NAVD88)	Freeboard (feet)	Distance to Top of Road (feet)	Average Velocity Upstream Inside Culvert (ft/s)	Average Velocity Downstream Inside Culvert (ft/s)
Present (2018) 2-Year	4.8	1.2	5.8	2.4	2.4
Present (2018) 10-Year	6.0	0.0	4.6	8.8	8.9
Present (2018) 25-Year	8.6	-2.6	2.0	12.9	13.2
Present (2018) 50-year	10.6	-4.6	-0.01	15.0	15.8
Present (2018) 100-year	10.6	-4.6	-0.03	15.7	16.9
Present (2018) 500-year	10.9	-4.9	-0.3	16.2	17.5
Present (2018) 25-year with MassDOT recommended SLR	9.0	-3.0	1.6	12.1	12.1
Present (2018) 25-year MSL with MassDOT recommended SLR	8.7	-2.7	1.9	14.0	15.4
Future (2100) 25-Year	10.9	-4.9	-0.3	13.5	13.5
Future (2100) 50-Year	10.9	-4.9	-0.3	13.5	13.5
Future (2100) 100-Year	10.6	-4.6	-0.01	14.8	14.8
Present (2018) 25-Year with Storm Surge	10.9	-4.9	-0.3	10.6	10.6
Present (2018) 50-year with Storm Surge	11.3	-5.3	-0.7	11.6	11.6

TABLE 3-5
HEC-RAS Results for Alternative 3 at Central Street Bridge (replace culvert in-kind)

Model Scenario	Peak Water Surface Elevation (NAVD88)	Freeboard (feet)	Distance to Top of Road (feet)	Average Velocity Upstream Inside Culvert (ft/s)	Average Velocity Downstream Inside Culvert (ft/s)
Present (2018) 2-Year	5.3	0.7	5.3	4.5	4.4
Present (2018) 10-Year	10.9	-4.9	-0.3	14.7	14.9
Present (2018) 25-Year	11.6	-5.6	-1.0	14.3	18.3
Present (2018) 50-year	11.9	-5.9	-1.4	14.7	18.8
Present (2018) 100-year	12.1	-6.1	-1.5	15.0	19.2
Present (2018) 500-year	11.9	-5.9	-1.3	15.5	19.7
Present (2018) 25-year with MassDOT recommended SLR	11.6	-5.6	-1.0	14.3	18.3
Present (2018) 25-year MSL with MassDOT recommended SLR	11.6	-5.6	-1.0	14.3	18.3
Future (2100) 25-Year	12.1	-6.1	-1.5	14.3	14.3
Future (2100) 50-Year	12.1	-6.1	-1.5	14.3	14.3
Future (2100) 100-Year	12.1	-6.1	-1.5	15.3	15.3
Present (2018) 25-Year with Storm Surge	11.9	-5.9	-1.3	11.7	11.7
Present (2018) 50-year with Storm Surge	12.1	-6.1	-1.5	12.3	12.3

3.3 Alternative Design Evaluation

Three alternative designs were evaluated to replace the existing culvert at Central Street. All alternatives are expected to result in increase hydraulic capacity compared to existing conditions with the tide gate in place. Alternative 1 and Alternative 2 would result in a more natural river alignment under the road by reducing the hydraulic restriction that currently exists. Also, all alternatives were limited in height by the existing road grade, which was assumed to remain the same from existing to proposed. The span width was also limited to 20 feet due to the upstream channel.

3.3.1 Preferred Alternative

Alternative 1 exceeds MassDOT hydraulic requirements by passing the 50-year frequency storm event for predicted climate change conditions without overtopping the road. This alternative also passes the 25-year frequency storm event with 0.4 feet of freeboard for MHHW conditions (compared to the low chord), and 4.2 of freeboard feet for MSL condition. Both of these scenarios assume MassDOT recommended increases in sea level due to climate change. Note that MHHW elevation is 5.75 NAVD88 when assuming MassDOT tidal increases due to sea level rise (0.25 feet lower than the maximum low chord based on site constraints). This alternative can also pass the 25-year frequency storm event during the annual storm surge without overtopping the road. While Alternative 2 met the MassDOT minimum hydraulic constraints for culvert design, it is not anticipated to meet predicted climate change conditions in 2100 for the 50-year frequency storm event. Alternative 3 does not meet the recommended MassDOT minimum hydraulic requirements, although it does offer an improvement to existing conditions due to removal of the tide gate. Alternative 1 was considered the preferred alternative.

3.4 Scour Analysis

Abutment, contraction, and long-term aggregation and degradation scour processes were evaluated in detail for the preferred alternative. Attachment D contains the calculations for this analysis.

Abutment scour was calculated for the 50-year scour design storm, and is anticipated to extend to the granite bedrock located approximately 0 to 2 feet below the channel bottom. If the bedrock had not been observed scour would be anticipated to a depth of 3.7 feet at the center of the channel and up to 10.8 feet toward the left and right abutment. Under the 100-year scour design check storm, scour is also anticipated to extend to the granite bedrock located approximately 0 to 2 feet below the channel bottom. If the bedrock had not been observed the scour would be anticipated to a depth of 4.1 feet at the center of the channel and up to 6.8 feet toward the left and right abutment. A contraction scour analysis shows that live-bed scour conditions are likely to dominate with sediment transport limiting the contraction scour depth rather than the size of the bed material.

The natural bed material of this stream is mostly comprised of medium to fine grain sands and silt, with average D50 and D85 values of approximately 0.011 inches and 0.05 inches, respectively. An incipient diameter analysis was performed and results indicate that the hydraulic forces are adequate to transport bed material up to 1 foot for a 50-year storm, which is greater than the average D85.

Based on this comparison between the incipient diameter particle size for the 50-year storm and the streambed material, it is anticipated that sediment will be mobilized from the upstream reach following the installation of an open-bottom culvert. The granite bedrock located 0 to 2 feet below the channel bottom will provide a vertical control for scour.

3.5 Stream-Crossing Standards

The preferred alternative of a 20-foot span open-bottom arch culvert was not designed to meet Stream-Crossing standards due to site constraints and coastal influence but does meet some of the recommendations. For replacement projects, stream simulation design approaches typically result in greater hydraulic capacity for passing flood flows than the existing bridge or culvert. This is true in this case, as the existing structure is an approximately 13 feet wide semi-circular arch culvert, which is proposed to be replaced with an open-bottom culvert with a clear span of 20 feet.

The proposed culvert is approximately the same width as the concrete wall lined channel located upstream of the bridge, so the opening width is not anticipated to limit flow. The concrete channel contains the 10-year frequency storm event, and is therefore anticipated to exceed the bankfull flow event (typically between the 1.5-, and 2-year frequency storm events).

The predicted opening area of the preferred replacement culvert is approximately 100 square feet. With a total length of approximately 45 feet, the openness ratio is approximately 2.2 feet, which exceeds the recommended openness ratio of 0.82 feet and approaches the recommended optimum standard. The height of the opening of the structure at this location is limited by the cover from the existing road grade, and a maximum low chord elevation of 6 feet NAVD88 is proposed for the preferred alternative.

3.6 Hydraulic Design Table

The H&H analysis is summarized in the design drawings in a hydraulic design data table. Table 3-6 provides the hydraulic design data table for Central Street Bridge.

TABLE 3-6

Hydraulic Design Data Table Included in Design Drawings for Central Street Bridge for a 20-foot span open-bottom arch culvert with low chord at 6 feet NAVD88.

HYDRAULIC DATA	
DRAINAGE AREA	5.0 SQ. MILES
WATER CONTROL FLOOD DISCHARGE (2 YR)	254 CFS
DESIGN FLOOD DISCHARGE (25 YR)	1,363 CFS
DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	4% (25-YEARS)
DESIGN FLOOD VELOCITY (25 YR)	7.5 FPS
DESIGN FLOOD ELEVATION (25 YR)	5.7 FEET
BASE 100-YR FLOOD DATA	
BASE FLOOD DISCHARGE (100 YR)	2,267 CFS
BASE FLOOD ELEVATION (100 YR)	7.7 FEET
DESIGN AND CHECK SCOUR DATA	
SCOUR DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	2% (50-YEARS)
DESIGN FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
SCOUR CHECK FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	1% (100-YEARS)
CHECK FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
FLOOD OF RECORD	
DISCHARGE	UNKNOWN
FREQUENCY (IF KNOWN)	N/A
MAXIMUM ELEVATION	N/A
DATE	N/A
HISTORY OF ICE FLOWS	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	NO

4 Summary

The H&H analysis methodology and results described above will be used as the basis of design of the Central Street Bridge along the Sawmill Brook in the Town of Manchester-by-the-Sea. The analysis confirms that the preferred alternative will provide both adequate hydraulic capacity for the design storm as well as will meet predicted future conditions due to climate change. Furthermore, scour is not anticipated to extend beyond the granite bedrock located between 0 to 2 feet below the channel bottom for the scour design storm (50-year storm) nor the scour check storm (100-year storm).

J:\M\M1476 Manchester MA Hydro Study\011-Central Street Bridge\Report_Evaluation\Hydrologic and Hydraulic Analysis Report\H&H Memo Central Street Bridge Replacement MBTS.doc

ATTACHMENT A
Figures



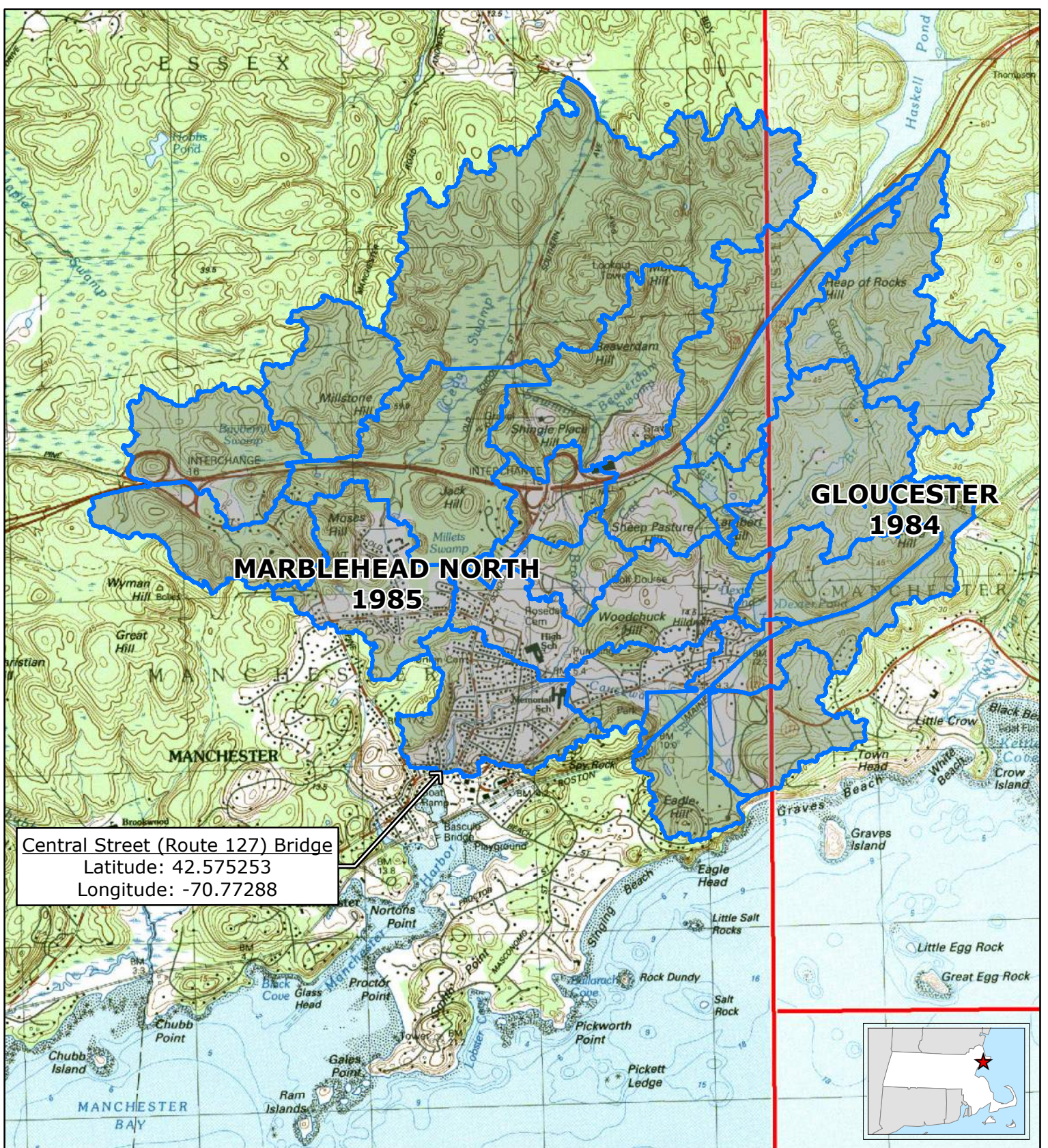
Central Street (Route 127) Bridge
 Latitude: 42.575253
 Longitude: -70.77288



**FIGURE 1
 SITE AERIAL OVERVIEW**

Central Street Bridge Reconstruction
 Manchester-by-the-Sea, Massachusetts

August 2018



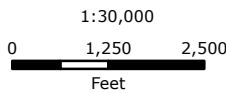
Central Street (Route 127) Bridge
 Latitude: 42.575253
 Longitude: -70.77288

Legend

- Central Street Bridge Drainage Area
- HEC-HMS Sub-Drainage Areas
- USGS Quadrangle Sheet Boundary

Based on USGS Topographic Map for Marblehead, MA Revised 1985. Gloucester, MA Revised 1984.

Tighe & Bond
 Engineers | Environmental Specialists

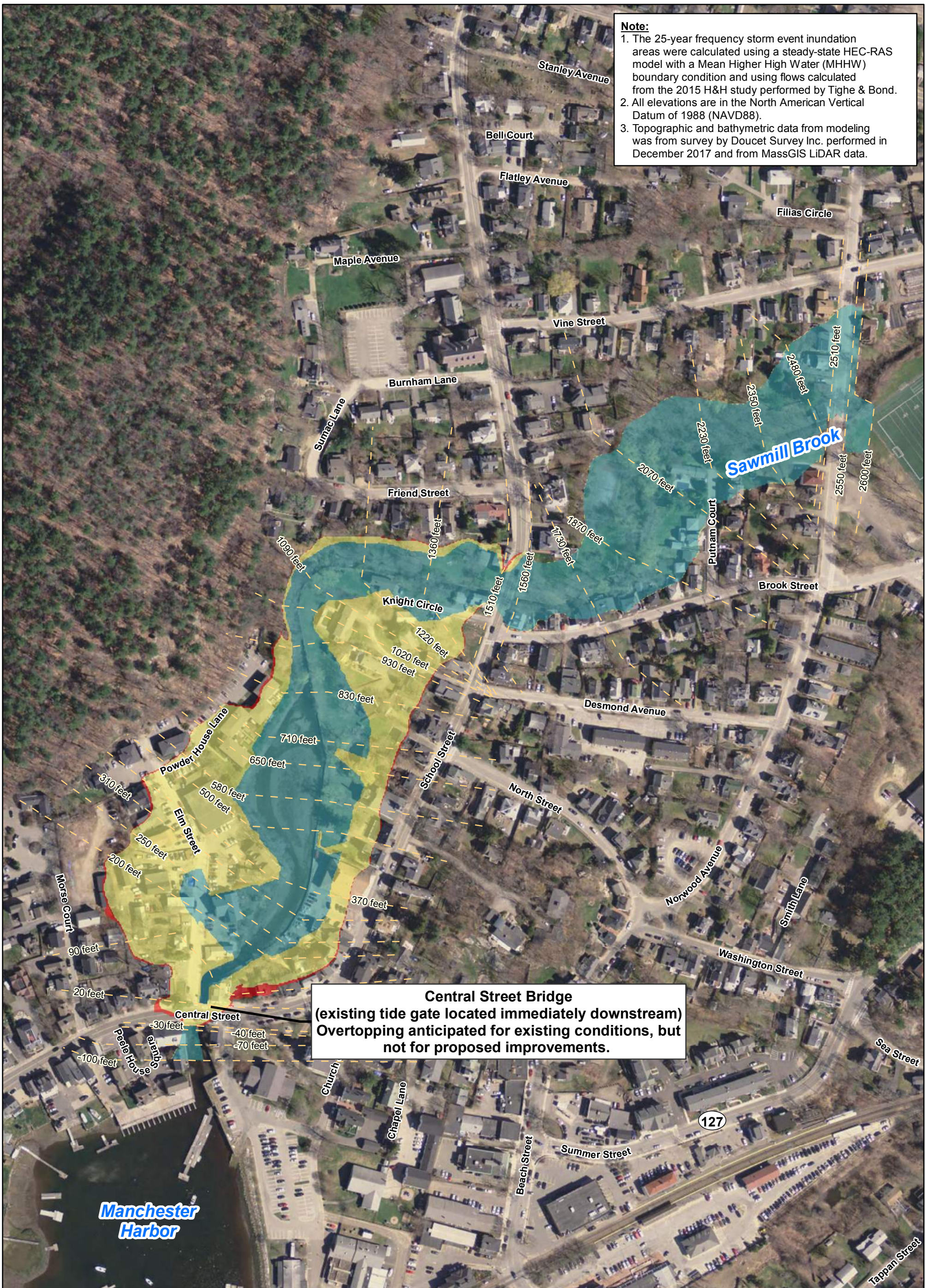


**FIGURE 1
 DRAINAGE AREA MAP**

Central Street Bridge Reconstruction
 Manchester-by-the-Sea, Massachusetts

August 2018

Note:
 1. The 25-year frequency storm event inundation areas were calculated using a steady-state HEC-RAS model with a Mean Higher High Water (MHHW) boundary condition and using flows calculated from the 2015 H&H study performed by Tighe & Bond.
 2. All elevations are in the North American Vertical Datum of 1988 (NAVD88).
 3. Topographic and bathymetric data from modeling was from survey by Doucet Survey Inc. performed in December 2017 and from MassGIS LiDAR data.



Central Street Bridge
 (existing tide gate located immediately downstream)
 Overtopping anticipated for existing conditions, but not for proposed improvements.

- LEGEND**
- Model Cross Section (label indicates feet upstream of Central Street)
 - Proposed Conditions 25-year Storm Flow (Larger Culvert, and tidegate removed) Inundation Area
 - Existing Conditions Tide Gate Open 25-year Storm Flow Inundation Area
 - Existing Conditions Tide Gate Closed 25-year Storm Flow Inundation Area

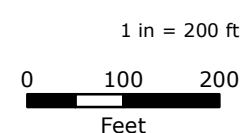


FIGURE 3
25-YEAR FREQUENCY STORM
EVENT INUNDATION AREA
 Manchester-by-the-Sea
 Sawmill Brook Feasibility Study
 October 2018

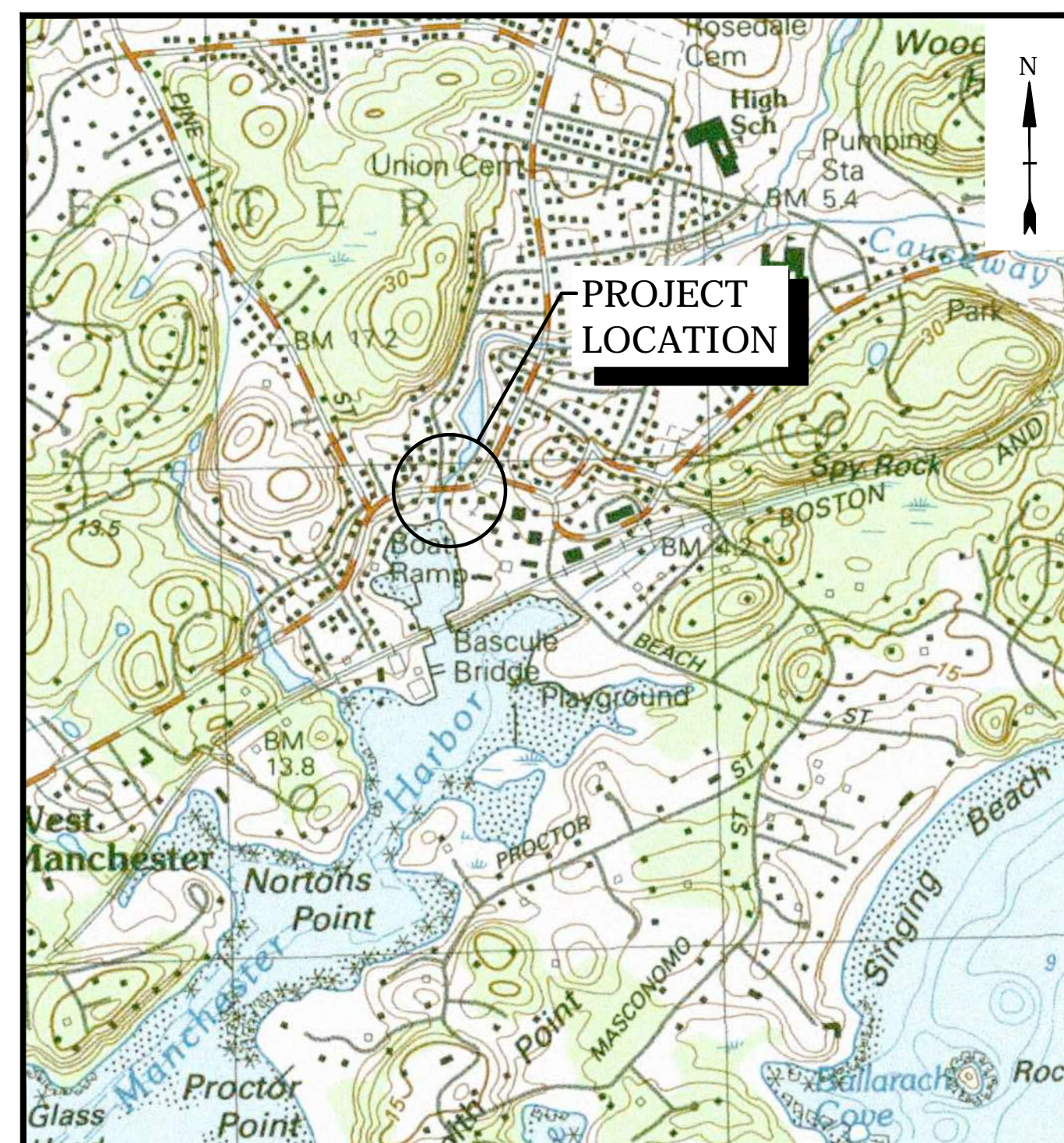
APPENDIX C2

Central Pond Restoration Plan Set

TOWN OF MANCHESTER-BY-THE-SEA, MASSACHUSETTS CENTRAL POND RESTORATION

JUNE 30, 2021

LIST OF DRAWINGS	
SHEET NO.	SHEET TITLE
	COVER
G-001	GENERAL NOTES, LEGEND & ABBREVIATIONS
C-001	EXISTING CONDITIONS & DEMOLITION PLAN
C-002	EXISTING CROSS SECTIONS - 1
C-003	EXISTING CROSS SECTIONS - 2
C-101	SITE PLAN
C-102	PLANTING PLAN
C-103	EASEMENTS, ACCESS, AND STAGING
C-104	PROPOSED CROSS SECTIONS - 1
C-105	PROPOSED CROSS SECTIONS - 2
C-501	CONTROL OF WATER NOTES
C-502	TYPICAL BANK DETAILS
C-503	REVEGETATION DETAILS
C-504	CONTROL OF WATER DETAILS - 1
C-505	CONTROL OF WATER DETAILS - 2
C-506	CONSTRUCTION DETAILS
C-507	BANK JAM SCHEDULE AND NOTES
C-601	TRANSECT PLAN
C-602	TRANSECT CROSS SECTIONS - 1
C-603	TRANSECT CROSS SECTIONS - 2



LOCATION MAP
SCALE: 1" = 1000'

PREPARED FOR:

TOWN OF MANCHESTER-BY-THE-SEA

GREG FEDERSPIEL, TOWN ADMINISTRATOR

CHUCK DAM, PE, DEPARTMENT OF PUBLIC WORKS DIRECTOR

MARY REILLY, GRANTS ADMINISTRATOR

BOARD OF SELECTMEN

ELI G. BOLING, CHAIR

JEFFREY H. BODMER-TURNER, VICE CHAIR

BECKY JAQUES

ANN HARRISON

JOHN ROUND



PREPARED BY:

Tighe & Bond

Engineers | Environmental Specialists

**100% DESIGN
NOT FOR CONSTRUCTION**

COMPLETE SET 20 SHEETS

GENERAL NOTES:

1. BASE PLAN ENTITLED "TOPOGRAPHIC PLAN FOR TIGHE & BOND OF SAWMILL BROOK BRIDGE STREET TO NORWOOD AVE, MANCHESTER-BY-THE-SEA, MASSACHUSETTS" PREPARED BY DOUCET SURVEY INC. IN DECEMBER 2017.
2. THE HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. BOLD TEXT AND LINES INDICATES PROPOSED WORK. LIGHT TEXT AND LINES INDICATES APPROXIMATE EXISTING CONDITIONS.
4. WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND ON 4/18/2018.
5. SOIL BORINGS WERE ADVANCED BY NEW ENGLAND BORING CONTRACTORS ON NOVEMBER 28, 2018.
6. NOTIFY "DIGSAFE" AT 1-888-344-7233 TO ARRANGE FOR MARKING OUT EXISTING UNDERGROUND UTILITIES AT LEAST 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS) PRIOR TO BEGINNING EXCAVATION AT ANY GIVEN LOCATION. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR BE ALLOWED TO START ANY KIND OF EXCAVATION WORK PRIOR TO OBTAINING ALL THE NECESSARY INFORMATION REGARDING THE LOCATION OF UNDERGROUND UTILITIES AT THE SITE. ACCOMPLISH ALL EXCAVATION SO THAT UNDERGROUND UTILITIES OR STRUCTURES ARE NOT DAMAGED. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED DURING EXCAVATION OPERATIONS. REPAIR ANY EXISTING PIPE OR UTILITY DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
7. THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR THE LOCATION OF EXISTING UTILITIES. THE ENGINEER AND OWNER MAKE NO GUARANTEE AS TO THE UNDERGROUND CONDITIONS THAT MAY BE ENCOUNTERED.
8. FIELD MEASURE TO VERIFY EXISTING AND CONTRACT INTERFACE DIMENSIONS, LOCATIONS, AND OTHER CONDITIONS.
9. TEST PITS TO LOCATE EXISTING UTILITIES ARE STRONGLY ENCOURAGED AND MAY BE ORDERED BY THE ENGINEER.
10. IF CHANGES TO THE DESIGN ARE PROPOSED, THE CHANGES SHALL BE SUBMITTED TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
11. MAKE NECESSARY ARRANGEMENTS TO PERFORM ANY WORK NEAR OVERHEAD UTILITIES PRIOR TO THE START OF CONSTRUCTION.
12. EXISTING UTILITY POLES IN CLOSE PROXIMITY TO CONSTRUCTION MAY REQUIRE TEMPORARY SUPPORT BY THE UTILITY COMPANY. INCLUDE COST UNDER THE PRICES BID FOR THE VARIOUS ITEMS OF WORK.
13. NO OPEN TRENCHES WILL BE ALLOWED OVERNIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED.
14. STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE FROM THE SITE TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
15. IMMEDIATELY REPORT SPILLS OF OIL AND/OR HAZARDOUS MATERIALS (OHM) TO THE MASSDEP.
16. PROVIDE A SUFFICIENT SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS, SUCH AS BOOMS OR BLANKETS, AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS.
17. FURNISH AND INSTALL TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR TRAFFIC THROUGH THE WORK AREA OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA.
18. SAWMILL BROOK IS RECOGNIZED AS A RAINBOW SMELT SPAWNING AREA. NO INWATER WORK WILL BE PERMITTED DURING SPAWNING SEASON.

PROJECT INFORMATION:

1. NATURE OF CONSTRUCTION INCLUDES: EXCAVATION AND REPLACEMENT OF AN EXISTING RETAINING WALL, EXCAVATION AND CONSTRUCTION OF IMBRICATED WALL AND INSTALLATION OF ENGINEERED LOG JAMES, TOE ROCK, ENCAPSULATED SOIL LIFTS AND HABITAT STRUCTURES, FLOODPLAIN BENCHING, BIO-STABILIZATION, AND REVEGETATION.
2. LOCATION: 42° 34' 34.98" N, 70° 46' 19.36" W
3. TOTAL AREA OF PROJECT: 1.3 ACRES, AREA TO BE DISTURBED: 0.34 ACRES
4. SWPPP IMPLEMENTATION - CONTRACTOR WILL BE RESPONSIBLE FOR IMPLEMENTATION OF THE PROJECT'S ESCP. POC: _____, CONTACT # _____.
5. RECEIVING WATERS - SAWMILL BROOK.
6. CONTRACTOR SHALL SUBMIT SEQUENCING PLAN FOR REVIEW AND APPROVAL BY ENGINEER.
7. APPROXIMATE SEQUENCE OF EVENTS:
 1. INSTALL EROSION AND SEDIMENT CONTROLS BMP'S AND TEMPORARY CONSTRUCTION ACCESS POINTS.
 2. INSTALL COFFER DAMS, TURBIDITY CURTAIN FOR STAGE 1 WATER CONTROL (WEST BANK TOE WOOD)
 3. PERFORM GRADING AND INSTALL TOE WOOD AS SHOWN IN PLANS (STAGE 1). RETAIN EXISTING BANK AND PROTECT EXISTING VEGETATION. PROVIDE WATER CONTROL FOR CONSTRUCTION ACTIVITIES (STAGE 1 WATER CONTROL).
 4. INSTALL TEMPORARY ACCESS ROAD & LOG MATT. APEX JAM CONSTRUCTION.
 5. REMOVE EXISTING UPSTREAM BANK OF HABITAT CHANNEL.
 6. INSTALL COFFER DAMS AND TURBIDITY CURTAIN FOR STAGE 2 WATER CONTROL (EAST BANK RETAINING WALL).
 7. REMOVE AND REPLACE EXISTING RETAINING WALL. RETAINING WALL MUST BE CONSTRUCTED IN SEGMENTS, MAXIMUM 250 LINEAR FEET COFFERDAM & ISOLATION AT ONCE (STAGE 2)
 8. REMOVE COFFER DAM, TEMPORARY RIVER ACCESS POINTS AND IN-CHANNEL BMP'S STREAM.
 9. INSTALL EROSION CONTROL MATTING AND SEEDING.
 10. REMOVE ACCESS ROAD AND REVEGETATE.
 11. REMOVE STAGING AREAS AND OTHER TEMPORARY BMP'S.
 12. PLANTING IN CENTRAL POND TO BE CONDUCTED BY HAND LABOR AT LOW TIDE AFTER CONSTRUCTION.

ABBREVIATIONS

BIT	BITUMINOUS
CONC	CONCRETE
CMP	CORRUGATED METAL PIPE
ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
EOW	EDGE OF WATER
HMA	HOT MIXED ASPHALT
MHHW	MEAN HIGH HIGH WATER
MLW	MEAN LOW WATER
MLLW	MEAN LOW LOW WATER
R&D	REMOVE AND DISPOSE
R&S	REMOVE AND STACK
RET	RETAIN
SPK	SPIKE
TBM	TEMPORARY BENCHMARK
TYP	TYPICAL
UP	UTILITY POLE

LEGEND

	INTERMEDIATE CONTOURS		EDGE OF WATER
	INDEX CONTOURS		EROSION CONTROL BARRIER
	PROPOSED CONTOURS		PROPOSED COFFERDAM
	OVERHEAD WIRES		LIMIT OF WORK
	EXISTING GUARD RAIL		PROPERTY BOUNDARY
	PROPOSED GUARD RAIL		RETVEMENT/COBBLE BOTTOM
	FEMA FLOOD ZONE		WETLAND FLAG
	VEGETATED WETLAND BOUNDARY (BVW)		UTILITY POLE
	WATERS OF THE UNITED STATES		DECIDUOUS/CONIFER TREE
			BOLLARD
			BORING
			PIPING, STRUCTURES, etc. TO BE REMOVED
			ENGINEERED LOG JAM
			APEX JAM

CONSTRUCTION NOTES:

1. SEE SHEET C-501 AND TECHNICAL SPECIFICATIONS FOR A DETAILED DESCRIPTION OF CONTRACTOR REQUIREMENTS CONCERNING EROSION CONTROL (NPDES) AND CARE OF WATER (USACE 401).
2. WATER HANDLING PLAN IS SHOWN FOR PERMITTING AND COST ESTIMATING PURPOSES ONLY. CONTRACTOR WILL BE RESPONSIBLE FOR DEVELOPING A CONTROL OF WATER PLAN TO MEET PERMITTING REQUIREMENTS AND CONSTRUCTION NEEDS. CONTRACTOR IS WHOLLY RESPONSIBLE FOR MONITORING RIVER LEVELS AND WEATHER FORECASTS AND MAKING ADJUSTMENTS TO THE PROJECT'S COFFER DAM SYSTEM OR DEMOBILIZING OUT OF THE RIVER IF FLOW CONDITIONS EXCEEDS OR IS PREDICTED TO EXCEED THE ISOLATION SYSTEM CAPACITY.

GENERAL REQUIREMENTS:

1. CONSTRUCTION STAKING
2. SITE PREPARATION - INSTALL CONSTRUCTION ENTRANCE AND EROSION & SEDIMENT CONTROL MEASURES
3. LOCATE AND CONSTRUCT CONSTRUCTION ACCESS ROUTES
4. PLACE COFFERDAMS, DEWATER PROJECT AREA
5. EARTHWORK AND CONSTRUCTION OF RETAINING WALLS AND LIVING SHORELINE
6. CHECK GRADES AND OBTAIN APPROVAL OF ALL HABITAT STRUCTURE INSTALLATION PRIOR TO EXCAVATION
7. REMOVE COFFERDAMS
8. RECLAIM CONSTRUCTION ACCESS AND STAGING AREAS

WORK SCHEDULE:

1. THE APPROVED IN-WATER WORK WINDOW FOR THIS PROJECT IS FROM JULY 1 TO FEBRUARY 28; ALL IN-WATER WORK SHALL BE COMPLETED DURING THIS PERIOD. WORK REQUIRING EQUIPMENT TO OPERATE PARTLY, OR WHOLLY, BELOW THE ORDINARY HIGH WATER LINE SHALL BE COMPLETED DURING THE IN-WATER WORK WINDOW.
2. THE CONTRACTOR MAY NOT LEAVE THE WORK SITE OR SUSPEND ACTIVITY FOR MORE THAN FIVE (5) CONSECUTIVE DAYS AFTER MOBILIZING TO THE SITE AND PRIOR TO REACHING SUBSTANTIAL COMPLETION UNLESS OTHERWISE APPROVED BY THE ENGINEER.

LOCATION:

1. ALL WORK IS ON THE SAWMILL BROOK AND ADJACENT FLOODPLAIN AND TERRACE
2. ACCESS TO THE PROJECT SITE: SITE IMPROVEMENTS WILL BE REQUIRED TO CREATE ACCESS POINTS SUITABLE FOR MOBILIZATION OF CONSTRUCTION EQUIPMENT AND DELIVERY OF PROJECT MATERIALS.

CONTRACTORS USE OF PREMISES:

1. PRIOR TO PERFORMING WORK, THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH THE PROJECT SITE, PROJECT SITE CONDITIONS, AND ALL PORTIONS OF THE WORK.
2. CONTRACTOR MUST COORDINATE ALL WORK AND ACCESS TO THE SITE WITH THE ENGINEER. THE ENGINEER WILL BE RESPONSIBLE FOR COORDINATION WITH THE PROPERTY OWNER.
3. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING PUBLIC SAFETY IN AND AROUND THE PROJECT SITE, AND WILL PROVIDE ANY SAFETY PRECAUTIONS SUCH AS TEMPORARY FENCING OR OTHER METHODS AT THE CONTRACTOR'S DISCRETION WHERE DEEMED NECESSARY. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE OSHA STANDARDS, IN THE CONSTRUCTION PRACTICES FOR ALL EMPLOYEES DIRECTLY ENGAGED IN THE CONSTRUCTION OF THIS PROJECT.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE SECURITY OF PROPERTY AT THE PROJECT SITE AND WILL PROVIDE REASONABLE PROTECTION TO PREVENT DAMAGE OR LOSS TO EQUIPMENT, MATERIALS, AND SUPPLIES INCORPORATED IN THE PROJECT AND TO THE PROPERTY OWNER.
5. THE CONTRACTOR SHALL ONLY ACCESS THE PROJECT SITE AS SHOWN ON THE DRAWINGS AND THE CONTRACTOR'S STAGING AND LAYOUT PLAN AS APPROVED BY THE ENGINEER.
6. CONTRACTOR SHALL ONLY USE DESIGNATED ACCESS ROUTES AND STREAM ACCESS AND CROSSING LOCATIONS AS INDICATED ON THE DRAWINGS.
7. AREAS FOR CLEARING AND GRUBBING SHALL BE THE MINIMUM NECESSARY AND WITHIN THE LIMITS OF DISTURBANCE (GRADING LIMITS) SHOWN ON THE PLANS AND INCLUDING TEMPORARY CONSTRUCTION ACCESS ROUTES, STAGING AREAS, STOCKPILE AREAS, STORAGE AREAS, AND CONTRACTOR PARKING AREAS.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO ANY UTILITY LINES AT NO COST OR OBLIGATION TO THE SPONSOR OR THE PROPERTY OWNER.
9. MOVEMENT OF CONSTRUCTION EQUIPMENT OVER PIPES, BRIDGES, UTILITIES OR INFRASTRUCTURE DURING CONSTRUCTION SHALL BE AT THE CONTRACTOR'S RISK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO INFRASTRUCTURE AT NO COST OR OBLIGATION TO THE SPONSOR OR THE PROPERTY OWNER.
10. CONTRACTOR IS EXPECTED TO KEEP A NEAT AND TIDY CONSTRUCTION SITE, FREE OF ACCUMULATED WASTE MATERIALS AND TRASH.
11. CONTRACTOR SHALL TAKE ALL MEASURES NECESSARY TO MINIMIZE DAMAGE TO EXISTING VEGETATION DURING CONSTRUCTION ACTIVITIES.
12. THE CONTRACTOR SHALL ONLY REMOVE TREES AND SHRUBS THAT ARE ABSOLUTELY NECESSARY FOR THE EXECUTION OF THE WORK AND SHALL MAKE ALL EFFORTS TO MINIMIZE TREE REMOVAL. IN THE EVENT THAT A TREE OR SHRUB OUTSIDE THE IMMEDIATE WORK AREAS MUST BE REMOVED OR DAMAGED, THE CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM THE ENGINEER. ANY TREE OR SHRUB UNNECESSARILY REMOVED FROM THE WORK SITE SHALL BE REPLACED BY A NEW TREE OR SHRUB OF EQUAL OR GREATER VALUE AT THE SOLE EXPENSE OF THE CONTRACTOR AS APPROVED BY THE CONTRACTING OFFICER.
13. THE CONTRACTOR SHALL REMOVE ALL TEMPORARY EQUIPMENT AND FACILITIES UPON COMPLETION OF WORK UNDER THIS CONTRACT.

EQUIPMENT:

1. CONTRACTOR IS REQUIRED TO PRESSURE WASH AND REMOVE ALL DIRT, GREASE, OIL, FUEL, VEGETATION AND WEED SEEDS BEFORE BRINGING EQUIPMENT AND CONSTRUCTION MATTING ON SITE TO LIMIT INTRODUCTION OF NOXIOUS WEEDS, AQUATIC INVASIVES AND POLLUTANTS TO THE SITE.
2. COMPLETE VEHICLE AND EQUIPMENT STAGING, CLEANING, MAINTENANCE, REFUELING, AND FUEL STORAGE IN THE DESIGNATED CONSTRUCTION STAGING AND MATERIAL STORAGE AREA A MINIMUM OF 150 FEET AWAY OR AS APPROVED BY ENGINEER FROM ANY NATURAL WATER BODY.
3. INSPECT ALL VEHICLES AND EQUIPMENT OPERATED WITHIN 150 FEET OF LIVE WATER DAILY FOR FLUID LEAKS BEFORE LEAVING THE CONSTRUCTION STAGING AND MATERIAL STORAGE AREA. REPAIR ANY LEAKS DETECTED IN THE CONSTRUCTION STAGING AND MATERIAL STORAGE AREA BEFORE RESUMING OPERATION. DOCUMENT INSPECTIONS IN A RECORD THAT IS AVAILABLE FOR REVIEW ON REQUEST BY THE ENGINEER AND REGULATORY AGENCIES.
4. USE OF EQUIPMENT IN FLOWING WATER IS LIMITED BY APPLICABLE PERMITS. EQUIPMENT MUST BE THOROUGHLY CLEANED BEFORE ENTERING THE WATER. CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH APPLICABLE REGULATIONS FOR IN-WATER EQUIPMENT USE.
5. ABSORBENT PADS TO SOAK UP LEAKS AND A FUEL SPILL RESPONSE KIT (INCLUDING RAG PADS AND BOOMS) OF APPROPRIATE SIZE FOR THE EQUIPMENT USED SHALL BE ON SITE AT ALL TIMES AND READILY AVAILABLE THROUGHOUT THE CONSTRUCTION PERIOD.

HOURS OF WORK:

1. THE NORMAL WORK HOURS SHALL BE 8:00 AM TO 4:00 PM, MONDAY THROUGH FRIDAY. NO WORK SHALL BE PERFORMED OUTSIDE THE NORMAL WORK HOURS, OR ON SATURDAYS, SUNDAYS, OR HOLIDAYS UNLESS AUTHORIZED BY THE ENGINEER. THE CONTRACTOR SHALL REQUEST WORK HOUR VARIATIONS IN WRITING VIA EMAIL AND OBTAIN WRITTEN APPROVAL FROM THE ENGINEER PRIOR TO WORKING OUTSIDE NORMAL WORK HOURS.

SPECIAL PROCEDURES:

IN-STREAM WORK

1. IN-STREAM WORK IS ALLOWED ONLY AS SPECIFIED IN THE PERMIT DOCUMENTS.
2. TURBIDITY CRITERIA SHALL BE STRICTLY ADHERED TO WHILE COMPLETING ALL INSTREAM WORK. COFFERDAMS, FLOW DIVERSION STRUCTURES AND BYPASS CHANNELS SHALL BE INSTALLED AT ALL LOCATIONS INDICATED ON THE DRAWINGS OR AT LOCATIONS SHOWN ON THE APPROVED "COFFERDAM AND FLOW DIVERSION PLAN." SOME ASPECTS OF THE PROJECT MAY NOT REQUIRE THE USE OF A COFFERDAM TO COMPLETE THE WORK. CONTRACTOR SHALL PREPARE AND SUBMIT COFFERDAM AND FLOW DIVERSION PLAN PER SHEET C-505.
3. DEWATERING WITHIN COFFERDAMS SHALL BE PERFORMED TO THE EXTENT NECESSARY TO CONSTRUCT THE PROJECT AS SHOWN ON THESE PLANS AS FOLLOWS: DEWATERING AT WOOD STRUCTURE LOCATIONS SHALL BE CONDUCTED SUCH THAT WATER IS NO DEEPER THAN THE DIAMETER OF THE LOG(S) ON THE LOWEST LAYER OF THE STRUCTURE, AND WITHIN CONSTRUCTION EXCAVATIONS SUCH THAT WATER IS SHALLOW ENOUGH TO ALLOW THE ENGINEER TO EASILY INSPECT FINISHED ELEVATIONS OF THE WORK. DISCHARGE FROM PUMPING SHALL BE ROUTED TO THE FLOODPLAIN AREAS SO AS TO ALLOW THE REMOVAL OF FINE SEDIMENTS PRIOR TO REENTERING SURFACE WATERS OR WETLANDS.

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Central Street
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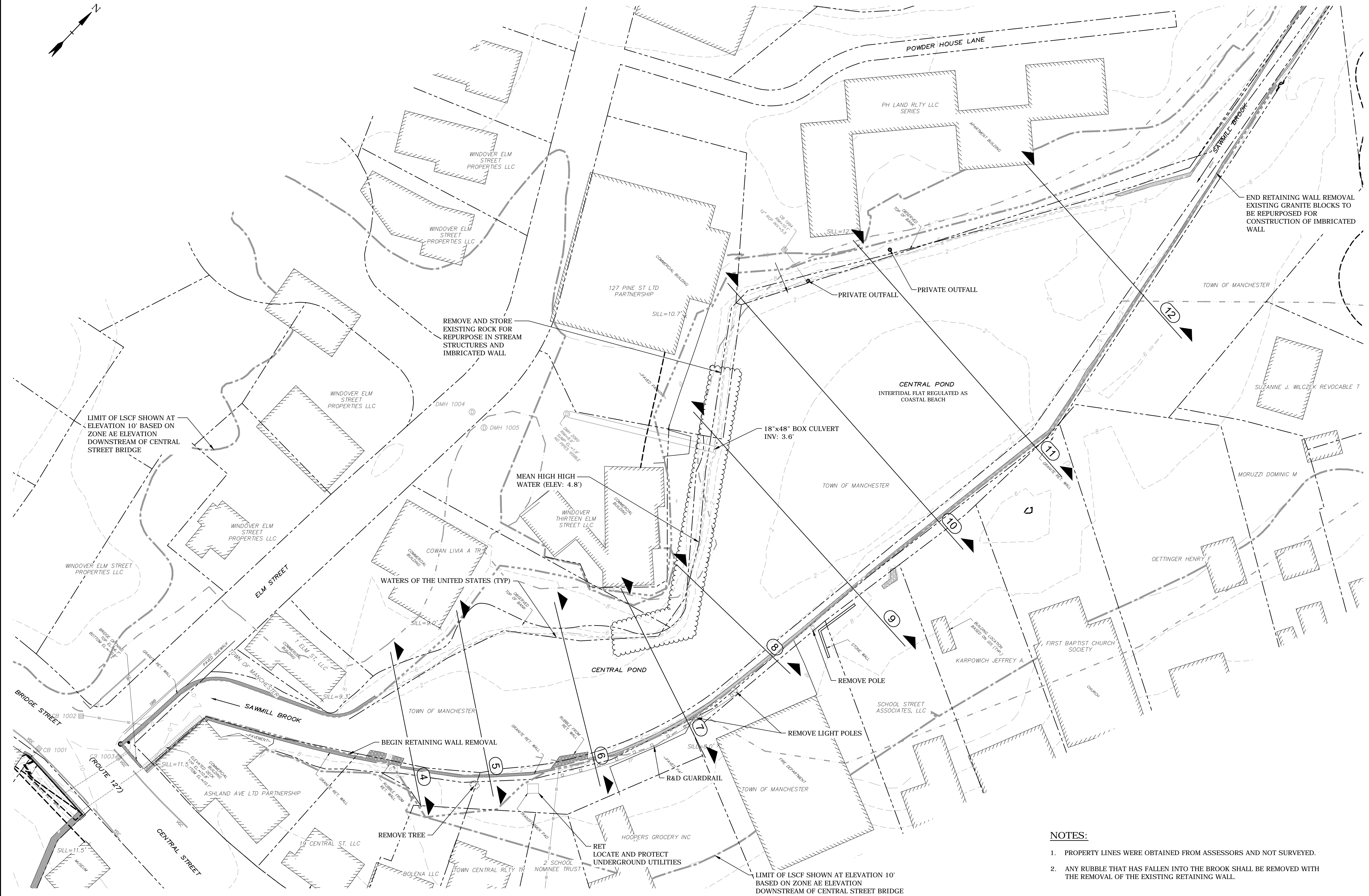
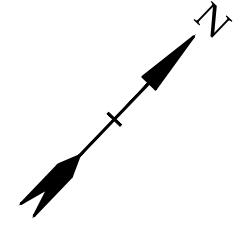
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MARK	DATE	DESCRIPTION
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DATE:	JUNE 30, 2021	
FILE:	M1476-014-G-001_Notes.gnd.dwg	
DRAWN BY:	DWB, TMP	
CHECKED:	DLM	
APPROVED:	DAM	

GENERAL NOTES, LEGEND & ABBREVIATIONS

SCALE: NO SCALE

G-001



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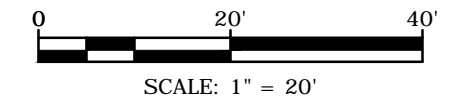
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MARK	DATE	DESCRIPTION

PROJECT NO:	M1467-014
DATE:	JUNE 30, 2021
FILE:	M1476-014-C-001_EC.dwg
DRAWN BY:	DLM
CHECKED:	DLM
APPROVED:	DAM

EXISTING CONDITIONS & DEMOLITION PLAN

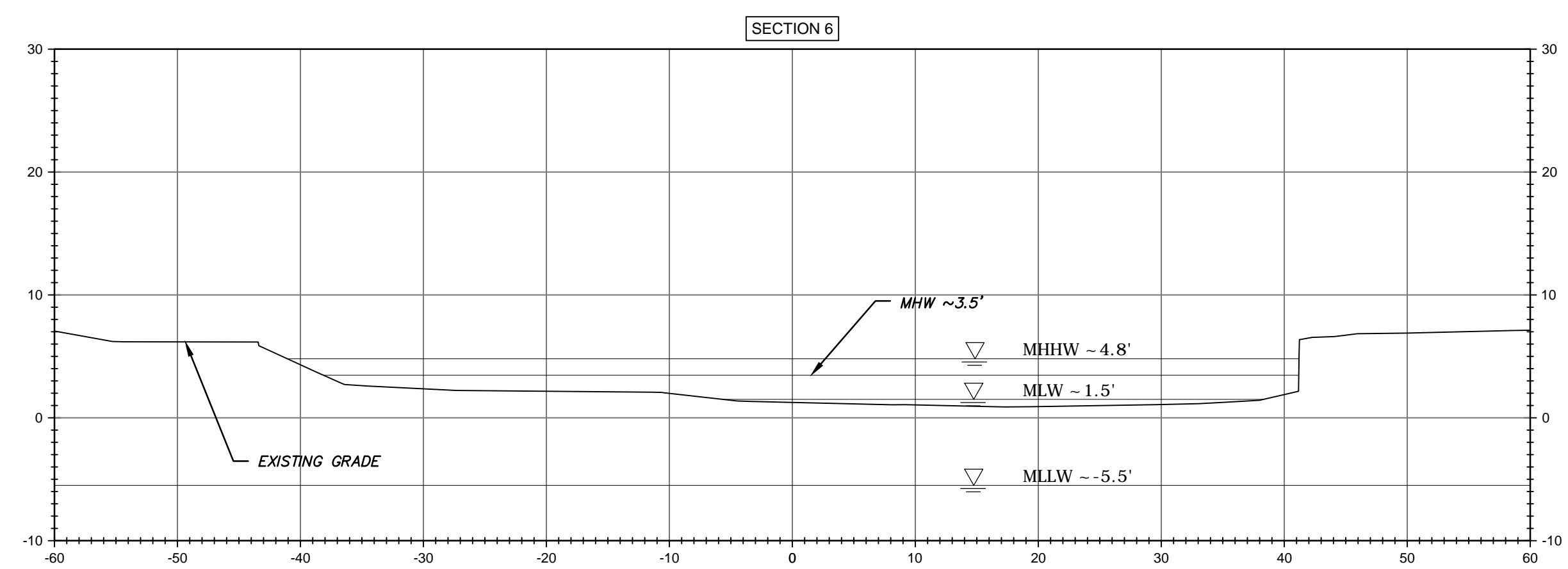
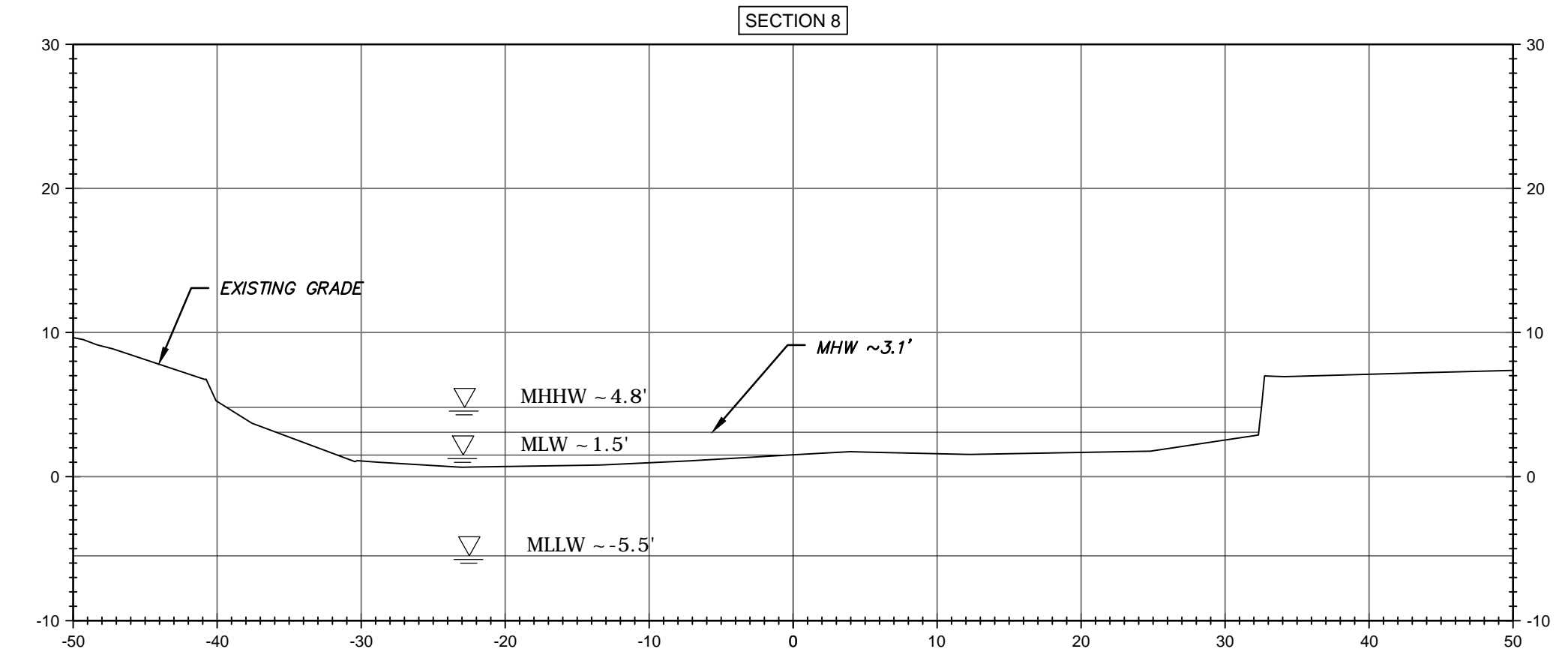
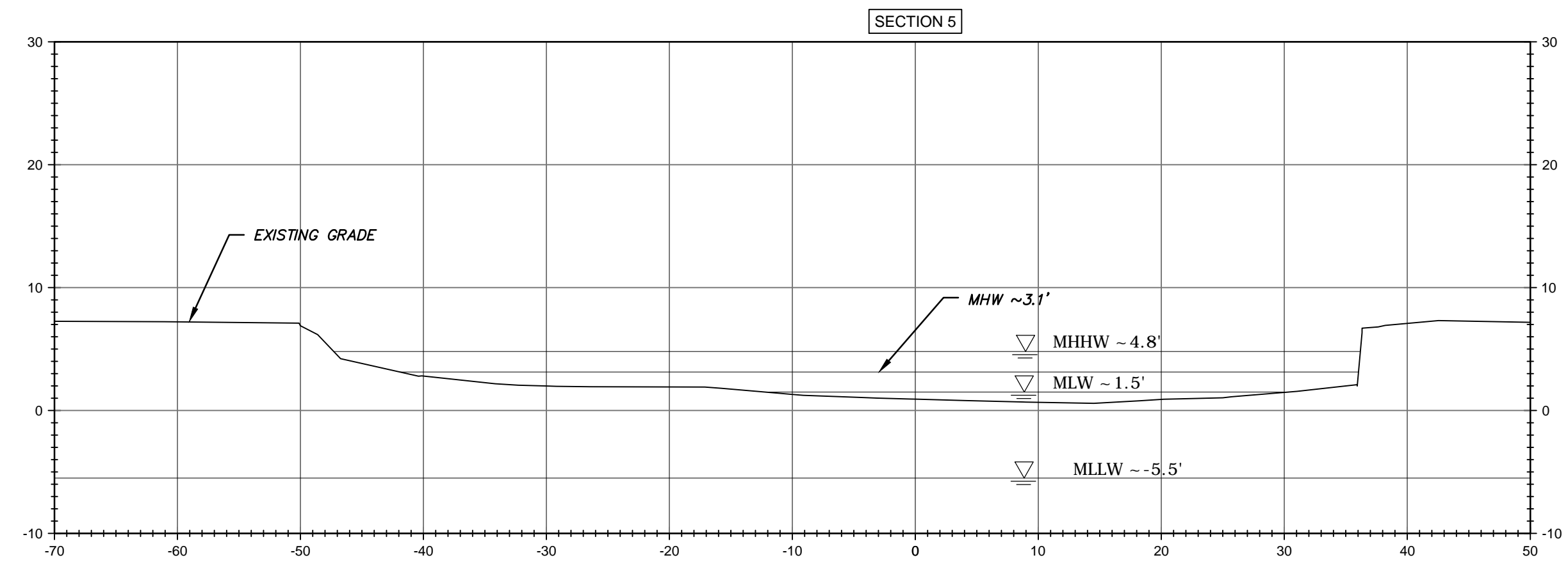
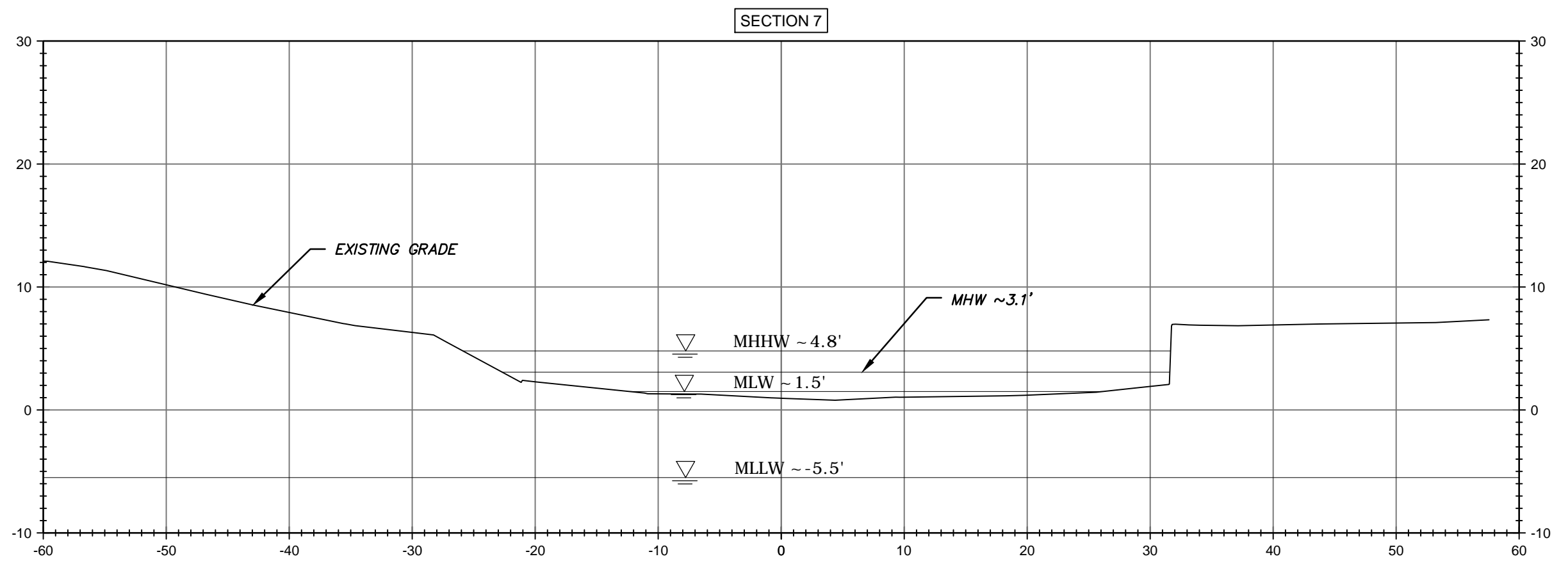
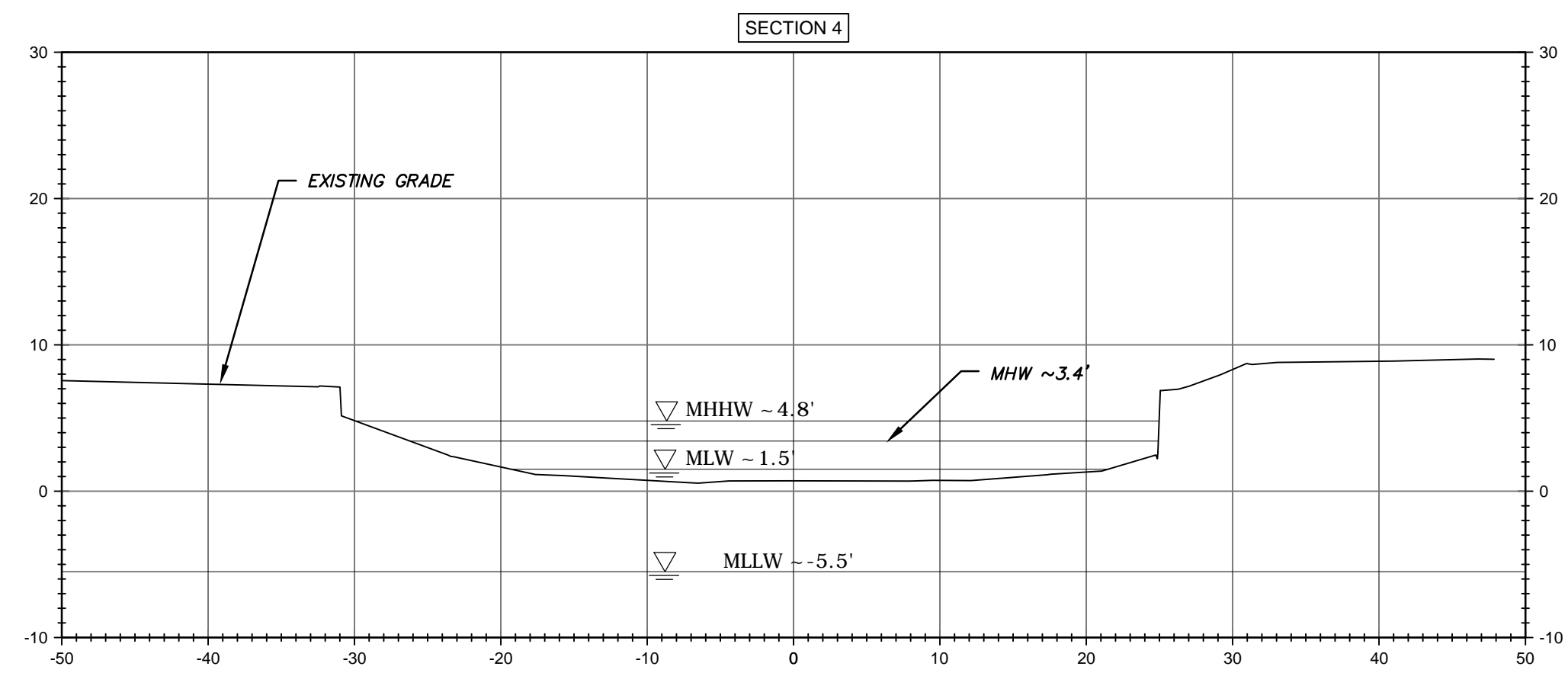
SCALE: 1" = 20'



NOTES:

- PROPERTY LINES WERE OBTAINED FROM ASSESSORS AND NOT SURVEYED.
- ANY RUBBLE THAT HAS FALLEN INTO THE BROOK SHALL BE REMOVED WITH THE REMOVAL OF THE EXISTING RETAINING WALL.

Last Saved: 6/29/2021 4:47pm By: DWB/ragshaw
Plotted On: Jun 29, 2021 4:47pm
Figure 8: Bond, Inc. 2101476 Manchester MA Hydro Study\014-Sawmill-Central Pond\PermitTask_4-Final Design\AutoCAD\Sheet\M1476-014-C-001_EC.dwg



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SCALES ACCORDINGLY

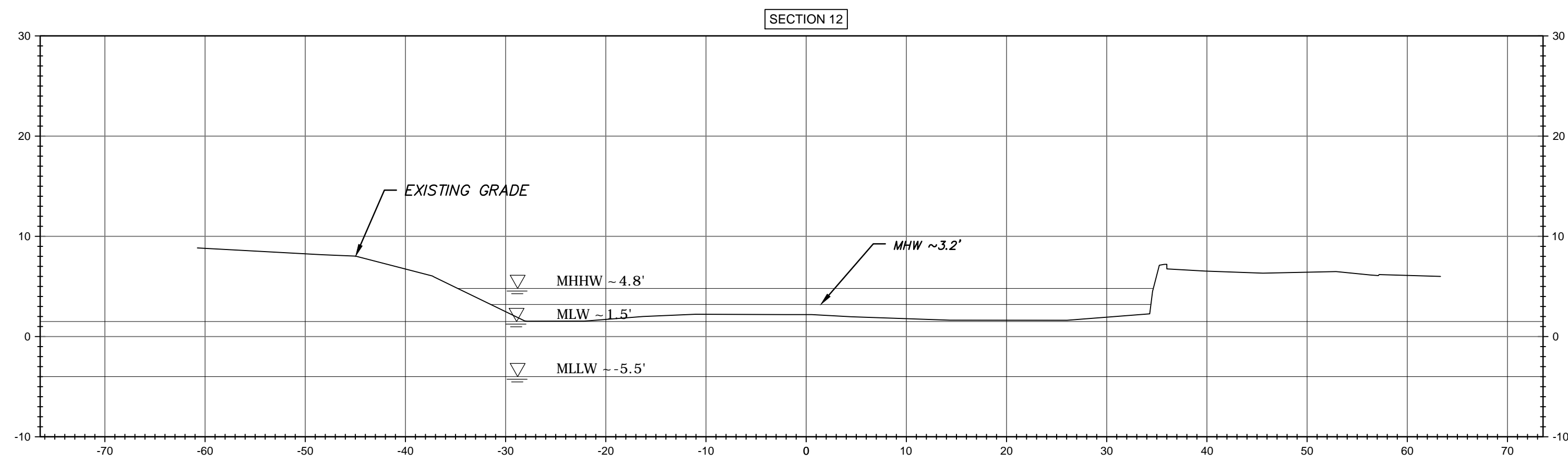
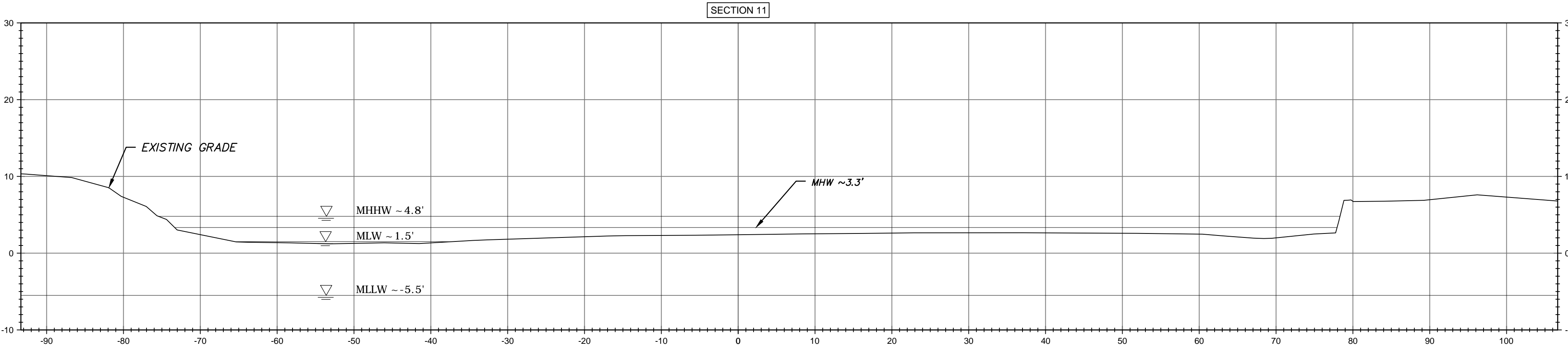
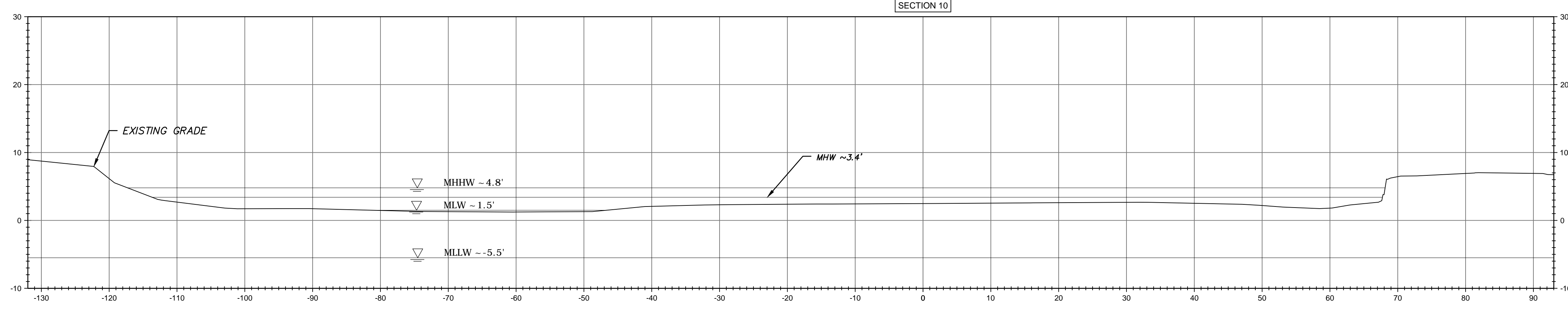
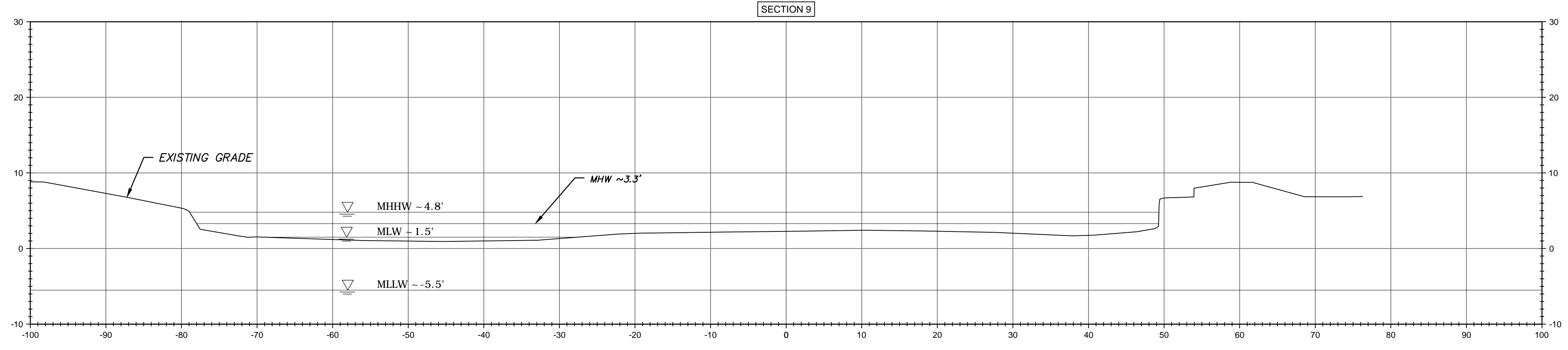
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PROJECT NO: M1467-014
DATE: JUNE 30, 2021
FILE: M1476-014-C-002_EXsec.dwg
DRAWN BY: DWB, TMP
CHECKED: DLM
APPROVED: DAM

EXISTING CROSS
SECTIONS - 1

SCALE: HOR: 1"=10'; VER: 1"=10'

C-002



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POND
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Manchester
-by-the-Sea, MA

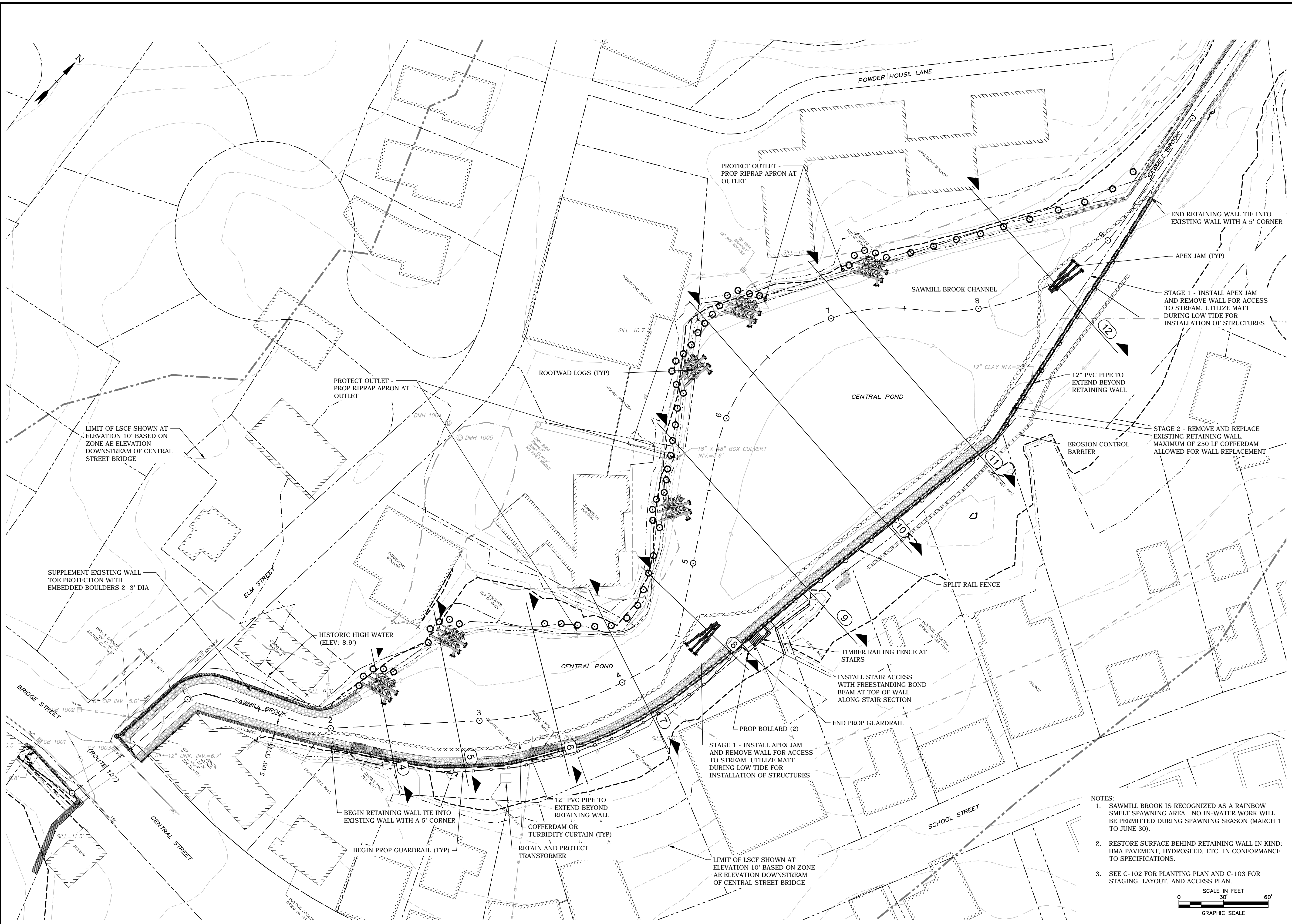
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MARK	DATE	DESCRIPTION

EXISTING CROSS SECTIONS - 2

SCALE: HOR: 1"=10'; VER: 1"=10'

C-003



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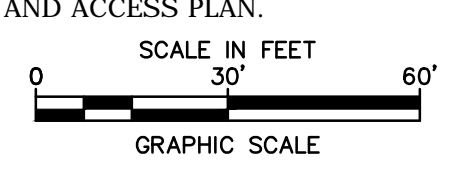
CENTRAL
POND
RESTORATION

Central Street
to Knight Circle

Manchester
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VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
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- NOTES:
- SAWMILL BROOK IS RECOGNIZED AS A RAINBOW SMELT SPAWNING AREA. NO IN-WATER WORK WILL BE PERMITTED DURING SPAWNING SEASON (MARCH 1 TO JUNE 30).
 - RESTORE SURFACE BEHIND RETAINING WALL IN KIND; HMA PAVEMENT, HYDROSEED, ETC. IN CONFORMANCE TO SPECIFICATIONS.
 - SEE C-102 FOR PLANTING PLAN AND C-103 FOR STAGING, LAYOUT, AND ACCESS PLAN.



MARK	DATE	DESCRIPTION
PROJECT NO:	M1467-014	
DATE:	JUNE 30, 2021	
FILE:	M1476-014-C-100_SP.dwg	
DRAWN BY:	DWB, JEP	
CHECKED:	DLM	
APPROVED:	DAM	

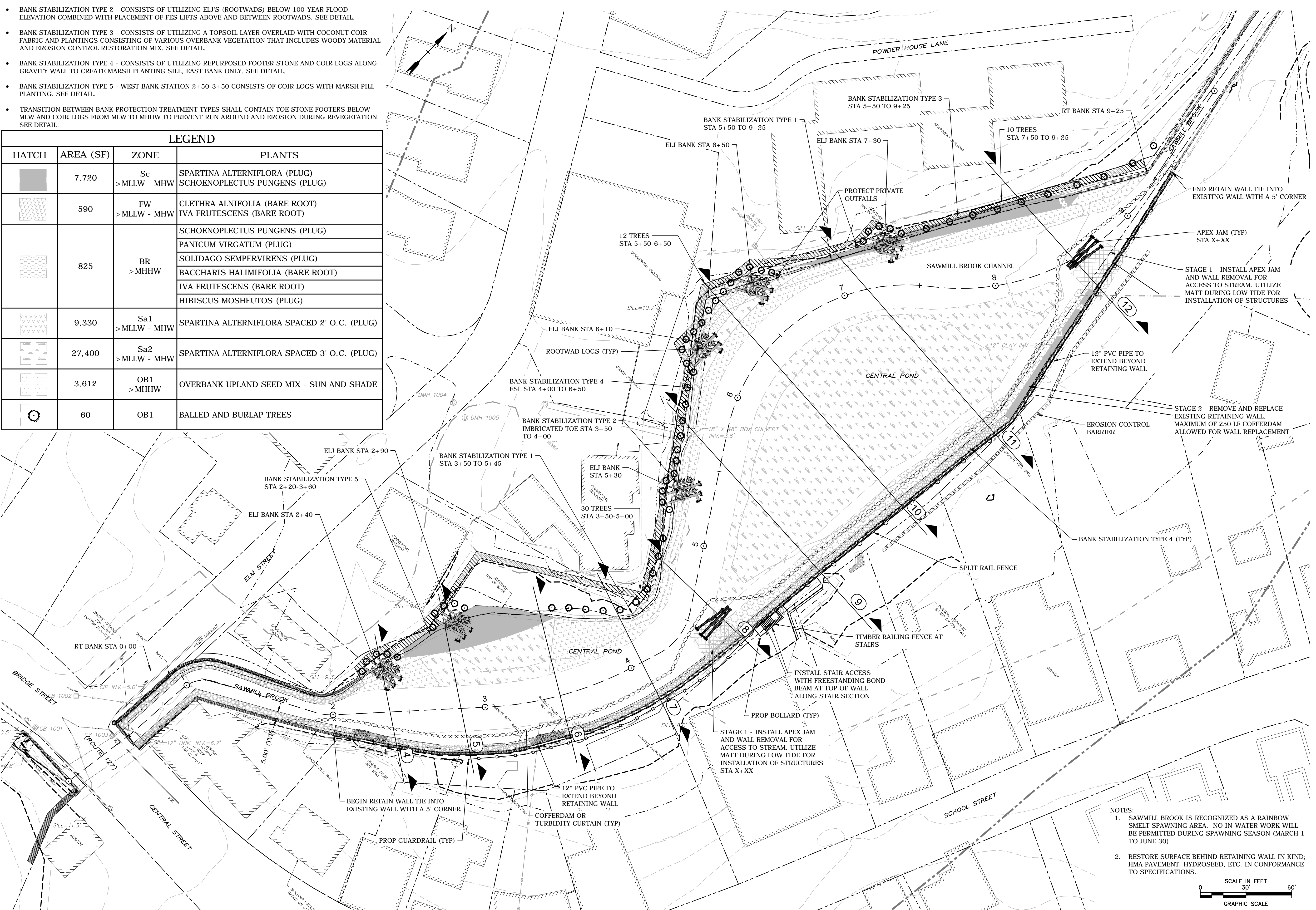
SITE PLAN

SCALE: 1" = 30'

Last Saved: 6/29/2021 4:49pm By: DWBrajshaw
 Plotted On: Jun 29, 2021 4:49pm By: DWBrajshaw
 Title: C-101.dwg
 Project: M1476-014-C-100_SP.dwg
 Study: 014-Sawmill_Central_PondRestoration
 Task: 4-Final_DesignAutoCAD_Sheet11726-014-C-100_SP.dwg

- BANK STABILIZATION TYPE 1 - CONSISTS OF UTILIZING BURIED FES, WOODY MATERIAL AND STONE MIX IN A CONTINUOUS CONFIGURATION, LOCATED ALONG THE OUTSIDE OF BENDS. SEE DETAIL.
- BANK STABILIZATION TYPE 2 - CONSISTS OF UTILIZING ELJ'S (ROOTWADS) BELOW 100-YEAR FLOOD ELEVATION COMBINED WITH PLACEMENT OF FES LIFTS ABOVE AND BETWEEN ROOTWADS. SEE DETAIL.
- BANK STABILIZATION TYPE 3 - CONSISTS OF UTILIZING A TOPSOIL LAYER OVERLAID WITH COCONUT COIR FABRIC AND PLANTINGS CONSISTING OF VARIOUS OVERBANK VEGETATION THAT INCLUDES WOODY MATERIAL AND EROSION CONTROL RESTORATION MIX. SEE DETAIL.
- BANK STABILIZATION TYPE 4 - CONSISTS OF UTILIZING REPURPOSED FOOTER STONE AND COIR LOGS ALONG GRAVITY WALL TO CREATE MARSH PLANTING SILL. EAST BANK ONLY. SEE DETAIL.
- BANK STABILIZATION TYPE 5 - WEST BANK STATION 2+50-3+50 CONSISTS OF COIR LOGS WITH MARSH PILL PLANTING. SEE DETAIL.
- TRANSITION BETWEEN BANK PROTECTION TREATMENT TYPES SHALL CONTAIN TOE STONE FOOTERS BELOW MLW AND COIR LOGS FROM MLW TO MHHW TO PREVENT RUN AROUND AND EROSION DURING REVEGETATION. SEE DETAIL.

LEGEND			
HATCH	AREA (SF)	ZONE	PLANTS
[Hatch]	7,720	Sc >MLLW - MHW	SPARTINA ALTERNIFLORA (PLUG) SCHOENOPLECTUS PUNGENS (PLUG)
[Hatch]	590	FW >MLLW - MHW	CLETHRA ALNIFOLIA (BARE ROOT) IVA FRUTESCENS (BARE ROOT)
[Hatch]	825	BR >MHHW	SCHOENOPLECTUS PUNGENS (PLUG) PANICUM VIRGATUM (PLUG) SOLIDAGO SEMPERVIRENS (PLUG) BACCHARIS HALIMIFOLIA (BARE ROOT) IVA FRUTESCENS (BARE ROOT) HIBISCUS MOSHEUTOS (PLUG)
[Hatch]	9,330	Sa1 >MLLW - MHW	SPARTINA ALTERNIFLORA SPACED 2' O.C. (PLUG)
[Hatch]	27,400	Sa2 >MLLW - MHW	SPARTINA ALTERNIFLORA SPACED 3' O.C. (PLUG)
[Hatch]	3,612	OB1 >MHHW	OVERBANK UPLAND SEED MIX - SUN AND SHADE
[Hatch]	60	OB1	BALLED AND BURLAP TREES



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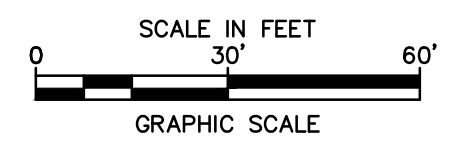
Central Street
to Knight Circle

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VERIFY SCALE
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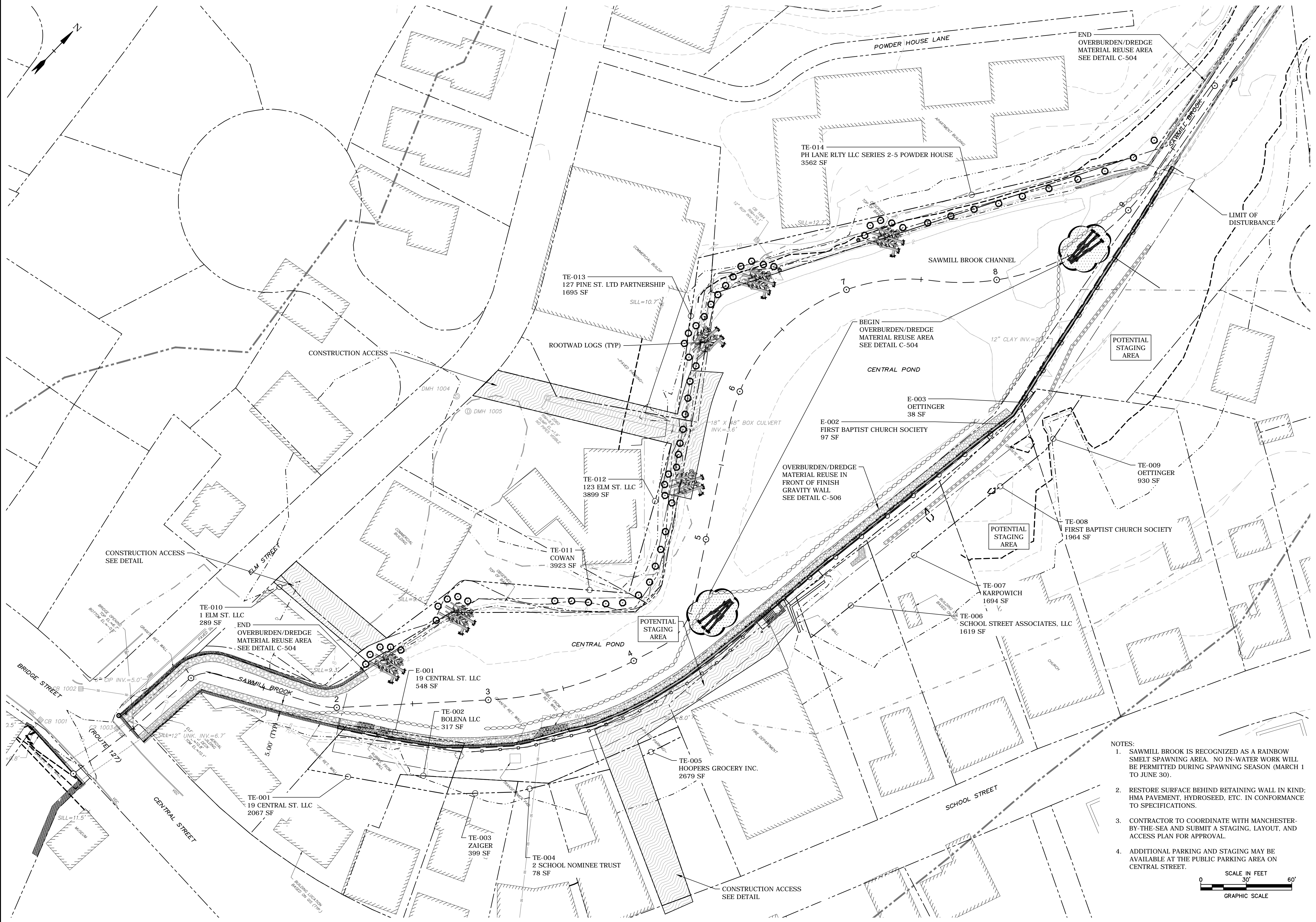
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PROJECT NO:	M1467-014	
DATE:	JUNE 30, 2021	
FILE:	M1476-014-C-100_SP.dwg	
DRAWN BY:	DWB, JEP	
CHECKED:	DLM	
APPROVED:	DAM	

- NOTES:
- SAWMILL BROOK IS RECOGNIZED AS A RAINBOW SMELT SPAWNING AREA. NO IN-WATER WORK WILL BE PERMITTED DURING SPAWNING SEASON (MARCH 1 TO JUNE 30).
 - RESTORE SURFACE BEHIND RETAINING WALL IN KIND: HMA PAVEMENT, HYDROSEED, ETC. IN CONFORMANCE TO SPECIFICATIONS.



PLANTING PLAN
SCALE: 1" = 30'
C-102

Last Saved: 6/29/2021 4:49pm By: DWBrajshaw
 Plotted On: Jun 29, 2021 4:49pm By: DWBrajshaw
 Title: C-102.dwg
 Project: M1476-014-C-100-SP.dwg
 Study: 014-Sawmill_Central_PondRestoration
 Task: 4-Final_Design/Construction/Sheet/M1476-014-C-100_SP.dwg



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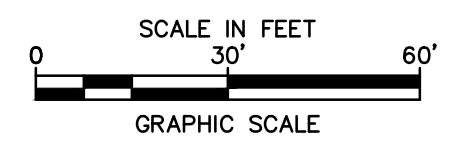
CENTRAL
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- NOTES:
- SAWMILL BROOK IS RECOGNIZED AS A RAINBOW SMELT SPAWNING AREA. NO IN-WATER WORK WILL BE PERMITTED DURING SPAWNING SEASON (MARCH 1 TO JUNE 30).
 - RESTORE SURFACE BEHIND RETAINING WALL IN KIND: HMA PAVEMENT, HYDROSEED, ETC. IN CONFORMANCE TO SPECIFICATIONS.
 - CONTRACTOR TO COORDINATE WITH MANCHESTER-BY-THE-SEA AND SUBMIT A STAGING, LAYOUT, AND ACCESS PLAN FOR APPROVAL.
 - ADDITIONAL PARKING AND STAGING MAY BE AVAILABLE AT THE PUBLIC PARKING AREA ON CENTRAL STREET.

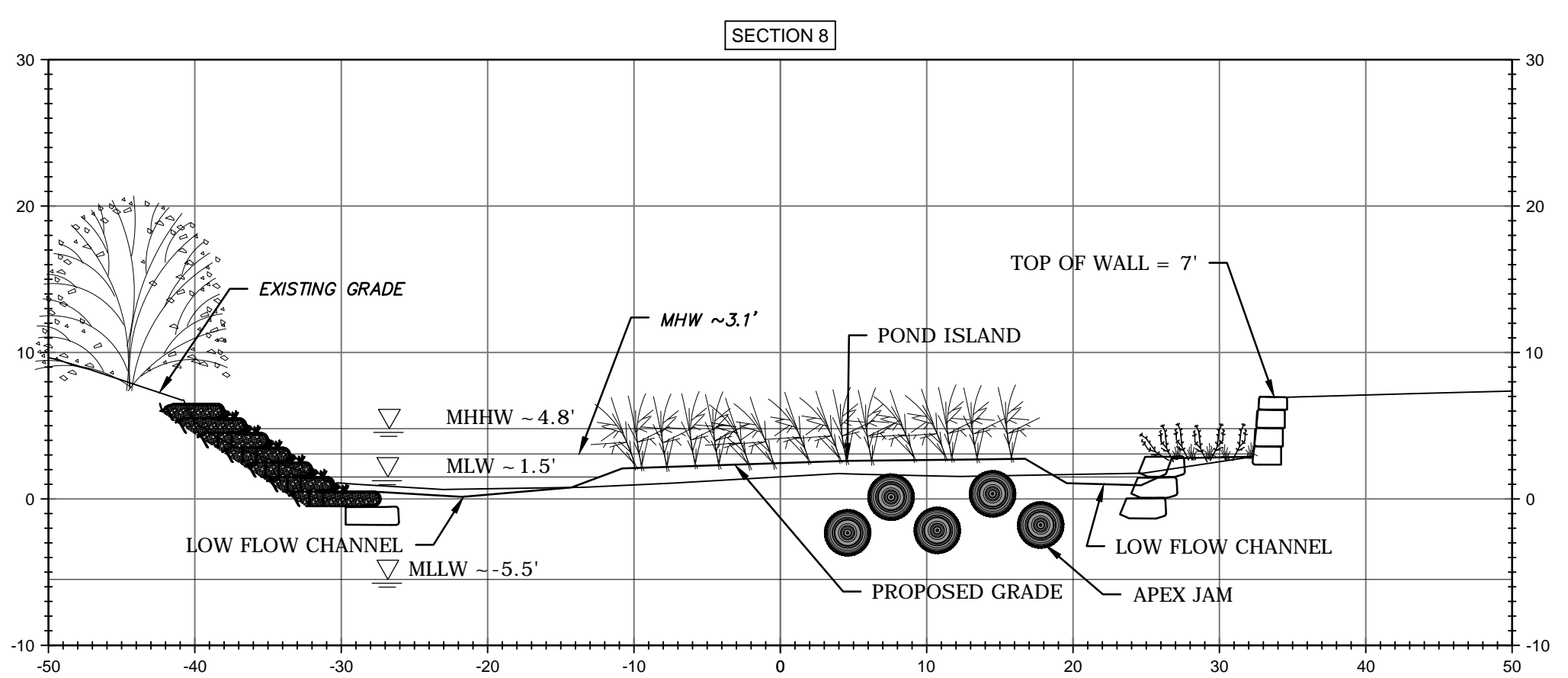
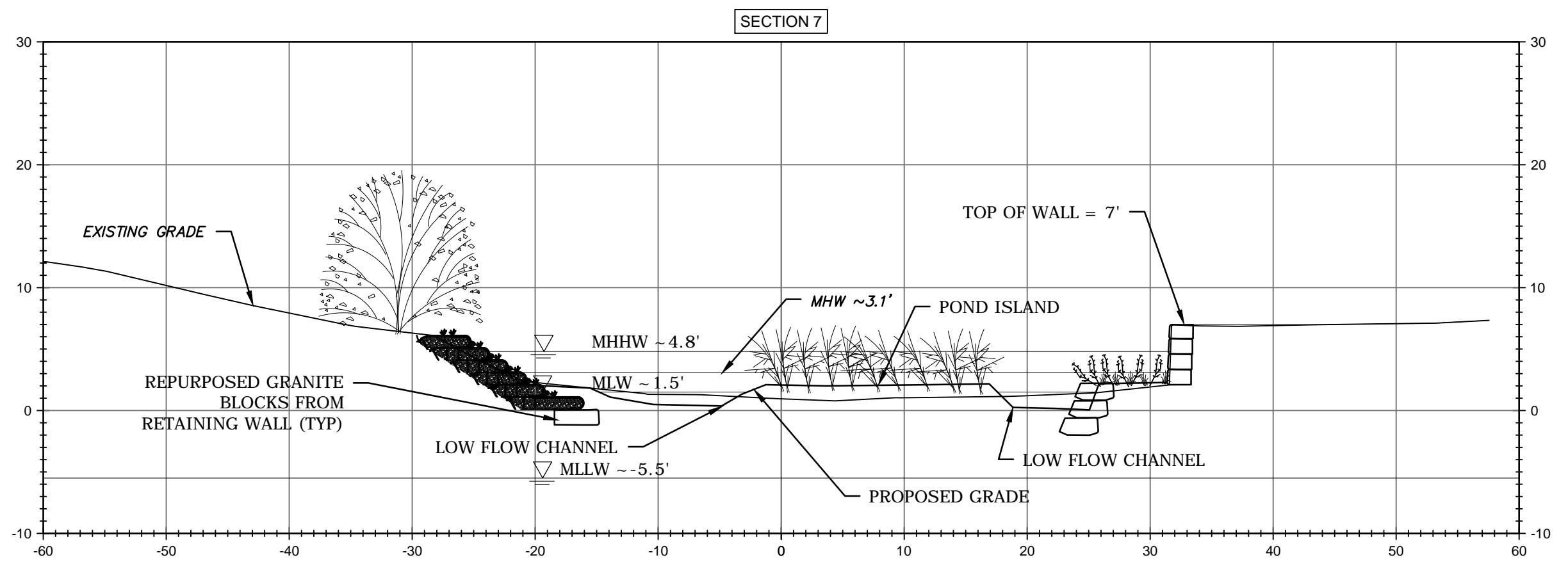
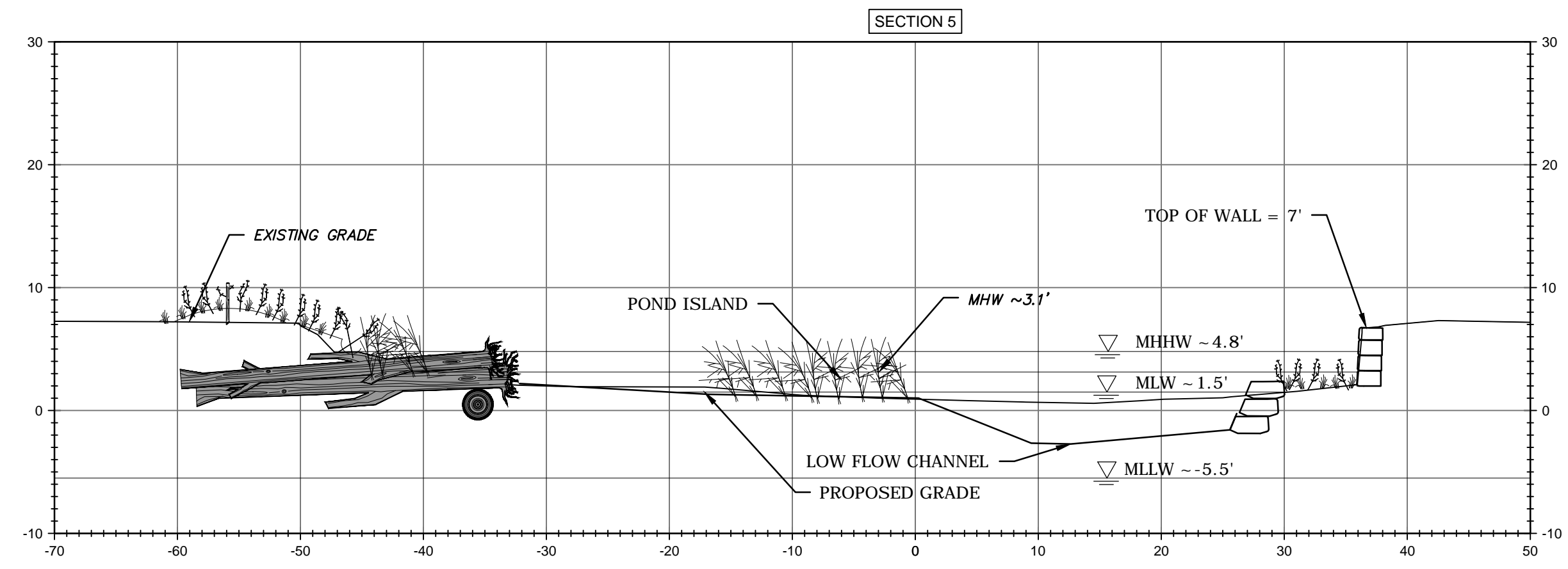
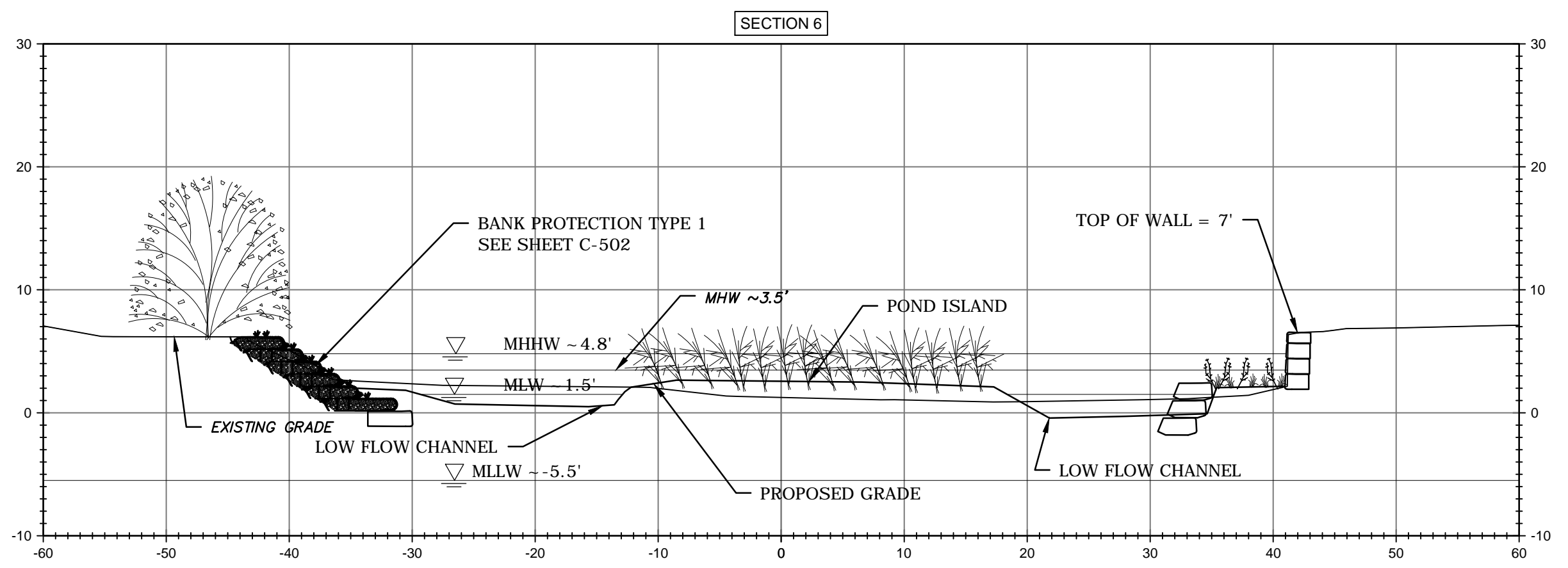
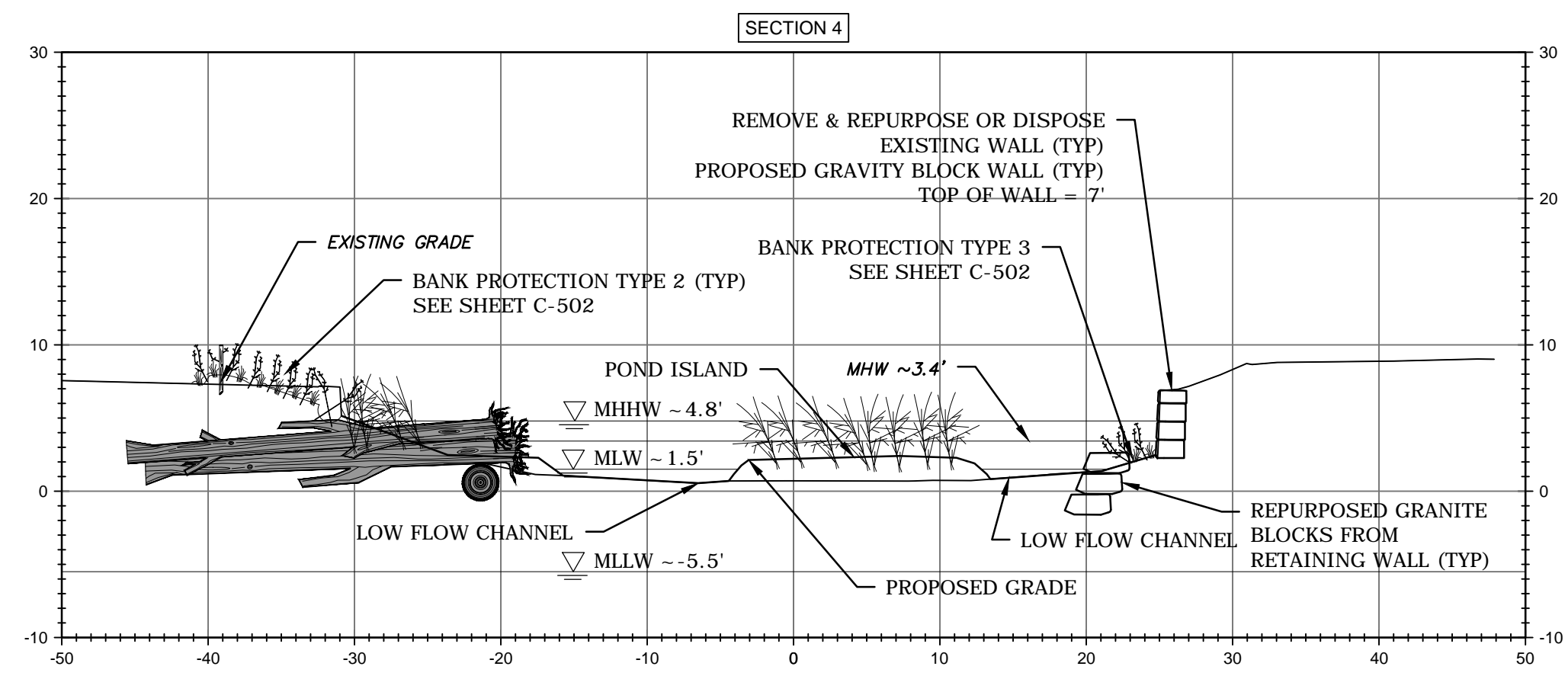


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DATE:	JUNE 30, 2021	
FILE:	M1476-014-C-100_SP.dwg	
DRAWN BY:	DWB, JEP	
CHECKED:	DLM	
APPROVED:	DAM	

EASEMENTS, ACCESS, AND STAGING

SCALE: 1" = 30'

Last Saved: 6/29/2021 4:49pm By: DWB/dgshaw
 Plotted On: Jun 29, 2021 4:49pm
 Project: M1476-014-C-100-SP.dwg
 Study: 014-Sawmill-Central-PondPermitTask-4-Final-DesignAutoCAD/Sheet/M1476-014-C-100-SP.dwg



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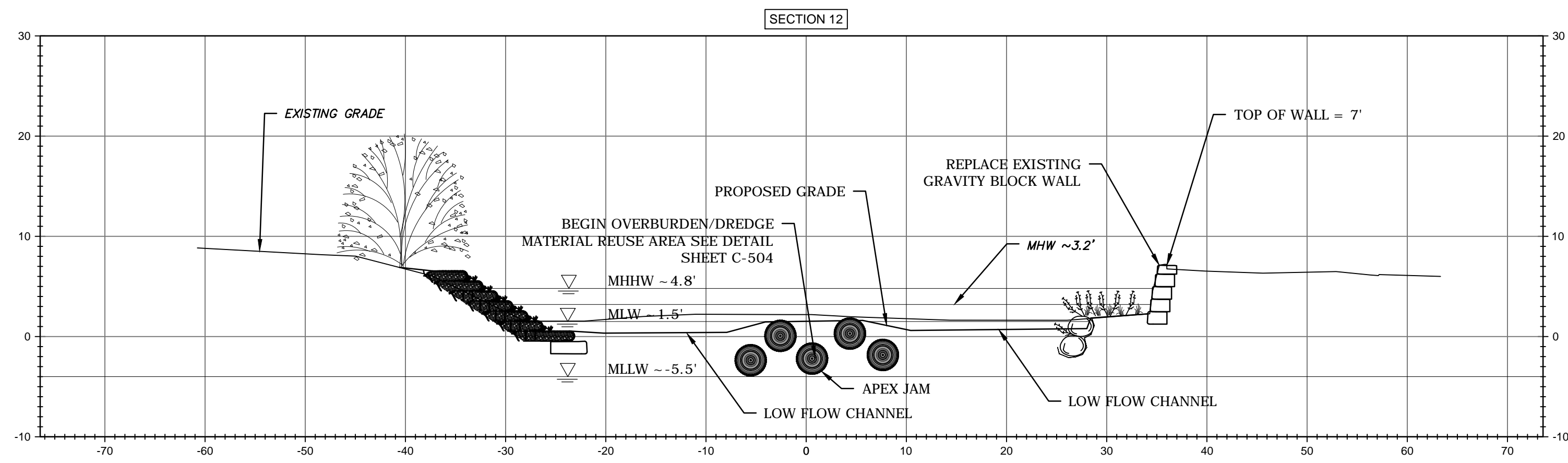
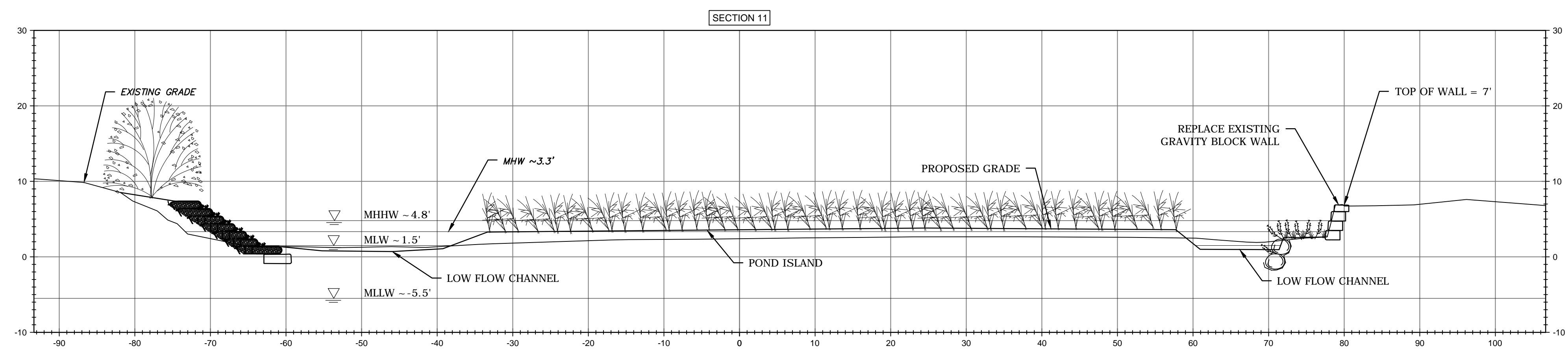
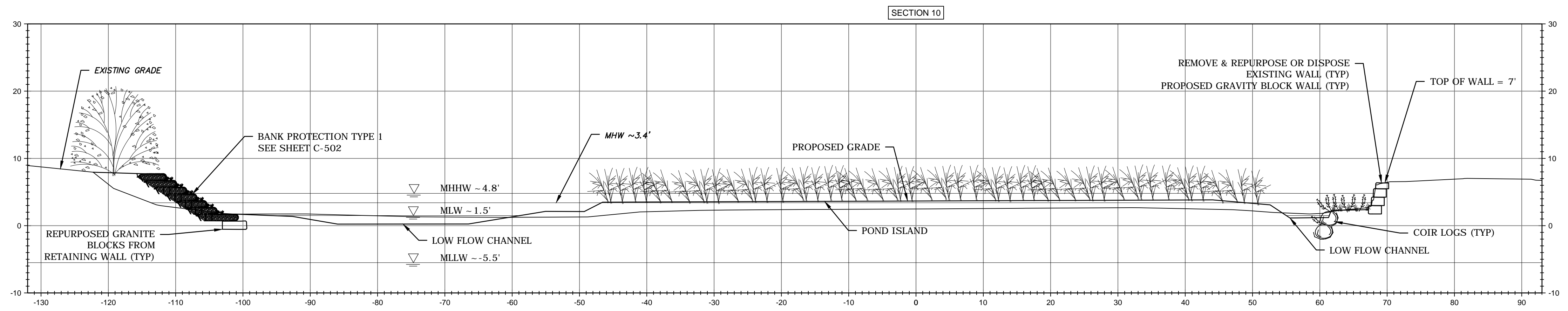
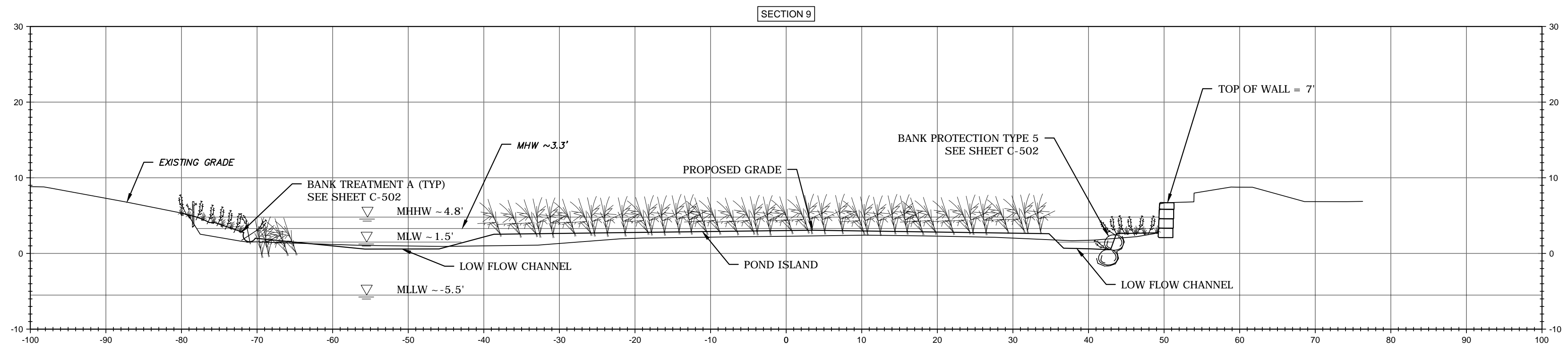
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DATE:	JUNE 30, 2021	
FILE:	M1476-014-C-104_xsec.dwg	
DRAWN BY:	DWB, TMP	
CHECKED:	DLM	
APPROVED:	DAM	

PROPOSED CROSS
SECTIONS - 1

SCALE: HOR: 1"=10'; VER: 1"=10'

C-104

Last Saved: 6/29/2021 4:49pm By: DWB/Bradshaw
 Plotted On: Jun 29, 2021 4:49pm
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MARK	DATE	DESCRIPTION

PROPOSED CROSS SECTIONS - 2
SCALE: HOR: 1"=10'; VER: 1"=10'

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BEST MANAGEMENT PRACTICES

INSPECTION AND MAINTENANCE

- SEDIMENT, EROSION CONTROLS, AND BEST MANAGEMENT PRACTICES (BMPs) SHALL BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION AT THE SITE. NO WORK WHICH SHALL DISTURB THE SITE OR CREATE THE POTENTIAL FOR SEDIMENT RELEASE SHALL COMMENCE UNTIL THE SEDIMENT AND EROSION CONTROLS HAVE BEEN INSPECTED AND APPROVED BY THE OWNER, ENGINEER, AND REGULATORY AGENCIES. ALL CONTROLS AND BMPs SHALL BE SUBJECT TO INSPECTION BY THE OWNER, HIS REPRESENTATIVE, AND REGULATORY AGENCIES AT ANYTIME THEREAFTER.
- PERIODIC INSPECTION, MAINTENANCE, AND CLEANING OF TEMPORARY EROSION OF SEDIMENT CONTROL MEASURES AND BMPs SHALL BE REQUIRED. ALL CONTROLS AND BMPs SHALL BE INSPECTED EVERY 7 DAYS AND WITHIN 24 HOURS OF RAINFALL EVENTS OF 0.25 INCHES OR GREATER. ROUTINE INSPECTION AND MAINTENANCE WILL REDUCE THE CHANCE OF POLLUTING STORMWATER BY FINDING AND CORRECTING PROBLEMS BEFORE THE NEXT RAIN EVENT. THE FOCUS OF THE INSPECTION WILL BE TO DETERMINE:
 1. WHETHER OR NOT THE MEASURE WAS INSTALLED / PERFORMED CORRECTLY;
 2. WHETHER OR NOT THERE HAS BEEN ANY DAMAGE TO THE MEASURE SINCE IT WAS INSTALLED OR PERFORMED; AND
 3. WHAT SHOULD BE DONE TO CORRECT ANY PROBLEMS WITH THE MEASURE. EACH MEASURE IS TO BE OBSERVED TO DETERMINE IF IT IS STILL EFFECTIVE.
 IN SOME CASES, SPECIFIC MEASUREMENTS MAY BE TAKEN TO DETERMINE IF MAINTENANCE OF THE MEASURES IS REQUIRED.

SITE MANAGER

- PRIOR TO CONSTRUCTION, A SITE MANAGER WILL BE DESIGNATED BY THE CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION, MONITORING, INSPECTION, AND CORRECTION OF EROSION AND SEDIMENT CONTROL MEASURES.

CONSTRUCTION SITE ENTRANCE

- TO REDUCE THE TRACKING OF SEDIMENT FROM THE CONSTRUCTION SITE ONTO OTHER AREAS OF THE PROPERTY AND/OR PUBLIC ROADS, AS WELL AS THE PRODUCTION OF AIRBORNE DUST, A STABILIZED CONSTRUCTION ENTRANCE IS TO BE ESTABLISHED AT ANY PERMANENT CONSTRUCTION STAGING AREA. THE ENTRANCE IS TO CONSIST OF RUBBER TIRE MATS WITH TIE WASH AND SEDIMENT BASIN WHERE ASPHALT STAGING IS THE SURFACE, OTHERWISE A 6-INCH THICK PAD OF CRUSHED STONE UNDERLAIN WITH FILTER FABRIC OR A BITUMINOUS CONCRETE APRON. IT IS TO BE REMOVED AND THE AREA RESTORED FOLLOWING CONSTRUCTION. CONTRACTOR TO PROVIDE TRUCK WASH PLAN FOR REVIEW AND APPROVAL BY THE TOWN AND THE ENGINEER.

SITE CLEARING

- DURING SITE CLEARING, EXISTING VEGETATION WITHIN THE OVERALL LIMITS OF CLEARING AND GRUBBING SHALL BE REMOVED, EXCEPT AS OTHERWISE DIRECTED. PRIOR TO ANY SITE CLEARING ACTIVITIES, SEDIMENT CONTROL BARRIERS SHALL BE PLACED ALONG THE OUTER LIMIT OF DISTURBANCE. CLEARING IS TO BE LIMITED TO THOSE AREAS OF PROPOSED WORK. DISTURBED AREAS ARE TO BE KEPT TO A MINIMUM. NO TREE WITH A BREAST HEIGHT DIAMETER OF GREATER THAN 6 INCHES SHALL BE CLEARED FROM AREAS OUTSIDE THE LIMITS OF CLEARING AND GRUBBING WITHOUT PRIOR APPROVAL BY ENGINEER.

DUST CONTROL

- STANDARD DUST CONTROL MEASURES, INCLUDING SPRAYING AND MISTING SHALL BE USED AS NECESSARY. CALCIUM CHLORIDE SHALL NOT BE ALLOWED ON THIS PROJECT.

STAGING AREAS

- THE CONTRACTOR SHALL COORDINATE LAYDOWN STAGING AREAS FOR STORING EQUIPMENT AND MATERIALS WITH THE OWNER.
- STAGING AREAS SHALL BE SURROUNDED WITH COMPOST FILTER TUBE EROSION BARRIERS ON THE DOWNHILL SIDE.
- DURING AND AFTER CONSTRUCTION, ALL PAVED ROAD AND DRIVEWAY SURFACES ARE TO BE SCRAPED AND BROOMED FREE OF EXCAVATED MATERIALS ON A DAILY BASIS, UNLESS APPROVED BY THE OWNER.

STOCKPILED MATERIALS

- STOCKPILES OF SOIL CREATED DURING CONSTRUCTION ACTIVITIES ARE TO BE SURROUNDED WITH AN EROSION CONTROL BARRIER AROUND THE PERIMETER OF THE STOCKPILE. STOCKPILES OF ERODIBLE MATERIAL ARE TO BE COVERED PRIOR TO INCLEMENT WEATHER WITH A MINIMUM OF 20 MIL POLYETHYLENE SHEETING. STOCKPILES LEFT UNDISTURBED LONGER THAN 14 DAYS SHALL BE SEEDED OR COVERED.

EQUIPMENT FUELING

- EQUIPMENT FUELING AND OTHER ACTIVITIES INVOLVING PETROLEUM, OIL, OR OTHER POTENTIALLY HAZARDOUS SUBSTANCES ARE TO BE PERFORMED AT PRE-APPROVED, DESIGNATED AREAS WITH APPROPRIATE SPILL PREVENTION AND CONTROL MEASURES. PORTABLE SECONDARY CONTAINMENT IS TO BE USED, AND SORBENT MATERIALS ARE TO BE PLACED AROUND THE PERIMETER OF THE FUELING AREA.

CONSTRUCTION DEWATERING

- CONSTRUCTION DEWATERING SHALL BE REQUIRED DURING PORTIONS OF CONSTRUCTION WHICH REQUIRE EXCAVATION OR OTHER ACTIVITIES WHERE GROUNDWATER MAY INTERFERE WITH THE WORK.
- CONSTRUCTION DEWATERING DISCHARGES SHALL BE PRE-TREATED FOR SEDIMENT REMOVAL BY PASSING THROUGH AN APPROPRIATELY SIZED FILTER SOCK, SILT BAG, FRACTIONATION / SEDIMENTATION TANK, OR SEDIMENT TRAP PRIOR TO DISCHARGE, AS NECESSARY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DEWATERING TECHNIQUES AND MAINTAINING DEWATERING PROCEDURES THROUGHOUT THE DURATION OF THE PROJECT.

OUTLET PROTECTION

- APPROPRIATE OUTLET PROTECTION, CONSISTING OF A LEVEL SPREADER SHALL BE PROVIDED AT THE OUTLET OF ANY DEWATERING CONDUIT OR STORMWATER CULVERT OR CHANNEL OUTFALL TO REDUCE VELOCITIES AND ENHANCE SEDIMENTATION PRIOR TO DISCHARGE.

LIMITS OF WORK

- THE CONTRACTOR SHALL LINE THE UPGRADIENT BOUNDARY OF WORK AREAS WITH ORANGE SAFETY FENCING BEFORE THE START OF SITE CLEARING ACTIVITIES EXCEPT WHERE CHAIN-LINK FENCING IS NEEDED TO RESTRICT PUBLIC ACCESS.

SURFACE WATER CONTROL

- THE CONTRACTOR MUST MAINTAIN THE SITE FLOWAGE OF SURFACE WATER THROUGH THE WORK AREA IN ACCORDANCE WITH THE SPECIFICATIONS. ALL COFFERDAMS SHALL CONSIST OF NON-ERODIBLE MATERIAL. THE CONTRACTOR SHALL SUBMIT A WATER CONTROL PLAN THAT WILL ADDRESS EMERGENCY MEASURES TO IMPLEMENT IN THE EVENT A STORM OCCURS DURING CONSTRUCTION.

TURBIDITY MONITORING AND CONTROL

- TURBIDITY SHALL BE MONITORED AND CONTROLLED BY THE CONTRACTOR. A TURBIDITY CURTAIN SHALL BE INSTALLED SURROUNDING AREAS OF EXCAVATION AT AND BELOW THE IMPOUNDMENT WATER LINE.
- IF TURBIDITY LEVELS ARE UNACCEPTABLE AS JUDGED BY THE OWNER, ENGINEER, OR REGULATORY AGENCY, ADDITIONAL MEASURES SHALL BE IMPLEMENTED AT NO EXPENSE TO THE OWNER.

TEMPORARY STABILIZATION

- WHEN NECESSARY, TEMPORARY SLOPE PROTECTION SHALL BE PROVIDED BY INSTALLING SEDIMENT TRAP BARRIERS AT THE TOE OF FILLS OR CUT SLOPES. IF ADDITIONAL STABILIZATION IS NEEDED, THEN THE CONTRACTOR SHALL INSTALL MULCH LOGS, MATTING, SUCH AS STRAW, JUTE, WOOD FIBER, OR BIODEGRADABLE MESH. A TACKIFIER SHALL BE USED ON LOOSE MATERIALS USED FOR TEMPORARY EROSION CONTROL.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN TWO WEEKS, THE AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 100 LBS. PER 1,000 S.F. TO HELP CONTROL EROSION. 100% BIODEGRADABLE EROSION CONTROL BLANKETS OR TWO INCHES OF WOOD CHIP MULCH MAY ALSO BE USED AS TEMPORARY COVER.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN ONE MONTH, THE AREAS SHALL BE TOPSOILED AND SEEDED AS PER THE SPECIFICATIONS AND AT NO ADDITIONAL COST TO THE OWNER.
- LEAVE THE SURFACE OF ALL EXCAVATIONS AND FILLS IN A FIRM AND STABLE CONDITION AT THE END OF EACH DAY. ROLL OR OTHERWISE TREAT THE SURFACE AS NEEDED.

SITE RESTORATION

- STABILIZATION OF DISTURBED AREAS OR NEW SOIL FILLS SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY AND PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF PREVIOUSLY VEGETATED UPLAND AREAS DISTURBED BY CONSTRUCTION ACTIVITIES. RESTORATION OF UPLAND AREAS CONSIST OF REPLACEMENT OF TOPSOIL OR PLACEMENT OF IMPORTED LOAM AS NEEDED SUCH THAT A MINIMUM OF 4 INCHES OF SUITABLE MATERIAL IS PRESENT AND APPROPRIATELY LIMED, FERTILIZED, GRADED, AND SCARIFIED. FIELDS DISTURBED OR COMPACTED BY CONSTRUCTION ACTIVITIES SHALL BE PLOWED TO LOOSEN THE SOIL, HARROWED TO PROVIDE AN EVEN SURFACE, AND APPROPRIATELY PREPARED FOR PLANTING.
- DISTURBED UPLAND AREAS SHALL THEN BE HYDROSEEDED WITH AN APPROVED SEED MIX AT THE RATE RECOMMENDED BY THE MANUFACTURER. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING. SEED MIX SHALL BE DRY SITE RESTORATION SEED MIX UNLESS OTHERWISE NOTED OR AS APPROVED BY THE ENGINEER.
- 100% BIODEGRADABLE EROSION CONTROL BLANKETS MUST BE USED FOR STABILIZATION OF SLOPES IN EXCESS OF 3H:1V AND MAY BE USED IN LIEU OF HYDROSEEDING AT THE CONTRACTOR'S DISCRETION TO PROVIDE ADDITIONAL EROSION PROTECTION.
- FINAL STABILIZATION SHALL BE CONSIDERED COMPLETE WHEN ALL SOIL-DISTURBING ACTIVITIES HAVE BEEN COMPLETED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY PERCENT HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES (SUCH AS THE USE OF MULCHES OR EROSION CONTROL MATTING) HAVE BEEN EMPLOYED ON ALL UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL VEGETATED SURFACES, INCLUDING WATERING, FERTILIZING, REPAIRING EROSION, INVASIVE PLANT REMOVAL, AND RE-SEEDING UNTIL ESTABLISHMENT CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.

EROSION CONTROL NOTES:

1. CONTRACTOR MUST FINALIZE AND IMPLEMENT THE EROSION AND SEDIMENT CONTROL PLAN (ESCP).
2. THE ESCP SHALL BE UPDATED AS CONSTRUCTION PROGRESSES. IT SHOULD REFLECT CURRENT OWNERSHIP, RESPONSIBILITIES, OPERATIONS AND FINDINGS. THE PLAN SHALL BE REVISED NO LATER THAN 7 DAYS AFTER THE INSPECTION. IF HAZARDOUS CONDITIONS OCCUR THE PLAN NEEDS TO BE MODIFIED BEFORE PROCEEDING WITH WORK. STEPS TO PREVENT THE REOCCURRENCE OF SUCH RELEASES WILL BE IDENTIFIED IN A PLAN REVISION AND IMPLEMENTED.
3. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
4. MAINTAIN ALL EROSION CONTROL MEASURES IN GOOD WORKING CONDITION. THIS MAY REQUIRE CLEANING, REPAIRING, REPLACEMENT, AND SEDIMENT DISPOSAL. MAINTENANCE SHALL BE INITIATED WITHIN 24 HOURS OF IDENTIFICATION. SEDIMENT BARRIERS SHOULD HAVE SEDIMENT CLEANED OUT WHEN THE BARRIER IS 50% OF CAPACITY. SOIL AND DEBRIS ON ADJOINING PROPERTIES OR STREETS SHALL BE MINIMIZED. HAZARDOUS MATERIAL SPILLS SHOULD BE REMOVED IMMEDIATELY AND REMEDIAL ACTIONS FOR PREVENTION MUST BE TAKEN. HAZARDOUS MATERIALS SHALL BE CLEANED UP BY REMOVING AND DISPOSING OF CONTAMINATED MATERIALS PROPERLY.
5. SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
6. THE ESCP MEASURES SHOWN ON THIS PLAN ARE THE BASE REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, UPGRADE THESE MEASURES AS NEEDED TO COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL EROSION AND SEDIMENT CONTROL REGULATIONS.
7. EROSION AND SEDIMENT CONTROL MEASURES INCLUDING PERIMETER SEDIMENT CONTROL MUST BE IN PLACE BEFORE VEGETATION IS DISTURBED AND MUST REMAIN IN PLACE AND BE MAINTAINED, CLEANED, REPAIRED OR REPLACED, AND PROMPTLY IMPLEMENTED FOLLOWING PROCEDURES ESTABLISHED FOR THE DURATION OF CONSTRUCTION, INCLUDING PROTECTION FOR ACTIVE STORM DRAIN INLETS AND CATCH BASINS AND APPROPRIATE NON-STORMWATER POLLUTION CONTROLS.
8. PHASE CLEARING AND GRADING TO THE MAXIMUM EXTENT PRACTICAL TO PREVENT EXPOSED INACTIVE AREAS FROM BECOMING A SOURCE OF EROSION. CONSTRUCTION ACTIVITIES MUST AVOID OR MINIMIZE UNSTABILIZED EXCAVATION AND CREATION OF BARE GROUND DURING WET WEATHER.
9. PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO PREVENT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
10. IDENTIFY, MARK, AND PROTECT (BY FENCING OFF OR OTHER MEANS) CRITICAL RIPARIAN AREAS AND VEGETATION INCLUDING ALL TREES AND ASSOCIATED ROOTING ZONES, AND VEGETATION AREAS NOT SPECIFICALLY IDENTIFIED FOR REMOVAL. MARK IN THE FIELD VEGETATIVE BUFFER ZONES BETWEEN THE SITE AND SENSITIVE AREAS (E.G., WETLANDS), AND OTHER AREAS TO BE PRESERVED, ESPECIALLY IN PERIMETER AREAS.
11. THE INTENTIONAL WASHING OF SEDIMENT INTO SAWMILL BROOK MUST NOT OCCUR. VACUUMING OR DRY SWEEPING AND MATERIAL PICKUP MUST BE USED TO CLEANUP SEDIMENTS.
12. STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY.
13. APPLY TEMPORARY AND/OR PERMANENT SOIL STABILIZATION MEASURES ON ALL DISTURBED AREAS AS GRADING PROGRESSES AND FOR ALL ROADWAYS INCLUDING GRAVEL ROADWAYS.
14. ESTABLISH CONCRETE TRUCK AND OTHER CONCRETE EQUIPMENT CONTAINED WASHOUT AREAS BEFORE BEGINNING CONCRETE WORK. CONCRETE WASHOUT MUST BE CONTAINED AWAY FROM DRAINAGE AREAS. IT MUST BE CLEARLY MARKED AND ACCESSIBLE.
15. ESTABLISH MATERIAL AND WASTE STORAGE AREAS, AND OTHER NON-STORMWATER CONTROLS. DISPOSAL OF MATERIALS AND WASTE SHALL COMPLY WITH STATE AND LOCAL WASTE DISPOSAL. SANITARY WASTE AND OTHER HAZARDOUS WASTE SHALL BE DISPOSED OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
16. DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER, DISCHARGE WATER FROM DEWATERING TO THE APPROPRIATE LOCATION AND WITHOUT SEDIMENT.
17. ALL SILT-LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS IN A SEDIMENTATION BASIN OR FILTER BAG LOCATED DOWNSTREAM, PRIOR TO RELEASE TO A WATERWAY OR EXISTING DRAINAGE SYSTEM.
18. PREVENT TRACKING OF SEDIMENT OUTSIDE OF PROJECT LIMITS USING BMPs SUCH AS: GRAVELED (OR PAVED) EXITS AND PARKING AREAS, GRAVEL ALL UNPAVED ROADS LOCATED ONSITE, OR USE AN EXIT TIRE WASH. THESE BMPs MUST BE IN PLACE PRIOR TO LAND-DISTURBING ACTIVITIES. AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHT-OF-WAYS BEYOND THE PROJECT LIMITS SHALL BE SWEEPED AWAY.
19. WHEN TRUCKING SATURATED SOILS FROM THE SITE, EITHER USE WATER-TIGHT TRUCKS OR DEWATER LOADS ON SITE.
20. BMP'S SHOULD BE IMPLEMENTED AND MONITORED THROUGHOUT THE PROJECT. USE BMPs TO PREVENT OR MINIMIZE STORMWATER EXPOSURE TO POLLUTANTS FROM SPILLS; VEHICLE AND EQUIPMENT FUELING, MAINTENANCE, AND STORAGE; OTHER CLEANING AND MAINTENANCE ACTIVITIES; AND WASTE HANDLING ACTIVITIES. THESE POLLUTANTS INCLUDE FUEL, HYDRAULIC FLUID, AND OTHER OILS FROM VEHICLES AND MACHINERY, AS WELL AS DEBRIS, LEFTOVER PAINTS, SOLVENTS, AND GLUES FROM CONSTRUCTION OPERATIONS.
21. WRITTEN SPILL PREVENTION AND RESPONSE PROCEDURES, EMPLOYEE TRAINING ON SPILL PREVENTION AND PROPER DISPOSAL PROCEDURES, SPILL KITS IN ALL VEHICLES, REGULAR MAINTENANCE SCHEDULE FOR VEHICLES AND MACHINERY, MATERIAL DELIVERY AND STORAGE CONTROLS, TRAINING AND SIGNAGE, AND COVERED STORAGE AREAS FOR WASTE AND SUPPLIES. HAZARDOUS MATERIALS SHOULD BE STORED AWAY FROM THE STREAM TO ELIMINATE CHANCES FOR ACCIDENTAL SPILL SHALL BE IMPLEMENTED.
22. IF A TREATMENT (FOR EXAMPLE, ELECTRO-COAGULATION, FLOCCULATION, FILTRATION, ETC.) FOR SEDIMENT OR OTHER POLLUTANT REMOVAL IS EMPLOYED, SUBMIT AN OPERATION AND MAINTENANCE PLAN (INCLUDING SYSTEM SCHEMATIC, LOCATION OF SYSTEM, LOCATION OF INLET, LOCATION OF DISCHARGE, DISCHARGE DISPERSION DEVICE DESIGN, AND A SAMPLING PLAN AND FREQUENCY) BEFORE OPERATING THE TREATMENT SYSTEM. OBTAIN ENGINEER'S PLAN REVIEW BEFORE OPERATING THE TREATMENT SYSTEM. OPERATE AND MAINTAIN THE TREATMENT SYSTEM ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
23. TEMPORARILY STABILIZE SOILS AT THE END OF THE SHIFT BEFORE HOLIDAYS AND WEEKENDS. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT SOILS ARE STABLE DURING EVENTS AT ANY TIME.
24. STABILIZING PRACTICES : SEEDING WITH MULCH AND ROLLED EROSION CONTROL MATTING. ANY AREAS NOT SUBJECT TO CONSTRUCTION ACTIVITY FOR 14 DAYS MUST BE STABILIZED IMMEDIATELY. PRESERVE EXISTING VEGETATION IN AREAS NOT DISTURBED DURING CONSTRUCTION. ANY ON SITE STOCK PILES SHALL BE STABILIZED WITHIN 14 DAYS AFTER CONSTRUCTION ACTIVITY HAS CEASED WITH SEDIMENT BARRIERS INSTALLED.
25. FINAL STABILIZATION: MEANS THAT ALL SOIL DISTURBING ACTIVITIES AT THE SITE HAVE BEEN COMPLETED AND THAT A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% FOR THE AREA HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES HAVE BEEN EMPLOYED.

100% DESIGN
NOT FOR
CONSTRUCTION

CENTRAL
POND
RESTORATION

Central Street
to Knight Circle

Manchester
-by-the-Sea, MA

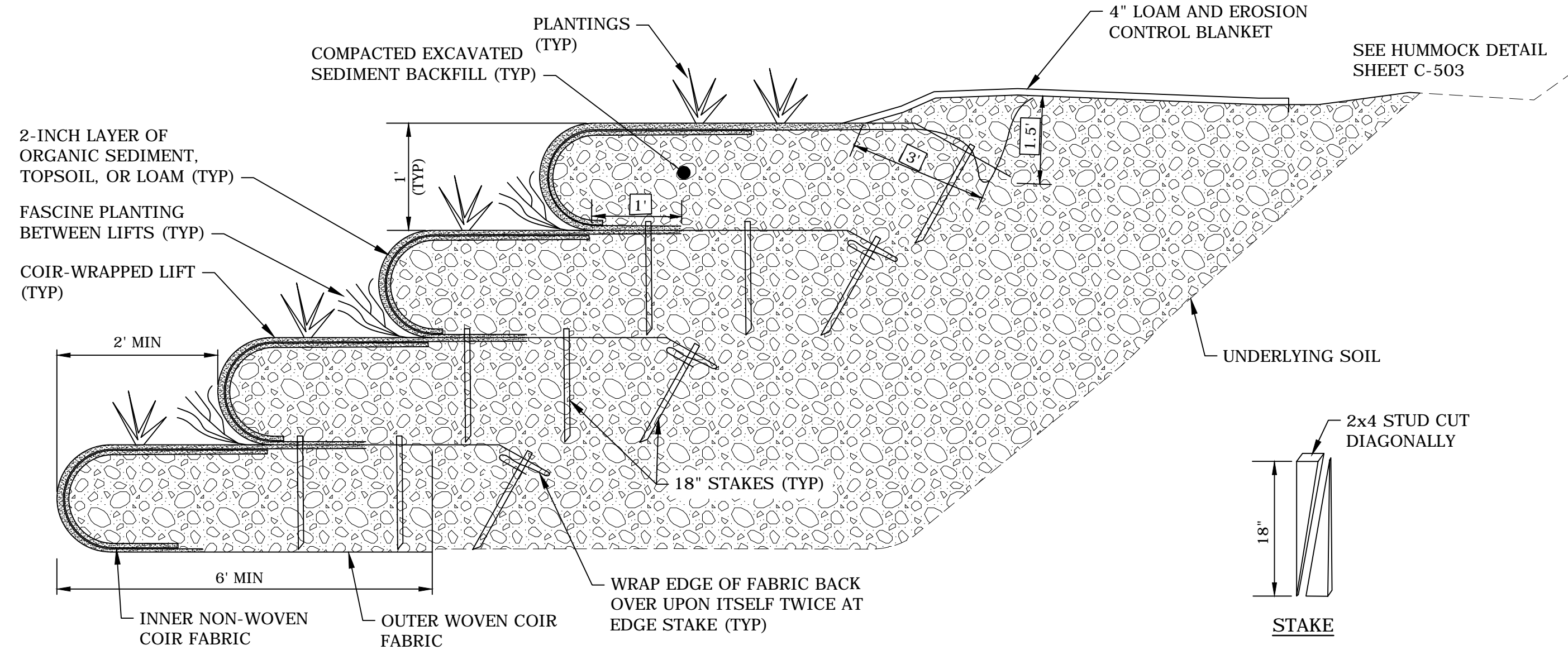
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	

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DATE:		JUNE 30, 2021
FILE: M1476-014-C-500_Details.dwg		
DRAWN BY:		DWB, TMP
CHECKED:		DLM
APPROVED:		DAM

CONTROL OF WATER NOTES

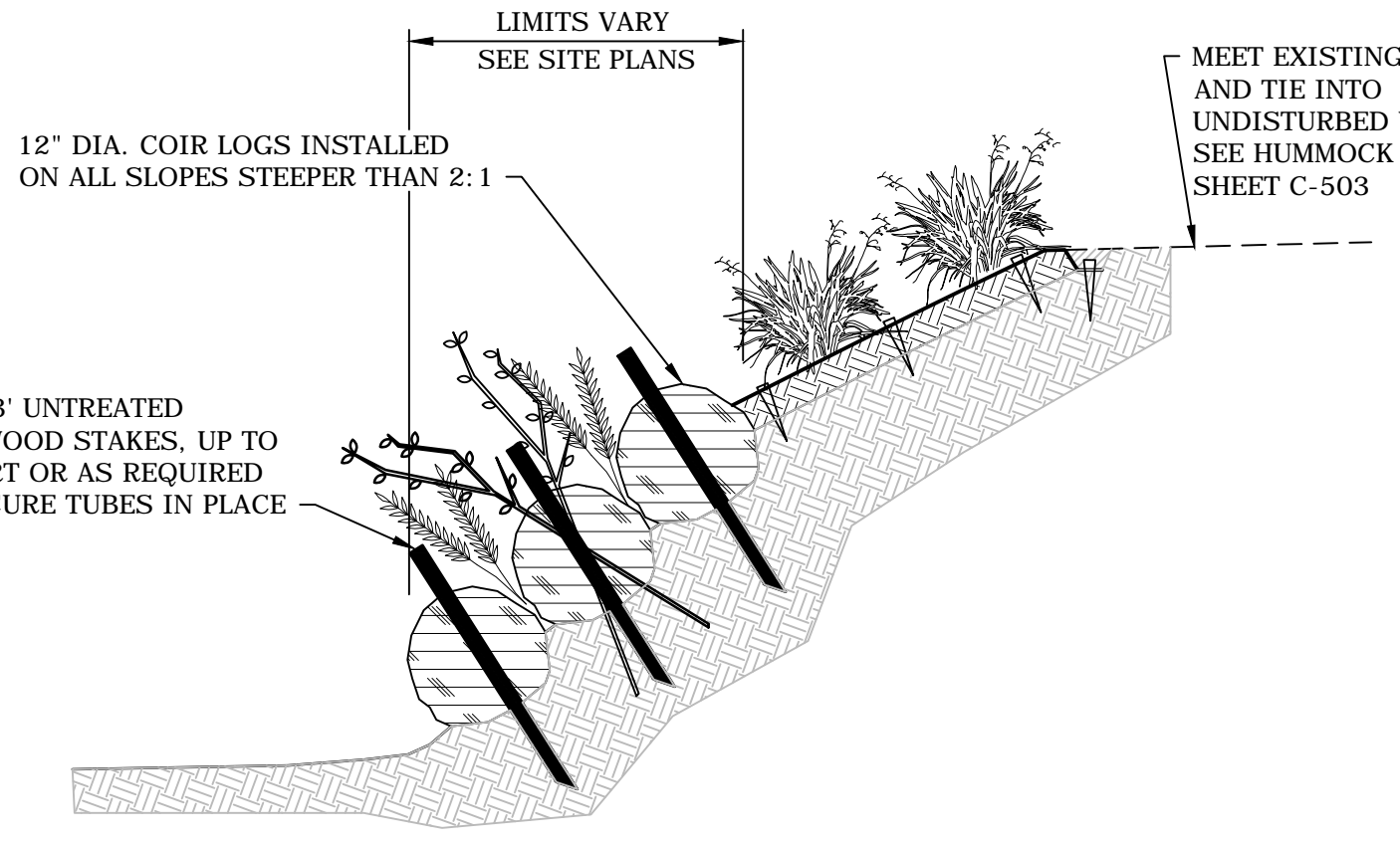
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C-501



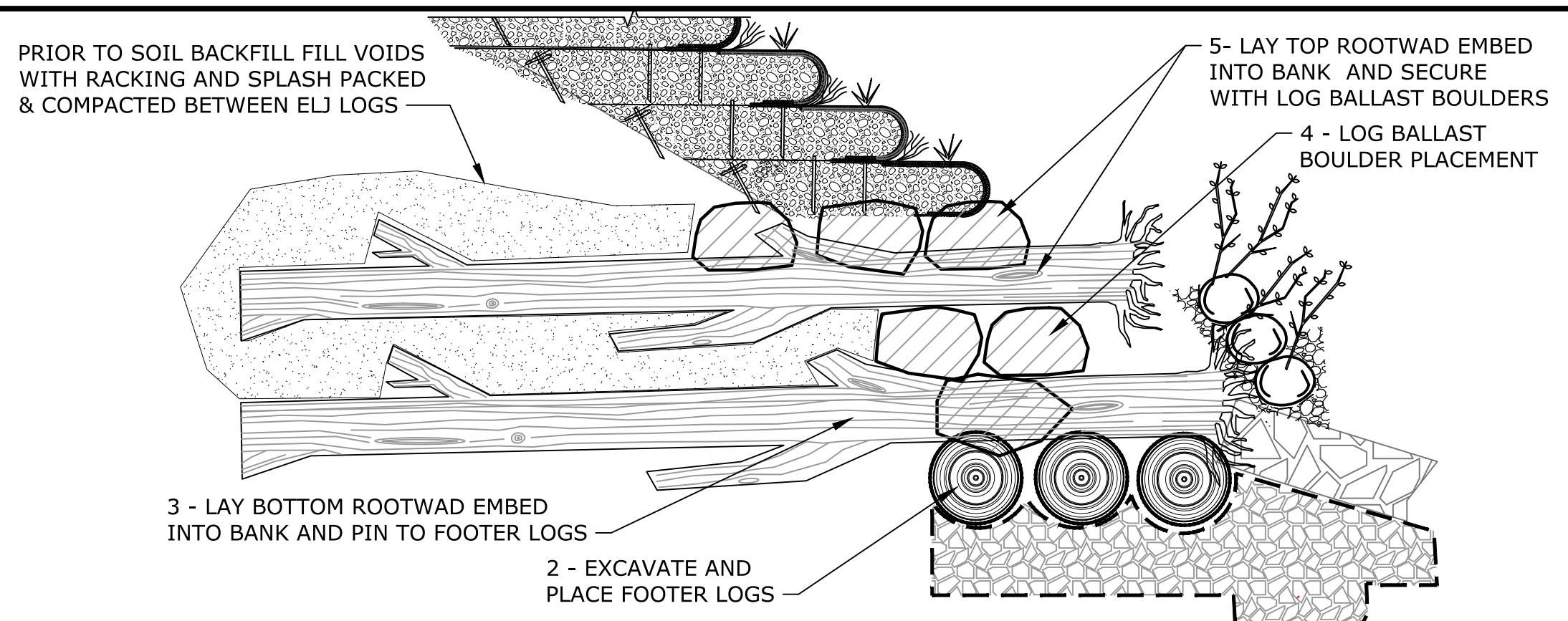
- NOTES:**
1. INSTALL ENCAPSULATED SOIL LIFTS FROM DOWNSTREAM TO UPSTREAM, WITH UPSTREAM COIR FABRIC OVERLAPPING DOWNSTREAM FABRIC BY 18" MINIMUM.
 2. USE SANDBAGS, TIMBER FORM, OR OTHER AS NECESSARY TO FORM FACE OF LIFT AND KEEP LOWER LIFTS SUFFICIENTLY DRY FOR INSTALLATION AND COMPACTION.
 3. PROTECT FROM DAMAGE WHEN CONSTRUCTED BELOW TEMPORARY ACCESS ROAD OR NEAR OTHER WORK.

**BANK STABILIZATION TYPE 1
FABRIC ENCAPSULATED SOIL LIFT (FES)**
NO SCALE



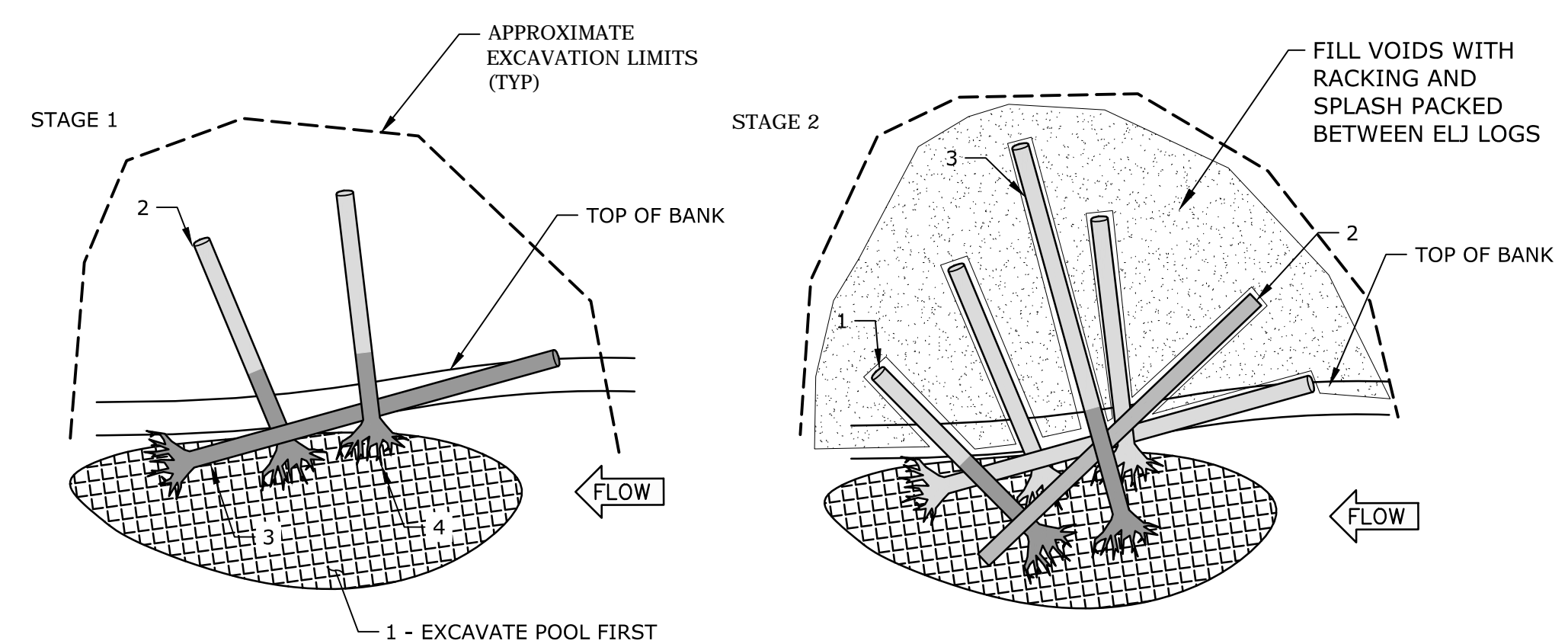
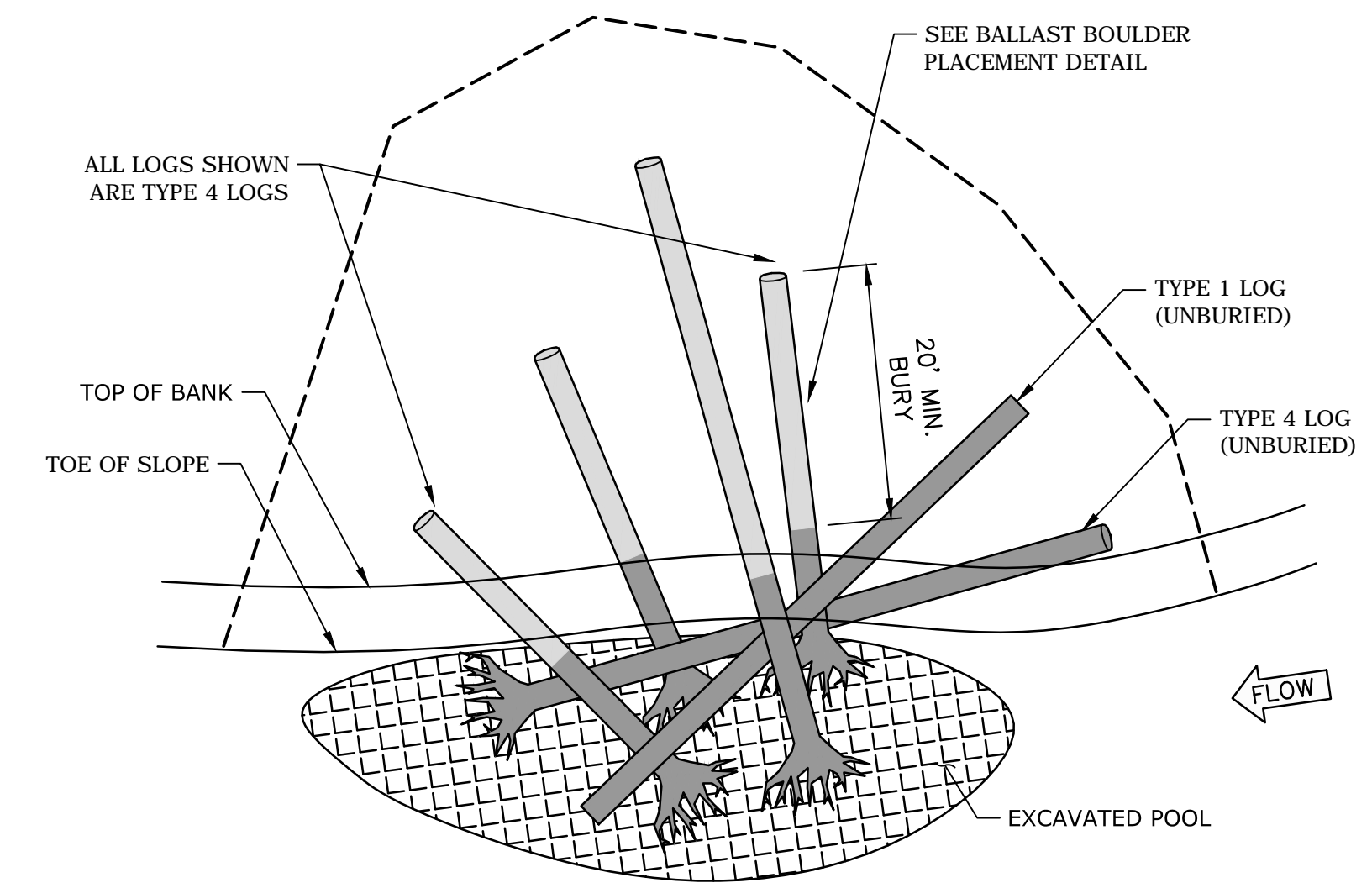
- NOTES:**
1. DETAIL SHOWN DIAGRAMATICALLY. STABILIZATION IMPROVEMENTS TO BE INSTALLED PER SITE PLAN GRADING.

**BANK STABILIZATION TYPE 3
TRANSITIONAL BANK PROTECTION TREATMENT**
NO SCALE

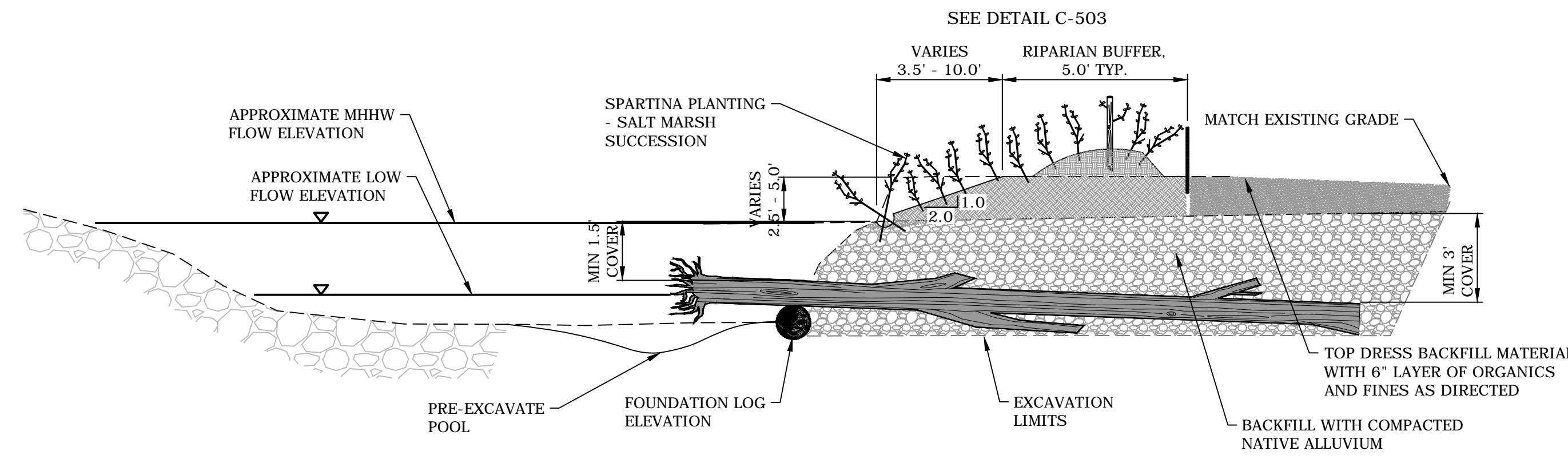


SEE BANK JAM QUANTITY TABLE ON SHEET C-507

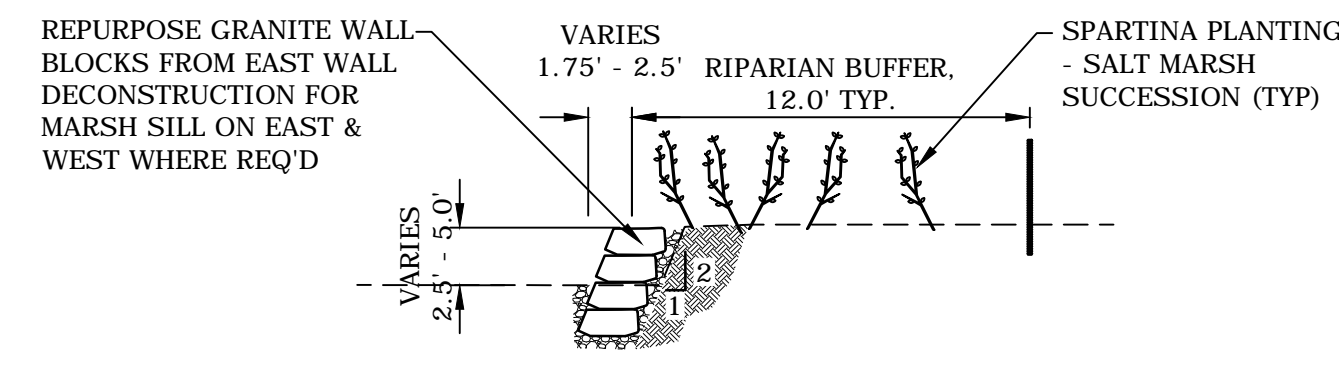
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NO SCALE



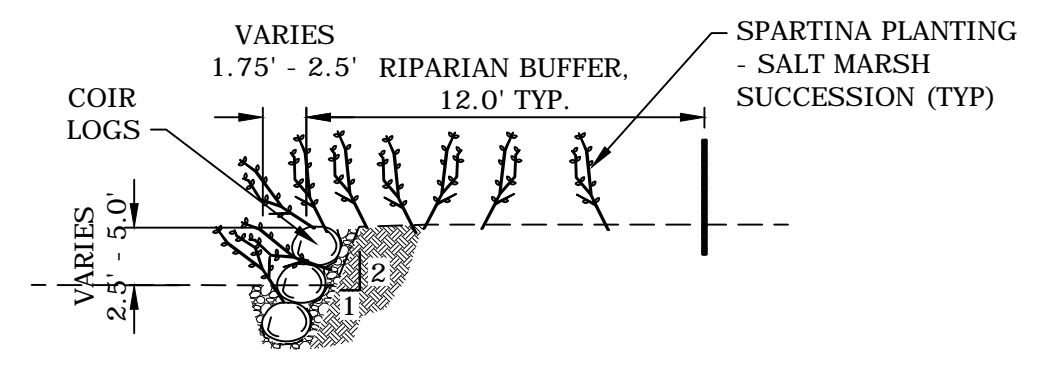
**ISOMETRIC
STRUCTURE SEQUENCING**
NO SCALE



**BANK STABILIZATION TYPE 2 < 2: 2:1 BANK SLOPE
ROOTWAD DETAIL**
NO SCALE



**BANK STABILIZATION TYPE 4
REPURPOSED GRANITE BLOCK TREATMENT
IMBRICATED ROCK WALL - RIGHT BANK**



**BANK STABILIZATION TYPE 5
COIR LOG TREATMENT
AND MARSH REVEGETATION**

**BANK STABILIZATION TYPE 4 AND TYPE 5
MARSH SILL**
NO SCALE

100% DESIGN
NOT FOR
CONSTRUCTION

CENTRAL
POND
RESTORATION

Central Street
to Knight Circle

Manchester
-by-the-Sea, MA

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

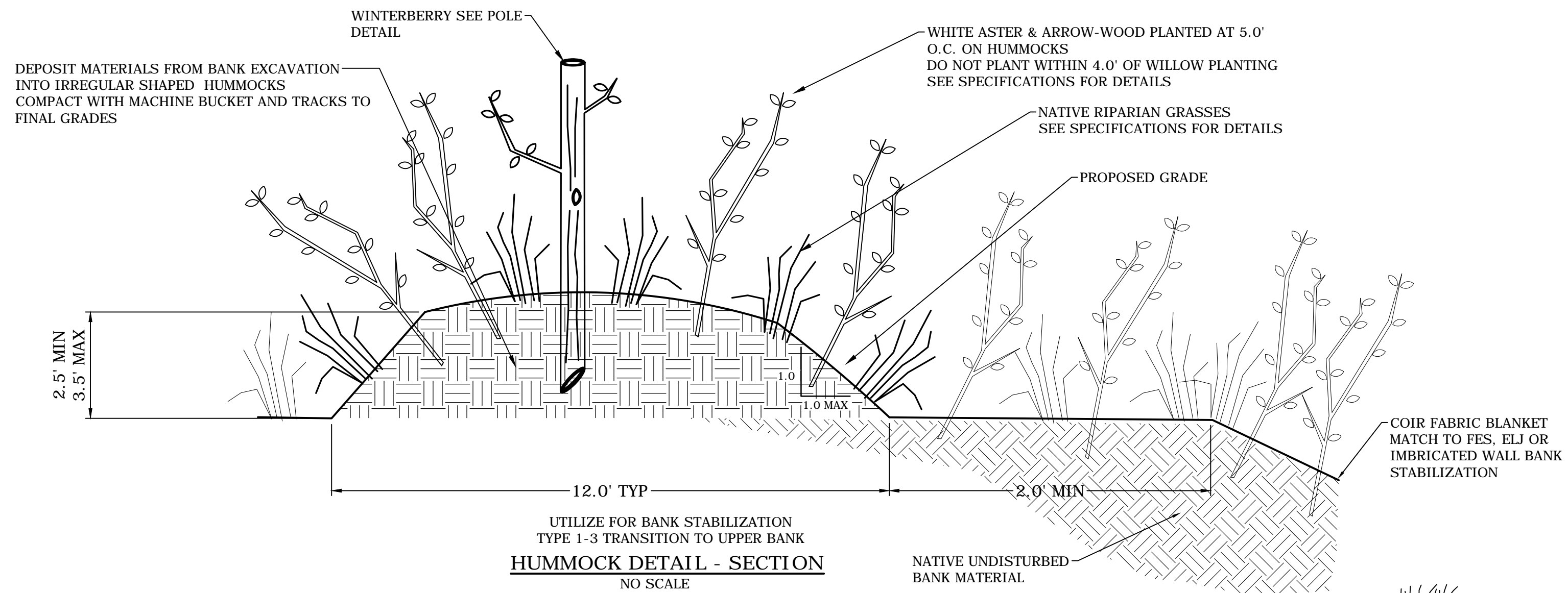
MARK	DATE	DESCRIPTION

TYPICAL BANK DETAILS

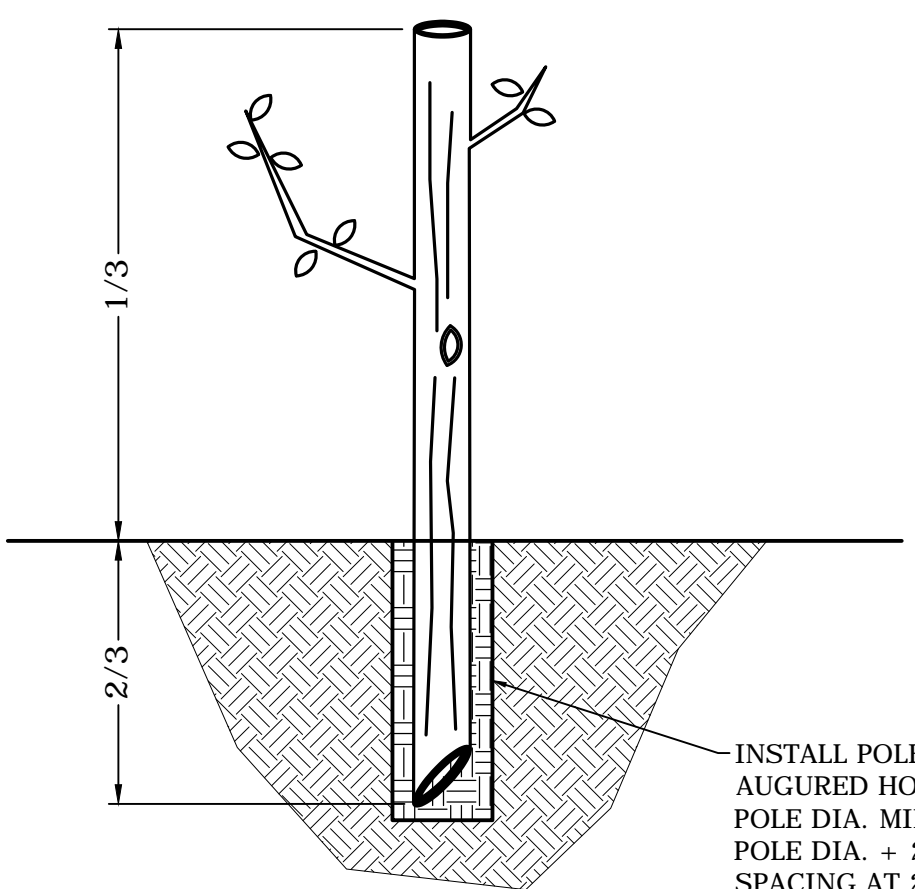
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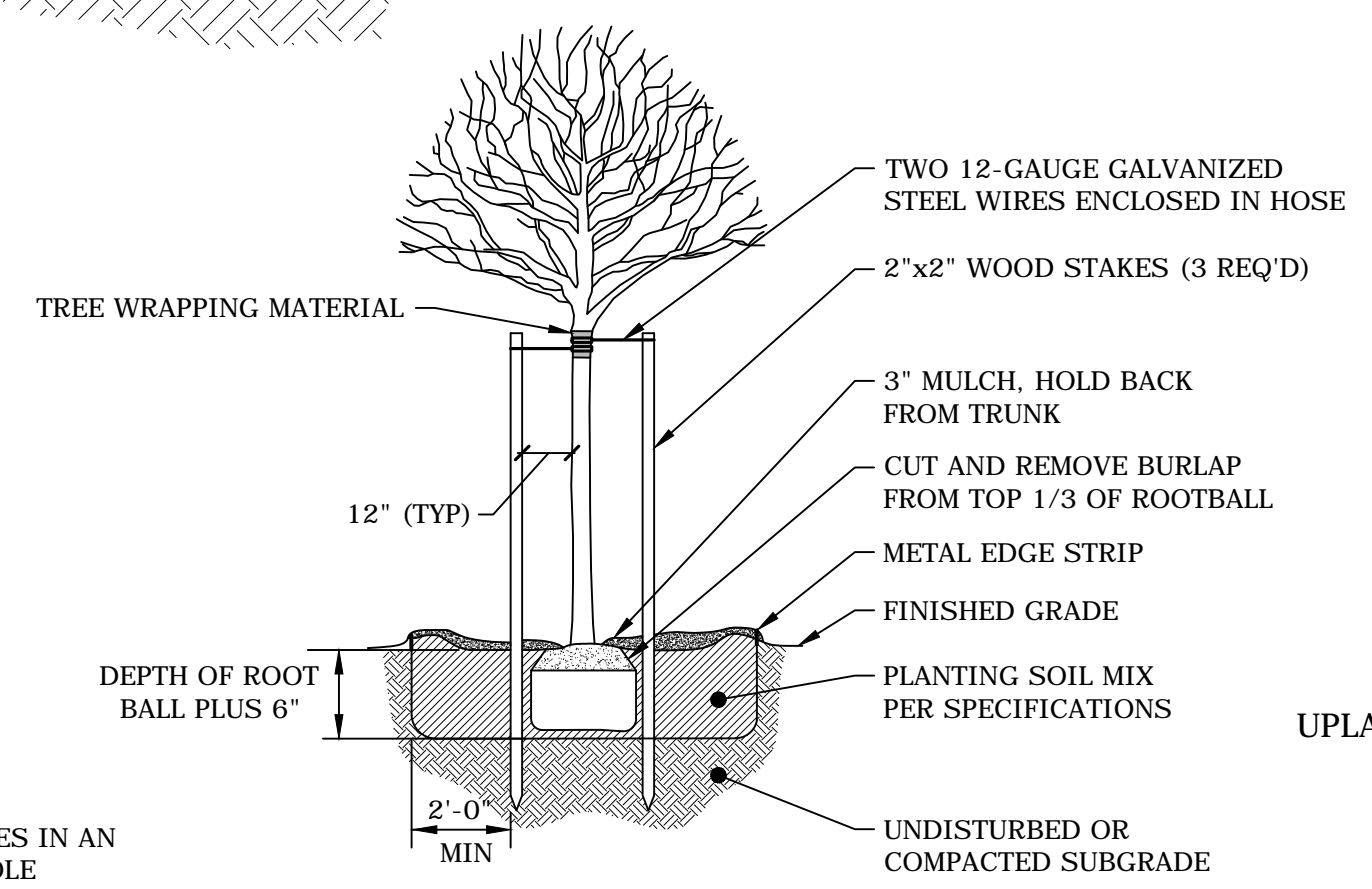
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 Plotted On: Jun 29, 2021 4:49pm
 Title & Board, Inc. 230 Main St. Manchester, MA 02110
 File: Final Design/Arch/CAD/Sheet/M1476-014-C-500_Details.dwg



HUMMOCK DETAIL - SECTION
NO SCALE



POLE PLANTING DETAIL
NO SCALE



TREE AND SHRUB PLANTING DETAIL
NO SCALE

CONSTRUCTION NOTES:

- SEE SPECIFICATIONS
- CUTTINGS SHALL BE COLLECTED WHILE DORMANT, WHEN THE LEAVES HAVE FALLEN, AND NIGHT TEMPERATURES ARE FREEZING.
- CUTTINGS OF WINTERBERRY SHALL BE 0.75" - 1.5" IN DIAMETER, AND 6' MINIMUM IN LENGTH.
- CUTTING SHALL BE TAKEN FROM THE BASE OF THE STEMS. CUT THE BOTTOMS AT A 45 DEG. ANGLE AND THE TOPS FLAT.
- CUTTINGS SHALL BE STRIPPED OF LEADERS, AND LONG BRANCHES TO AVOID EXCESS DRYING.
- CUTTINGS SHOULD BE STORED IN WATER AND SHADE FOR UP TO 24 HOURS BEFORE PLANTING.

REVEGETATION NOTES:

SALVAGED TOPSOIL

- SURFACING OF ALL WOOD STRUCTURES SHALL INCLUDE A 8" LAYER OF TOPSOIL AND SLASH MIXTURE. TOPSOIL SHALL BE SALVAGED AT PROJECT EXCAVATIONS SHOWN IN THE PLANS.
- CONTRACTOR SHALL USE CAUTION TO NOT COMPACT TOPSOIL LAYER. TOPSOIL LAYER THAT HAS BEEN TRACKED OVER SHALL BE SCARIFIED TO A DEPTH OF 8".
- TOPSOIL LAYER SHALL BE PLACED SUCH THAT THE TOP OF THE ORGANIC LAYER EQUALS THE DESIGN FINISH GARDE ELEVATION.

SEEDING

- SEEDING SHALL OCCUR AFTER ALL CONSTRUCTION ACTIVITIES AND AFTER SPRING HIGH WATER. TIMING TO BE DETERMINED BY THE TOWN OR ENGINEER OR AS SPECIFIED IN THE CONTRACT DOCUMENTS.
- ALL DISTURBED AREAS OUTSIDE OF THE ORDINARY HIGH WATER LIMITS SHALL BE SEEDED WITH SEED MIX 1.
- ALL DISTURBED AREAS WITHIN THE ORDINARY HIGH WATER LIMITS (EXCLUDING CHANNELS) SHALL BE SEEDED WITH SEED MIX 2.
- SEED SHALL BE BROADCAST APPLIED AT THE RATES SPECIFIED BELOW. SEEDBED SHALL BE GENTLY HARROWED/RAKED OR CHAINED FOLLOWING APPLICATION OF SEED. TO MIX SEED WITH THE TOP 1/2" OF SOIL.
- ALL SEED SHALL BE CERTIFIED.
- SEED MIXES SHALL CONFORM TO TH ADDITIONAL CRITERIA AS FOLLOWS:
 - 1-97% PER SEED (MINIMUM)
 - 2-85% GERMINATION (MINIMUM)
 - 3-TOTAL WEED SEED LESS THAN 0.5%
 - 4-ALL SEED SHALL BE FREE OF SEEDS OF WEEDS LISTED AS PRIMARILY NOXIOUS BY THE MASSACHUSETTS NATURAL HERITAGE & ENDANGERED SPECIES PROGRAM, SPECIFICALLY MIPAG.

LIVE STAKES

- LIVE STAKES SHALL BE INSTALLED WITHIN ALL WOOD HABITAT STRUCTURES PER THE LIVE STAKE SCHEDULE. LIVE STAKE MATERIAL SHALL CONSIST OF A VARIETY OF SPECIES INCLUDED IN THE TABLE.
- LIVE STAKES SHALL CONSIST OF LOCALLY HARVESTED WILLOW OR COTTONWOOD STAKES. STAKES ARE BETWEEN APPROXIMATELY 3/4" TO 4" IN DIAMETER DEPENDING UPON SPECIES AND SOURCE. STAKES HARVESTED WITH CARE AND CUT TO LENGTHS OF 3' TO 4'. STAKES SHALL BE BUNDLED AND SUBMERGED IN STANDING WATER FOR 5 TO 7 DAYS PRIOR TO PLANTING. CARE SHOULD BE TAKEN TO MARK UPWARD OR DOWNWARD ENDS OF STAKES (I.E. DIPPED).

BARE ROOT & PLUG QUANTITY SCHEDULE							
LOCATION	LOCATION		BANK LENGTH (LF)	PLANTING AREA (SF)	LIVE STAKE PLANTING DENSITY (STAKES PER LF OF BANK LENGTH)	LIVE STAKE PLANTING DENSITY (ON CENTER WITHIN PLANTING AREA)	TOTAL LIVE STAKES (EA)
	START STA	END STA					
TYPE 1 BANK STABILIZATION	3+50	5+45	R	175	2		350
	5+50	10+00		450			900
TYPE 2 BANK STABILIZATION	2+15	2+45			PLUG PLANTING DENSITY	4' O.C. TRIANGULAR	30
	2+65	2+95					30
	5+15	5+45					30
	5+90	6+20					30
	6+40	6+70					30
	7+10	7+40					30
TYPE 3 BANK STABILIZATION	2+25	3+50		500	TOTAL	8' O.C. TRIANGULAR	50
	5+50	10+00		4500			225

PLANTING SCHEDULES

OVERBANK AREA (SUN): ABOVE MHHW

SURFACE TREATMENTS: ENCAPSULATED SOIL LIFTS - FES

SEED: THE NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DRY SITES:

COMMON NAME	BOTANICAL NAME
CREeping RED FESCUE	<i>Festuca rubra</i>
CANADA WILD RYE	<i>Elymus canadensis</i>
ANNUAL RYEGRASS	<i>Lolium multiflorum</i>
PERENNIAL RYEGRASS	<i>Lolium perenne</i>
BLUE GRAMA	<i>Bouteloua gracilis</i>
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>
INDIAN GRASS	<i>Sorghastrum nutans</i>
ROUGH BENTGRASS/TICKLEGRASS	<i>Agrostis scabra</i>
UPLAND BENTGRASS	<i>Agrostis perennans</i>

PLANTINGS: PLANT THE FOLLOWING TUBLINGS OR LIVE STAKINGS THROUGH COIR BLANKET AT 4' O.C. GRID; PLANT LIVE STAKES IN CLUSTERS OF 3.

TABLE 1: BARE ROOT PLANTINGS SPECIES

COMMON NAME	BOTANICAL NAME
SWEET PEPPERBUSH	<i>Clethra alnifolia</i>
GROUNDSELTREE	<i>Baccharus halimifolia</i>
JESUIT'S BARK	<i>Iva frutescens</i>

OVERBANK AREA (SHADE): ABOVE MHHW

SURFACE TREATMENTS: 4" LOAM COVERED WITH EROSION CONTROL BLANKETS
SEED: NONE
PLANTINGS: PLANT PLUGS OF THE FOLLOWING SHADE TOLERANT HERBS PER STAKE AND PLUG SCHEDULE; ALTERNATE BETWEEN DECIDUOUS TREE PLANTINGS

COMMON NAME	BOTANICAL NAME
WHITE WOOD ASTER	<i>Eurybia divaricata</i>
VIRGINIA WILD RYE	<i>Elymus virginicus</i>
RIVERBANK WILD RYE	<i>Elymus riparius</i>

PLANT THE FOLLOWING SHADE TOLERANT SHRUBS

COMMON NAME	BOTANICAL NAME
GRAY DOGWOOD, 24", x4	<i>Cornus racemosa</i>
WITCH HAZEL, 24", x2	<i>Hamamelis virginiana</i>

UPLAND AREA: ABOVE MHHW

SURFACE TREATMENTS: 4" LOAM (INCLUDES STRIPPED TOPSOIL AND RECOVERED ORGANIC SEDIMENT) COVERED WITH EROSION CONTROL BLANKETS

SEED: THE NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR MOIST SITES:

COMMON NAME	BOTANICAL NAME
RIVERBANK WILD RYE	<i>Elymus riparius</i>
RED FESCUE	<i>Festuca rubra</i>
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>
SWITCH GRASS	<i>Panicum</i>
BIG BLUESTEM	<i>Andropogon gerardii</i>
BLUE VERVAIN	<i>Verbena hastata</i>
UPLAND BENTGRASS	<i>Agrostis perennans</i>
NODDING BUR MARIGOLD	<i>Bidens cernua</i>
HOLLOW-STEM JOE PYE WEED	<i>Eupatorium fistulosum</i>
BONESET	<i>Eupatorium perfoliatum</i>
NEW ENGLAND ASTER	<i>Aster novae-angliae</i>
WOOL GRASS	<i>Scirpus cyperinus</i>
SOFT RUSH	<i>Juncus effusus</i>

THE NEW ENGLAND SHOWY WILDFLOWER MIX:

COMMON NAME	BOTANICAL NAME
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>
PARTRIDGE PEA	<i>Chamaecrista fasciculata</i>
INDIANA GRASS	<i>Sorghastrum nutans</i>
RED FESCUE	<i>Festuca rubra</i>
CANADA WILD RYE	<i>Elymus canadensis</i>
RIVERBANK WILD RYE	<i>Elymus riparius</i>
OX EYE SUNFLOWER	<i>Heliopsis helianthoides</i>
LANCE LEAVED COREOPSIS	<i>Coreopsis lanceolata</i>
BLACK EYED SUSAN	<i>Rudbeckia hirta</i>
WILD BLUE FALSE INDIGO	<i>Baptisia australis</i>
SPIKED GAYFEATHER	<i>Liatris spicata</i>
COMMON SNEEZEWEED	<i>Helianthus autumnale</i>
BLUE VERVAIN	<i>Verbena hastata</i>
BUTTERFLY MILKWEED	<i>Asclepias tuberosa</i>
NEW ENGLAND ASTER	<i>Aster novae-angliae</i>
HOLLOW-STEM JOE PYE WEED	<i>Eupatorium fistulosum</i>
EARLY GOLDENROD	<i>Solidago juncea</i>

PLANTINGS: 1.5" CALIPER RED MAPLE 8' O.C.

STONE TOE AREA: BR ZONE - BELOW MHHW (SALT TOLERANT SPECIES)

SURFACE TREATMENTS: COVER LIBERALLY WITH EXCAVATED SEDIMENT; WASH SEDIMENT WITH WATER AND REPEAT UNTIL VOIDS ARE FILLED AND STONE TOE IS COVERED
SEED: NEW ENGLAND EROSION CONTROL MIX FOR DRY SITES (SEE COMPOSITION ABOVE)
PLANTINGS: LIVE STAKES OR TUBLINGS, AS RECOMMENDED BY SUPPLIER FOR SEASON, WITHIN STONE TOE AT 4' O.C.; LIVE STAKES TO BE GRIDDED IN CLUSTERS OF 3.

TABLE 3: PLUG PLANTINGS BELOW MHHW, WHERE SPECIFIED ON REVEGETATION AND PLANTING PLAN

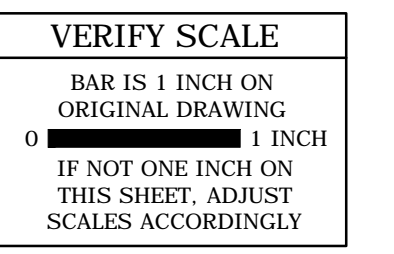
COMMON NAME	BOTANICAL NAME
SMOOTH CORDGRASS	<i>Spartina alterniflora</i>
COMMON THREE-SQUARE	<i>Schoenoplectus pungens</i>
SWITCHGRASS	<i>Panicum virgatum</i>
SEASIDE GOLDENROD	<i>Solidago sempervirens</i>
SWAMP ROSE MALLOW	<i>Hibiscus moscheutos</i>

100% DESIGN
NOT FOR
CONSTRUCTION

CENTRAL
POND
RESTORATION

Central Street
to Knight Circle

Manchester
-by-the-Sea, MA

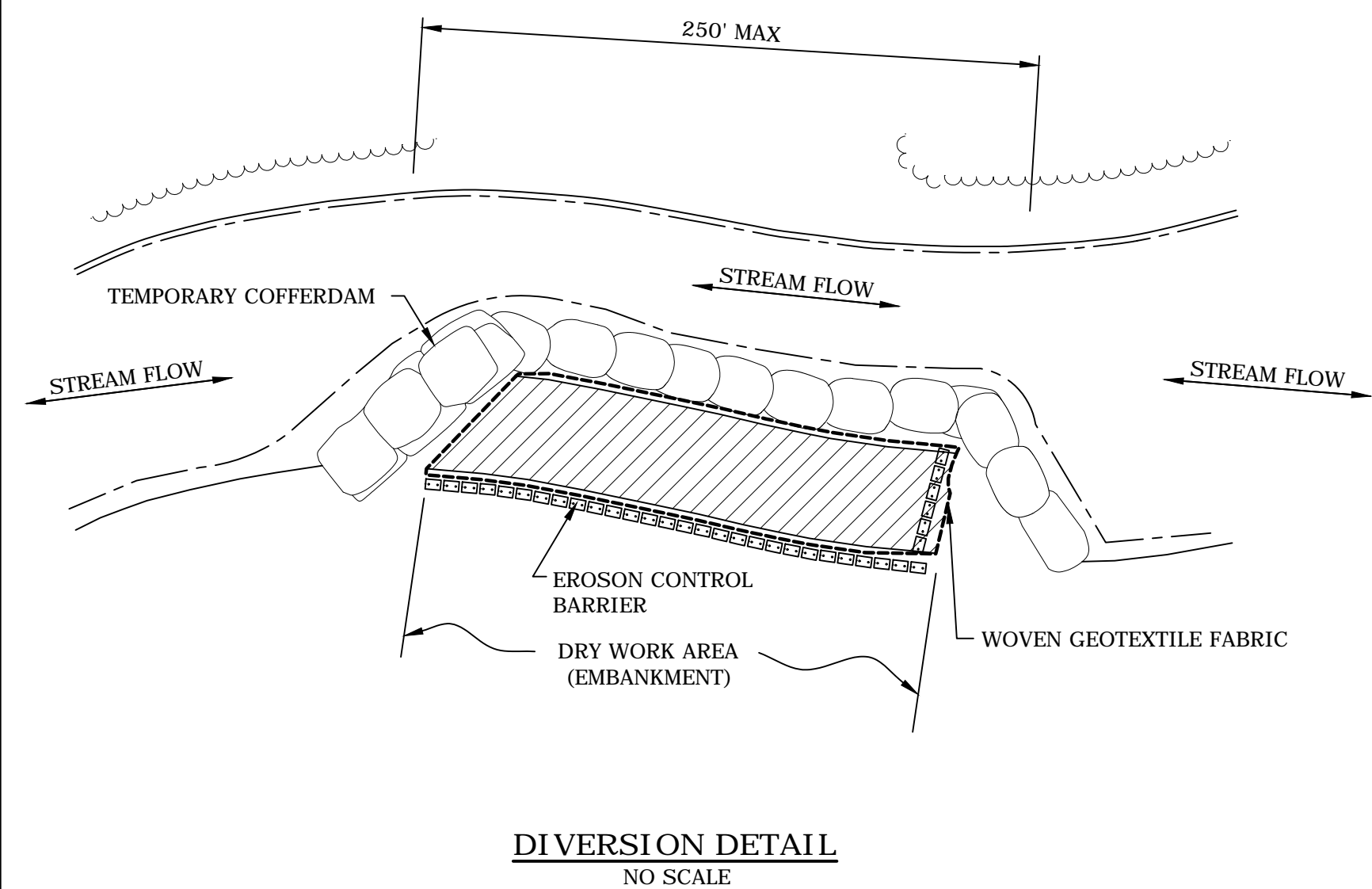


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DATE:	JUNE 30, 2021	
FILE:	M1476-014-C-500_Details.dwg	
DRAWN BY:	DWB, TMP	
CHECKED:	DLM	
APPROVED:	DAM	

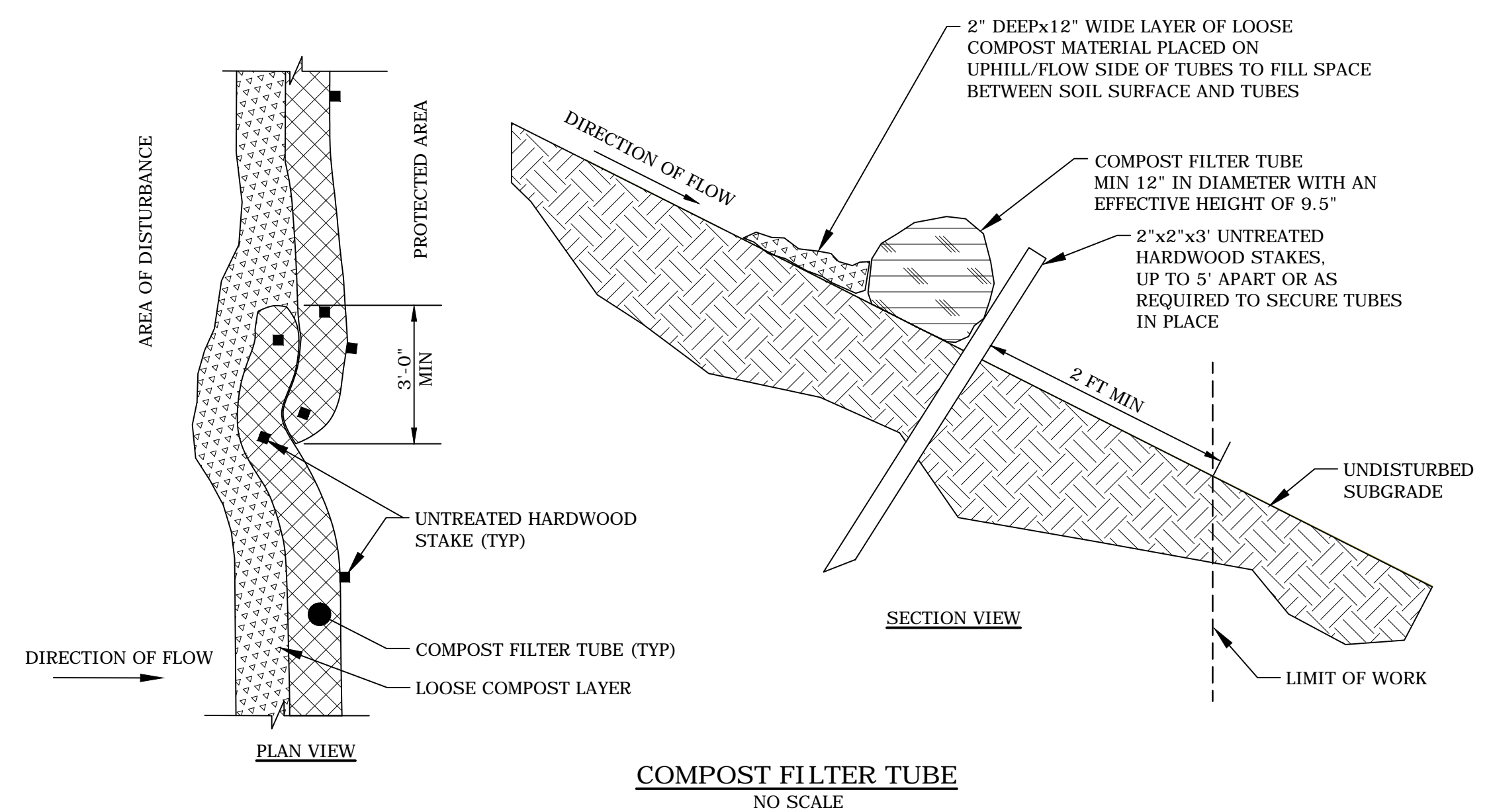
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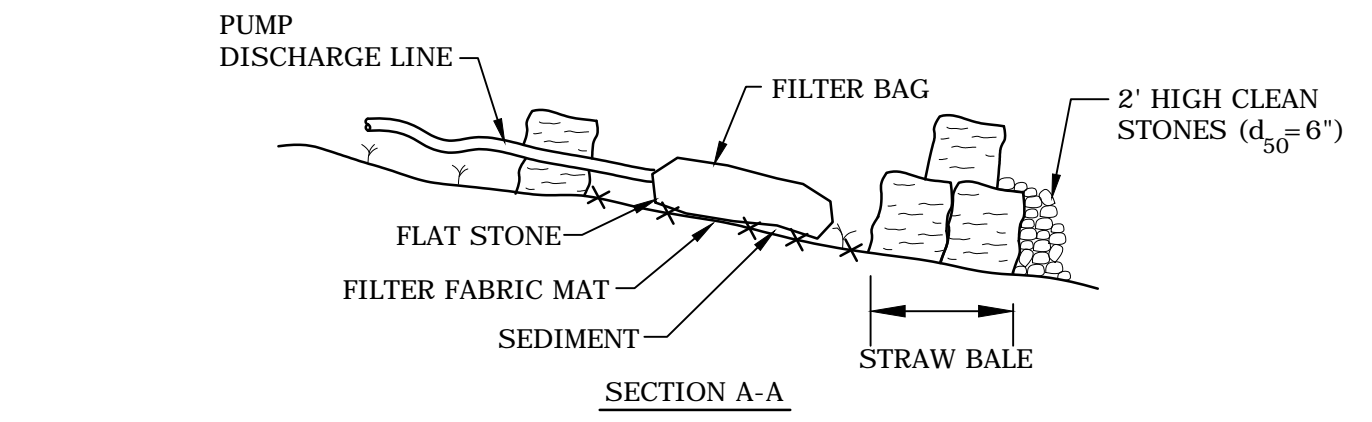
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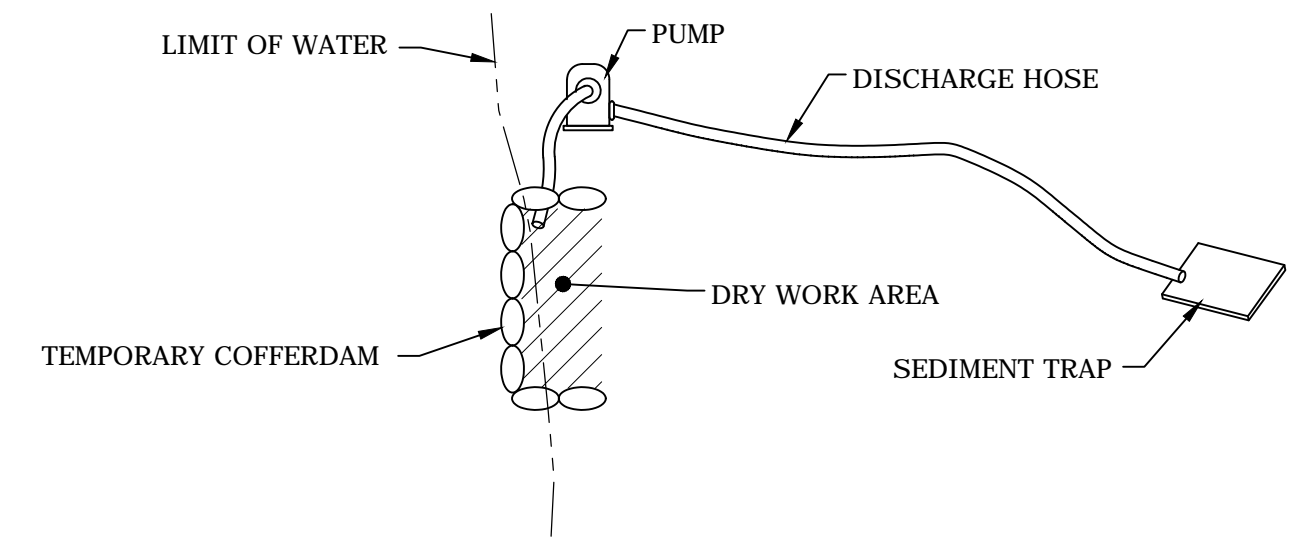
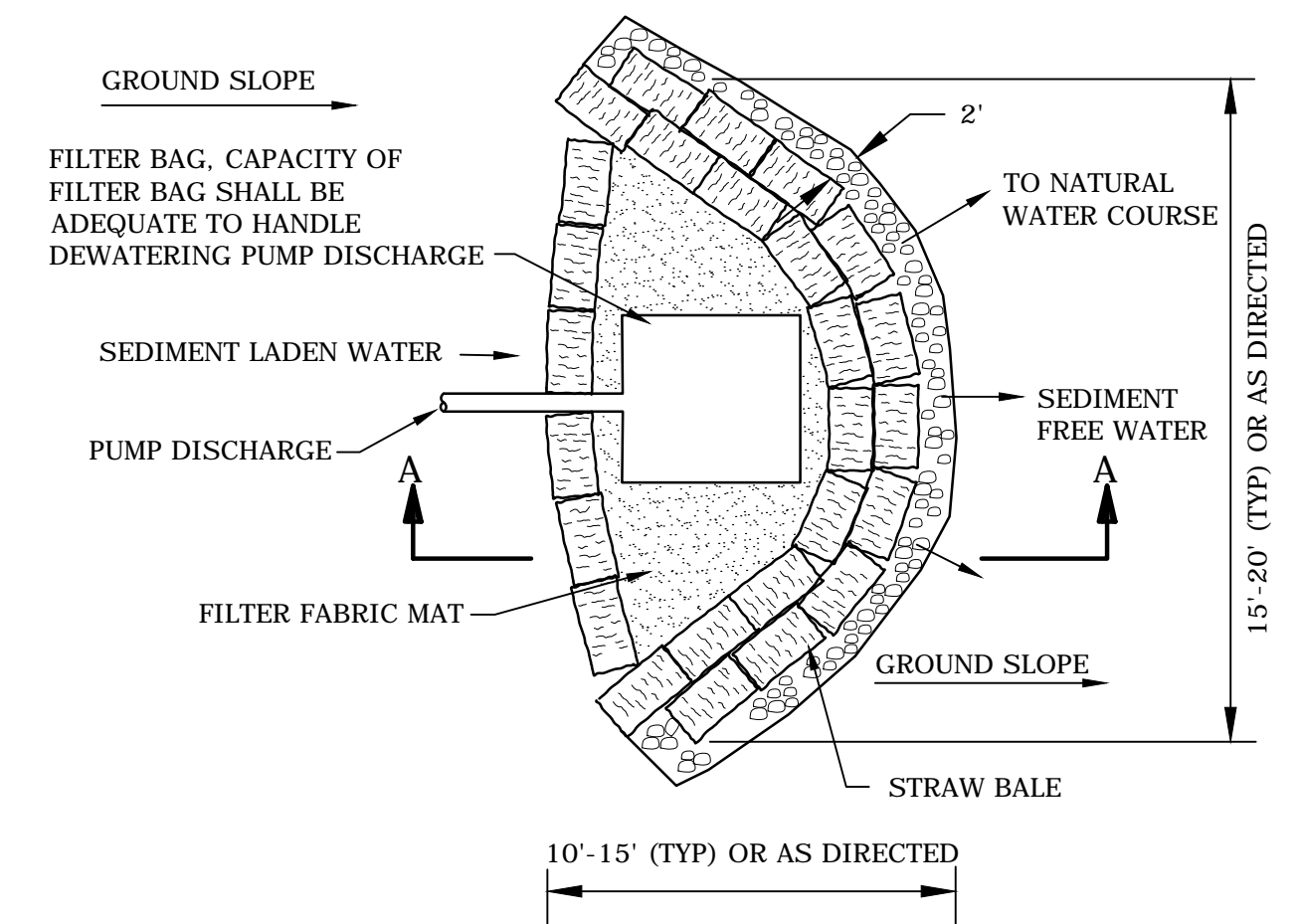
DIVERSION DETAIL
NO SCALE



COMPOST FILTER TUBE
NO SCALE



SECTION A-A



- NOTES:**
1. DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS AND SHALL DISCHARGE OUTSIDE OF THE WETLAND BOUNDARY AS SHOWN ON SHEET C-001.
 2. DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION.
 3. CONTRACTOR IS RESPONSIBLE FOR SUBMITTING DEWATERING AND CARE OF WATER PLAN TO REVIEWED AND APPROVED BY THE ENGINEER. MODIFICATIONS TO THE DEWATERING PLAN WILL BE REQUESTED IN WRITING AND APPROVED BY THE ENGINEER.

SEDIMENT TRAP AND DEWATERING
NO SCALE

100% DESIGN
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CONSTRUCTION

**CENTRAL
POND
RESTORATION**

Central Street
to Knight Circle

Manchester
-by-the-Sea, MA

VERIFY SCALE	
BAR IS 1 INCH ON ORIGINAL DRAWING	1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	

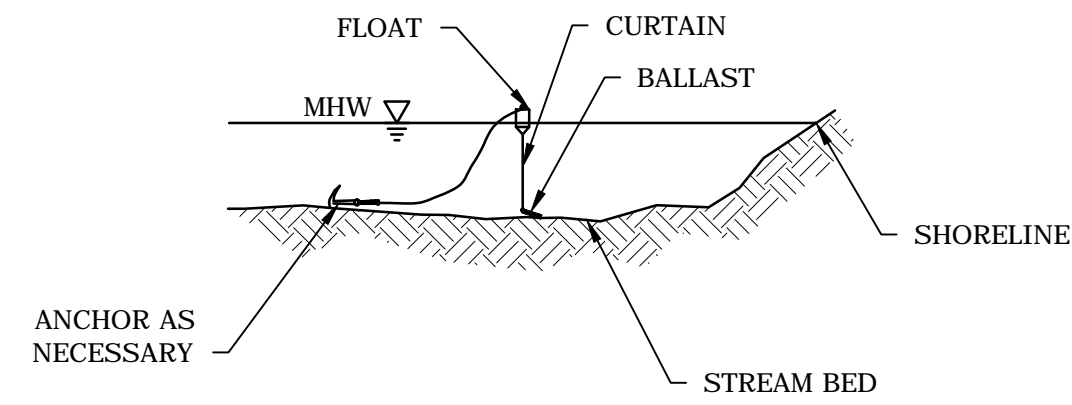
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APPROVED:	DAM	

**CONTROL OF WATER
DETAILS - 1**

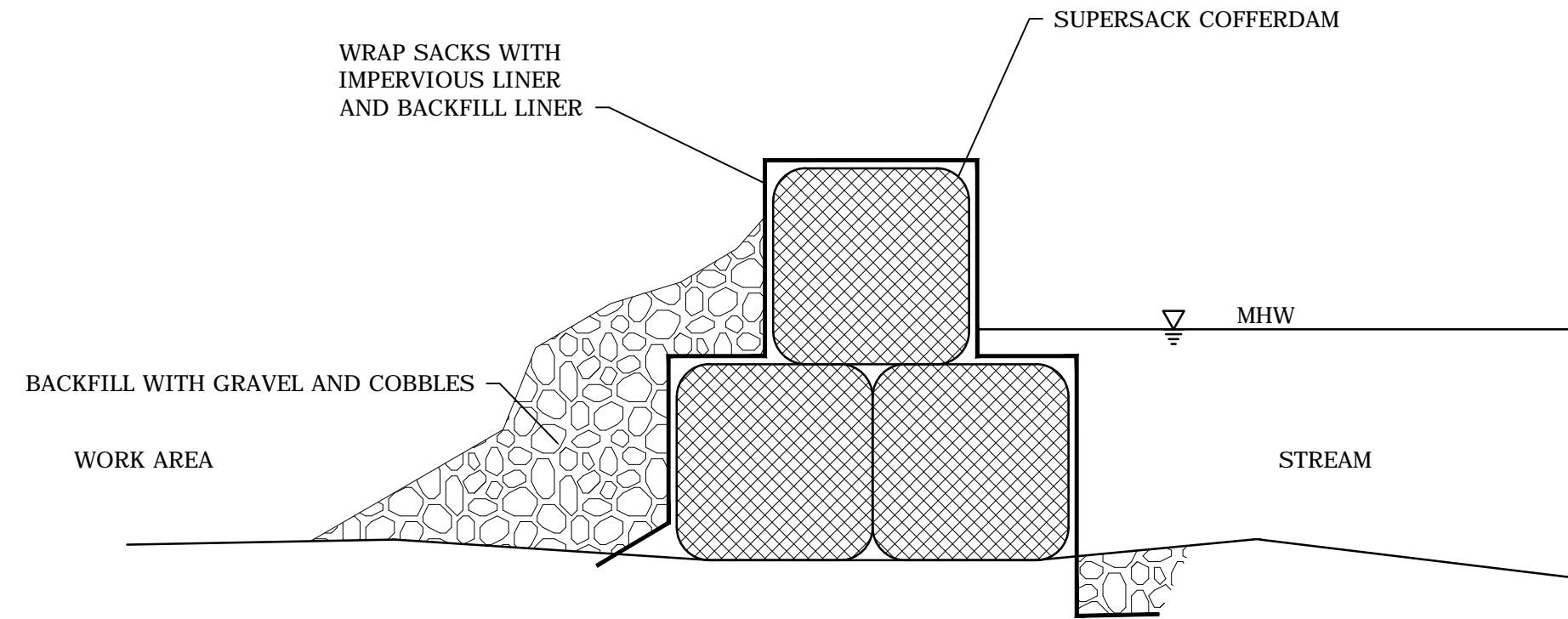
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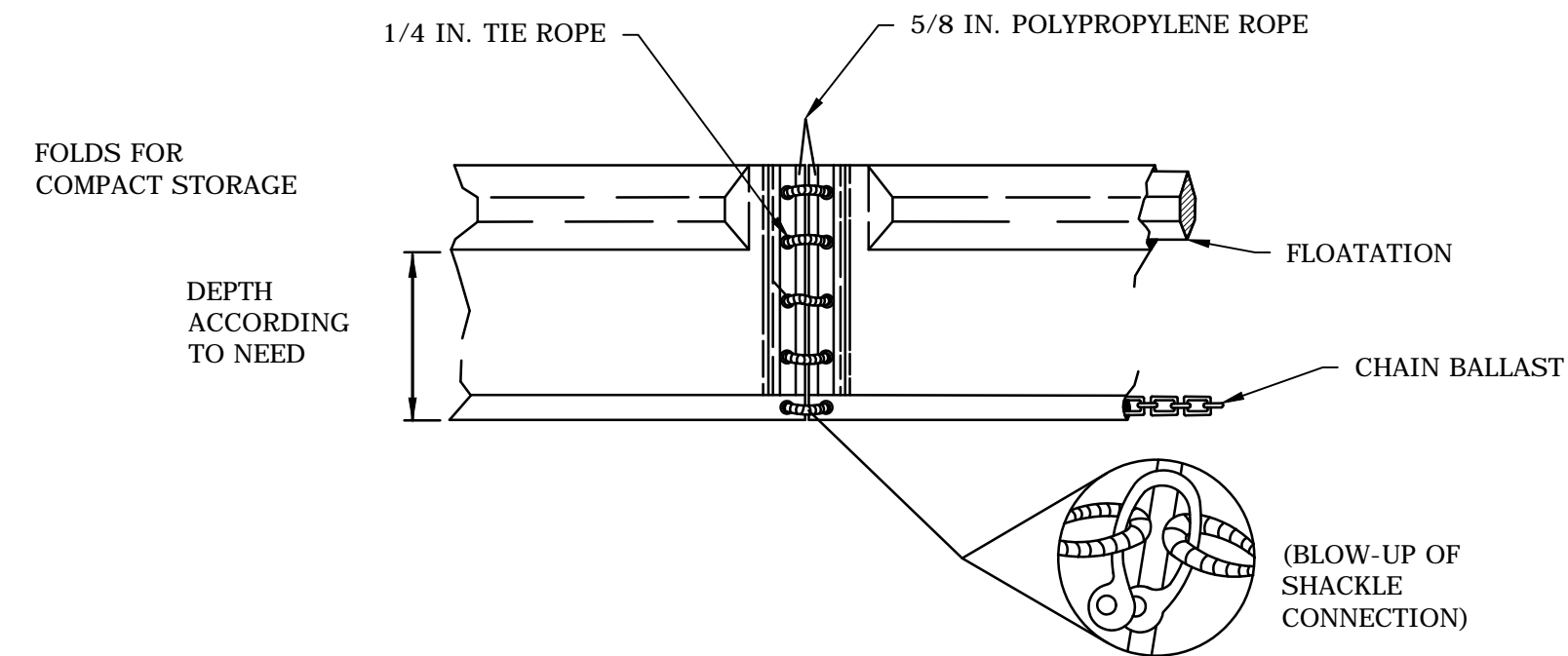
SECTION VIEW
TURBIDITY CURTAIN (TYP)
NO SCALE



COFFERDAM SECTION
NO SCALE

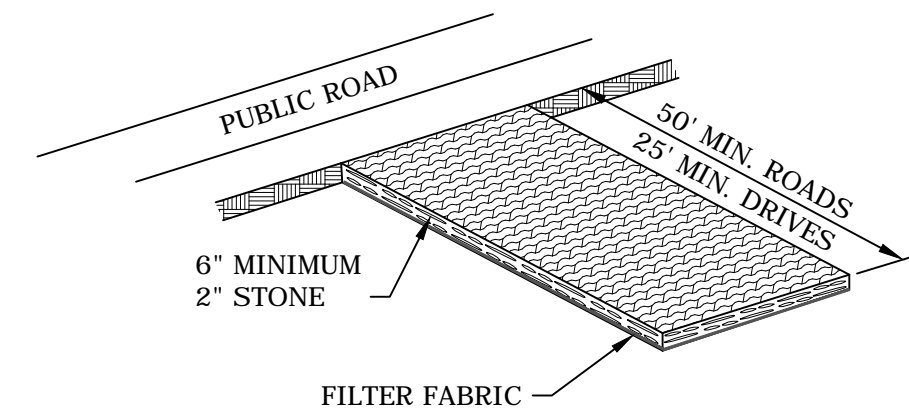
COFFERDAMS, PUMPING, DEWATERING, AND STREAM BYPASS NOTES:

1. THE DETAILS SHOWN ON THIS SHEET ARE AN EXAMPLE OF ACCEPTABLE METHODS TO USE DURING CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND SUBMITTING A COFFERDAM PLAN, PUMPING AND DEWATERING PLAN FOR REVIEW AND APPROVAL BY THE CONTRACTING AGENCY OR ENGINEER. THE PLAN SHALL INCLUDE SUFFICIENT DETAIL OF MEANS AND METHODS TO SATISFY THE PROJECT SPECIFICATIONS AND PERMIT REQUIREMENTS. IF APPROVED, OTHER METHODS MAY BE USED SUCH AS UTILIZING INFLATABLE BLADDERS, PLATES, OR BARRIERS OF VARIOUS MATERIALS. COFFERDAMS SHALL INCLUDE PLASTIC LINER OR FINE MESH SILT FENCE TO REDUCE TURBIDITY AND FINES FROM ENTERING THE FREE FLOWING PORTION OF LIVE WATER.
2. THE CONTRACTING AGENCY IS RESPONSIBLE FOR MEASURING TURBIDITY HOWEVER THE CONTRACTOR SHALL ADHERE TO THE SPECIAL PROCEDURES REGARDING IN-STREAM WORK, TURBIDITY, AND DEWATERING IN THE DESIGN DRAWINGS.
3. CONSERVATION MEASURES ARE SUMMARIZED IN THE PLANS AND SHALL BE STRICTLY ADHERED TO.
4. THE CONTRACTOR SHALL NOTIFY THE OWNER AND CONTRACTING OFFICER AT LEAST 5 DAYS BEFORE EACH COFFERDAM INSTALLATION DATE. ANTICIPATED COFFERDAM LOCATIONS ARE SHOWN IN THE PLANS.
5. FILL MATERIAL FOR BULK BAGS FOR "SUPER SACKS", IF USED, SHALL BE CLEAN, WASHED, AND ROUNDED MATERIAL MEETING STANDARD SPECIFICATIONS FOR DRAIN ROCK, STREAMBED AGGREGATES, STREAMBED SEDIMENTS, OR STREAMBED COBBLES. MATERIAL USED TO FILL BULK BAGS SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PERMITS. IF PERMITS ALLOW, MATERIAL MAY BE DISPOSED OF IN UPLAND AREAS AS DIRECTED BY THE CONTRACTING OFFICER.
6. DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
7. EXCAVATIONS ASSOCIATED WITH CHANNEL, FLOODPLAIN, AND WOOD HABITAT STRUCTURES SHALL BE DEWATERED.
8. WATER SHALL BE PUMPED AND DISCHARGED AWAY FROM THE WORK AREAS TO SEDIMENT TRAPS.
9. DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
10. ALL PUMP INTAKES SHALL BE SCREENED FOR FISH PROTECTION AS REQUIRED BY NOAA.
11. ALL EARTHWORK ACTIVITIES AND WOOD HABITAT STRUCTURE CONSTRUCTION WITHIN THE ORDINARY HIGH WATER CHANNEL SHALL CONFORM TO THE WATER QUALITY STANDARDS ESTABLISHED BY REGULATORY AGENCY PERMITS FOR THIS PROJECT.

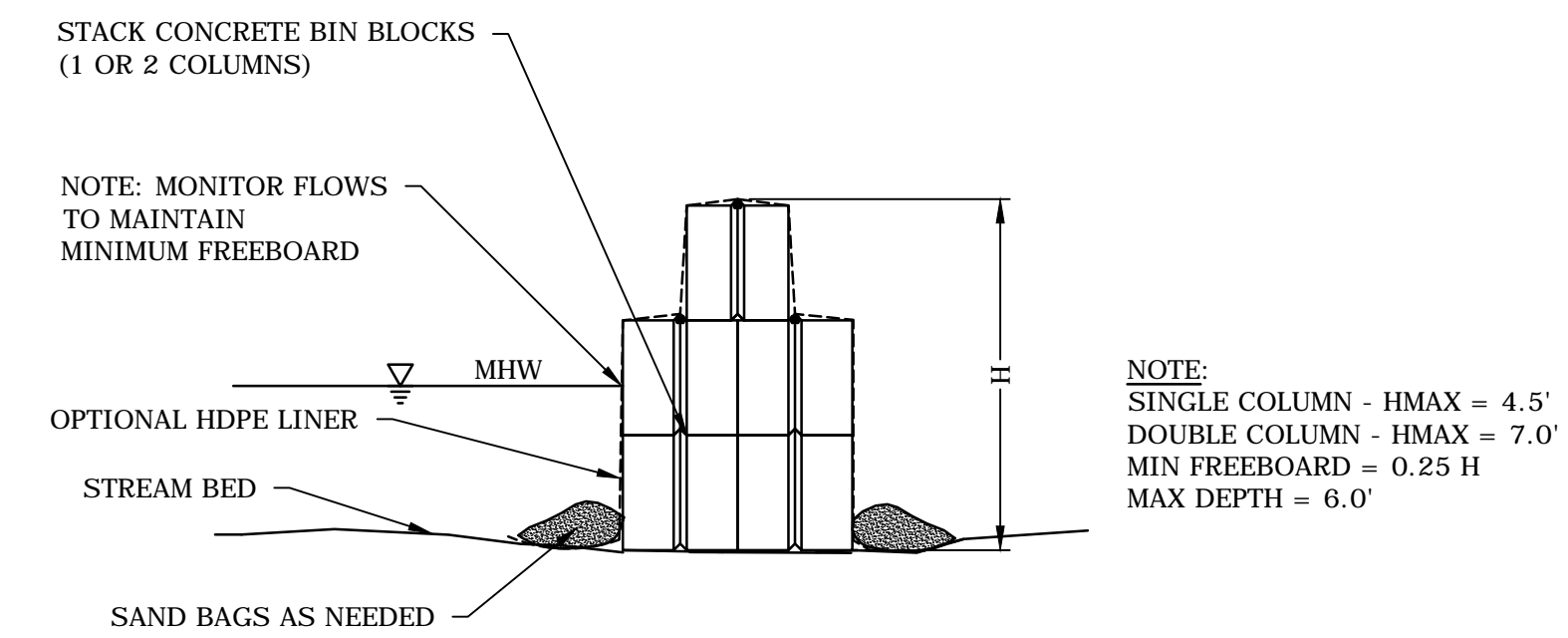


SILTMASTER II PERMEABLE GEOTEXTILE DREDGE BARRIER NON-WOVEN DBNW BY PARKER SYSTEMS OR EQUIVALENT

PROFILE VIEW
TURBIDITY CURTAIN (TYP)
NO SCALE



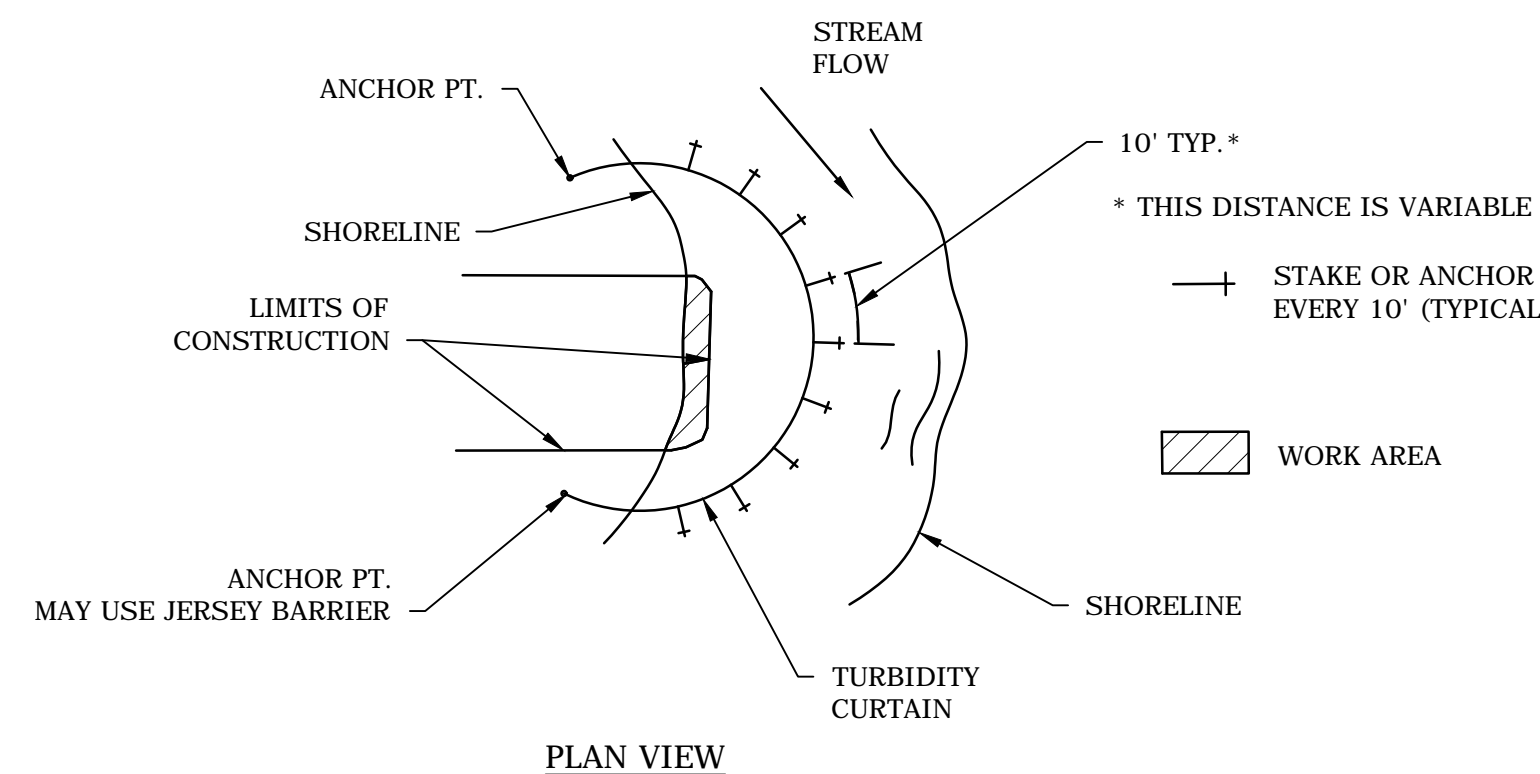
CONSTRUCTION ENTRANCE
NO SCALE



CONCRETE BARRIER COFFERDAM (TYP)
NO SCALE

NOTE:
SINGLE COLUMN - HMAX = 4.5'
DOUBLE COLUMN - HMAX = 7.0'
MIN FREEBOARD = 0.25 H
MAX DEPTH = 6.0'

TYPICAL LAYOUTS
STREAMS, PONDS, AND LAKES (PROTECTED AND NON-TIDAL)

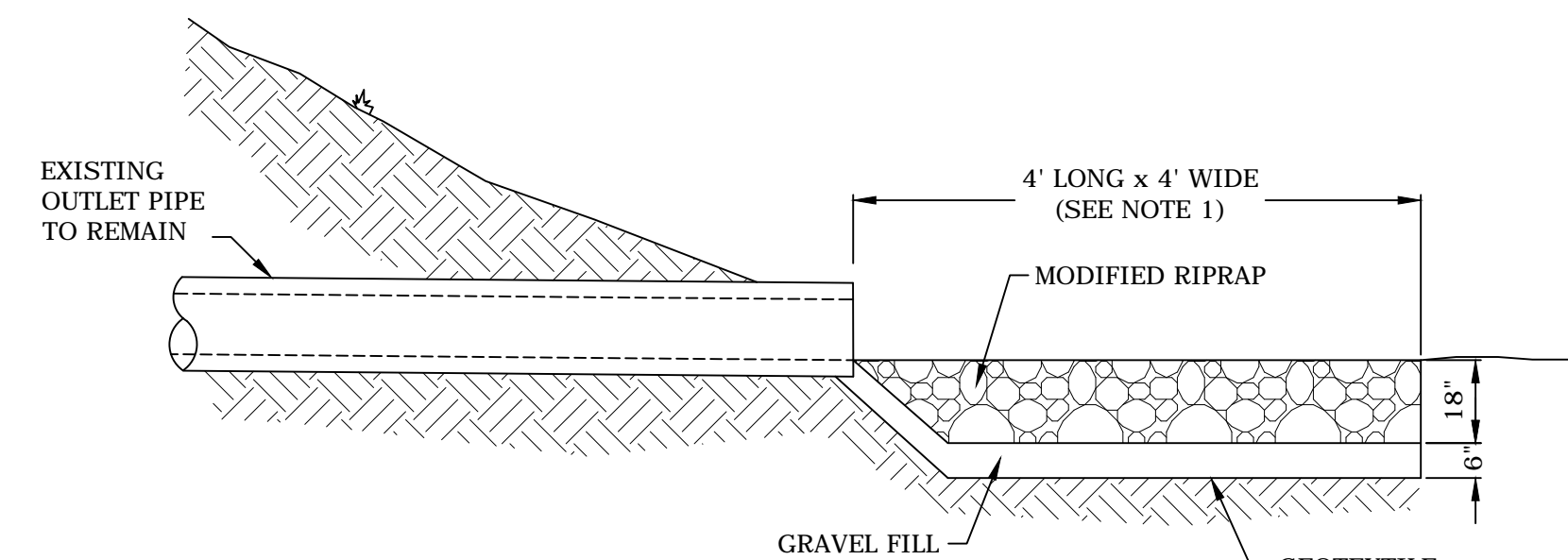


PLAN VIEW

NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR SUBMITTING DEWATERING AND CARE OF WATER PLAN TO REVIEWED AND APPROVED BY THE ENGINEER. MODIFICATIONS TO THE DEWATERING PLAN WILL BE REQUESTED IN WRITING AND APPROVED BY THE ENGINEER.

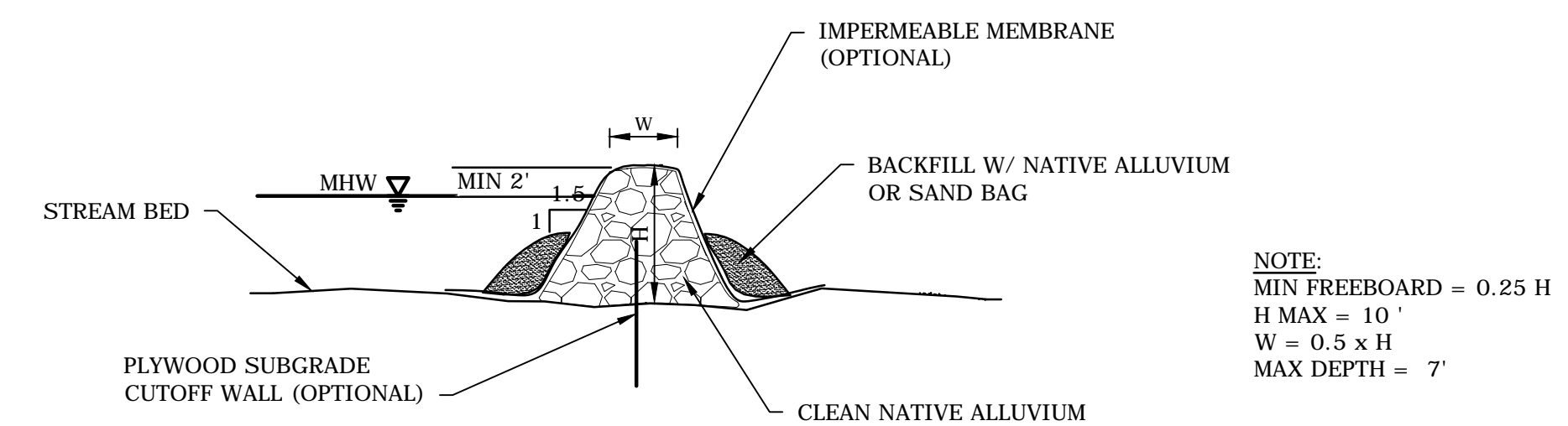
TURBIDITY CURTAIN (TYP)
NO SCALE



NOTES:

1. PAD DIMENSIONS AT EXISTING 18" x 48" CULVERT SHALL BE 6' LONG x 6' WIDE.

RIPRAP APRON AT STORMWATER OUTFALLS
NO SCALE



NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR SUBMITTING A COFFERDAM PLAN TO REVIEWED AND APPROVED BY THE ENGINEER. MODIFICATIONS TO THE DEWATERING PLAN WILL BE REQUESTED IN WRITING AND APPROVED BY THE ENGINEER.

ALLUVIAL COFFER (TYP)
NO SCALE

100% DESIGN
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to Knight Circle

Manchester
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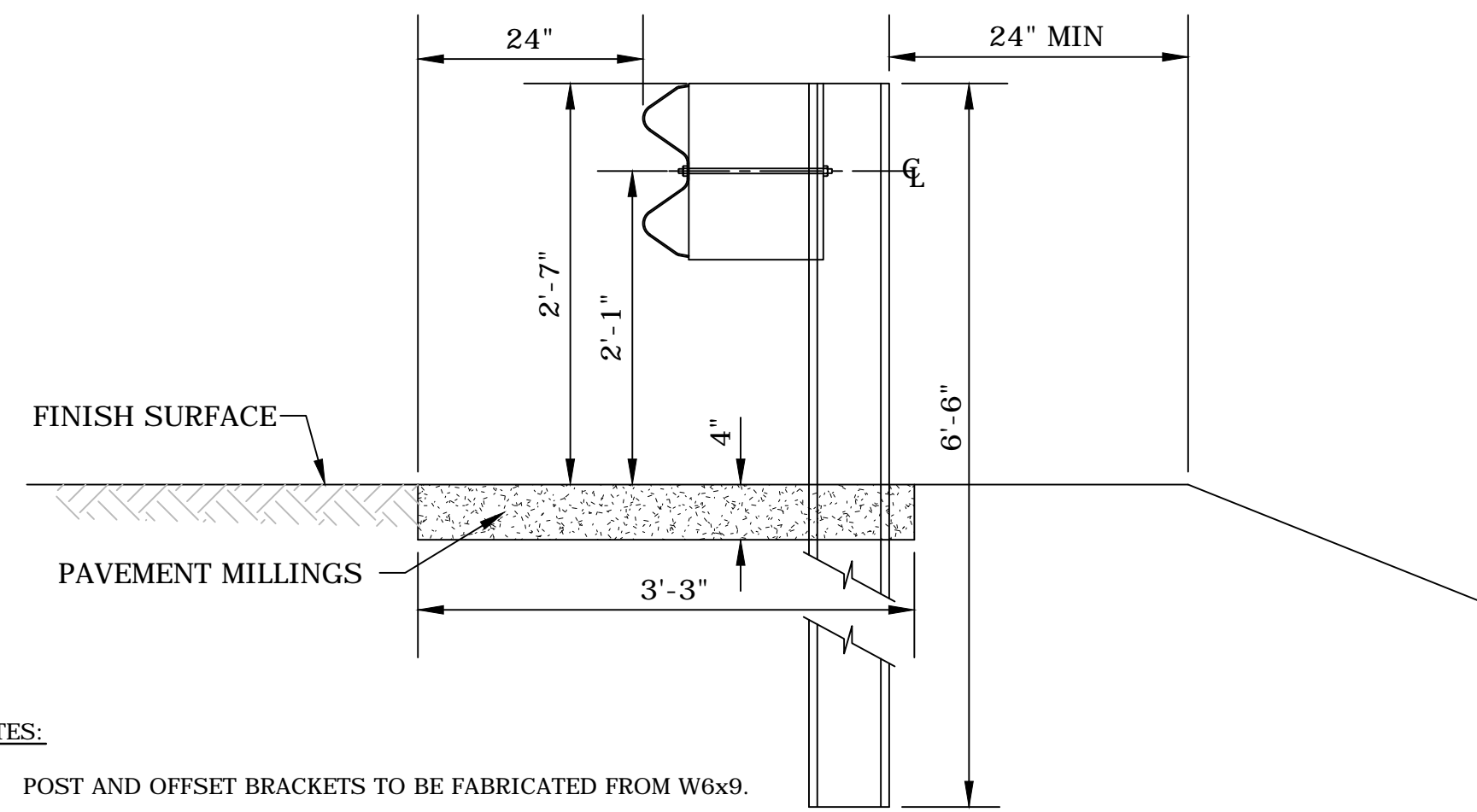
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APPROVED:	DAM	

CONTROL OF WATER
DETAILS - 2

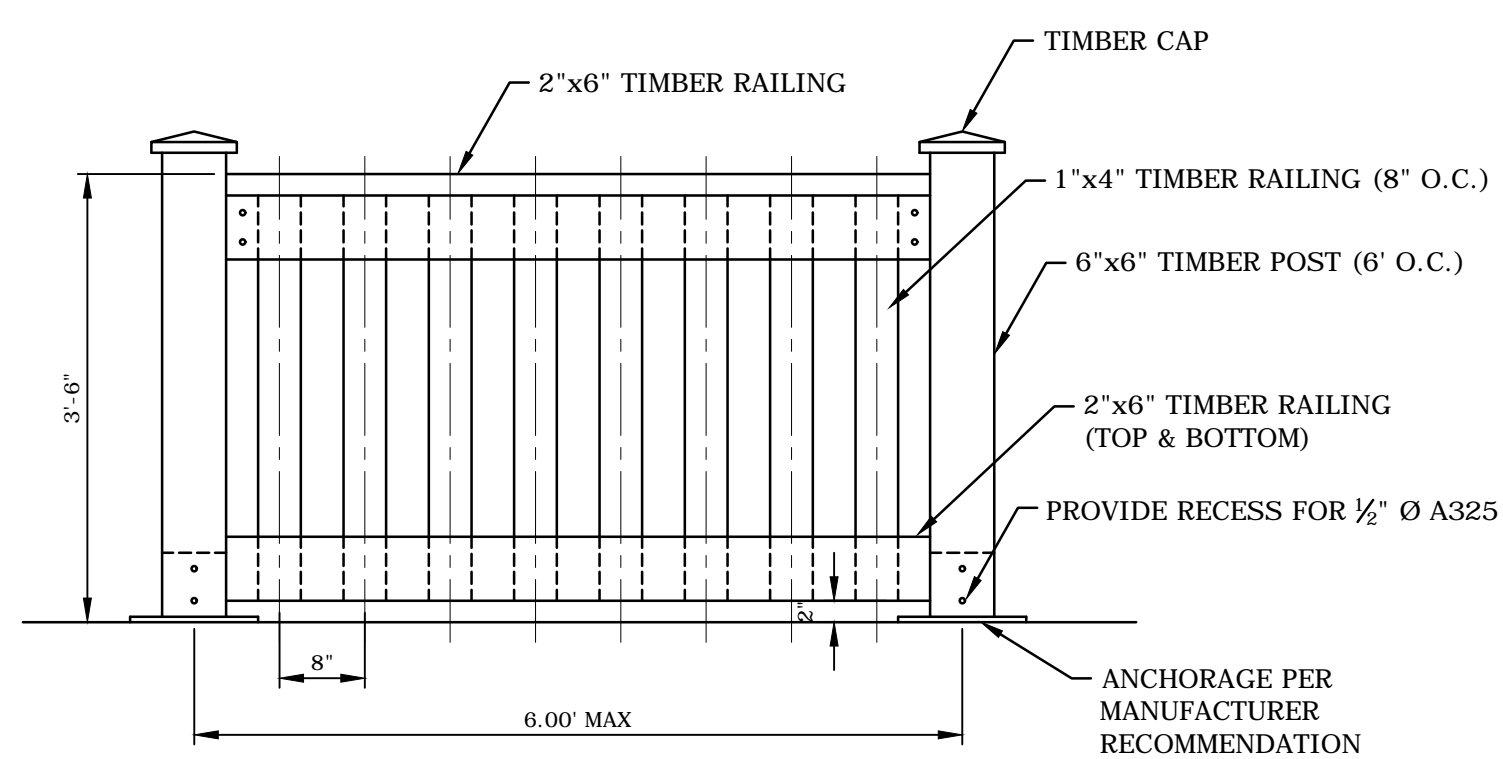
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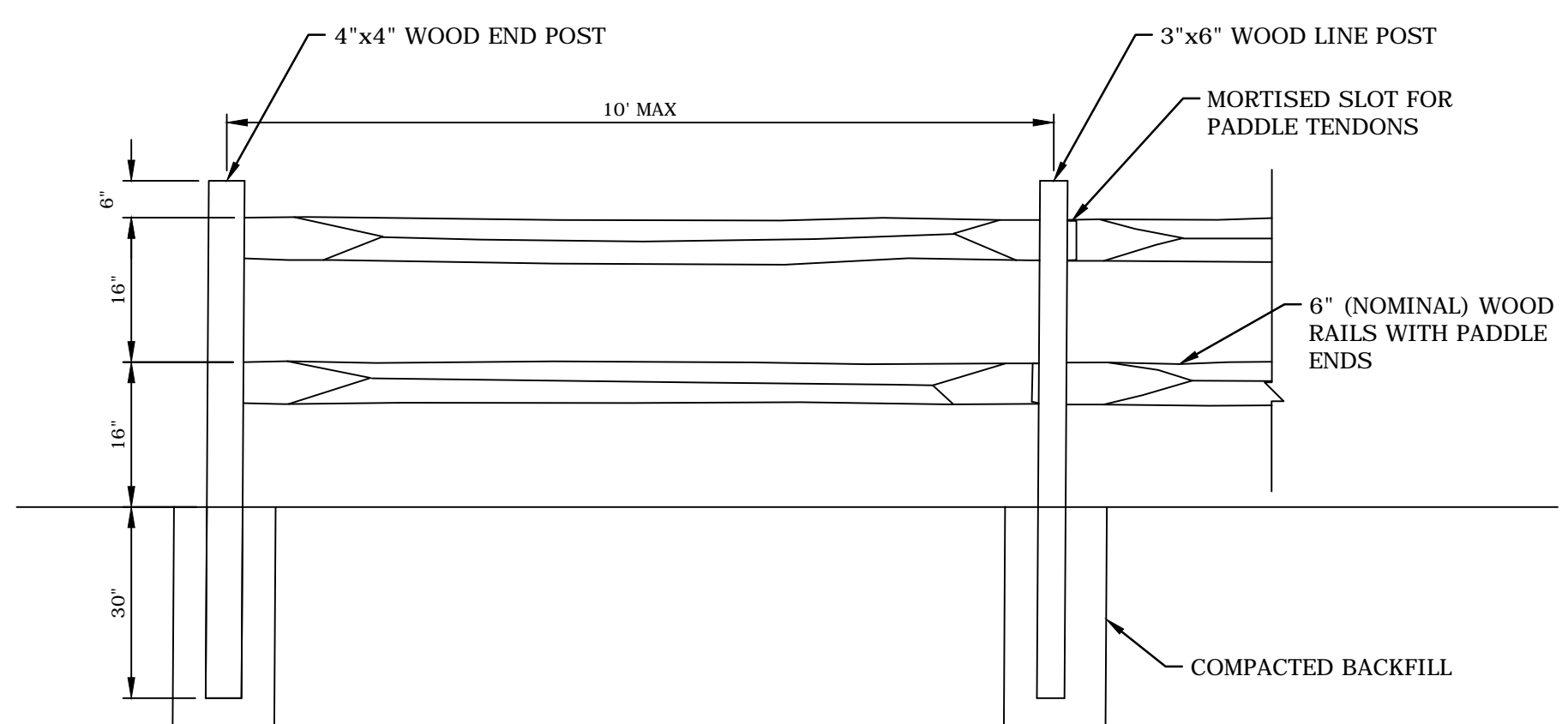


- NOTES:**
1. POST AND OFFSET BRACKETS TO BE FABRICATED FROM W6x9.
 2. POST AND BRACKET HOLES TO BE 3/4" DIAMETER.
 3. BACK-UP PLATE TO BE USED ON POSTS WHERE NO SPLICE OCCURS.
 4. FABRICATION DIMENSIONS ALSO APPLY TO "C" POSTS AND BRACKETS.
 5. MAXIMUM POST SPACING IS 6'-3" CENTER TO CENTER.
 6. WHEN THE MAXIMUM POST SPACING IS EXCEEDED, NEST UP GUARDRAIL WITH 25' RAIL SEGMENT. MAXIMUM SPIN IS 12'-6" CENTER TO CENTER.
 7. PROVIDE A TL2 RATED TERMINAL END SECTION AT EACH W RAIL TERMINUS.

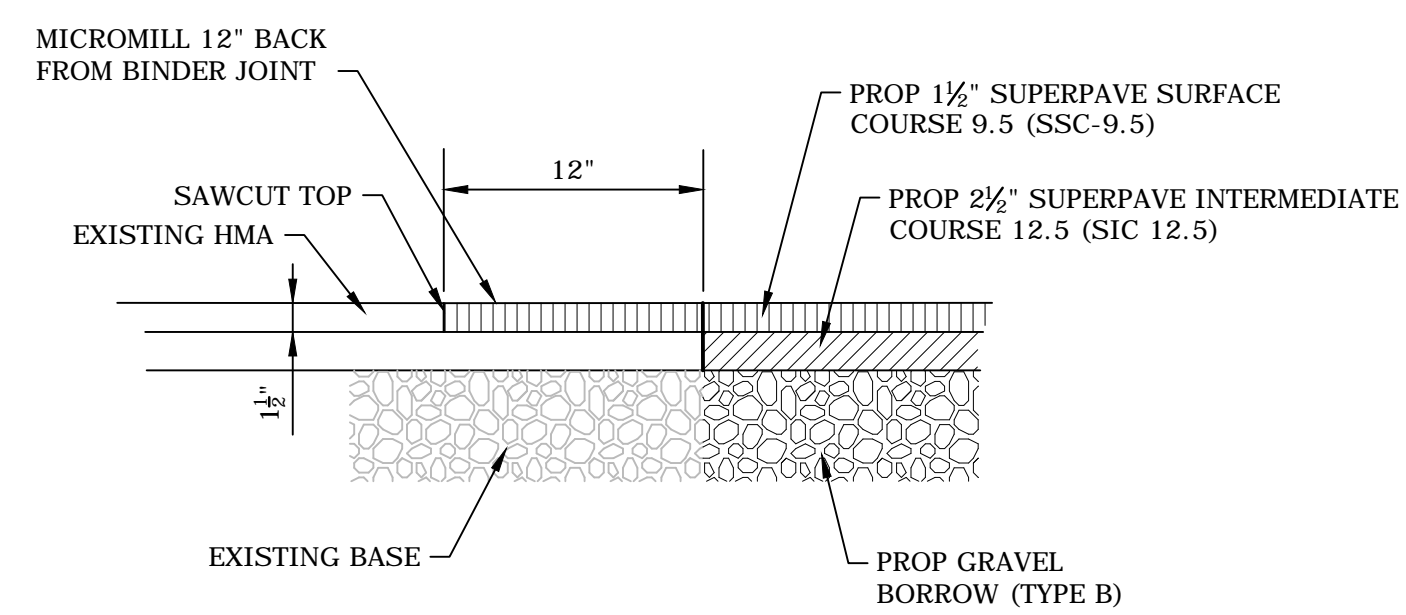
STEEL BEAM HIGHWAY GUARD W/RAIL
NO SCALE



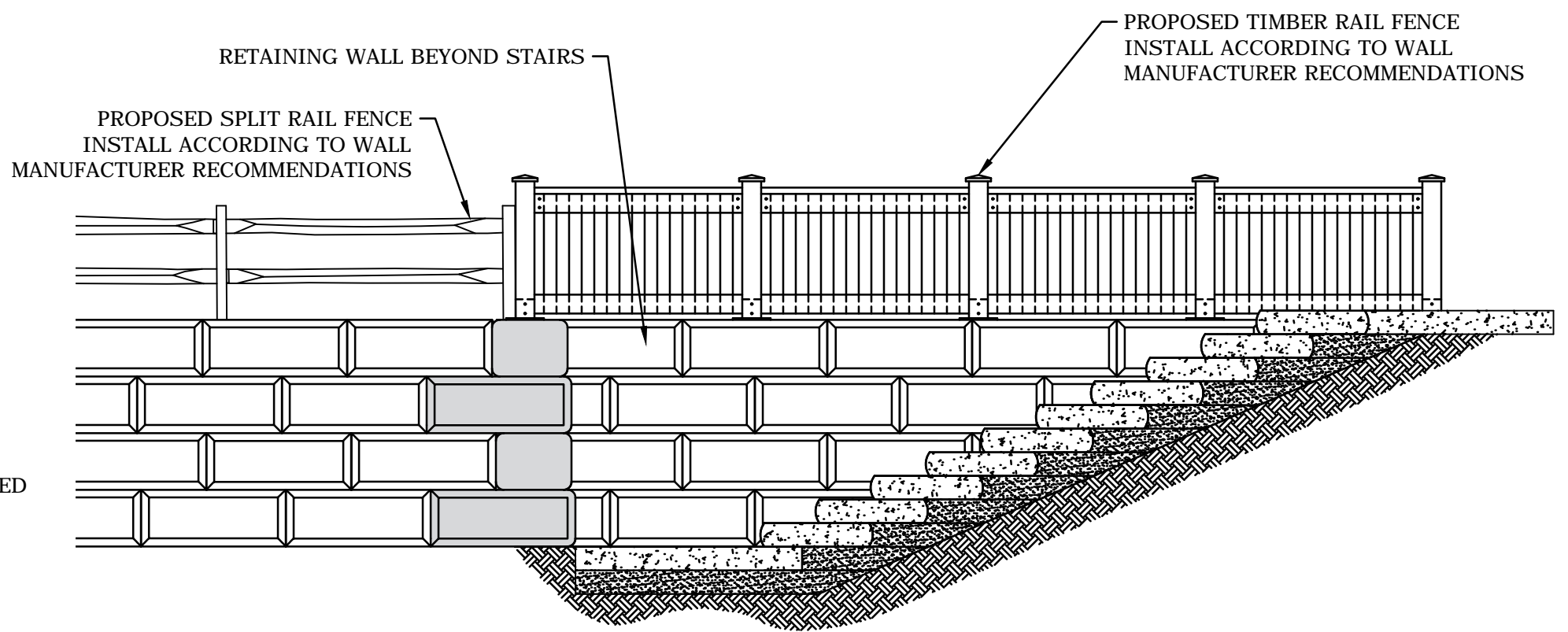
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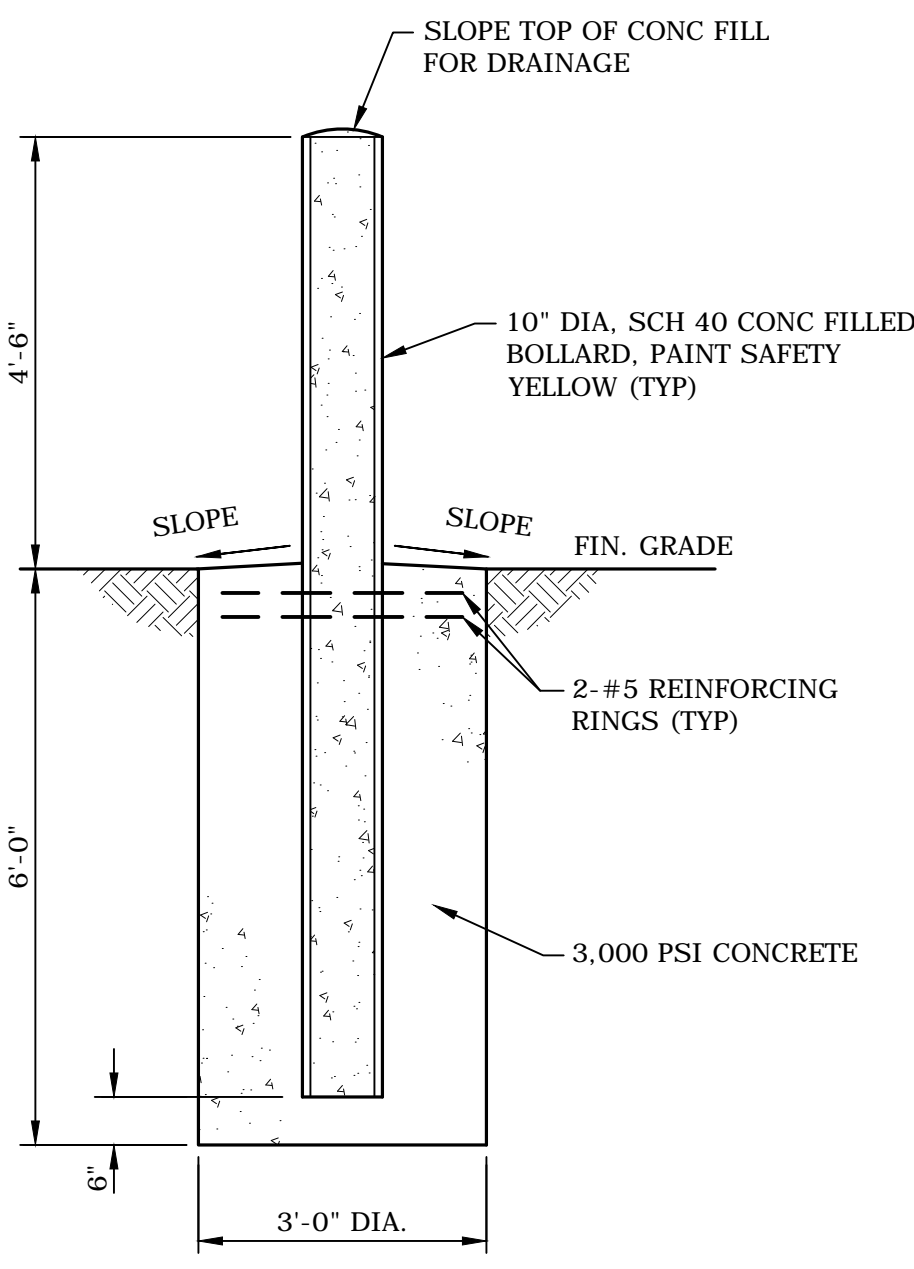
SPLIT RAIL FENCE
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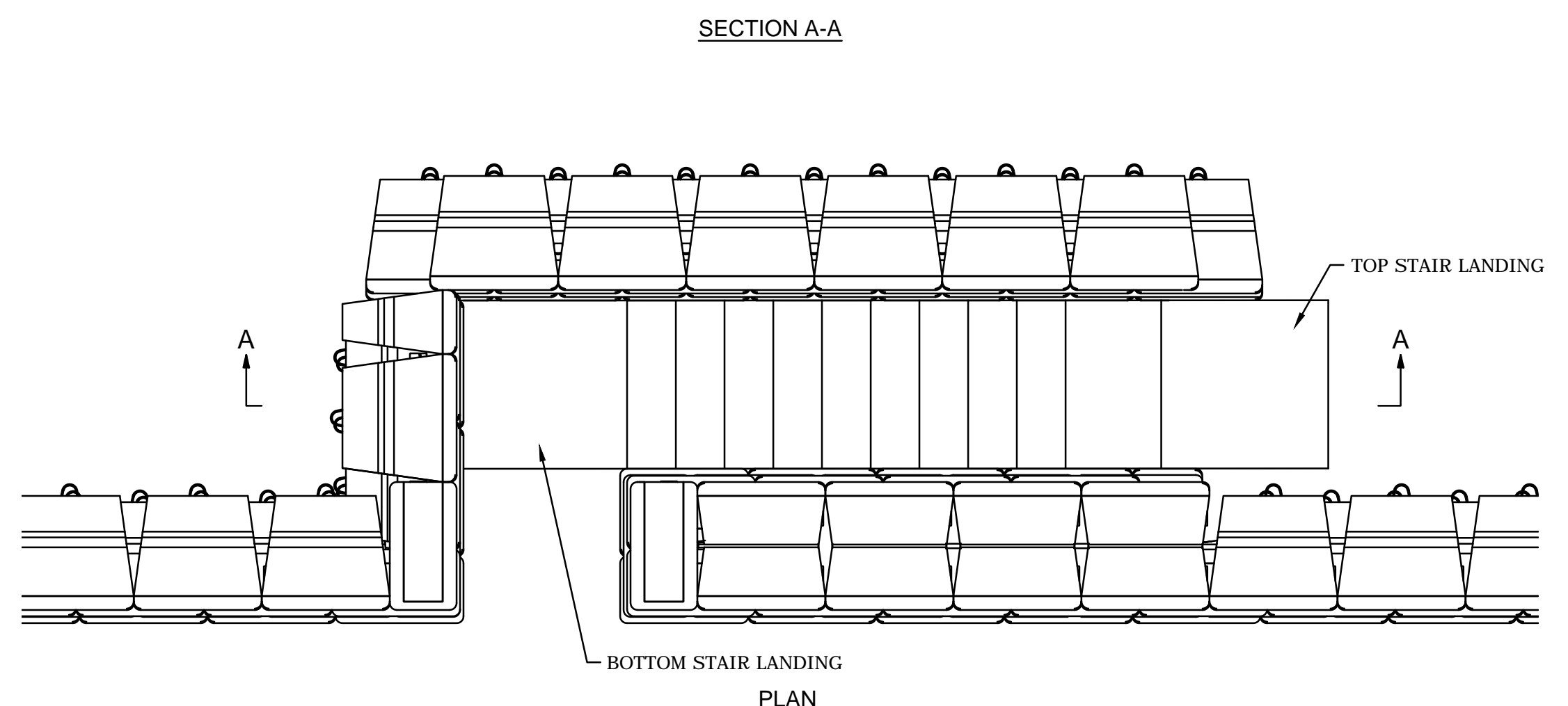
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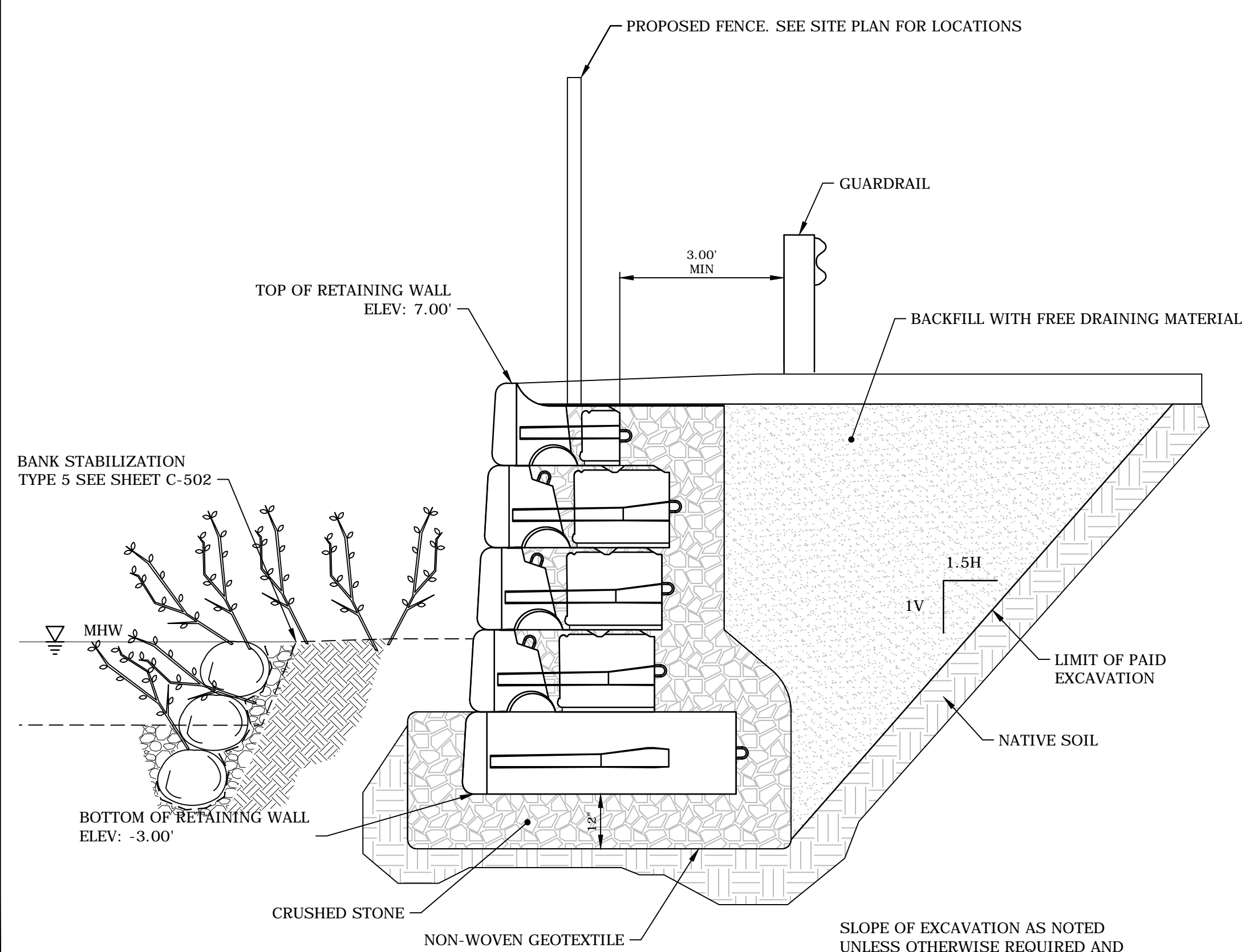
SECTION A-A



10" DIAMETER STEEL BOLLARD
NO SCALE



STAIR ACCESS
NO SCALE



GRAVITY BLOCK WALL
NO SCALE

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VERIFY SCALE
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CONSTRUCTION DETAILS

SCALE: AS NOTED

C-506

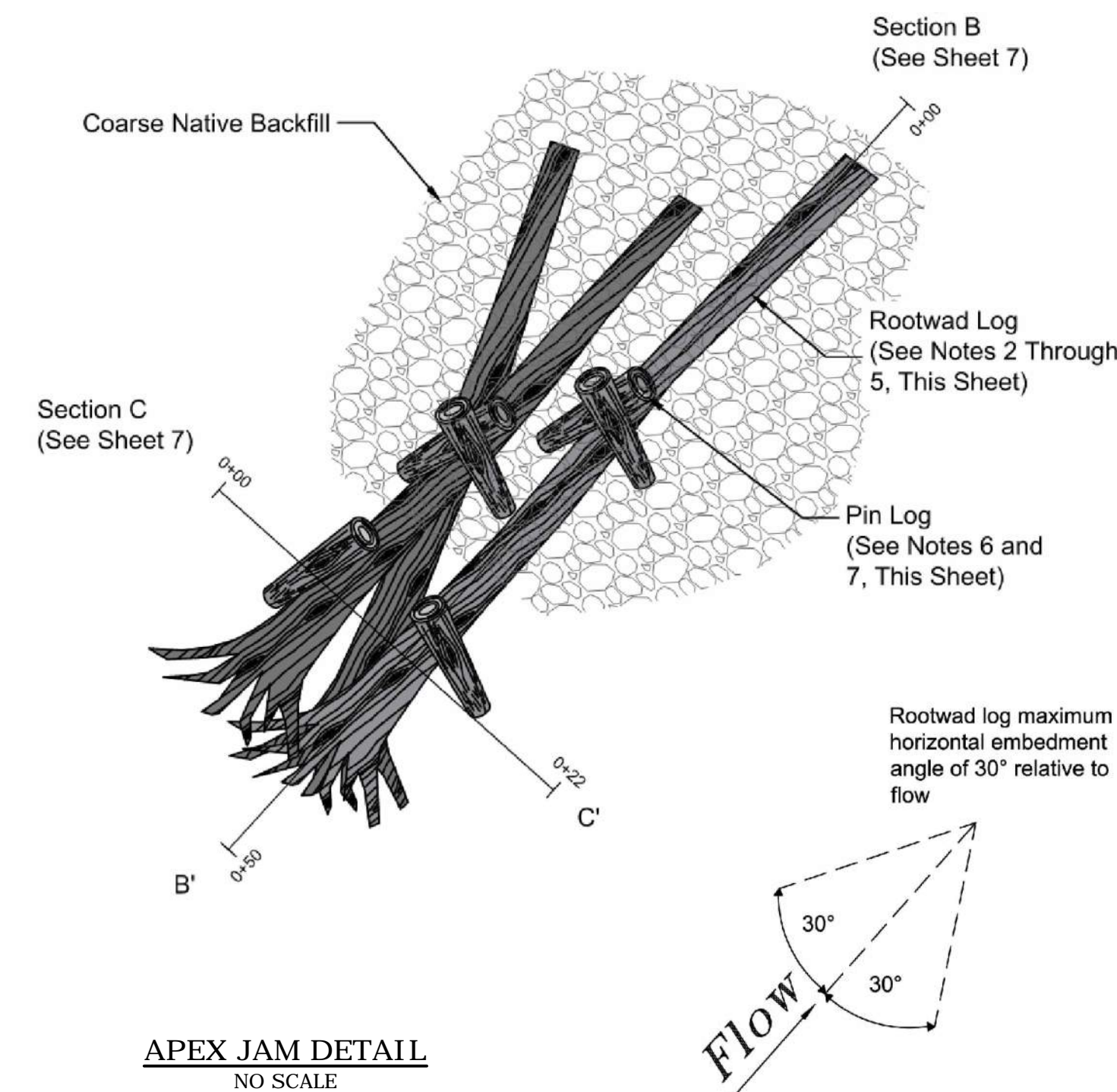
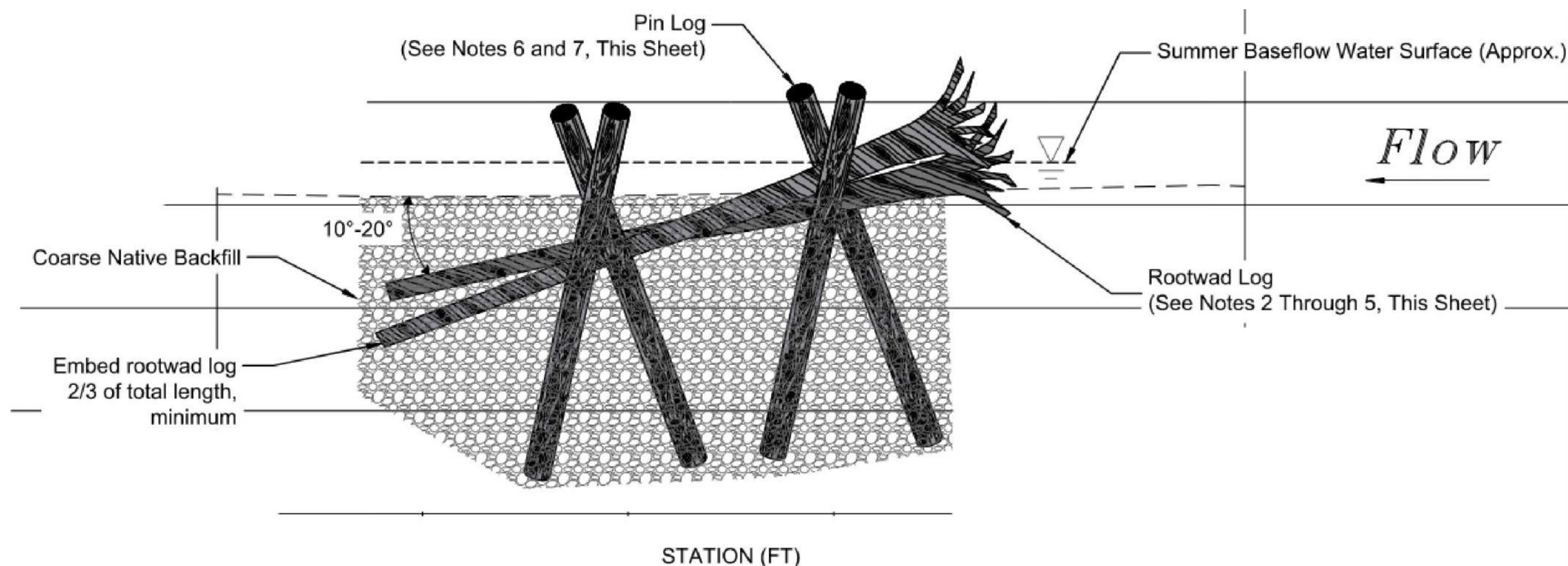
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BANK JAM A LOG QUANTITY SCHEDULE

STRUCTURE	LOCATION				TYPE 1 **	TYPE 2 *	TYPE 4 **	RACKING (EA) *	SLASH (CY) *
	ID	RIVER	STA	BANK					
ELJ-ROOTWAD STRUCTURE	SAWMILL BK	NA	R	0.0	18	6	18	24	10
APEX JAM					6	0	6	8	2
3' ROOTWAD CLUSTERS AT 18' EA					24	6	24	32	12
* LOGS WITHOUT ROOTWADS									
** LOGS WITH ROOTWAD									

BANK JAM NOTES:

- INSTALL STRUCTURES AT LOCATIONS IDENTIFIED ON PLAN SHEETS.
- BASE ELEVATION (BOTTOM OF FIRST PLACED LOG) OF EACH STRUCTURE (SPECIFIED IN THE STRUCTURE SCHEDULE) SHALL BE CHECKED/VERIFIED BY THE TOWN OR ENGINEER IN THE FIELD - CHECK WITH TOWN OR ENGINEER BEFORE BEGINNING WORK FOR EACH STRUCTURE.
- SEE "STRUCTURE SEQUENCING" DETAIL ON SHEET C-103 FOR NUMBER OF STRUCTURES, LOCATIONS, LOGS, AND ASSOCIATED MATERIAL QUANTITIES.
- EXCAVATE A 2' DEEP POOL ADJACENT TO THE STRUCTURE AND EXTEND POOL OUT PAST THE END OF THE ROOTWADS EXTENDING INTO THE CHANNEL AT THE DIRECTION OF THE TOWN OR ENGINEER.
- ALL CUT ENDS OF LOGS THAT WILL BE EXPOSED UPON COMPLETION OF STRUCTURE SHALL BE MARRED PRIOR TO INSTALLATION. THE CONTRACTOR SHALL USE AN EXCAVATOR, OR OTHER HEAVY EQUIPMENT TO TEAR APART WOOD FIBERS AT THE CUT END OF THE LOG TO CREATE THE APPEARANCE OF A LOG THAT HAS NATURALLY BROKEN APART.
- TYPE 4 LOG SHALL BE HANDLED A MINIMUM NUMBER OF TIMES TO REDUCE LOSS OF LIMBS, FOLIAGE, ETC.. IF MORE THAN 15% OF TREE BRANCHES ARE REMOVED OR DAMAGED DURING HANDLING THE CONTRACTOR SHALL REPLACE TYPE 4 LOG AT NO COST TO THE CONTRACTING AGENCY.
- RACKING AND SLASH MATERIAL SHALL BE INCORPORATED INTO THE STRUCTURE BY WEAVING IT IN BETWEEN PLACED LOGS, FILLING VOIDS, ETC. AT EACH STEP THROUGHOUT CONSTRUCTION AS DIRECTED BY THE ENGINEER.
- BACKFILL USING NATIVE EXCAVATED MATERIAL UNLESS NATIVE MATERIAL IS UNSUITABLE FOR BACKFILL. PLACE BACKFILL IN 1-FOOT MAXIMUM LIFTS. COMPACT EACH LIFT USING MECHANICAL EQUIPMENT SUCH AS AN EXCAVATOR BUCKET OR EQUIPMENT TRACKING MAKING CERTAIN TO NOT DAMAGE OR CHANGE THE ELEVATION OF THE STRUCTURE MATERIAL DURING COMPACTION.
- LOG PLACEMENT CAN BE ADJUSTED IN THE FIELD AT THE DIRECTION OF THE TOWN OR ENGINEER.
- LIVE STAKES SHALL BE INSTALLED TO ENSURE A MINIMUM OF 1-FT SUBMERGENCE IN GROUND WATER. SEE LIVE STAKE QUANTITIES ON SHEET C-503 REVEGETATION NOTES.



APEX JAM DETAIL
NO SCALE

NOTES:

- A 3 ROOTWAD LOG, 6 PIN LOG STRUCTURE IS SHOWN IN SECTION B AND C TO ILLUSTRATE EMBEDMENT SPECIFICATIONS. THE SAME EMBEDMENT SPECIFICATIONS SHALL BE USED FOR A 5 ROOTWAD LOG, 8 PIN LOG STRUCTURE.
- ROOTWAD LOG DIAMETER 16" MINIMUM.
- TOTAL LENGTH FOR ROOTWAD LOGS SHALL BE 20' MINIMUM, INCLUDING ROOT WAD.
- ROOTWADS SHALL BE ORIENTED FACING UPSTREAM.
- ROOTWAD LOGS SHALL BE BURIED A MINIMUM OF 2/3 OF LENGTH WITH AN AVERAGE BURIAL DEPTH OF 4'. VERTICALLY ANGLED 10 DEGREES TO 20 DEGREES RELATIVE TO THE CHANNEL SURFACE, AND HORIZONTALLY ANGLED NO MORE THAN 30 DEGREES RELATIVE TO THE DIRECTION OF FLOW.
- PIN LOGS SHALL BE A MINIMUM 18' IN LENGTH AND MAY VARY FROM 12" TO 14" IN DIAMETER. PIN LOGS SHALL BE PLACED AT A VERTICAL ANGLE NO GREATER THAN 55 DEGREES FROM VERTICAL.
- PIN LOGS SHALL BE DRIVEN AS DEEP AS POSSIBLE AND MEET A MINIMUM EMBEDMENT LENGTH OF AT LEAST 12' OF THE PIN LOG BURIED BELOW THE SURFACE.
- BACKFILL LARGE WOOD WITH NATIVE CHANNEL MATERIAL, LEAVING ROOTWAD EXPOSED.
- IF IT IS INFEASIBLE FOR ALL LOGS IN A STRUCTURE TO MEET THE MINIMUM EMBEDMENT SPECIFICATIONS, ADDITIONAL PIN LOGS SHALL BE FIELD-FIT TO ENSURE STRUCTURAL INTEGRITY IS MAINTAINED.

NOTES:

- LARGE WOOD HABITAT STRUCTURES WILL RANGE FROM 3 ROOTWAD LOG, 6 PIN LOG (A) TO 5 ROOTWAD LOG, 8 PIN LOG (B) STRUCTURES.
- ROOTWAD LOG DIAMETER 16" MINIMUM.
- TOTAL LENGTH FOR ROOTWAD LOGS SHALL BE 20' MINIMUM, INCLUDING ROOT WAD.
- ROOTWADS SHALL BE ORIENTED FACING UPSTREAM.
- ROOTWAD LOGS SHALL BE BURIED A MINIMUM OF 2/3 OF LENGTH WITH AN AVERAGE BURIAL DEPTH OF 4'. VERTICALLY ANGLED NO MORE THAN 10 DEGREES RELATIVE TO THE CHANNEL SURFACE, AND HORIZONTALLY ANGLED NO MORE THAN 30 DEGREES RELATIVE TO THE DIRECTION OF FLOW.
- PIN LOGS SHALL BE A MINIMUM 18' IN LENGTH AND MAY VARY FROM 12" TO 14" IN DIAMETER. PIN LOGS SHALL BE PLACED AT A VERTICAL ANGLE NO GREATER THAN 55 DEGREES FROM VERTICAL.
- PIN LOGS SHALL BE DRIVEN AS DEEP AS POSSIBLE AND MEET A MINIMUM EMBEDMENT LENGTH OF AT LEAST 12' OF THE PIN LOG BURIED BELOW THE SURFACE.
- BACKFILL LARGE WOOD WITH NATIVE CHANNEL MATERIAL, LEAVING ROOTWAD EXPOSED.
- IF IT IS INFEASIBLE FOR ALL LOGS IN A STRUCTURE TO MEET THE MINIMUM EMBEDMENT SPECIFICATIONS, ADDITIONAL PIN LOGS SHALL BE FIELD-FIT TO ENSURE STRUCTURAL INTEGRITY IS MAINTAINED.

100% DESIGN
NOT FOR
CONSTRUCTION

CENTRAL
POND
RESTORATION

Central Street
to Knight Circle

Manchester
-by-the-Sea, MA

VERIFY SCALE
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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

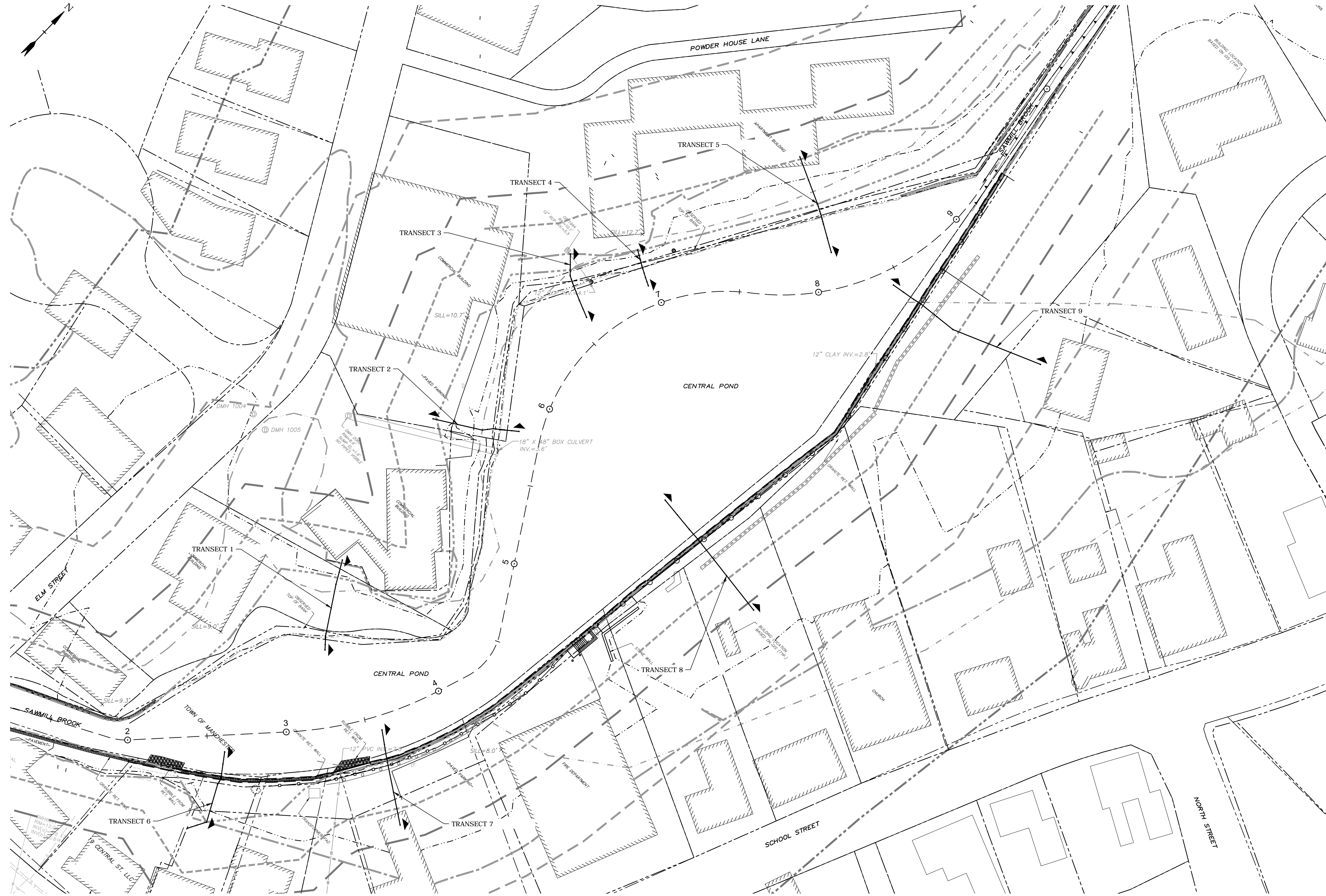
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DATE:	JUNE 30, 2021	
FILE:	M1476-014-C-500_Details.dwg	
DRAWN BY:	DWB, TMP	
CHECKED:	DLM	
APPROVED:	DAM	

BANK JAM SCHEDULE AND NOTES

SCALE: AS NOTED

C-507

Last Saved: 6/29/2021 4:50pm By: DWB/Bradsaw
 Plotted On: Jun 29, 2021 4:50pm
 Digne & Bond, Inc. 23 W. Main St. Manchester, MA 01748



90% DESIGN
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CONSTRUCTION

CENTRAL
POND
RESTORATION

Central Street
to Knight Circle

Manchester
-by-the-Sea, MA

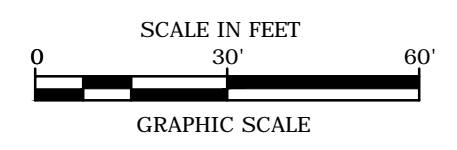
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IF NOT ONE INCH ON
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SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION

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DATE:	JUNE 30, 2021
FILE:	M1476-012_Design.dwg
DRAWN BY:	DWB
CHECKED:	DLM
APPROVED:	DAM

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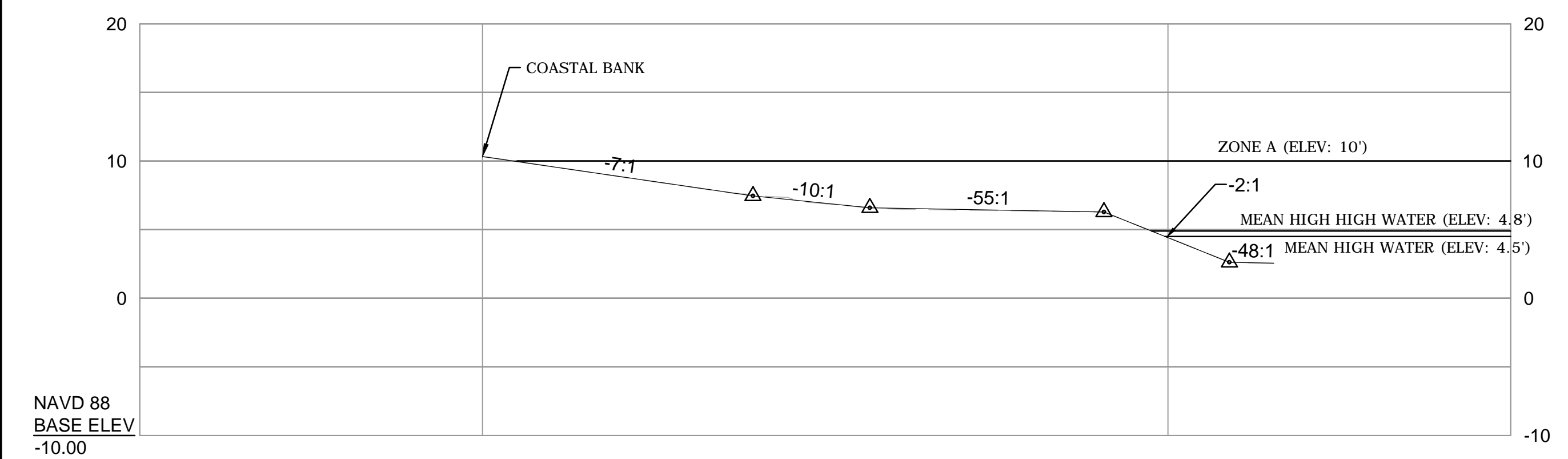
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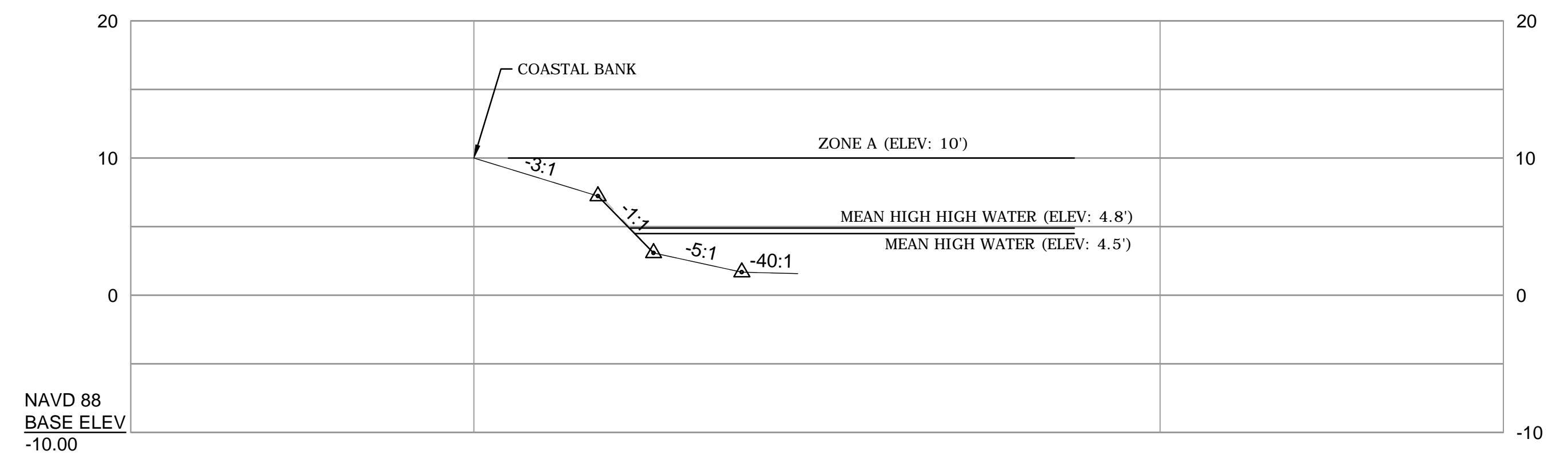
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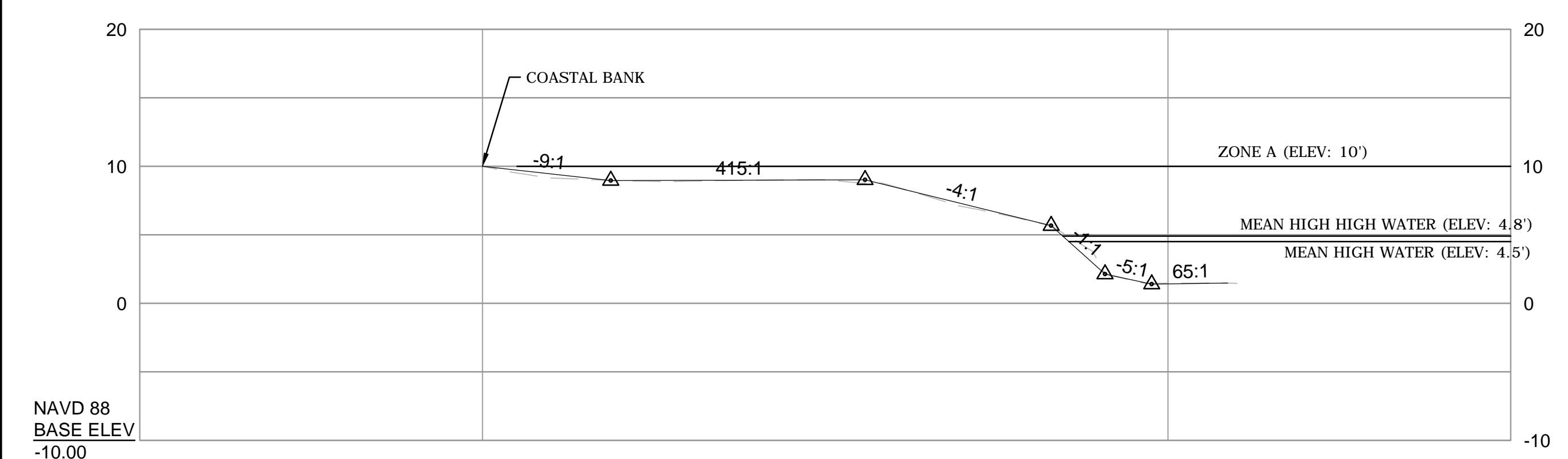
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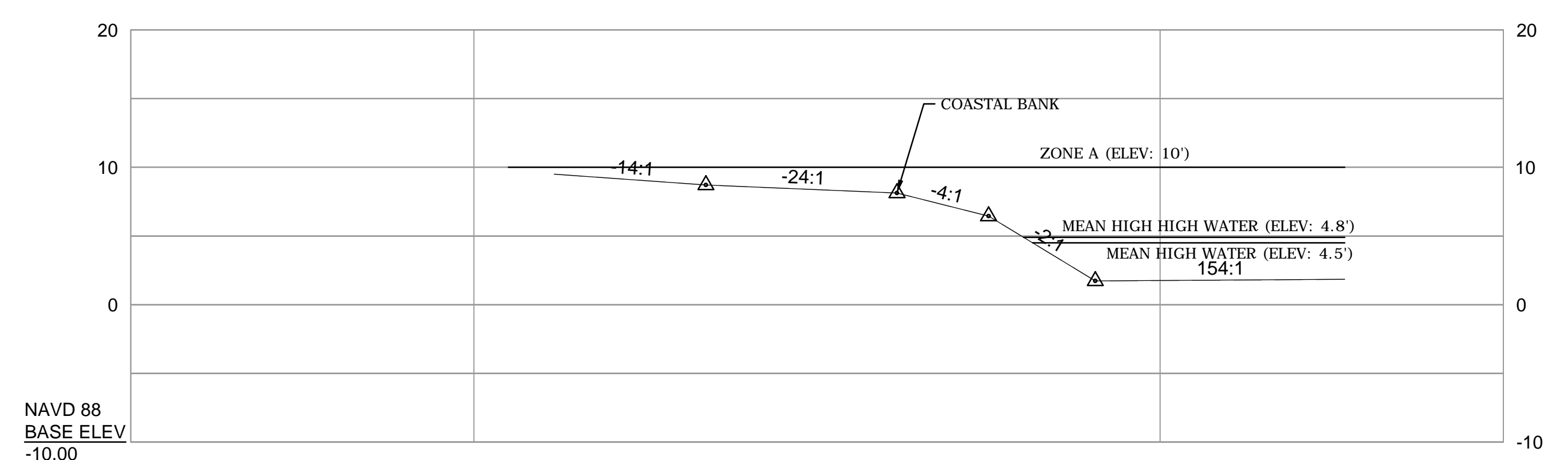
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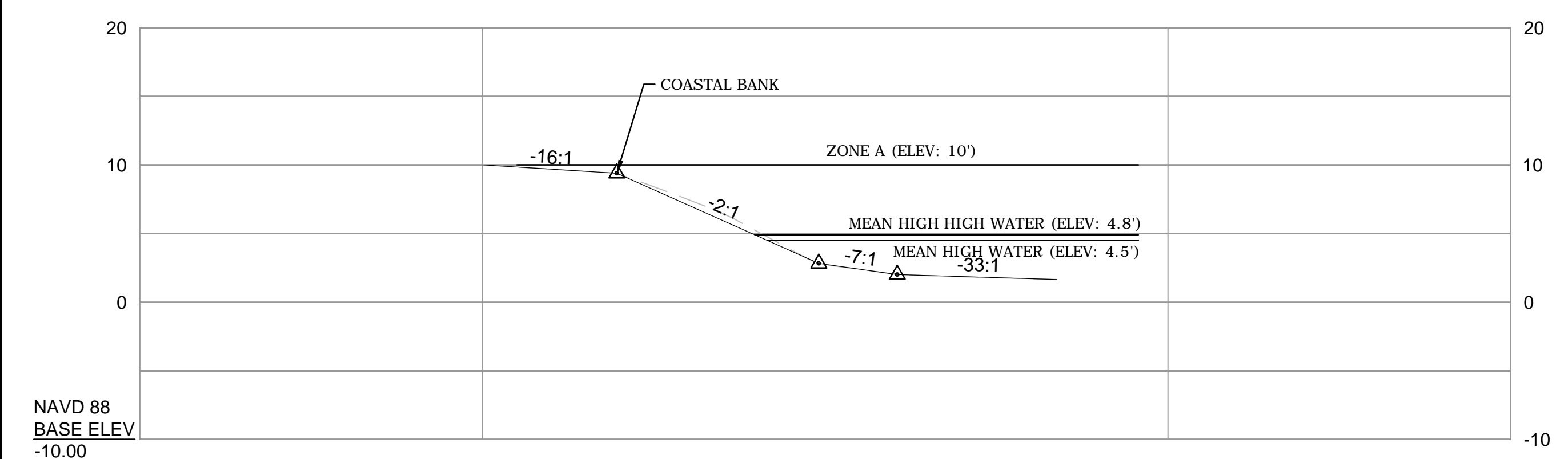
TRANSECT 2



TRANSECT 5



TRANSECT 3



**90% DESIGN
NOT FOR
CONSTRUCTION**

**CENTRAL
POND
RESTORATION**

**Central Street
to Knight Circle**

**Manchester
-by-the-Sea, MA**

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
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MARK	DATE	DESCRIPTION

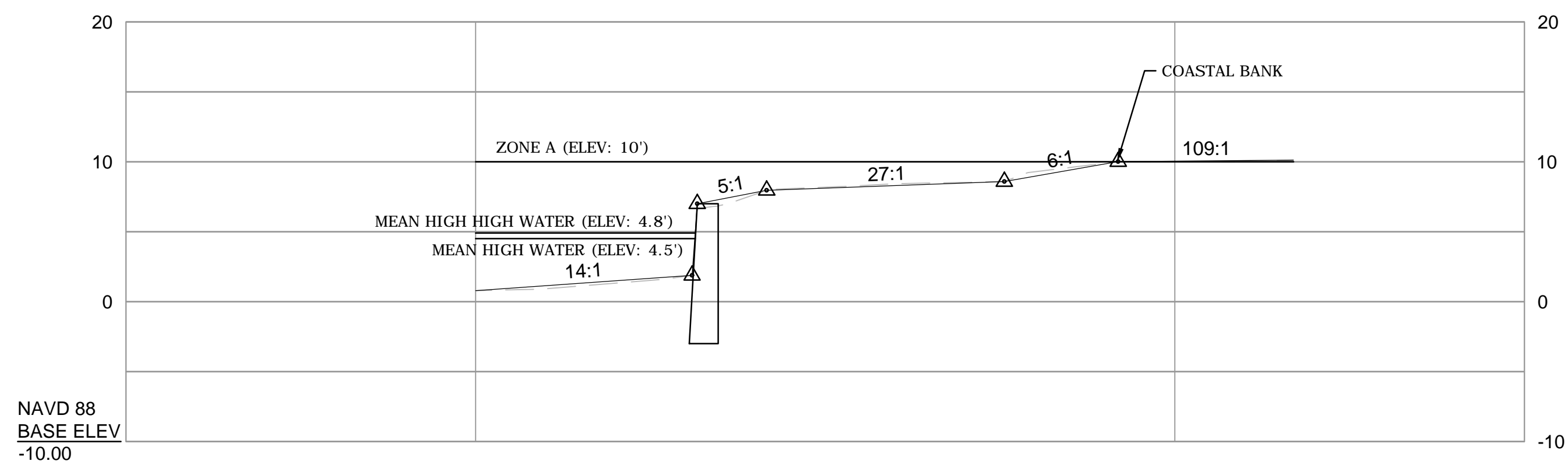
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APPROVED:	DAM

**TRANSECT CROSS
SECTIONS - 1**

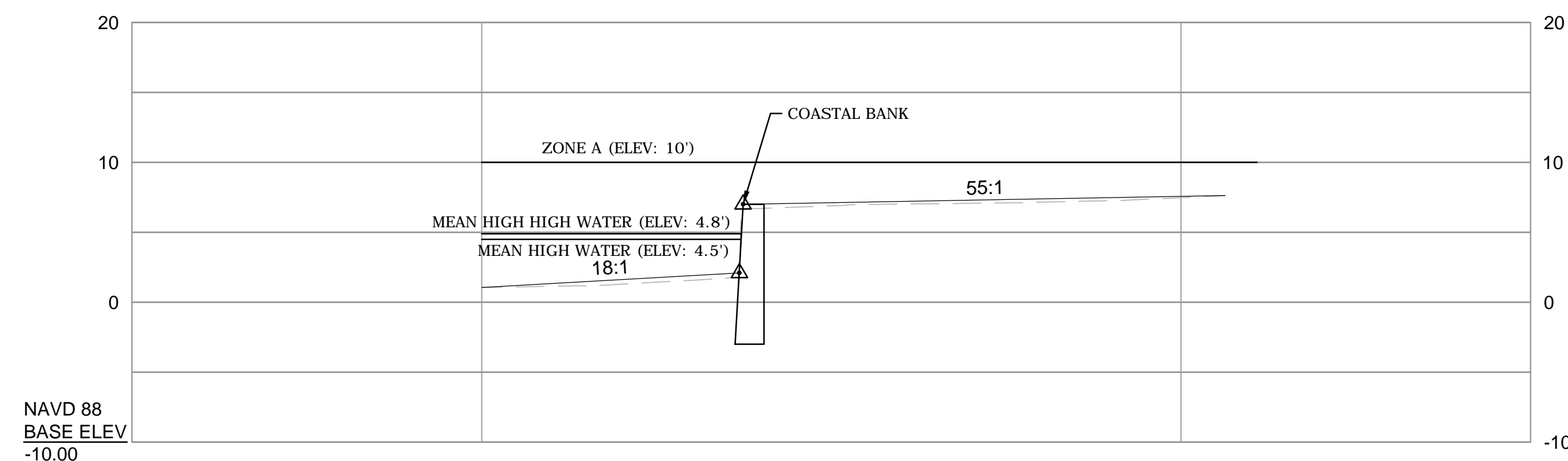
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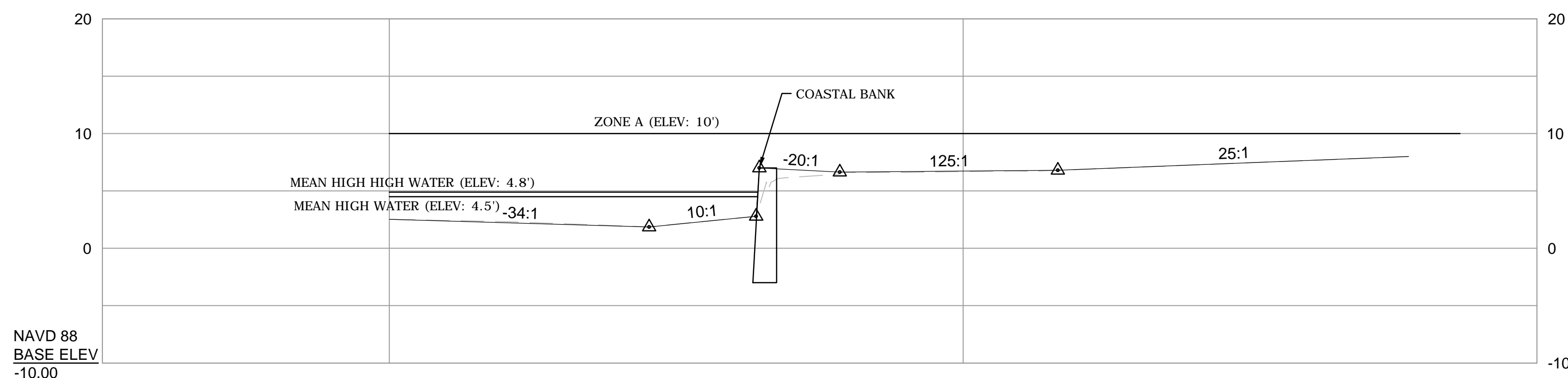
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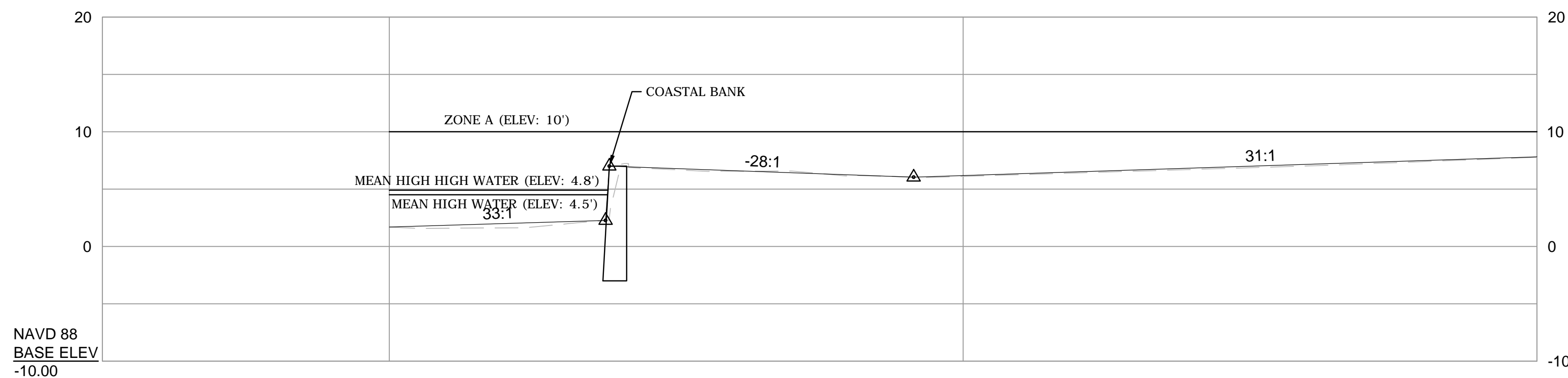
TRANSECT 7



TRANSECT 8



TRANSECT 9



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RESTORATION

Central Street
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THIS SHEET, ADJUST
SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION
PROJECT NO:	M1467-014	
DATE:	JUNE 30, 2021	
FILE:	M1476-012_Design.dwg	
DRAWN BY:	DWB	
CHECKED:	DLM	
APPROVED:	DAM	

TRANSECT CROSS
SECTIONS - 2

SCALE: HOR: 1"=8'; VER: 1"=8'

C-603

APPENDIX C3

Central Street Bridge Replacement Plan Set

TOWN OF MANCHESTER-BY-THE-SEA, MASSACHUSETTS

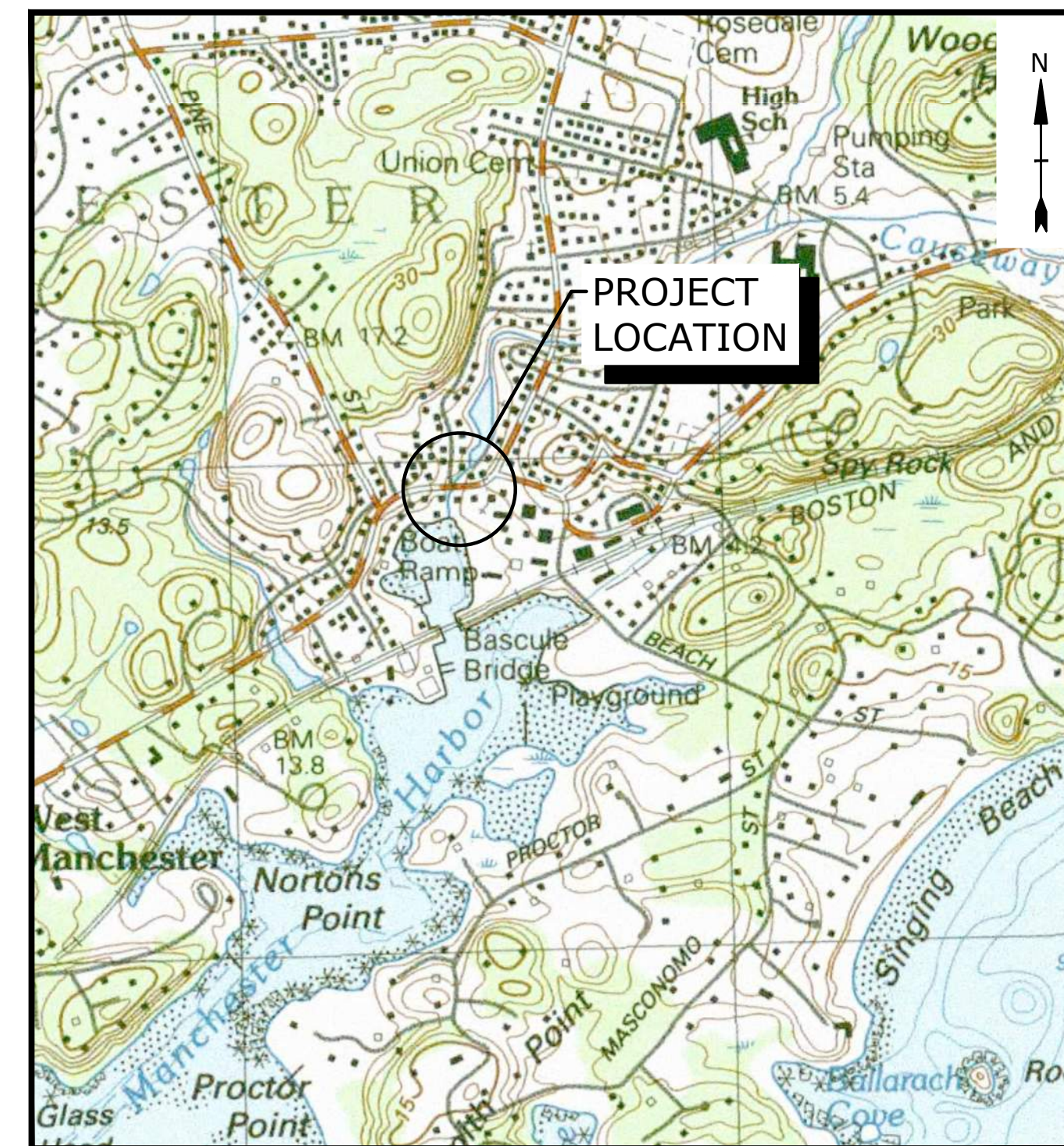
CENTRAL STREET BRIDGE

RECONSTRUCTION

PROJECT NO: M1476-011

FEBRUARY 2022

LIST OF DRAWINGS		
SHEET NO.	DRAWING NO.	SHEET TITLE
1		COVER
2	G-001	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
3	C-001	CENTRAL STREET SURVEY 1 OF 4
4	C-002	CENTRAL STREET SURVEY 2 OF 4
5	C-003	CENTRAL STREET SURVEY 3 OF 4
6	C-004	CENTRAL STREET SURVEY 4 OF 4
7	C-005	DEMOLITION PLAN & SITE PREPARATION PLAN
8	C-101	SITE PLAN AND PROFILE
9	C-102	GRADING AND ALIGNMENT PLAN
10	C-103	UTILITY PLAN
11	C-104	TEMPORARY ROADWAY PLAN
12	C-105	UTILITY/WORK STAGING PLAN
13-14	C-501 TO C-502	CONSTRUCTION DETAILS
15	C-503	COASTAL BANK PLAN
16-17	C-504 TO C-505	CONTROL OF WATER NOTES AND DETAILS
18	C-701	TEMPORARY TRAFFIC CONTROL PLAN - GENERAL
19	C-702	TEMPORARY TRAFFIC CONTROL PLAN - DETOUR
20	S-001	BRIDGE KEY PLAN, PROFILES, LOCUS AND INDEX
21	S-002	BRIDGE NOTES
22	S-003	BORING LOGS AND BORING NOTES
23-25	S-101 TO S-103	BRIDGE PLANS & DETAILS
26-27	S-104 TO S-105	BRIDGE SECTIONS & DETAILS
28	R-101	S3-TL4 BARRIER DETAILS
29	R-102	PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS



LOCATION MAP
SCALE: 1" = 2000'

PREPARED FOR:

TOWN OF MANCHESTER-BY-THE-SEA
DEPARTMENT OF PUBLIC WORKS
CHARLES DAM, PE, DIRECTOR
NATHAN DESROSIER, PE, TOWN ENGINEER

BOARD OF SELECTMEN

JEFFERY BODMER-TURNER, CHAIR
BECKY JAQUES, VICE CHAIR
ANN HARRISON
JOHN ROUND
ELI BOLING

PREPARED BY:

Tighe & Bond
Engineers | Environmental Specialists

**100% DRAWINGS
NOT FOR CONSTRUCTION**

COMPLETE SET 29 SHEETS

GENERAL NOTES

- BASE PLAN ENTITLED "MASSACHUSETTS DEPARTMENT OF TRANSPORTAION PLAN OF TOPOGRAPHIC SURVEY OF CENTRAL STREET, MANCHESTER BY THE SEA" PREPARED BY DOUCET SURVEY INC. ON NOVEMBER 9, 2018.
- THE HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
- BOLD TEXT AND LINES INDICATES PROPOSED WORK. LIGHT TEXT AND LINES INDICATES APPROXIMATE EXISTING CONDITIONS.
- WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND ON APRIL 18, 2018.
- SOIL BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS ON AUGUST 9, 2018.
- NOTIFY "DIGSAFE" AT 1-888-344-7233 TO ARRANGE FOR MARKING OUT EXISTING UNDERGROUND UTILITIES AT LEAST 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS) PRIOR TO BEGINNING EXCAVATION AT ANY GIVEN LOCATION. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR BE ALLOWED TO START ANY KIND OF EXCAVATION WORK PRIOR TO OBTAINING ALL THE NECESSARY INFORMATION REGARDING THE LOCATION OF UNDERGROUND UTILITIES AT THE SITE. ACCOMPLISH ALL EXCAVATION SO THAT UNDERGROUND UTILITIES OR STRUCTURES ARE NOT DAMAGED. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED DURING EXCAVATION OPERATIONS. REPAIR ANY EXISTING PIPE OR UTILITY DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
- THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR THE LOCATION OF EXISTING UTILITIES. THE ENGINEER AND OWNER MAKE NO GUARANTEE AS TO THE UNDERGROUND CONDITIONS THAT MAY BE ENCOUNTERED.
- FIELD MEASURE TO VERIFY EXISTING AND CONTRACT INTERFACE DIMENSIONS, LOCATIONS, AND OTHER CONDITIONS.
- TEST PITS TO LOCATE EXISTING UTILITIES ARE STRONGLY ENCOURAGED AND MAY BE ORDERED BY THE ENGINEER.
- IF CHANGES TO THE DESIGN ARE PROPOSED, THE CHANGES SHALL BE SUBMITTED TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
- MAKE NECESSARY ARRANGEMENTS TO PERFORM ANY WORK NEAR THE OVERHEAD UTILITIES PRIOR TO THE START OF CONSTRUCTION.
- EXISTING UTILITY POLES IN CLOSE PROXIMITY TO CONSTRUCTION MAY REQUIRE TEMPORARY SUPPORT BY THE UTILITY COMPANY. INCLUDE COST UNDER THE PRICES BID FOR THE VARIOUS ITEMS OF WORK.
- NO OPEN TRENCHES WILL BE ALLOWED OVERNIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED.
- STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE FROM THE SITE TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
- IMMEDIATELY REPORT SPILLS OF OIL AND/OR HAZARDOUS MATERIALS (OHM) TO THE MASSDEP.
- PROVIDE A SUFFICIENT SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS, SUCH AS BOOMS OR BLANKETS, AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS.
- FURNISH AND INSTALL TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR TRAFFIC THROUGH THE WORK AREA OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA.

SURFACE RESTORATION NOTES

- RESTORE ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE LIMITS OF WORK TO ORIGINAL CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
- ALL PAVEMENT DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- PROTECT SURFACE FEATURES (E.G., WALLS, FENCES, MAIL BOXES, SIGNS, SIDEWALKS, CURBING, STAIRS, WALKWAYS, TREES, ECT.) FROM DAMAGE DURING CONSTRUCTION, INCLUDING PROVIDING TEMPORARY SUPPORTS, WHEN APPROPRIATE.
- IF REMOVAL OF SURFACE FEATURES IS REQUIRED IN ORDER TO PERFORM THE PROPOSED WORK, REMOVE THOSE SITE FEATURES ONLY UPON APPROVAL OF ENGINEER. REPLACE ALL REMOVED SITE FEATURES; NEW ITEMS SHALL BE EQUAL OR BETTER IN QUALITY AND CONDITION TO THE ITEMS REMOVED.
- EXISTING SURVEY MONUMENTS DISTURBED BY THE CONTRACTOR SHALL BE REPLACED BY A LAND SURVEYOR LICENSED IN THE STATE IN WHICH THE WORK IS PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
- REPAIR DISTURBED PAVED SURFACES AT THE END OF EACH WORK WEEK, UNLESS OTHERWISE APROVED/REQUIRED BY THE OWNER.

LEGEND

EXISTING	NEW	
		IRON PIPE FOUND
		UTILITY POLE
		BURIED DRAIN PIPE
		OVERHEAD UTILITY WIRES
		FENCE (SIZE AND TYPE NOTED)
		GUARDRAIL
		APPROXIMATE PROPERTY LINE
		SIGN AND POST
		TREE LINE
		INDEX CONTOUR
		INTERMEDIATE CONTOUR
		STONEWALL
		BORING
		PROFILE ELEVATIONS
		WETLAND FLAGS
		WETLAND SYMBOL
		LAND SUBJECT TO COASTAL STORM FLOWAGE
		100-FOOT BUFFER ZONE
		200-FOOT RIVERFRONT AREA
		30-FOOT NO DISTURBANCE ZONE
		50-FOOT NO BUILD ZONE
		COASTAL BANK
		TEMPORARY COFFER DAM
		EROSION CONTROL BARRIERS
		SURVEYED EDGE OF WATER (APRIL 2018)

ABBREVIATIONS

GENERAL		UTILITIES	
ABAN	ABANDON	AC	ASBESTOS CEMENT PIPE
ADJ	ADJUST	ACCOMP	ASPHALT COATED CORRUGATED METAL PIPE
APPROX	APPROXIMATE	CAP	CORRUGATED ALUMINUM PIPE
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS	CB	CATCH BASIN
BIT	BITUMINOUS	CI	CAST IRON PIPE
BO	BY OTHERS	CIT	CHANGE IN TYPE
BOS	BOTTOM OF SLOPE	CMP	CORRUGATED METAL PIPE
BVW	BORDERING VEGETATIVE WETLANDS	CNO	COULD NOT OPEN
CC	CONCRETE CURB	COND	CONDUIT
CCW	CEMENT CONCRETE WALK	CPP	CORRUGATED PLASTIC PIPE
CEM	CEMENT	CS	CURB STOP
CLF	CHAIN LINK FENCE	DIA	DIAMETER
CMP	CORRUGATED METAL PIPE	DI	DUCTILE IRON PIPE
CONC	CONCRETE	DMH	DRAIN MANHOLE
CS	CUT SPIKE	EMH	ELECTRIC MANHOLE
CW	CONCRETE WALK	F&C	FRAME AND COVER
DIM	DIMENSION	F&G	FRAME AND GRATE
DPW	DEPARTMENT OF PUBLIC WORKS	GSO	GAS SHUT OFF
EOP	EDGE OF PAVEMENT	HH	HANDHOLE
EXIST	EXISTING	HYD	HYDRANT
'	FEET/FOOT	INV	INVERT ELEVATION
FDN	FOUNDATION	MJ	MECHANICAL JOINT
FND	FOUND	MW	MONITORING WELL
GC	GRANITE CURB	PVC	POLYVINYLCHLORIDE PIPE
GE	GRANITE EDGING	RCP	REINFORCED CONCRETE PIPE
GRAN	GRANITE	RP	RECORD PLAN
HMA	HOT MIX ASPHALT	SC	STORM WATER TREATMENT UNIT
"	INCH	SD	STORM DRAIN LINE
I FO	IN FRONT OF	SMH	SEWER MANHOLE
IP	IRON PIN	TSV&B	TAPPING SLEEVE, VALVE AND BOX
LSCSF	LAND SUBJECT TO COASTAL STORM FLOWAGE	UP	UTILITY POLE
MASSDEP	MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION	WG	WATER GATE
MAX	MAXIMUM	WSO	WATER SHUT OFF
MIN	MINIMUM		
MHD	MASSACHUSETTS HIGHWAY DEPARTMENT		
M	MHD MATERIAL REFERENCE	ALIGNMENT/PROFILE	
MISC	MISCELLANEOUS	AD	ALGEBRAIC DIFFERENCE
N/F	NOW/FORMERLY	ℓ	CONSTRUCTION BASELINE
NTS	NOT TO SCALE	CC	CENTER OF CURVE
PCR	PEDESTRIAN CURB RAMP	E	EAST
PREF	PREFERRED	EL/ELEV	ELEVATION
PROP	PROPOSED	GB	GRANITE BOUND
PSF	POUNDS PER SQUARE FOOT	K	RATE OF VERTICAL CURVATURE
PSI	POUNDS PER SQUARE INCH	L	LENGTH
PVMT	PAVEMENT	LT	LEFT
QTY	QUANTITY	N	NORTH
REMOD	REMODEL	OC	ON CENTER
REM	REMOVE	PC	POINT OF CURVE
REQD	REQUIRED	PCC	POINT OF COMPOUND CURVE
RET	RETAIN	PK/SPIKE	SURVEY NAIL
R&D	REMOVE AND DISPOSE	ℓ	PROPERTY LINE
R&R	REMOVE AND RESET	PRC	POINT OF REVERSE CURVE
R&S	REMOVE AND STACK	PT	POINT OF TANGENT
SB	STONE BOUND	PVC	POINT OF VERTICAL CURVE
SF	SQUARE FEET	PVI	POINT OF VERTICAL INTERSECTION
SPKS	SURVEY SPIKE	PVCC	POINT OF VERTICAL COMPOUND CURVE
TOS	TOP OF SLOPE	PVRC	POINT OF VERTICAL REVERSE CURVE
TYP	TYPICAL	PVT	POINT OF VERTICAL TANGENT
VGC	VERTICAL GRANITE CURB	R	RADIUS
YD	YARD	ROW	RIGHT OF WAY
		RT	RIGHT
		S	SOUTH
		STA	STATION
		VC	VERTICAL CURVE
		W	WEST

**100%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO: M1476-011		
DATE: FEBRUARY 2022		
FILE: M1476-011-G-001.dwg		
DRAWN BY:	AGB	
CHECKED BY:	BRB	
APPROVED BY:	DLM	

LEGEND, ABBREVIATIONS, AND
GENERAL NOTES

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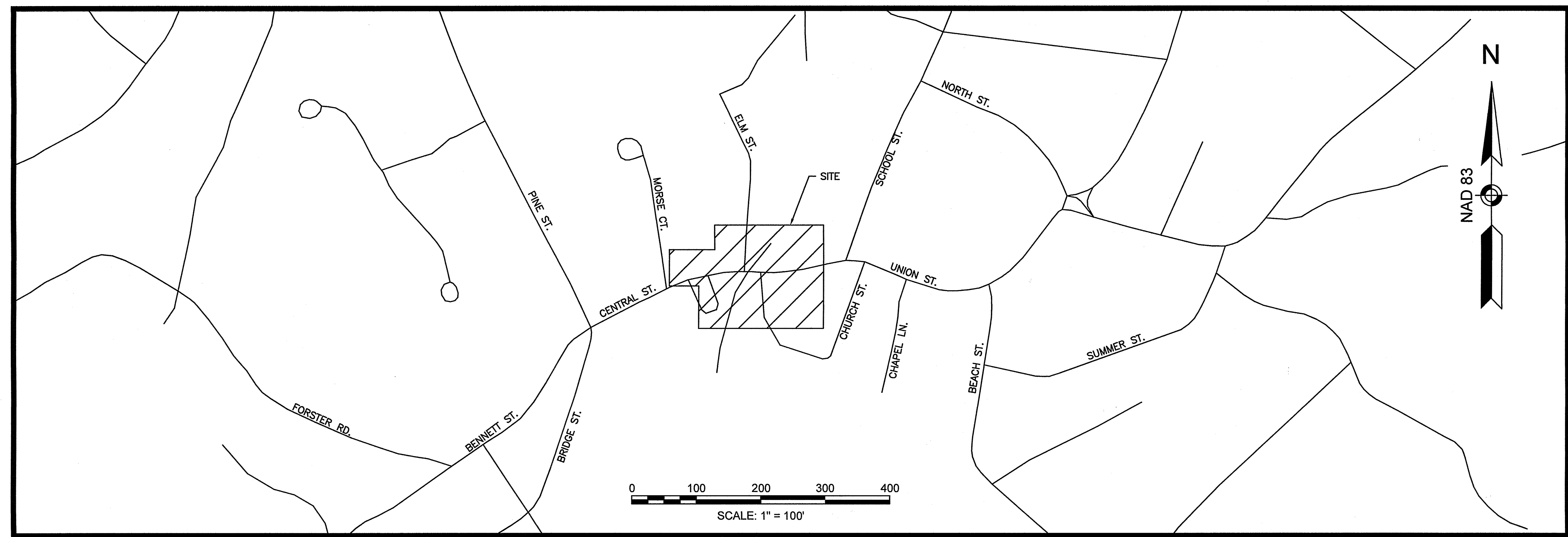
G-001
SHEET 2 OF 29

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MA	-	4	X
PROJECT FILE NO.		XXXXXX	

TITLE SHEET, LEGEND & ABBREVIATIONS

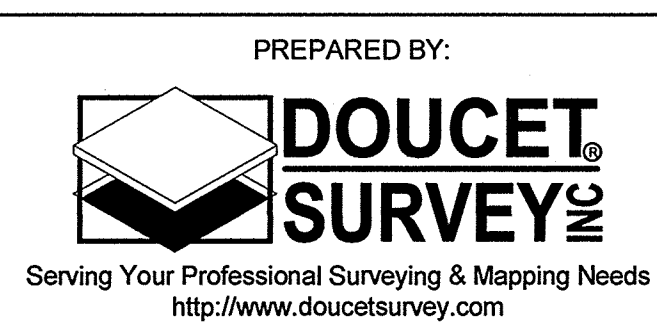
LEGEND

	APPROX. ABUTTERS LOT LINE (SEE NOTE 9)
	GAS LINE
	SEWER LINE
	TELEPHONE LINE
	WATER LINE
	UNDERGROUND ELECTRIC LINE
	SHRUB LINE
	OVERHEAD WIRE
	CHAIN-LINK FENCE
	HAND RAIL
	OTHER FENCE
	MAJOR CONTOUR LINE
	MINOR CONTOUR LINE
	RIVER BED MAJOR CONTOUR LINE (SEE NOTE 10)
	RIVER BED MINOR CONTOUR LINE (SEE NOTE 10)
	BRICK
	CONCRETE
	CRUSHED STONE
	LANDSCAPED AREA
	CATCH BASIN - SQUARE
	CLEANOUT
	DISK (CAV, USC&GS, LAND COURT, ETC.)
	DRAIN MANHOLE
	ELECTRIC HANDHOLE
	ELECTRIC MANHOLE
	ELECTRIC METER
	FLAG POLE
	GAS GATE
	GAS METER
	GAS SHUTOFF VALVE
	FIRE HYDRANT
	LIGHT POLE
	OTHER MANHOLE
	SQUARE POST
	SEWER MANHOLE
	TELEPHONE MANHOLE
	TREE
	SIGN
	UTILITY POLE
	WATER GATE
	WATER SHUTOFF
BB	BITUMINOUS BERM
CIP	CAST IRON PIPE
CONC	CONCRETE
CS	COBBLESTONE
DBYL	DOUBLE YELLOW LINE
DMH	DRAIN MANHOLE
DS	DOWN SPOUT
DSK	DISK
EL	ELEVATION
EP	EDGE OF PAVEMENT
ETW	EDGE OF TRAVELED WAY
FF	FINISHED FLOOR
GRAN	GRANITE
HDW	HEADWALL
PLUG	LEAD PLUG WITH ESCUTCHEON PIN
RET	RETAINING
SWL	SOLID WHITE LINE
TYP	TYPICAL
VGC	VERTICAL GRANITE CURB



NOTES:

- REFERENCE: TOWN OF MANCHESTER-BY-THE-SEA. CENTRAL STREET BRIDGE OVER SAWMILL BROOK.
- FIELD SURVEY PERFORMED BY B.T. & T.M.M. DURING AUGUST 2018 USING A TRIMBLE S6 TOTAL STATION WITH A TRIMBLE TSC3 DATA COLLECTOR AND A SOKKIA B21 AUTO LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS. ADDITIONAL FIELD SURVEY PERFORMED BY M.J.C. IN AUGUST 2018 USING A LEICA P40 HDS SCANNER. REGISTRATION ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- THIS MAP WAS PREPARED FROM RECORD RESEARCH, OTHER MAPS, LIMITED FIELD MEASUREMENTS AND OTHER SOURCES. IT IS NOT TO BE CONSTRUED AS A PROPERTY / BOUNDARY SURVEY AND IS SUBJECT TO SUCH FACTS AS SAID SURVEYS MAY DISCLOSE.
- HORIZONTAL DATUM BASED ON MASSACHUSETTS MAINLAND ZONE NAD83(2011) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- VERTICAL DATUM IS BASED ON NAVD88 DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK AND CALIBRATED TO THREE MASSDOT GEODETIC CONTROL STATIONS (REF. DSI PROJECT 4536).
- PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT (1') INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY, INC. WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.
- THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING; THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.
- ALL ELECTRIC, GAS, TEL. WATER, SEWER AND DRAIN SERVICES ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN ON THIS SITE USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.
- ABUTTER AND RIGHT OF WAY LINES SHOWN HEREON ARE FROM MASS.GOV OFFICE OF GEOGRAPHIC INFORMATION (MASSGIS) ONLY.THE REFERENCE PLANS LISTED HEREON ARE PROVIDED AS A COURTESY ONLY; THE SCOPE OF THIS TOPOGRAPHIC SURVEY DID NOT INCLUDE BOUNDARY ANALYSIS OR FIELD SURVEY EFFORTS TO UNCOVER RECORD MONUMENTS.
- ELEVATIONS AND LOCATIONS SHOWN DEPICTING SPRING LINE ARE BASED ON DATA FROM LASER SCAN POINT CLOUD OF STONE ARCH CULVERT.
- VISIBLE UTILITTY STRUCTURES (MANHOLES, CATCH BASINS, GAS & WATER VALVES, ETC.) WERE LOCATED BY INSTRUMENT SURVEY BY THIS OFFICE. THE CORRESPONDING STORMWATER DRAIN & SANITARY SEWER INVERT SIZE & ELEVATION IS PER SURVEY DONE BY THIS OFFICE. THE LOCATIONS OF THE REMAINING UNDERGROUND UTILITIES ARE BASED ON THE LOCATIONS OF S.U.E. PAINT MARKS (BY OTHERS - UNKNOWN) OBSERVED ON SITE AT THE TIME OF OUR SURVEY.



REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

SCALE: 10 FEET TO THE INCH	
FILE NAME: 5521A_SV	
FIELD BOOK NO: XXXX	
DRAWN BY: W.D.C.	CHECKED BY: W.J.D.
FIELD CHIEF: XXX	PARS. NO: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
 PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
 (BRIDGE NO. X-XX-XXX)
 IN THE (TIC) OF
MANCHESTER BY THE SEA
 AS ORDERED BY
 THE MASSACHUSETTS DEPARTMENT OF
 TRANSPORTATION, HIGHWAY DIVISION

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	

TITLE SHEET, LEGEND & ABBREVIATIONS

REFERENCE PLANS:

- "PLAN OF A PORTION OF THE MAIN ROAD IN MANCHESTER SHOWING THE PROPOSED WIDENINGS" DONE BY CHARLES A. PUTNAM, DATED NOVEMBER 23, 1871. COUNTY OF ESSEX RECORD #1230.
- "PLAN OF A PORTION OF CENTRAL STREET AT THE JUNCTION OF SCHOOL STREET AND UNION STREET IN THE TOWN OF MANCHESTER AS ALTERED" DONE BY CLINTON C. BARKER COUNTY ENGINEER DATED SEPTEMBER 1947. S.E.D.R.D. PLAN #76-35.
- "PLAN OF A PORTION OF CENTRAL STREET FROM ELM STREET TO SCHOOL STREET IN THE TOWN OF MANCHESTER AS ALTERED" BY JOHN O. MARMAALA COUNTY ENGINEER DATED SEPTEMBER 1953. S.E.D.R.D. PLAN #84-8.
- "PLAN OF LAND IN MANCHESTER, MASS FOR JEAN E. GRELET" DATED MARCH 20, 1959 BY DANA F. PERKINS & SONS, INC. S.E.D.R.D. PLAN #92-74.
- "PLAN OF A PORTION OF ELM STREET FROM CENTRAL STREET 700 FEET NORTHERLY IN THE TOWN OF MANCHESTER AS LAID OUT" BY EARL H. PAGE DATED OCTOBER 25, 1966. S.E.D.R.D. PLAN #107-91.
- "PLAN OF LAND IN MANCHESTER, MASSACHUSETTS COUNTY OF ESSEX FOR ANN N. KILEY & DOROTHY B. KILEY" DATED FEBRUARY 14, 1985. DONE BY W. C. CAMMETT ENGINEERING, INC. S.E.D.R.D. PLAN #233-32.
- "SITE PLAN 27 CENTRAL ST. CONDOMINIUMS" DONE BY W. C. CAMMETT ENGINEERING, INC. DATED FEBRUARY 1985. S.E.D.R.D. PLAN #233-33.
- "PLAN OF LAND BELONGING TO SAMUEL KNIGHT SONS CO." DATED SEPTEMBER 27, 1946 BY RICHARD A. WIRLING. S.E.D.R.D. PLAN #1946-824.
- "PLAN OF LAND IN MANCHESTER TO BE CONVEYED FROM F. J. MERRILL TO THE CRICKET PRESS, INC." FEBRUARY 15, 1923. BY RAYMOND C. ALLEN. S.E.D.R.D. PLAN #2549-181.
- "LAND OF JOHN W. MARSHALL HEIRS" DATED OCTOBER 28, 1944 BY WARREN A. CROMBIE. S.E.D.R.D. PLAN #3465-1.
- "PLAN OF LAND BELONGING TO SAMUEL KNIGHT SONS, CO." DATED DECEMBER 10, 1946 BY RICHARD A. WIRLING. S.E.D.R.D. PLAN #3521-600.
- "PROPERTY OF JEAN E. GRELET, CENTRAL ST, MANCHESTER MASS" DATED NOVEMBER 8, 1952 S.E.D.R.D. PLAN #3925-1.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF SEA ROCK ESTATE, INC." DATED DECEMBER 18, 1970. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5765-800.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF SEA ROCK ESTATE, INC." DATED MAY 3, 1971 BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5835-1.
- "PLAN OF LAND IN MANCHESTER PEELE HOUSE SQUARE" FOR SEA ROCK ESTATE, INC. DATED JULY 11, 1972 BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5961-297.
- "PLAN OF LAND IN MANCHESTER PEELE HOUSE SQUARE" FOR SEA ROCK ESTATE, INC. DATED MAY 8, 1973. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #6025-1.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF ARTHUR A. & MARJOIRE SECHER" DATED JUNE 11, 1984. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #7688-133.
- "PLAN TO ACCOMPANY PETITION OF THE TOWN OF MANCHESTER. TO CONSTRUCT A RETAINING WALL AND FILL SOLID MANCHESTER HARBOR" DATED NOVEMBER 3, 1921. BY RAYMOND C. ALLEN. S.E.D.R.D. PLAN #36-31.
- PLAN TITLED "MANCHESTER-BY-THE-SEA DOWNTOWN ATLAS, MANCHESTER-BY-THE-SEA, MASSACHUSETTS, ESSEX COUNTY" PREPARED BY DGT SURVEY GROUP DATED 6-10-2015.

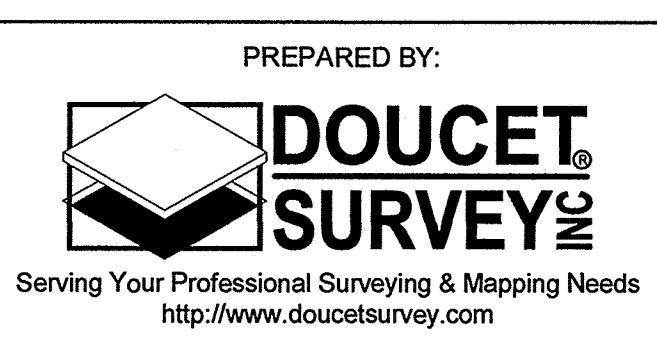
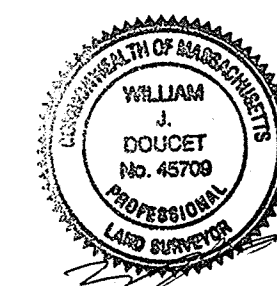
DRAINAGE STRUCTURES	
CB 1104	RIM ELEV.=14.2'
(A) 4" CIP INV.=12.1' (4" METAL**)	
(B) 10" CMP INV.=10.5' (8"**)	
CB 1153	RIM ELEV.=10.1'
SUMP ELEV.=7.8'	
CONC. CHANNEL TO OUTFALL	
CB 1196	RIM ELEV.=9.2'
(OUTFALL) 12" CLAY INV.=5.3' (10" CONC**)	
(A) 12" CLAY INV.=5.2' (12"**)	
CB 1215	RIM ELEV.=9.2'
(1228) 15" CMP INV.=2.6'	
(A) 8" METAL INV.=1.6'	
(B) 8" METAL INV.=1.5'	
DMH 1228	RIM ELEV.=10.1'
(1245) 10" CLAY INV.=6.4' (10" CLAY**)	
(1215) 15" CMP INV.=5.5'	
DMH 1245	RIM ELEV.=11.5'
(1215) 12" PVC INV.=9.3' (12" PVC**)	
(A) VERY RECESSED (12" CLAY FROM CB 1246**)	
WATER ELEV.=9.3'	
SUMP ELEV.=8.3'	
CB 1246	RIM ELEV.=11.2'
(A) 12" UNKN INV.=9.6'	
(10" OR 12" CLAY TO DMH 1245**)	

**INDICATES PIPE SIZE/DIA. INFO.
IS PER REF. PLAN 19

SEWER STRUCTURES	
SMH 1081	RIM ELEV.=12.4'
CC=-1.1'	
(1155) UNKN BC=-1.2' (12" PIPE**)	
(1109) UNKN BC=-1.3' (15" PIPE**)	
SMH 1109	RIM ELEV.=14.6'
(1081) 15" UNKN INV.=2.1' (15" PIPE**)	
(A) 15" UNKN INV.=2.6'	
(B) 15" UNKN INV.=2.7' (18" PIPE**)	
SMH 1155	RIM ELEV.=10.2'
(A) 4" PVC INV.=4.7'	
(B) 4" PVC INV.=0'	
(C) UNKN INV.=0.3' (6" PIPE**)	
(1248) UNKN INV.=0.6' (15" PIPE**)	
(1081) UNKN INV.=0.6' (12" PIPE**)	
CC=-0.6'	
SMH 1248	RIM ELEV.=13.7'
(A) 8" UNKN INV.=6.7'	
(B) 8" UNKN INV.=0.1'	
(1155) 12" UNKN INV.=0.3' (15" PIPE**)	
(C) 12" UNKN INV.=0.4' (12" PIPE**)	
(D) 12" UNKN INV.=0.4'	

**INDICATES PIPE SIZE/DIA. INFO.
IS PER REF. PLAN 19

OTHER STRUCTURES	
MH 1063	RIM ELEV.=11.5'
SUMP ELEV.=6.8'	
DRY NO PIPES W/ WATER SHUT OFF	
MH 1550	RIM ELEV.=13.8'
SUMP ELEV.=9.9'	
DRY NO PIPES W/ ELECTRIC METER AND CHANNEL TO FOUNTAIN	

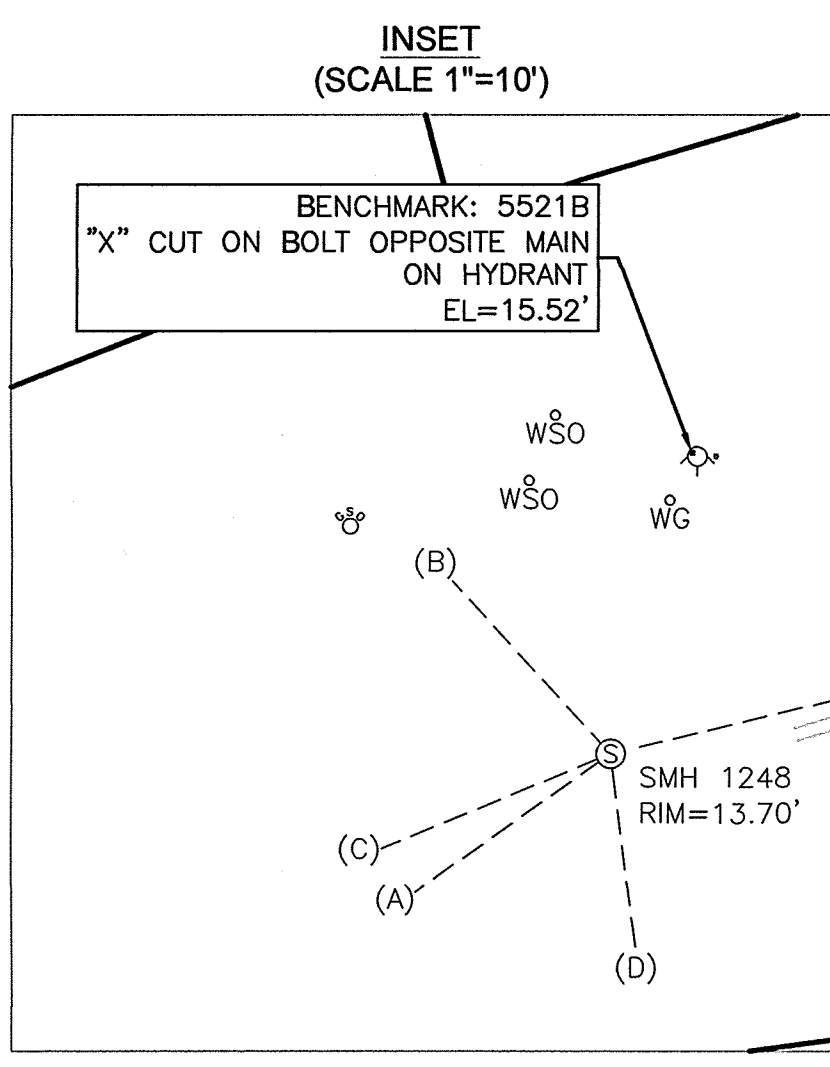
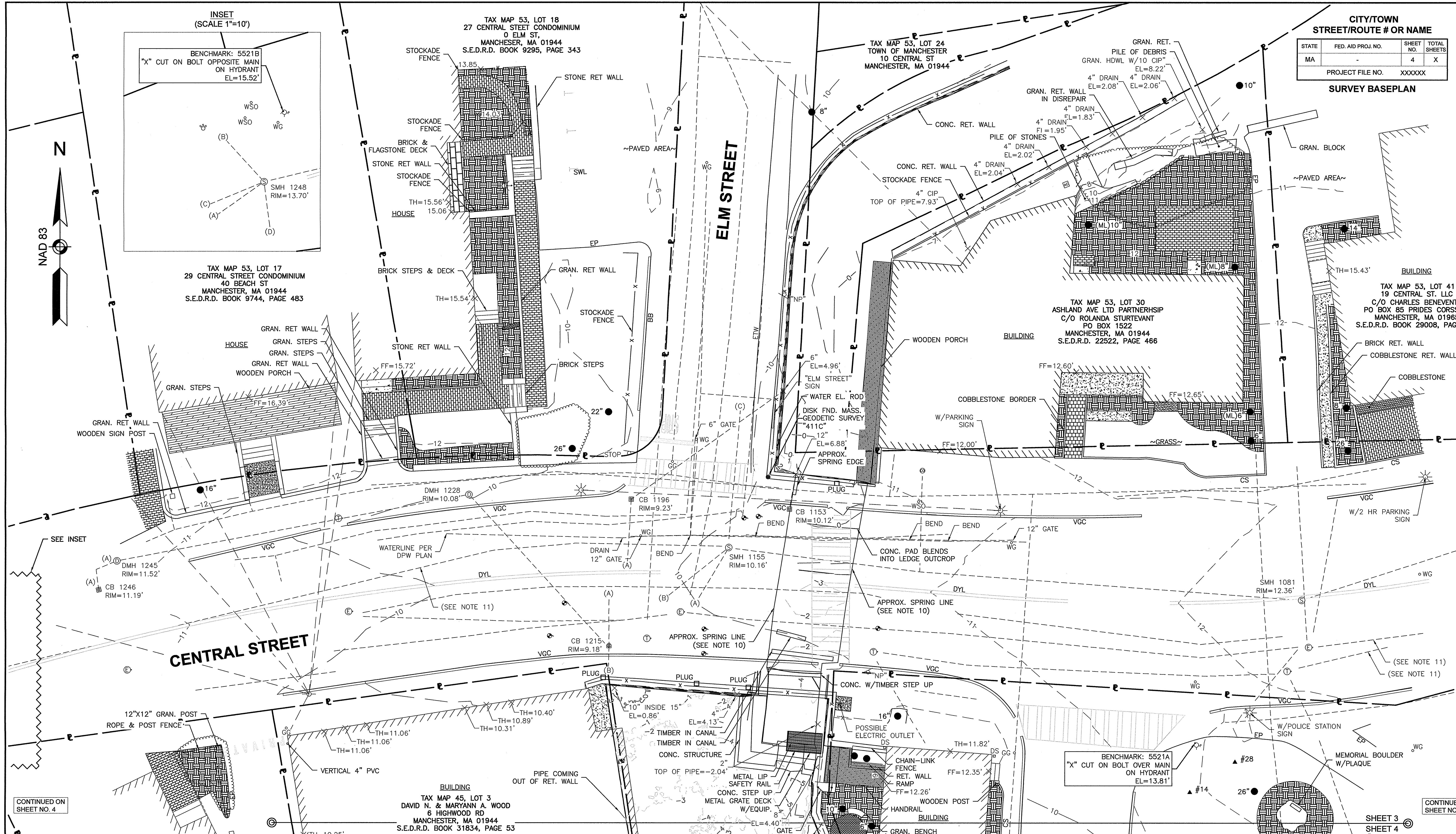


REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

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FIELD BOOK NO: XXXX	
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FIELD CHIEF: XXX	PARS. NO: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PLAN OF TOPOGRAPHIC SURVEY OF CENTRAL STREET (BRIDGE NO. X-XX-XXX) IN THE (T/C) OF MANCHESTER BY THE SEA AS ORDERED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION	
DATE:	SHEET 2 OF 4

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	
SURVEY BASEPLAN			



TAX MAP 53, LOT 17
29 CENTRAL STREET CONDOMINIUM
40 BEACH ST
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 9744, PAGE 483

TAX MAP 53, LOT 18
27 CENTRAL STREET CONDOMINIUM
0 ELM ST,
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 9295, PAGE 343

TAX MAP 53, LOT 24
TOWN OF MANCHESTER
10 CENTRAL ST
MANCHESTER, MA 01944

TAX MAP 53, LOT 30
ASHLAND AVE LTD PARTNERSHIP
C/O ROLANDA STURTEVANT
PO BOX 1522
MANCHESTER, MA 01944
S.E.D.R.D. 22522, PAGE 466

TAX MAP 53, LOT 41
19 CENTRAL ST. LLC
C/O CHARLES BENEVENTO
PO BOX 85 PRIDES CORSSING
MANCHESTER, MA 01965
S.E.D.R.D. BOOK 29008, PAGE 552

TAX MAP 45, LOT 3
DAVID N. & MARYANN A. WOOD
6 HIGHWOOD RD
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 31834, PAGE 53

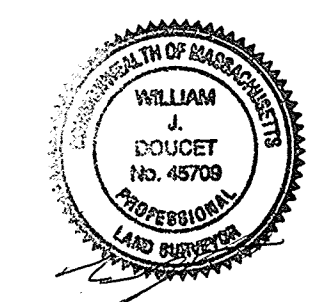
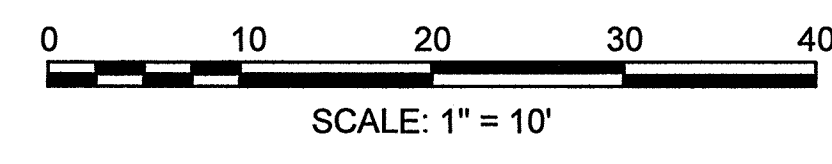


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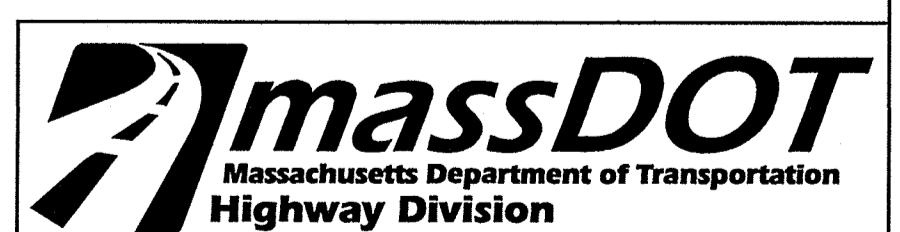
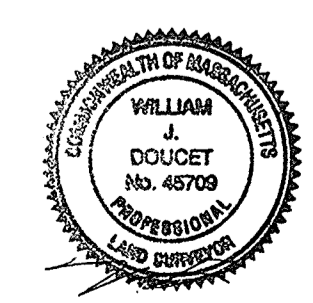
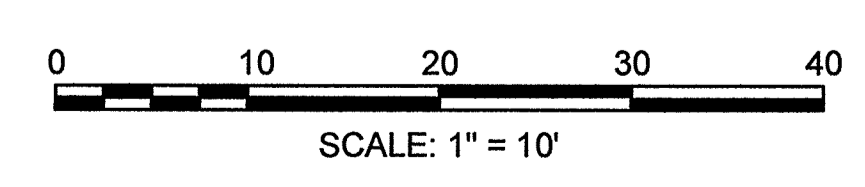
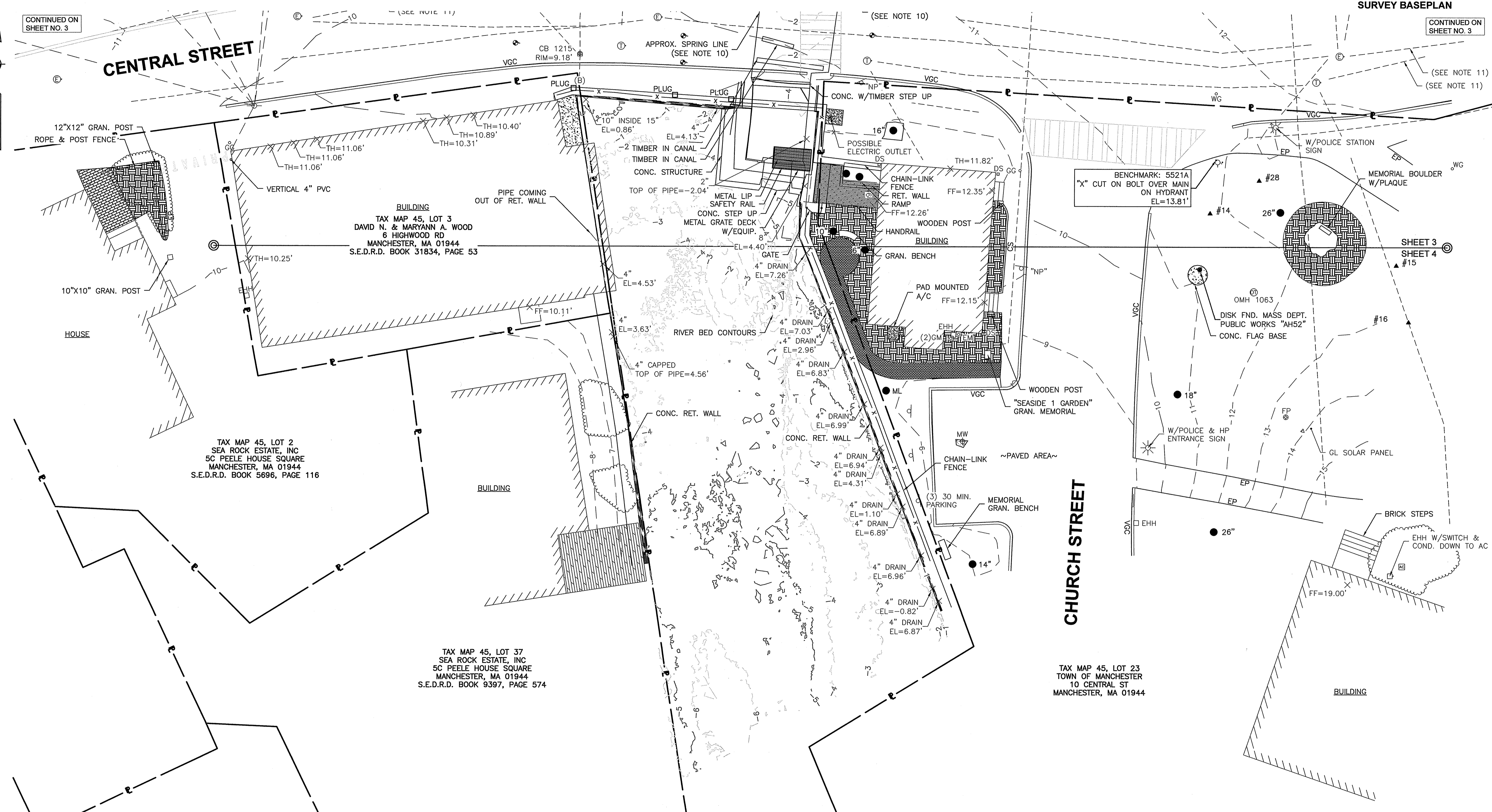
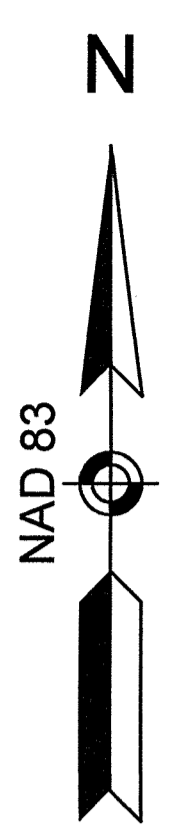
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01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

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FILE NAME: 5521A_SV
FIELD BOOK NO.: XXXX
DRAWN BY: W.D.C. CHECKED BY: W.J.D.
FIELD CHIEF: XXX PARS. NO.: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF
MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION



CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO. XXXXX			
SURVEY BASEPLAN			



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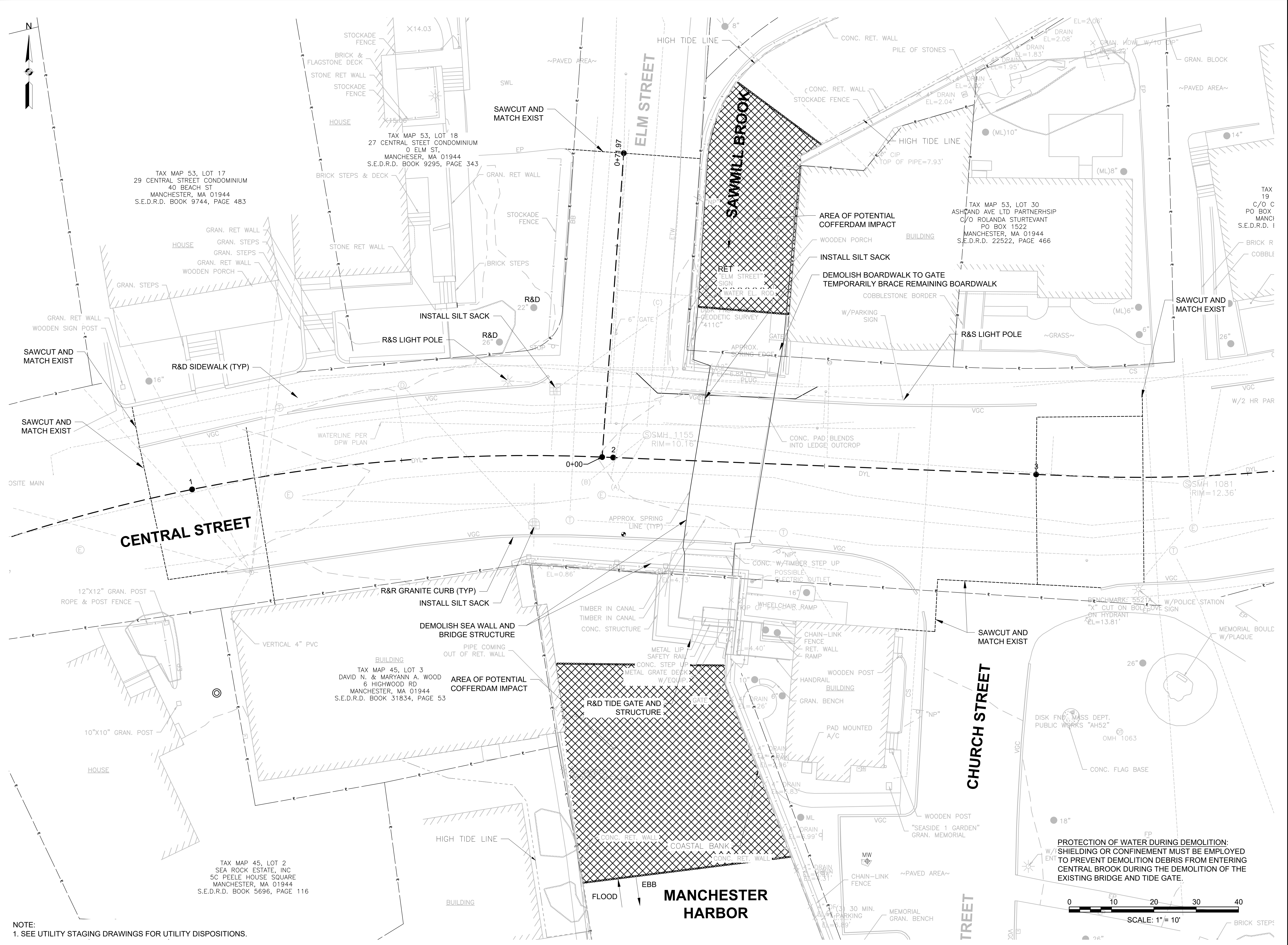
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REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
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FIELD BOOK NO: XXXX	PARS. NO: XXXXXX
DRAWN BY: W.D.C.	DATE:
FIELD CHIEF: XXX	

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
 PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
 (BRIDGE NO. X-XX-XXX)
 IN THE (T/C) OF
MANCHESTER BY THE SEA
 AS ORDERED BY
 THE MASSACHUSETTS DEPARTMENT OF
 TRANSPORTATION, HIGHWAY DIVISION

SHEET 4 OF 4



100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476-011	
DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-005.dwg	
DRAWN BY:	AGB	
CHECKED:	BBB	
APPROVED:	DLM	

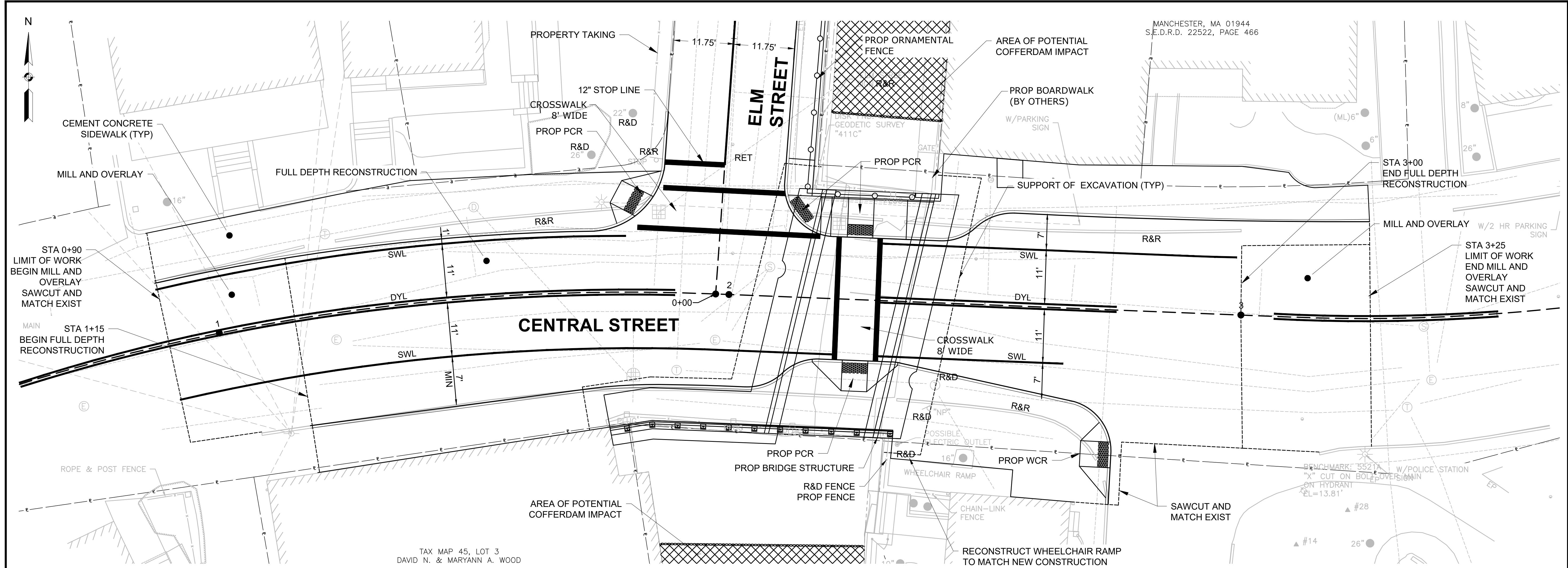
DEMOLITION AND SITE PREPARATION PLAN

SCALE: 1" = 10'

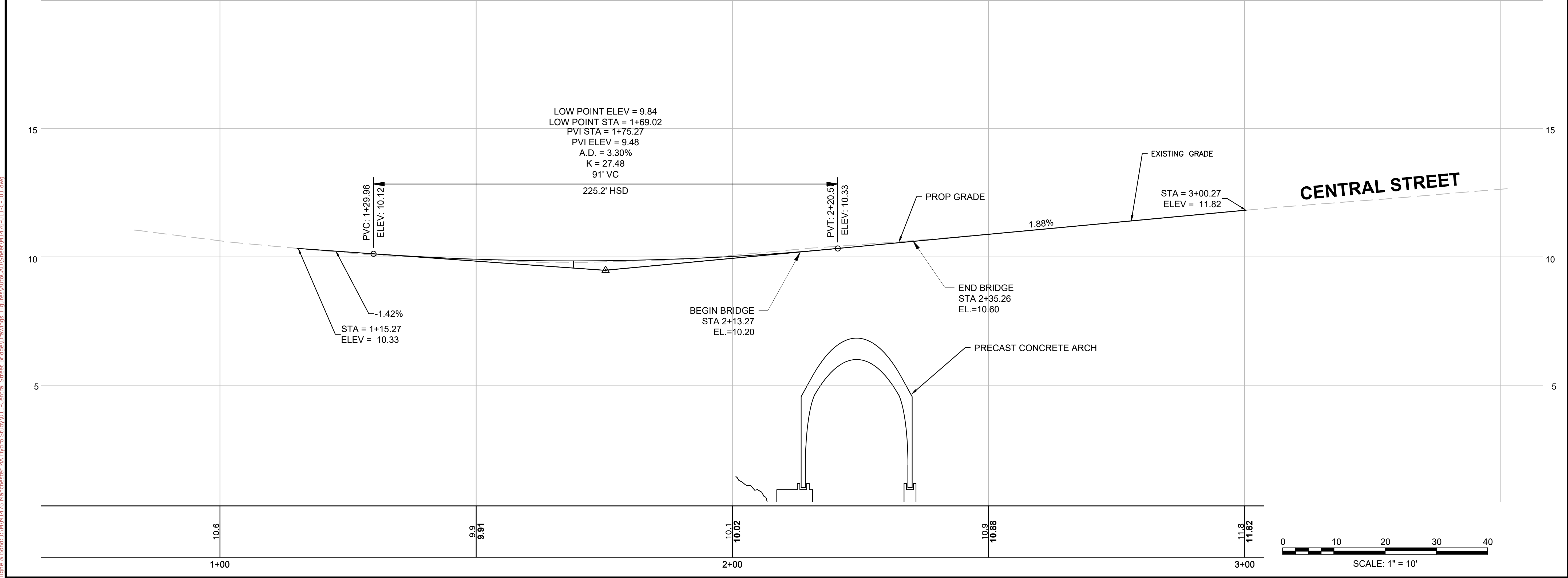
C-005 SHEET 7 OF 29

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NOTE:
 1. SEE UTILITY STAGING DRAWINGS FOR UTILITY DISPOSITIONS.



**100%
Drawings
Not For
Construction**



**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-101.dwg	
DRAWN BY:	AGB	
CHECKED:	BBB	
APPROVED:	DLM	

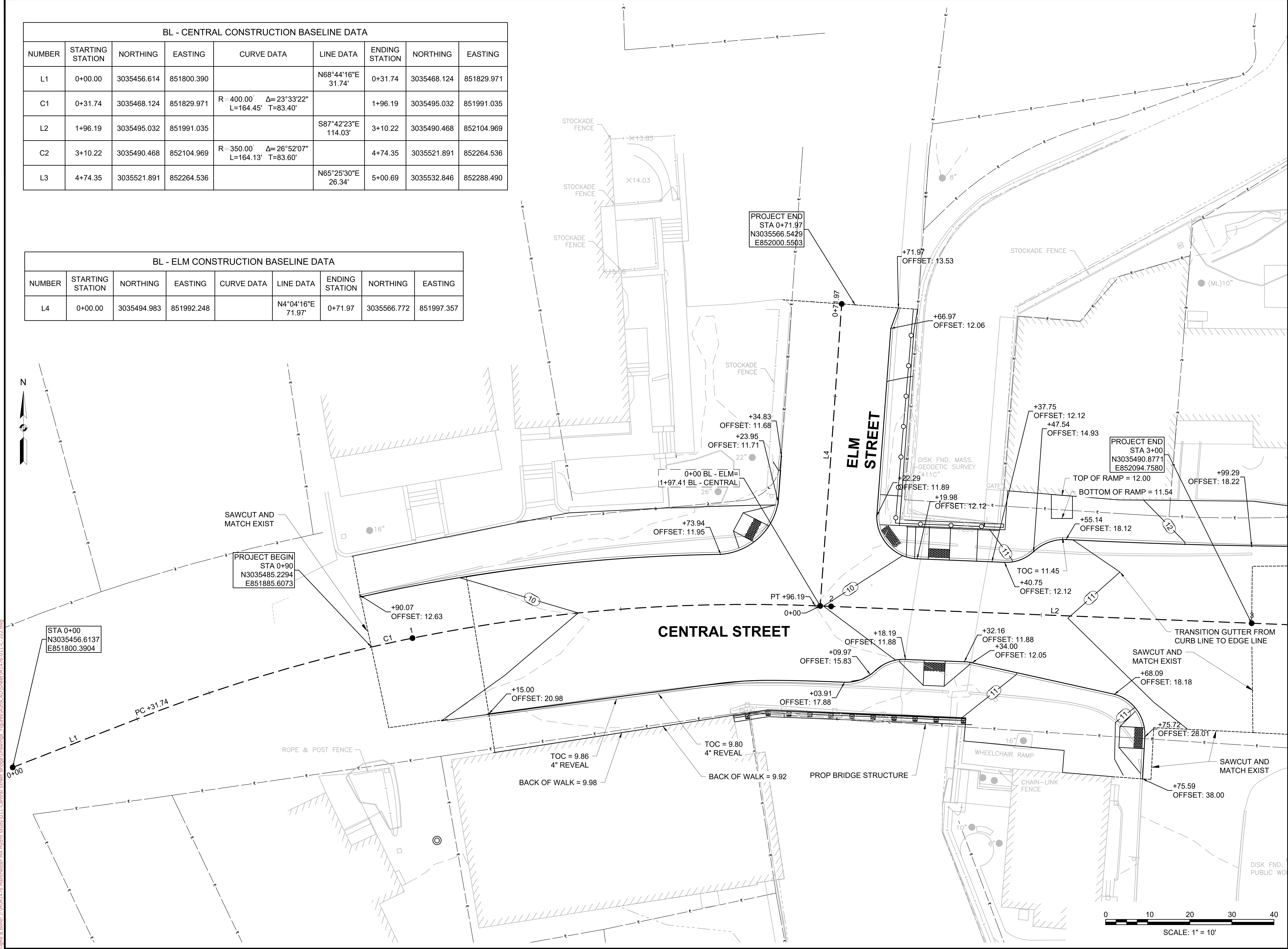
SITE PLAN AND PROFILE

SCALE: 1"=10' HORIZ, 1"=4' VERT

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BL - CENTRAL CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	0+00.00	3035456.614	851800.390		N68°44'16"E 31.74'	0+31.74	3035468.124	851829.971
C1	0+31.74	3035468.124	851829.971	R= 400.00' Δ= 23°33'22" L=164.45' T=83.40'		1+96.19	3035495.032	851991.035
L2	1+96.19	3035495.032	851991.035		S87°42'23"E 114.03'	3+10.22	3035490.468	852104.969
C2	3+10.22	3035490.468	852104.969	R= 350.00' Δ= 26°52'07" L=164.13' T=83.60'		4+74.35	3035521.891	852264.536
L3	4+74.35	3035521.891	852264.536		N65°25'30"E 26.34'	5+00.69	3035532.846	852288.490

BL - ELM CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L4	0+00.00	3035494.983	851992.248		N4°04'16"E 71.97'	0+71.97	3035566.772	851997.357



**100%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

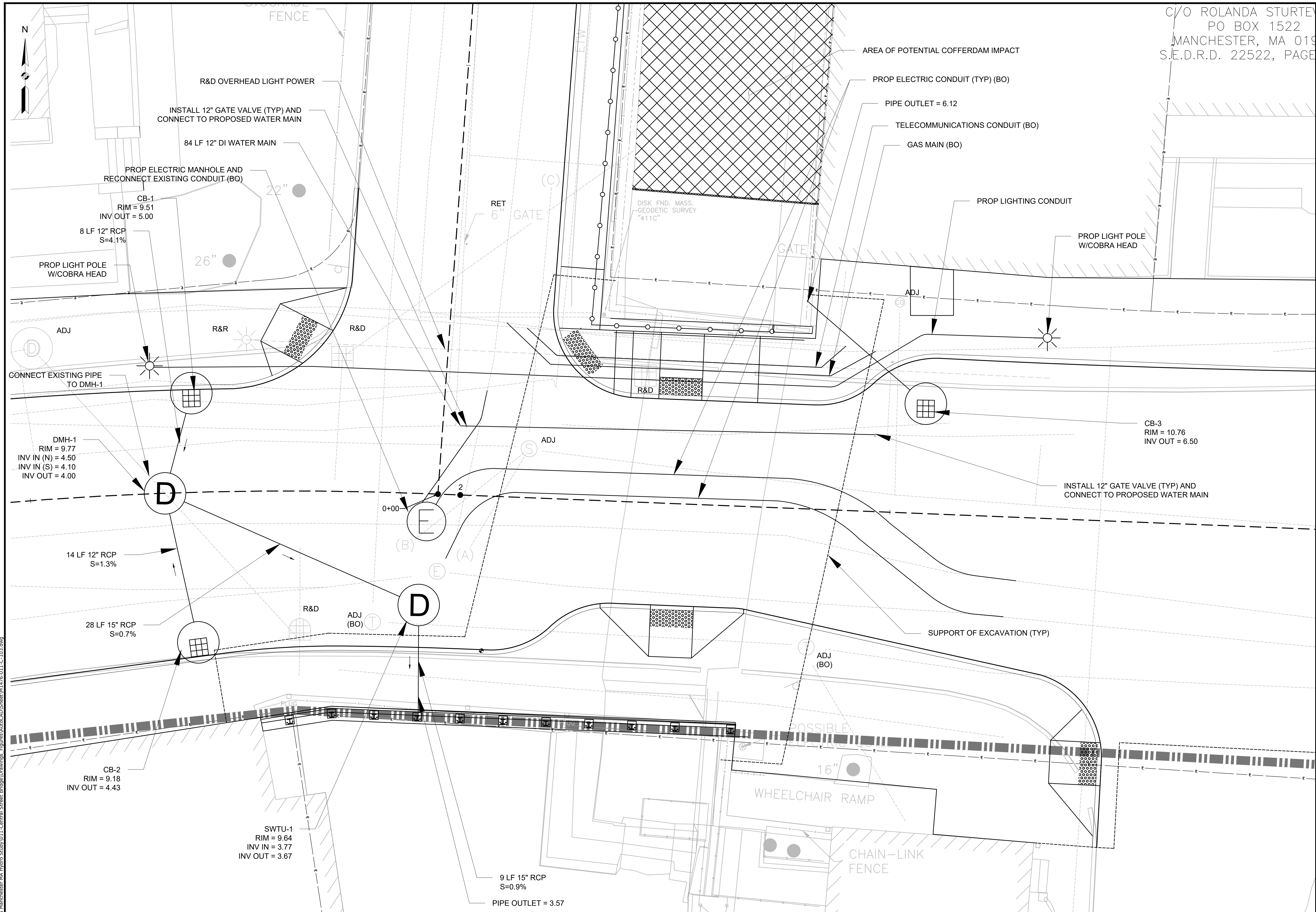
Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
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DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-102.dwg	
DRAWN BY:	AGB	
CHECKED:	BBB	
APPROVED:	DLM	

GRADING AND ALIGNMENT PLAN

SCALE: 1"=10' HORIZ, 1"=4' VERT

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**100%
 Drawings
 Not For
 Construction**

**Central Street
 Bridge
 Replacement**

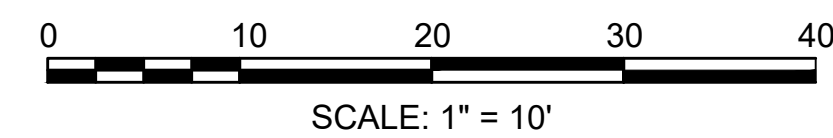
Department of
 Public Works

MassDOT Bridge No.
 M-02-001, BIN 8AM

Town of
 Manchester-By-
 The-Sea,
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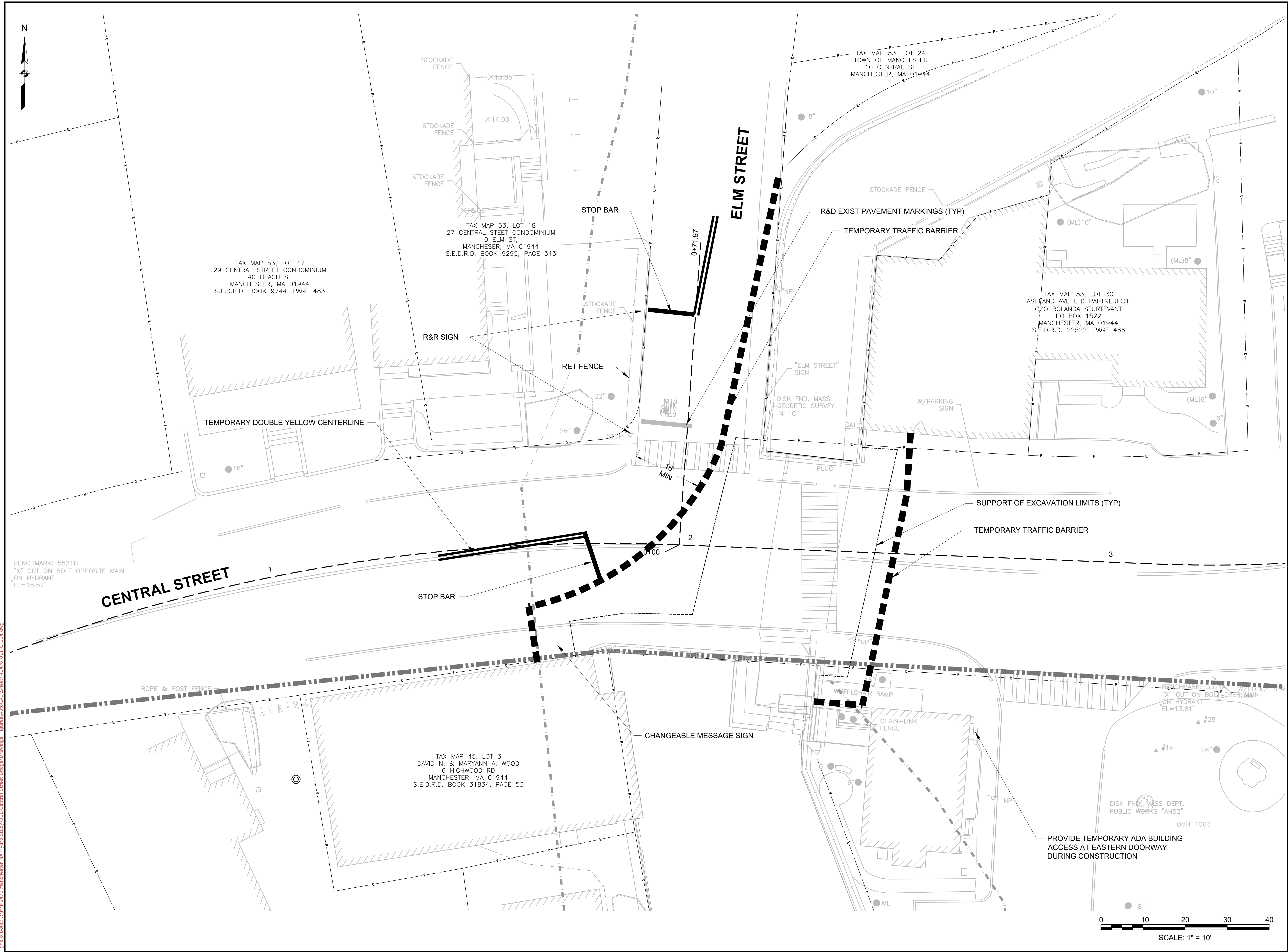
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DATE:	FEBRUARY 2022	
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DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

UTILITY PLAN



NOTE:
 1. PROPOSED UTILITY LAYOUT SUBJECT TO DESIGN BY UTILITY COMPANIES.
 EXISTING UTILITIES SHOWN BASED ON LIMITED INFORMATION AVAILABLE FROM
 SURVEY AND UTILITY RECORDS. CONTRACTOR TO CONFIRM LOCATION.

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Drawings
Not For
Construction

Central Street Bridge Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-104.dwg	
DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

TEMPORARY ROADWAY PLAN

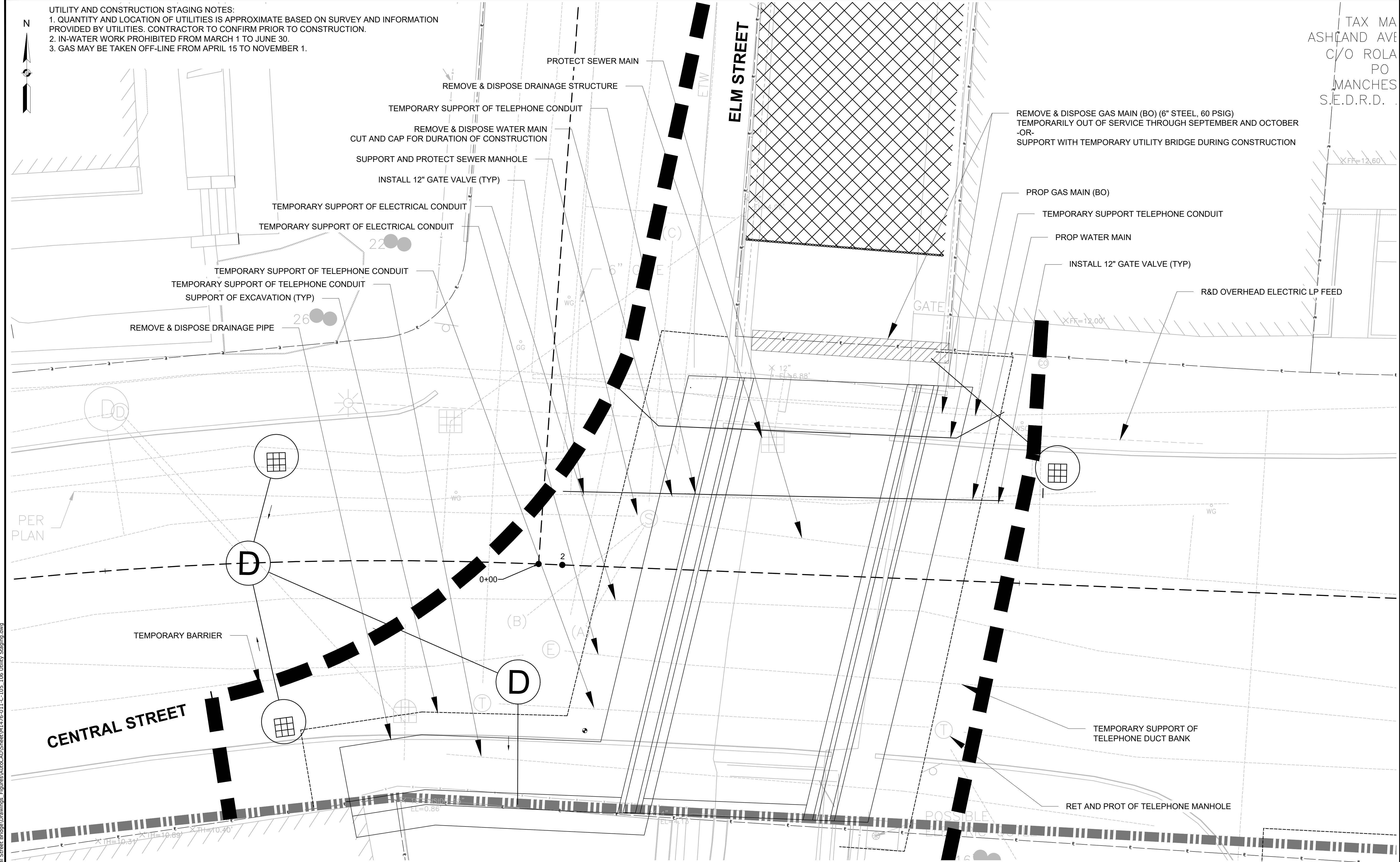
SCALE: 1" = 10'

C-104
SHEET 11 OF 29

Plot Saved: 2/10/2022 1:52pm By: Mikesel
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TAX MAP
 ASHLAND AVE
 C/O ROLA
 PO
 MANCHES
 S.E.D.R.D.

UTILITY AND CONSTRUCTION STAGING NOTES:
 1. QUANTITY AND LOCATION OF UTILITIES IS APPROXIMATE BASED ON SURVEY AND INFORMATION PROVIDED BY UTILITIES. CONTRACTOR TO CONFIRM PRIOR TO CONSTRUCTION.
 2. IN-WATER WORK PROHIBITED FROM MARCH 1 TO JUNE 30.
 3. GAS MAY BE TAKEN OFF-LINE FROM APRIL 15 TO NOVEMBER 1.



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 Construction**

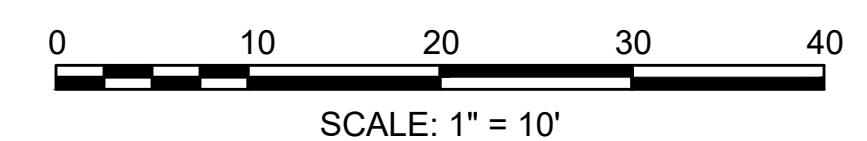
**Central Street
 Bridge
 Replacement**

Department of
 Public Works

MassDOT Bridge No.
 M-02-001, BIN 8AM

Town of
 Manchester-By-
 The-Sea,
 Massachusetts

- NOTE:**
1. IMMEDIATELY AFTER CONTRACT AWARD AND NOTICE TO PROCEED, DEVELOP MONITORING PROGRAM FOR ADJACENT STRUCTURES, SUBMIT FOR APPROVAL AND INSTALL ONCE APPROVED TO BEING CAPTURING DATA REGARDING BASELINE MOVEMENTS OF STRUCTURES.
 2. EARLY ACTIONS ARE REQUIRED, AFTER LABOR DAY 2022, TO IDENTIFY LOCATIONS OF ALL EXISTING UTILITIES WITHIN THE LIMITS OF WORK. PERFORM TEST PITS AND COORDINATE WITH THE RESPECTIVE UTILITY COMPANIES TO DETERMINE MEANS OF TEMPORARY SUPPORT OR POTENTIAL RELOCATION.
 3. DESIGN TEMPORARY UTILITY SUPPORT SYSTEMS AND SUPPORT OF EXCAVATION SYSTEMS FOR APPROVAL BY THE RESPECTIVE UTILITIES AND THE ENGINEER. INCLUDE THE OWNER AND ENGINEER ON ALL CORRESPONDENCE BETWEEN THE CONTRACTOR AND THE UTILITY COMPANIES.
 4. PRIOR TO ROAD CLOSURE AND UTILITY STAGING, SUPPORT, OR RELOCATION, INSTALL COFFERDAMS, AND WATER CONTROLS.
- COMMENCING AFTER LABOR DAY 2023:
5. INSTALL SUPPORT OF EXCAVATION AND TEMPORARILY SHUT DOWN/REMOVE, PROTECT, AND SUPPORT EXISTING UTILITIES AS SHOWN.
 6. EXCAVATE AND DEMOLISH EXISTING ARCH STRUCTURE WHILE UTILITIES ARE TEMPORARILY SUPPORTED.
 7. INSTALL PEDESTAL FOOTINGS WHILE UTILITIES ARE TEMPORARILY SUPPORTED.
 8. INSTALL PRECAST ARCH SEGMENTS NORTH OF THE CENTRAL STREET CONSTRUCTION BASELINE WITHIN THE CLEAR SPACE BETWEEN THE WATER MAIN AND THE GAS MAIN (APPROXIMATELY 8'-10' WIDE).
 9. SLIDE AND CONNECT EACH ARCH SECTION INTO PLACE BY USING HYDRAULIC JACKS, ROLLERS, CASTER, ETC.
 10. INSTALL THE SOUTHWEST SEAWALL AND BRIDGE HEADWALLS.
 11. EXISTING UTILITIES SHOWN ARE BASED ON SURVEY AND LIMITED INFORMATION PROVIDED BY UTILITIES. FIELD CONFIRM ALL UTILITIES.
 12. BACKFILL STRUCTURE, REMOVE TEMPORARY SUPPORT OF UTILITIES, AND SUPPORT OF EXCAVATION.
 13. INSTALL REMAINING DRAINAGE, WATER, AND GAS UTILITIES.
 14. RECONSTRUCT REMAINING ROADWAY AND SURFACE ELEMENTS.



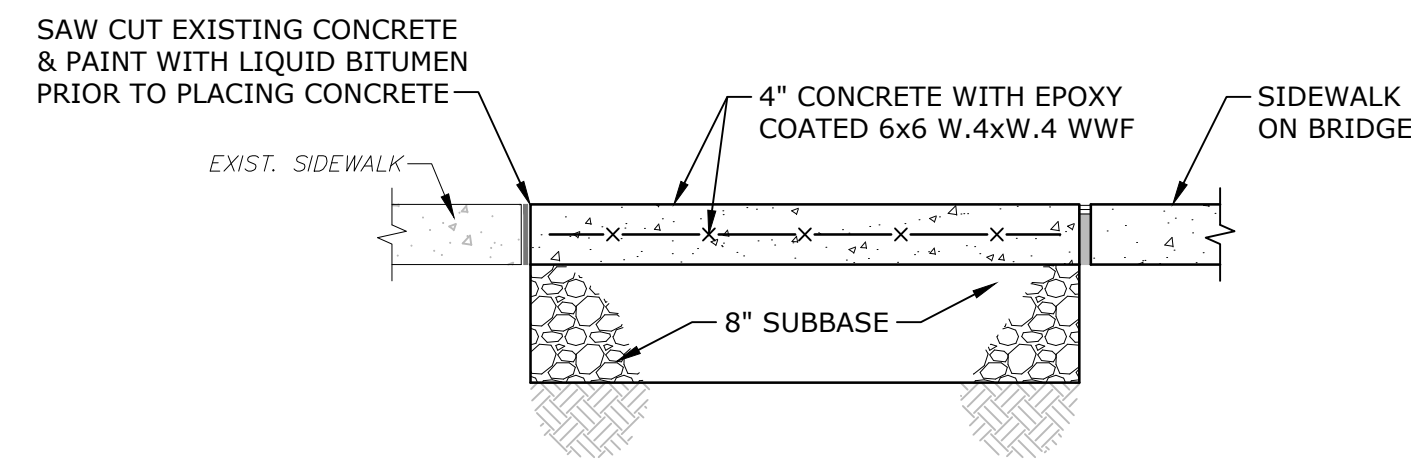
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DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-105_106 Utility Staging.dwg	
DRAWN BY:	AGB	
CHECKED:	BBB	
APPROVED:	DLM	

UTILITY/WORK
 STAGING PLAN - PHASE 1

SCALE: 1" = 10'

C-105
 SHEET 12 OF 29

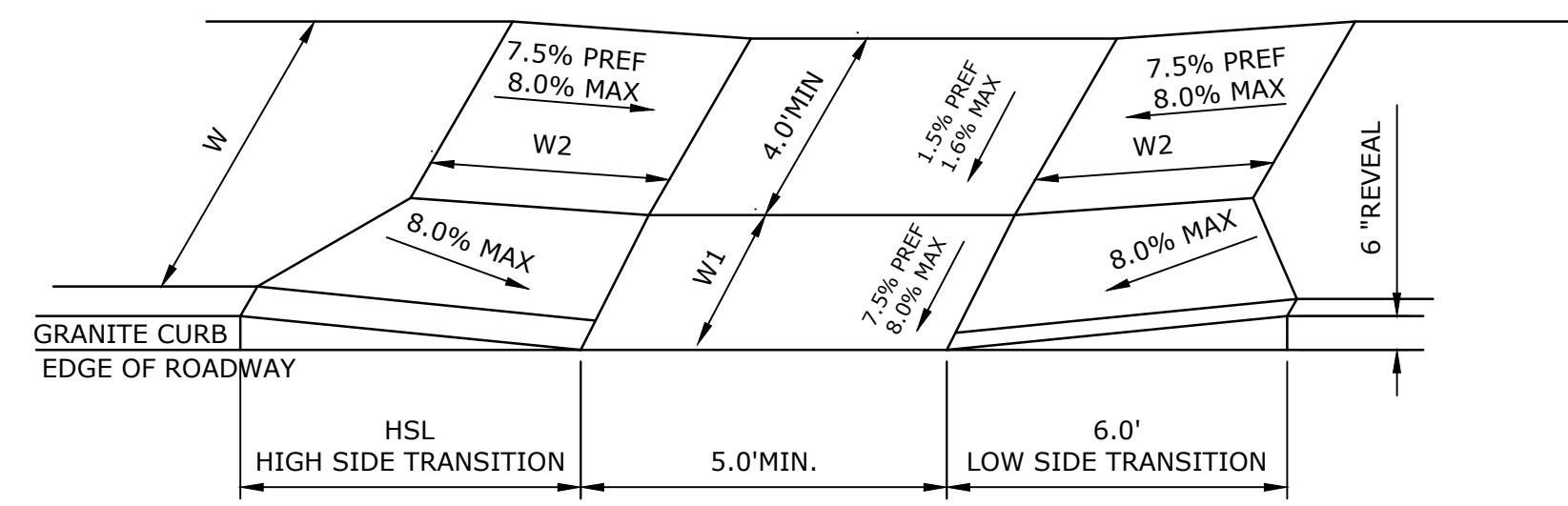
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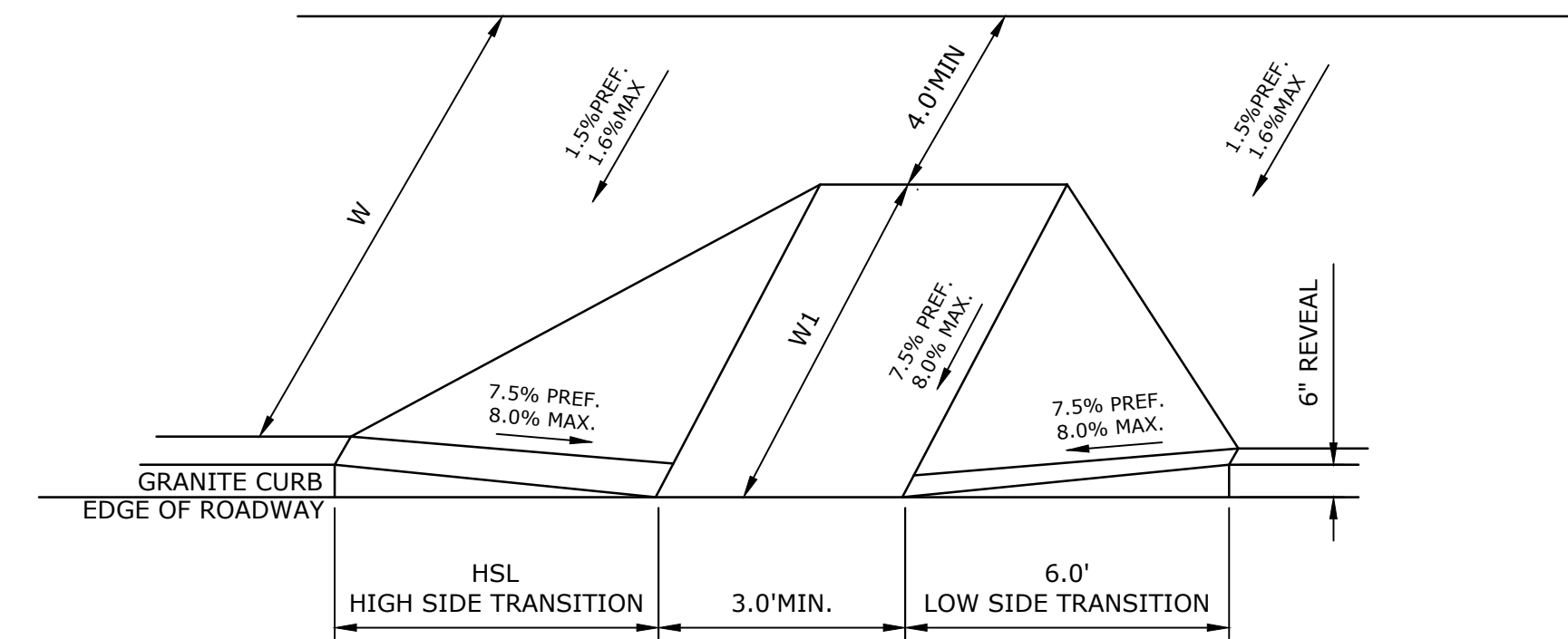
NOTES:

1. ALL CONCRETE, AGGREGATE, STABILIZED COURSE, SUBBASE AND LIQUID BITUMEN SHALL CONFORM TO THE MATERIALS EQUIPMENT AND CONSTRUCTION REQUIREMENTS AS PER STATE SPECIFICATIONS.
2. PROVIDE A 1" CONSTRUCTION JOINT BETWEEN BRIDGE AND APPROACH SIDEWALK. FILL JOINT WITH COMPRESSIBLE FILLER MATERIAL AND SEAL WITH 1" WIDE x 1/2" DEEP SILICONE JOINT SEALANT.
3. MATCH FINISH GRADE AND WIDTH OF EXISTING SIDEWALK.

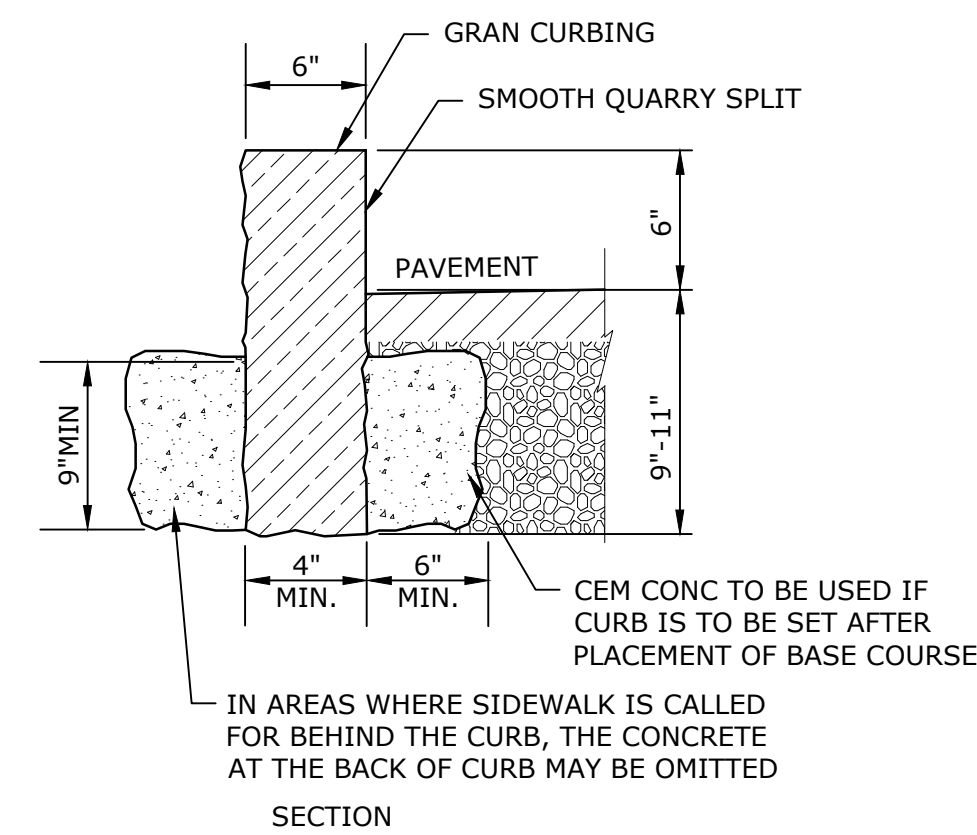
APPROACH SIDEWALK
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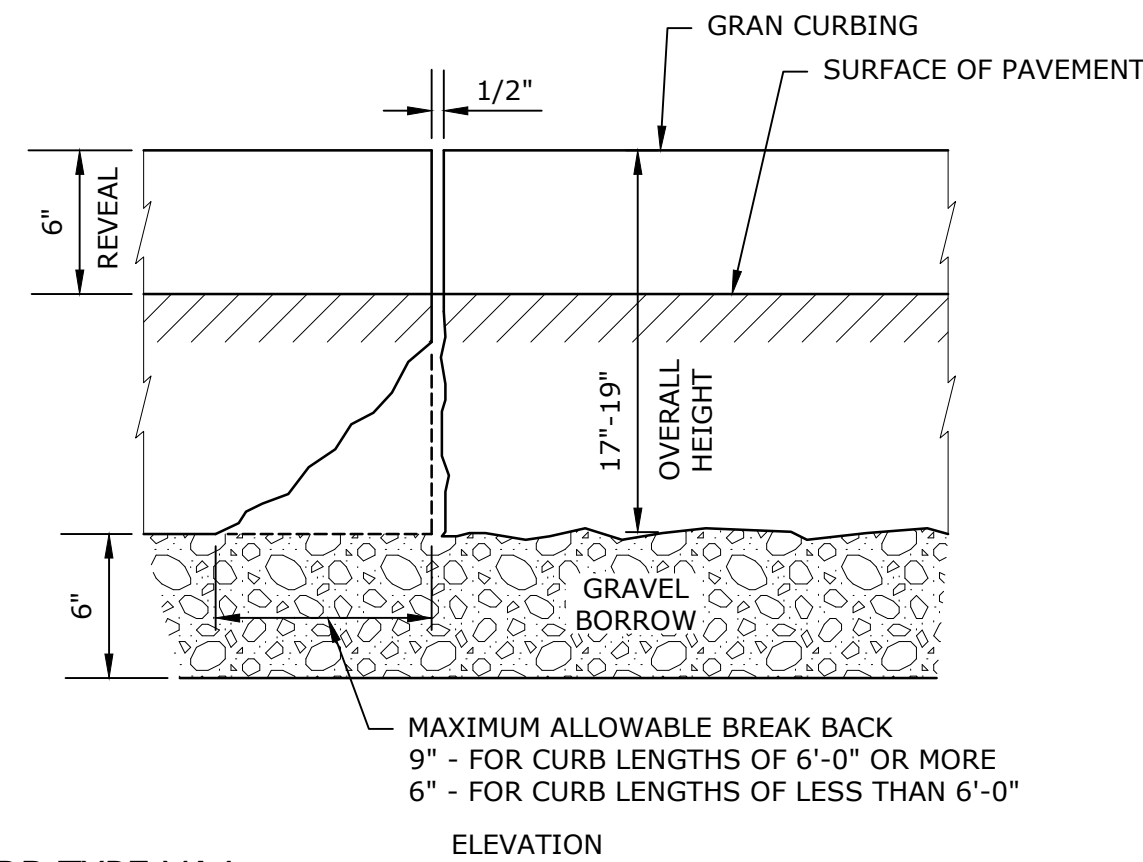
HANDICAP RAMP FOR LESS THAN 11.5' SIDEWALK
NO SCALE



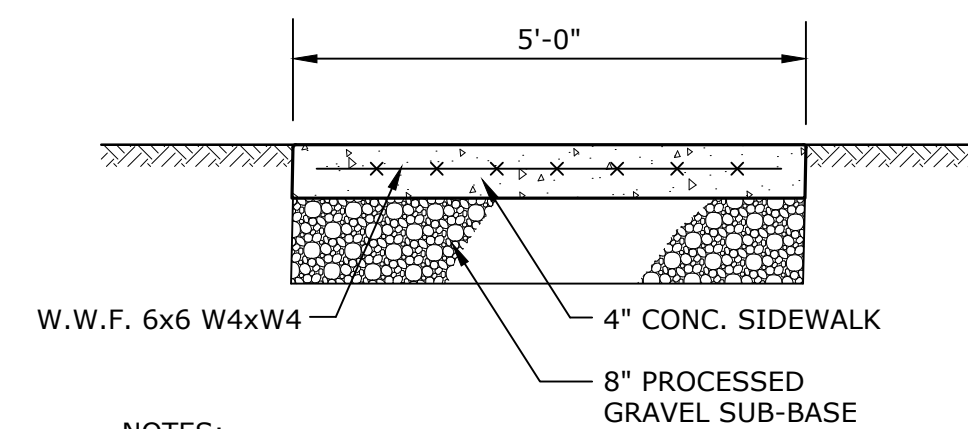
HANDICAP RAMP FOR WIDER THAN 11.5' SIDEWALK
NO SCALE



GRANITE CURB TYPE VA4
NO SCALE



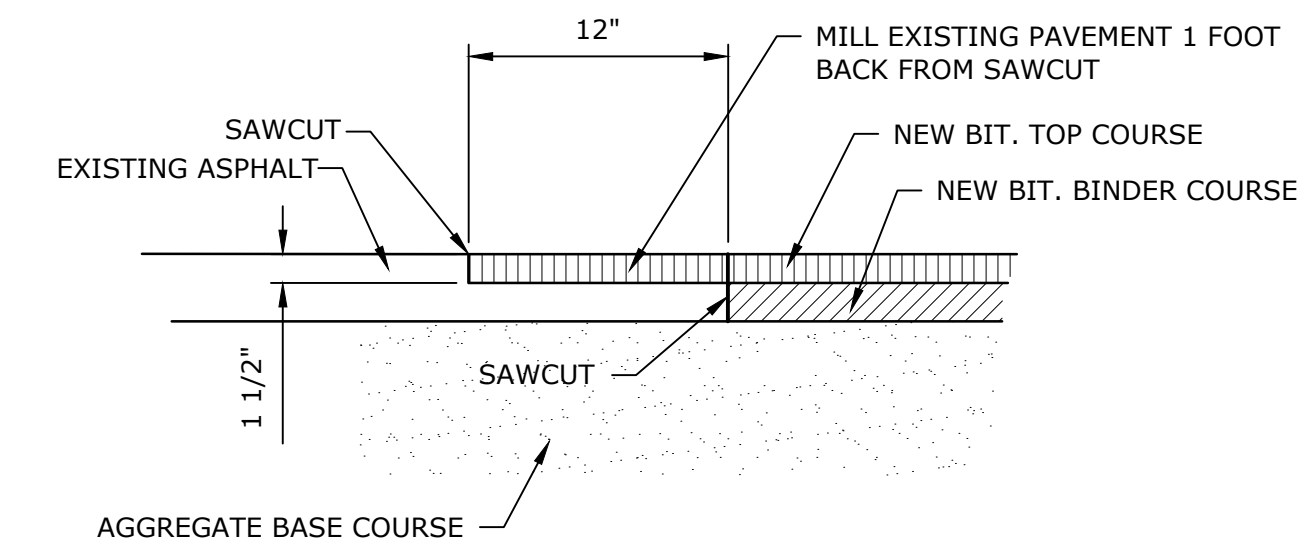
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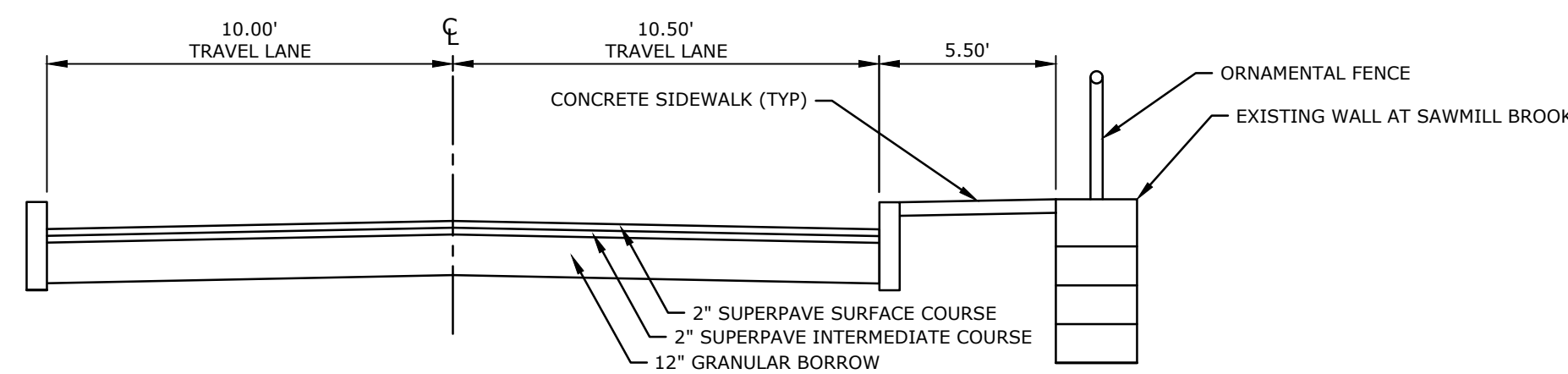
NOTES:

1. WALK TO HAVE 1/4" RADIUS TOOLED DUMMY JOINT 1/4 OF THE THICKNESS OF THE SIDEWALK IN DEPTH EVERY 5 L.F. OF WALK.
2. WALK TO HAVE 1/2" WIDE NON-EXTRUDING PREFORMED EXPANSION JOINT EVERY 20 L.F. OF WALK.

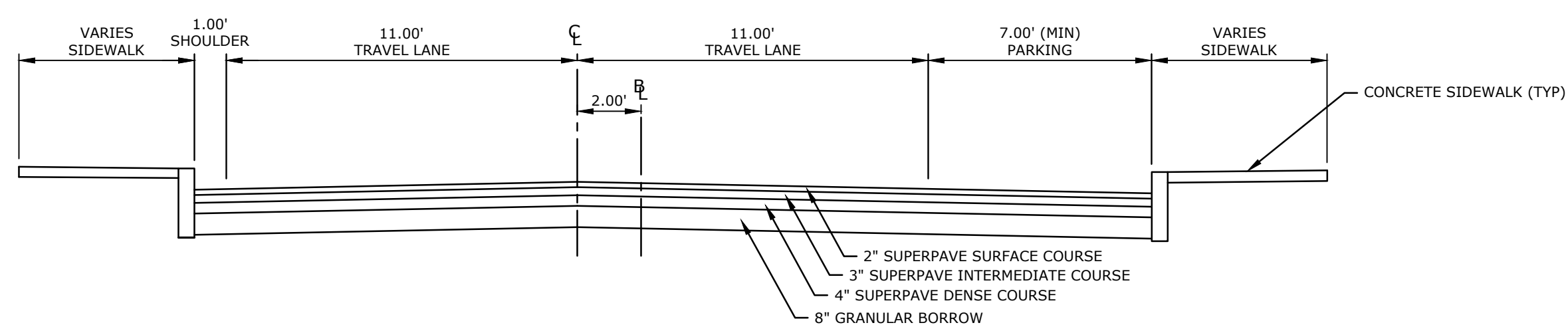
CONCRETE SIDEWALK
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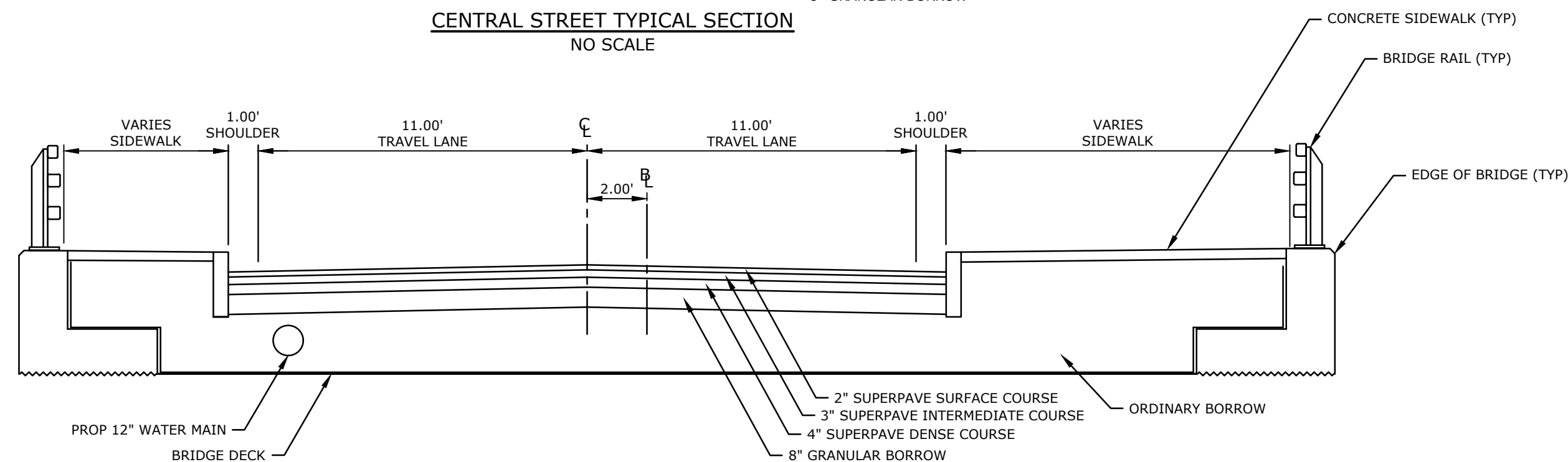
TYPICAL BUTT JOINT TO EXISTING PAVEMENT
NO SCALE



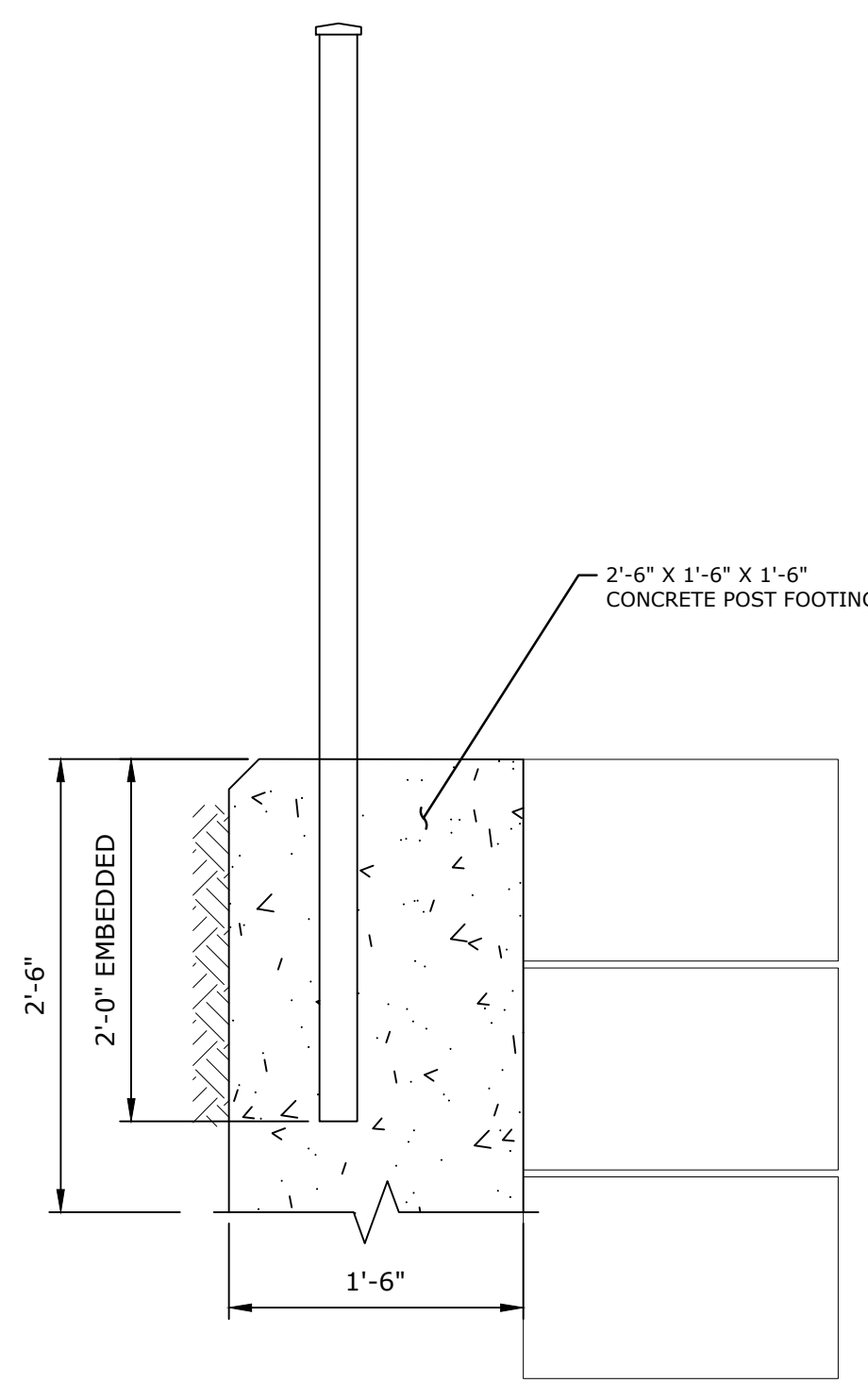
ELM STREET TYPICAL SECTION
NO SCALE



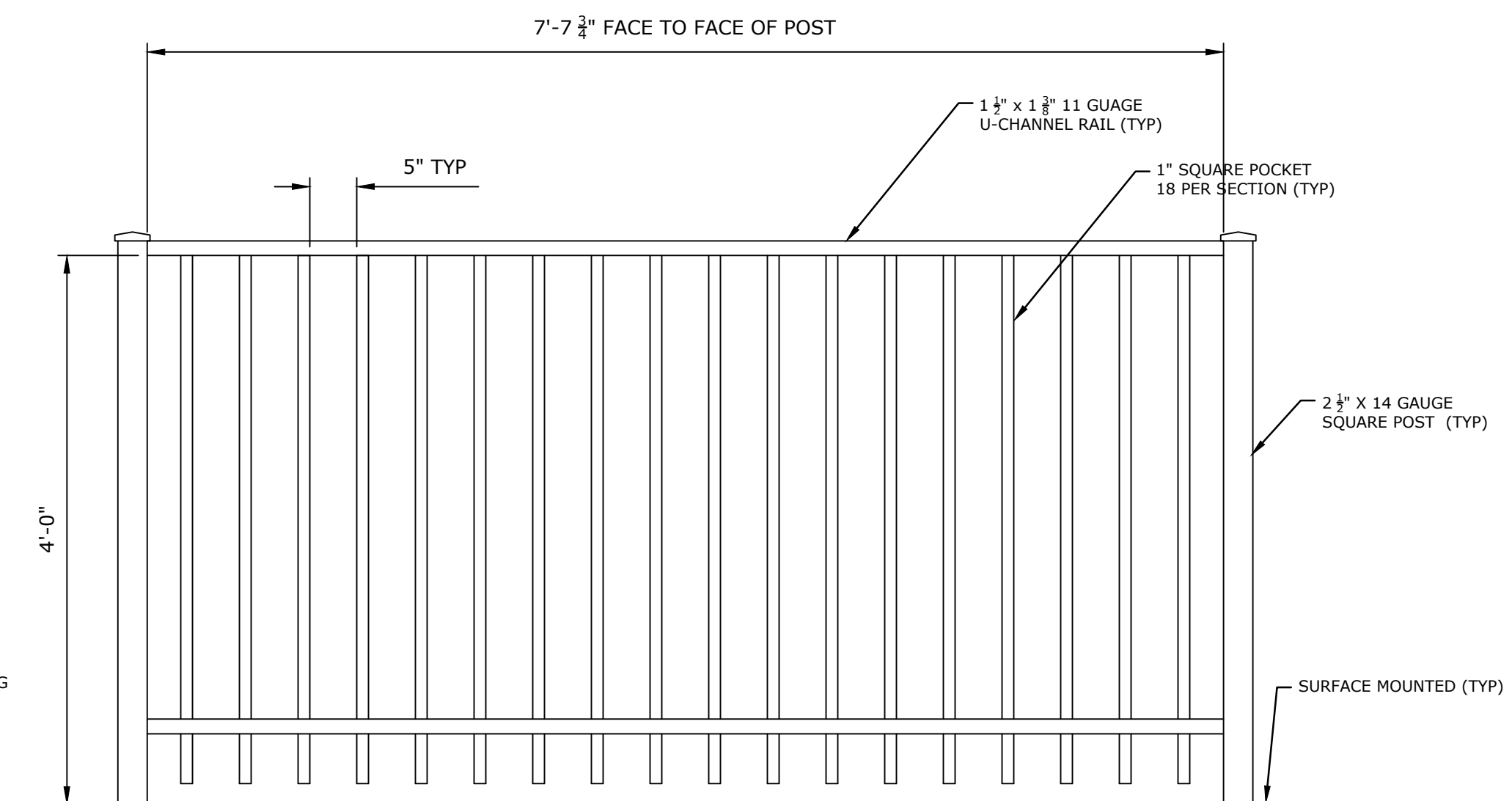
CENTRAL STREET TYPICAL SECTION
NO SCALE



CENTRAL STREET BRIDGE TYPICAL SECTION
NO SCALE



ORNAMENTAL FENCE
NO SCALE



ORNAMENTAL FENCE
NO SCALE

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Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

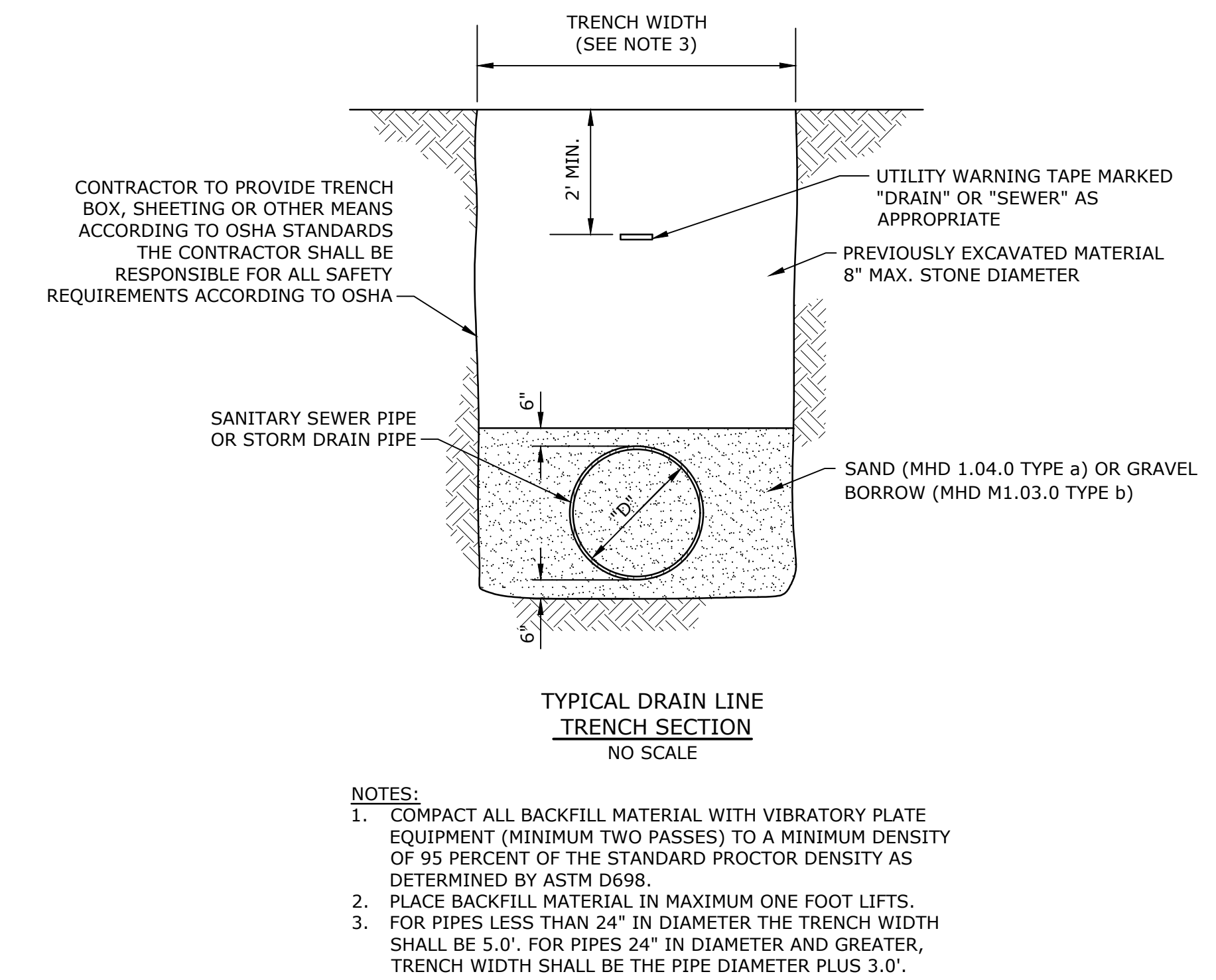
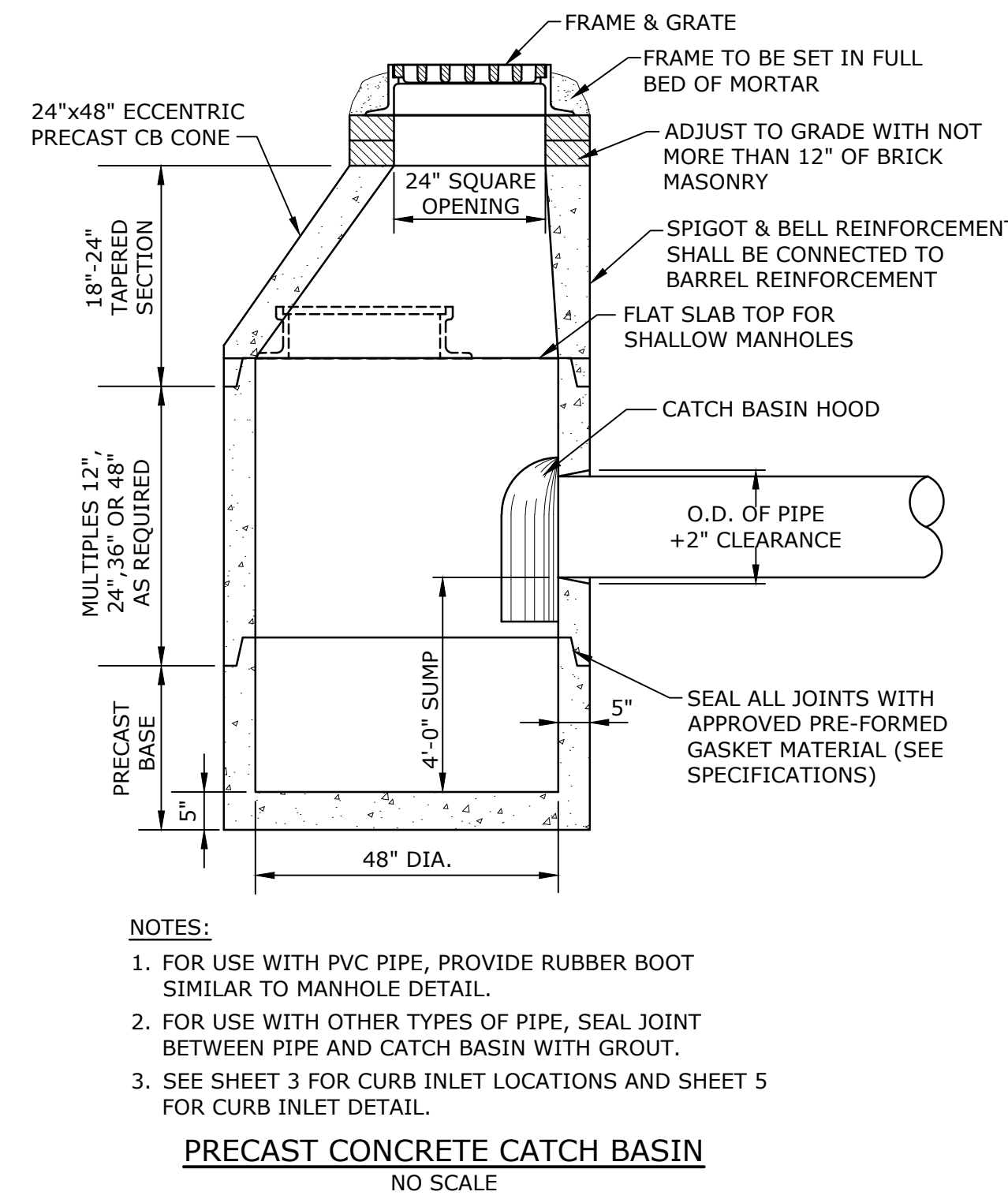
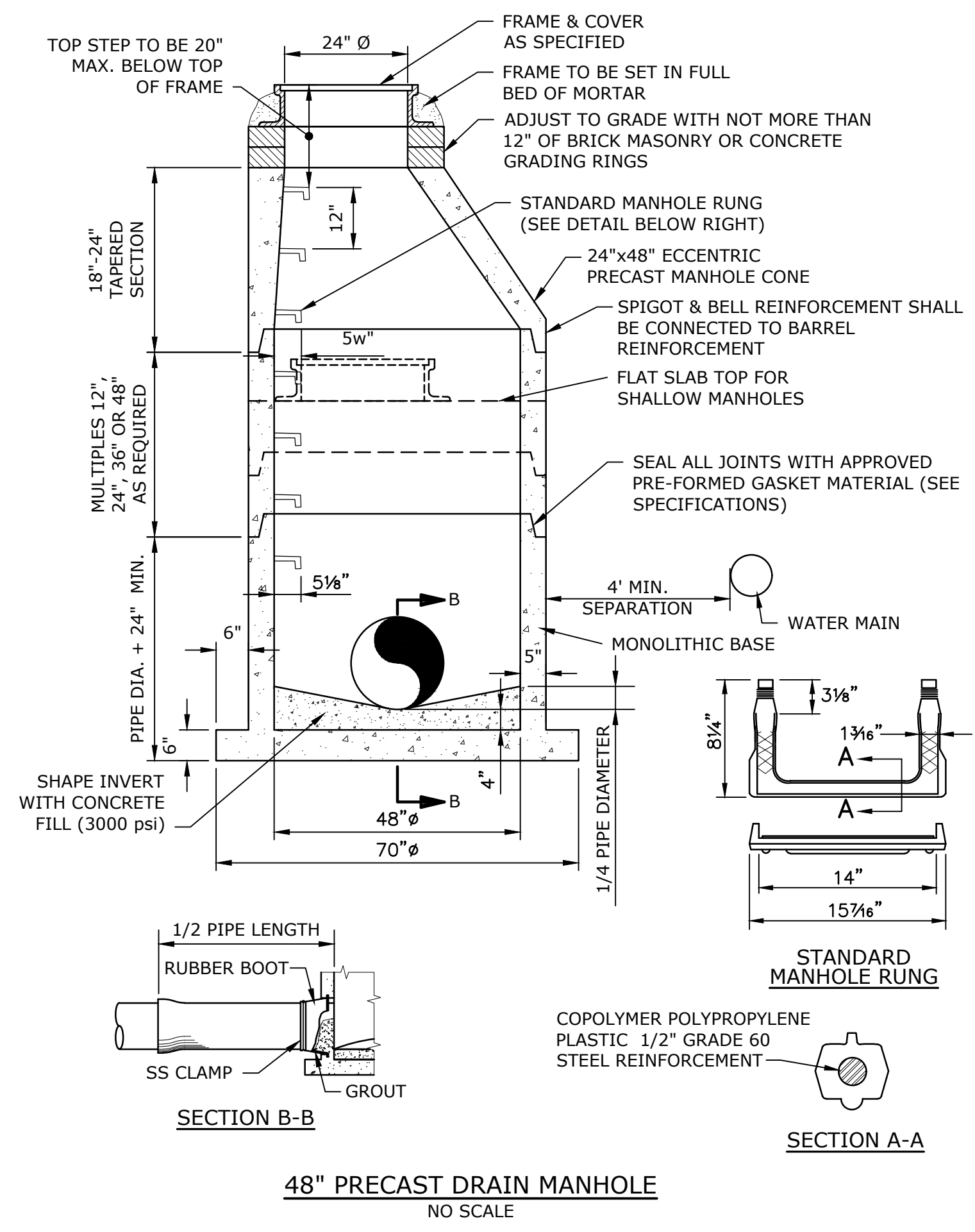
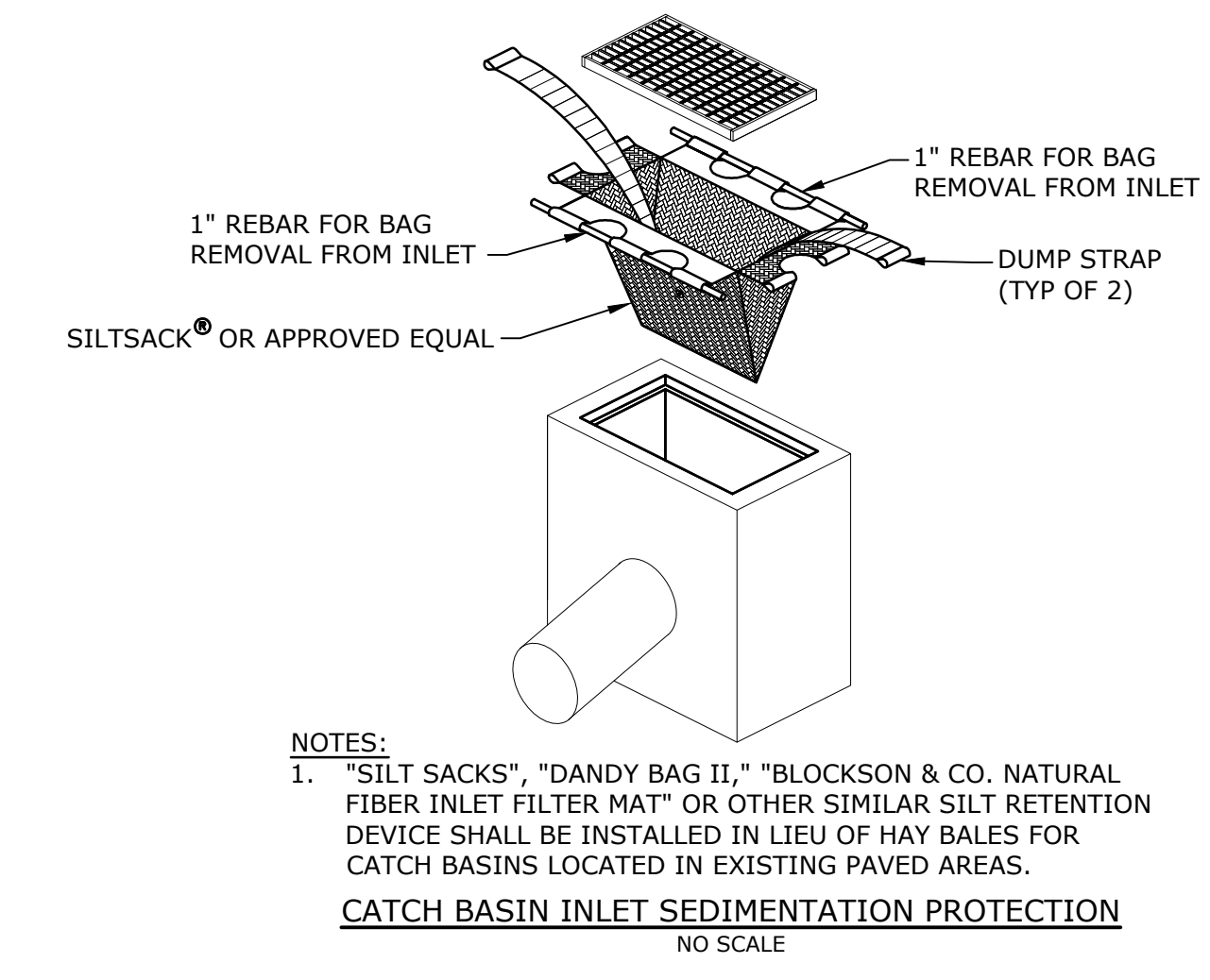
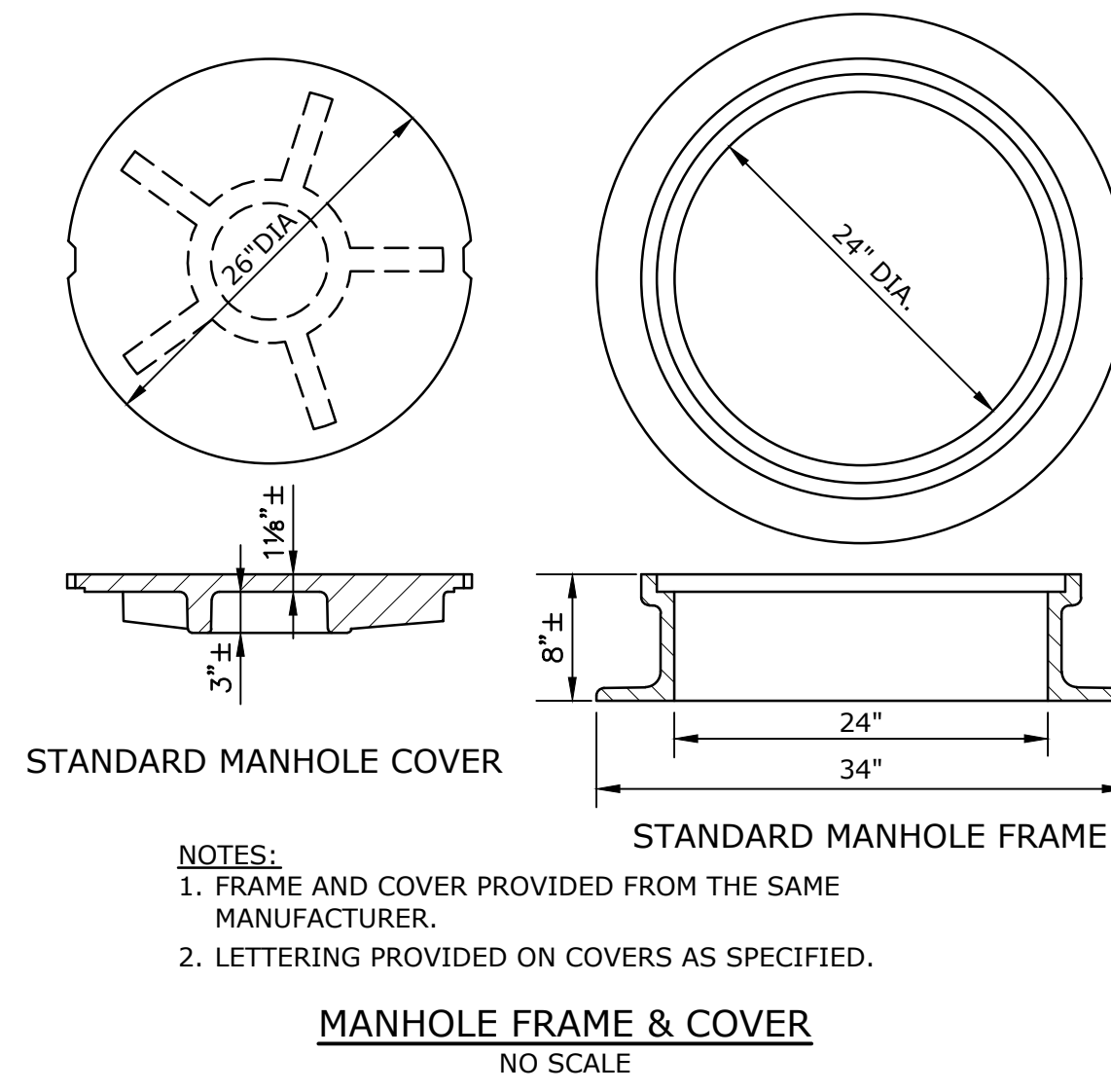
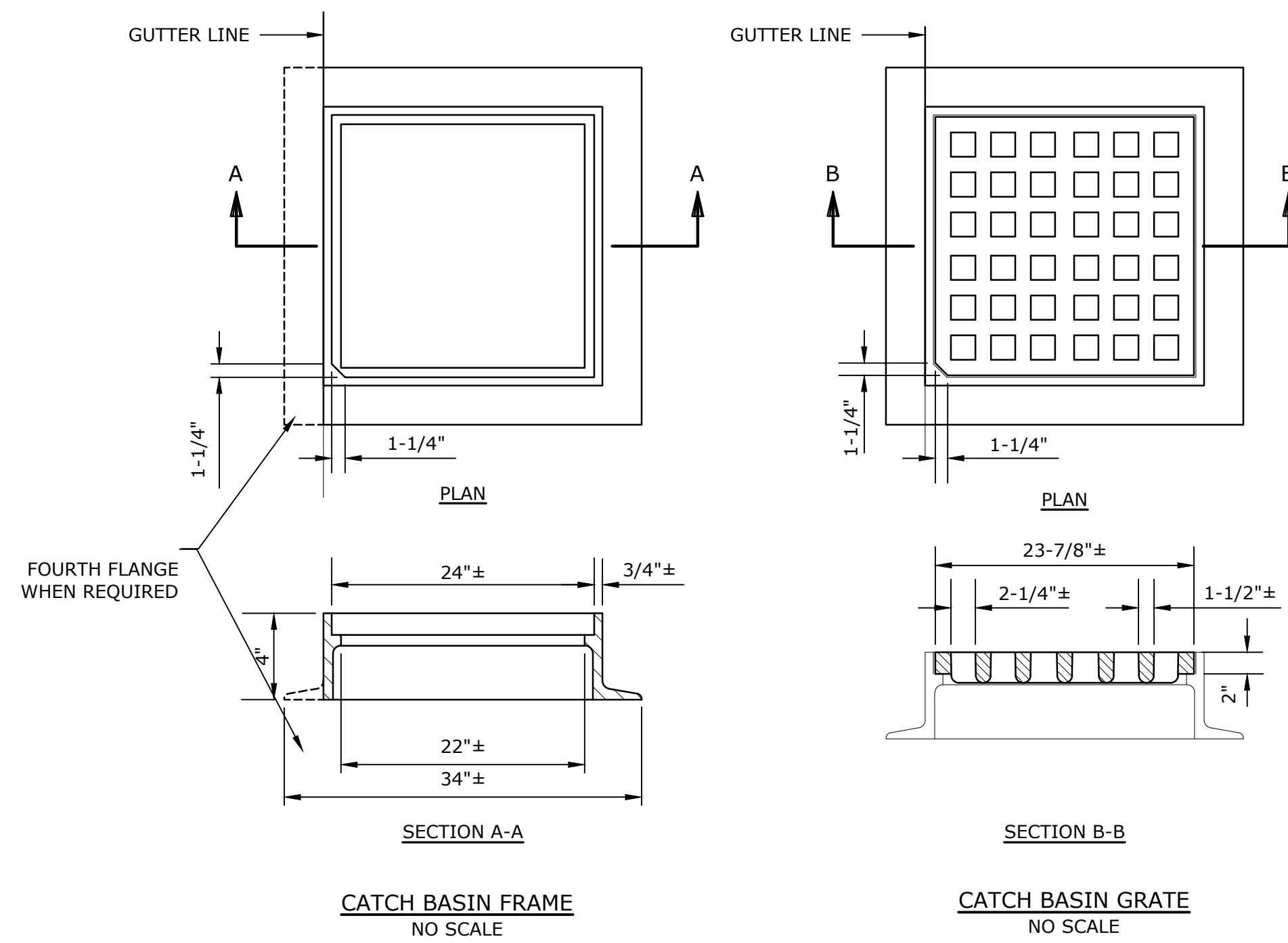
Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
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DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-501.dwg	
DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

CONSTRUCTION DETAILS

SCALE: AS NOTED

C-501
SHEET 13 OF 29



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**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

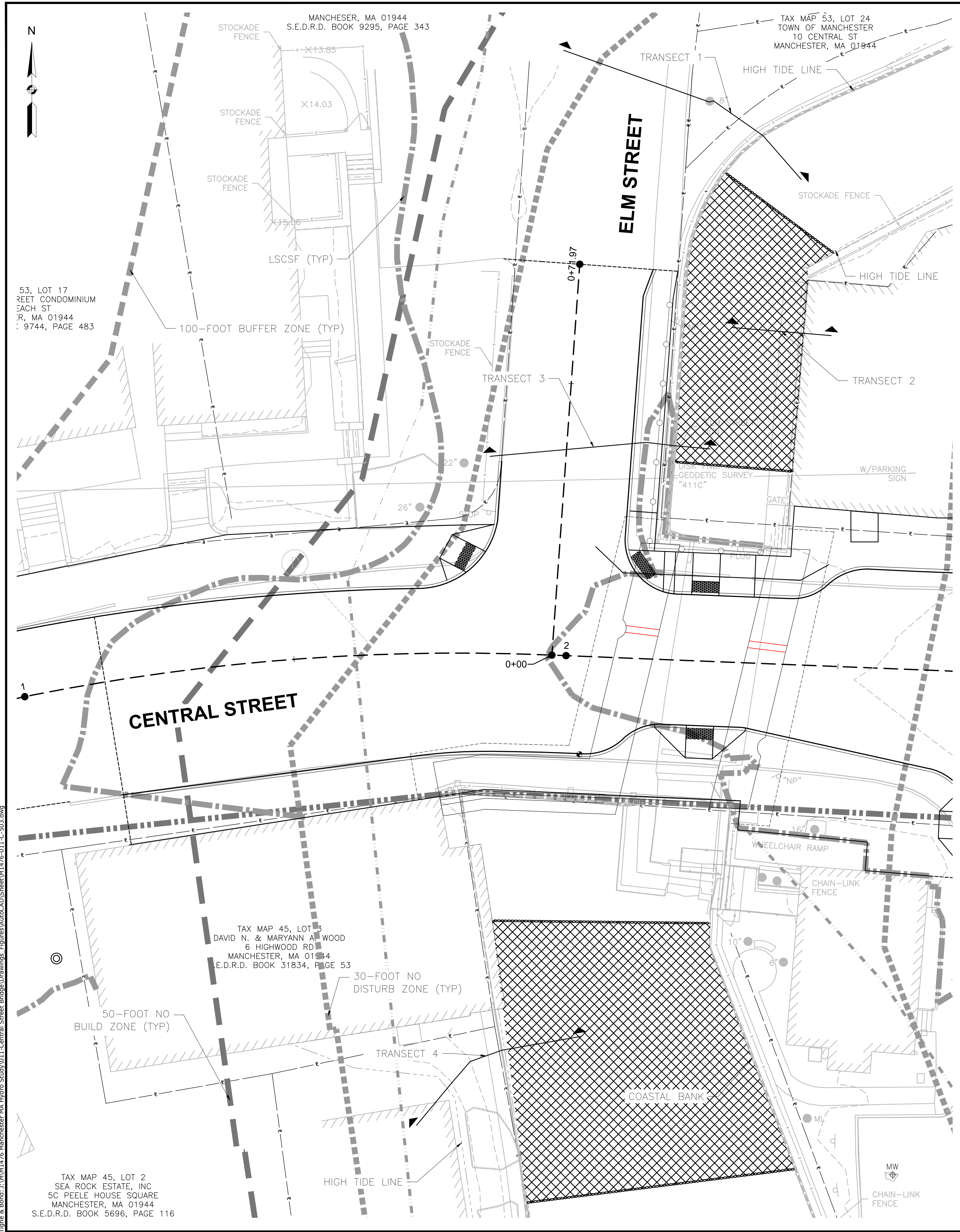
Town of
Manchester-By-
The-Sea,
Massachusetts

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PROJECT NO:	M1476 - 011	
DATE:	FEBRUARY 2022	
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DRAWN BY:	AGB	
CHECKED BY:	BRB	
APPROVED:	DLM	

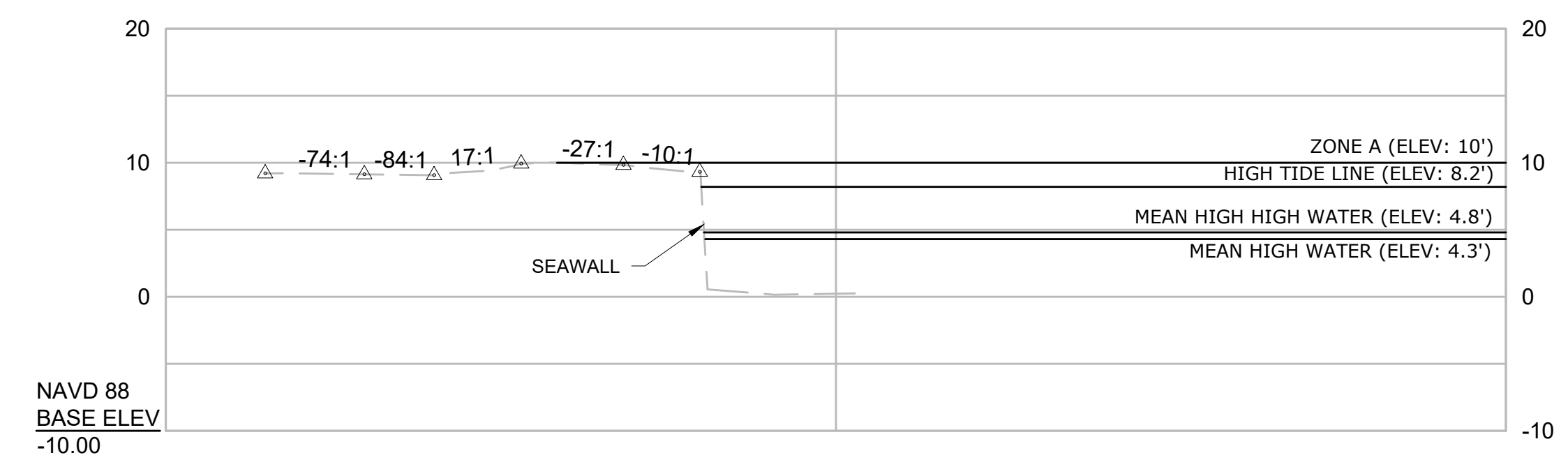
CONSTRUCTION DETAILS

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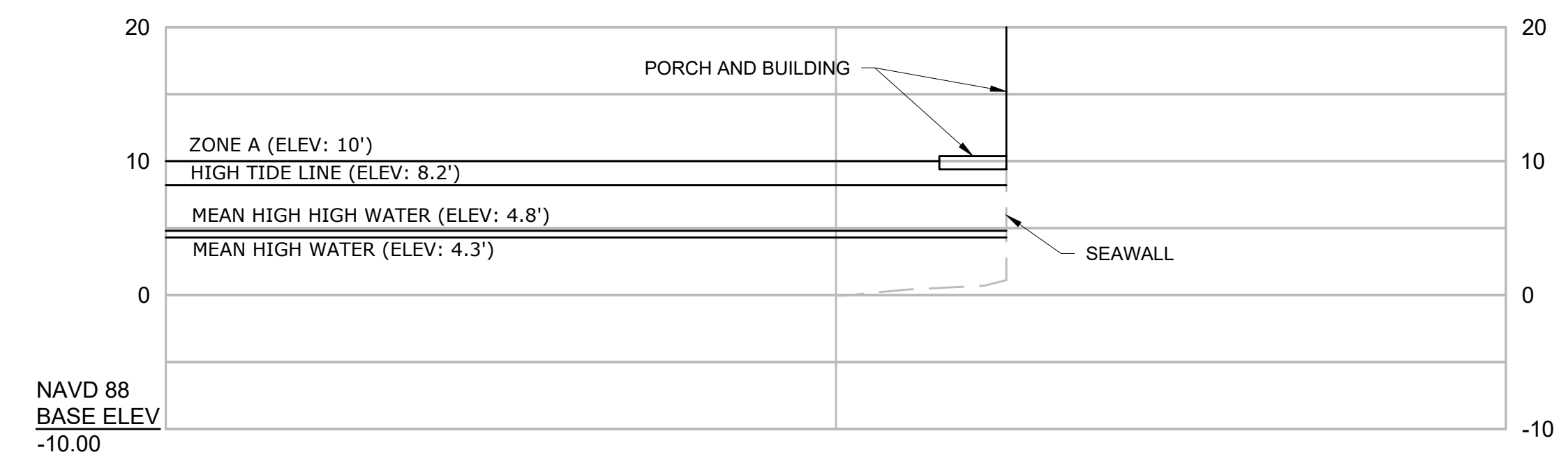
C-502
SHEET 14 OF 29



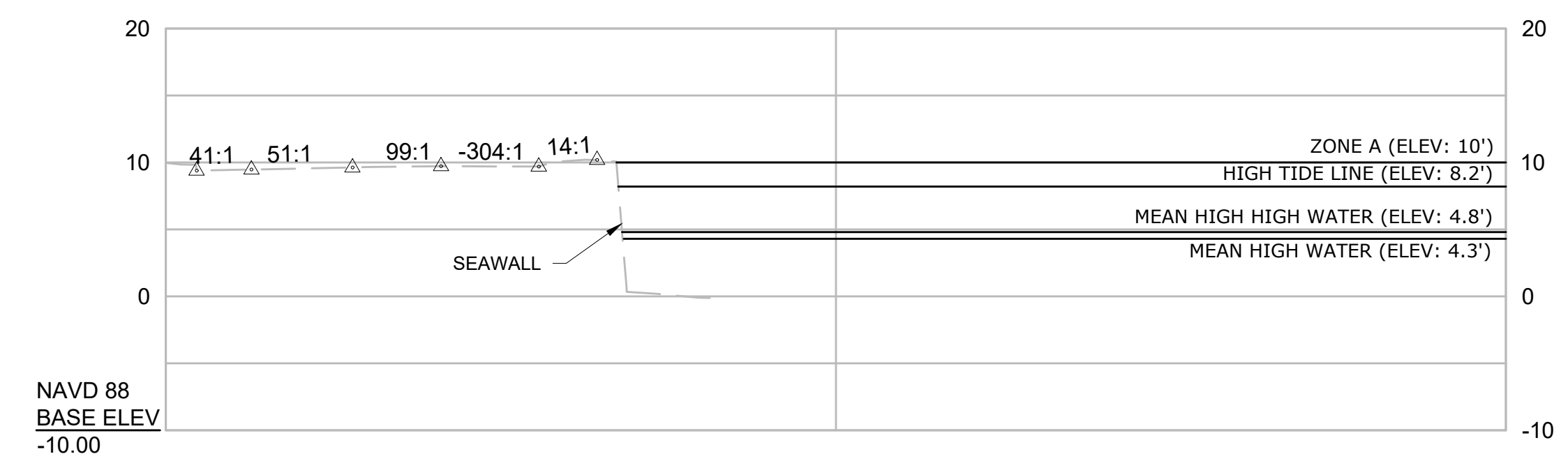
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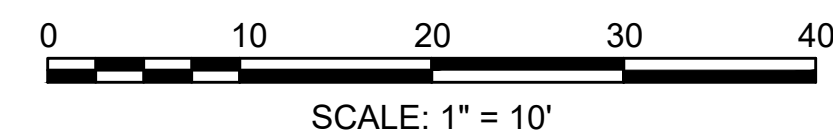
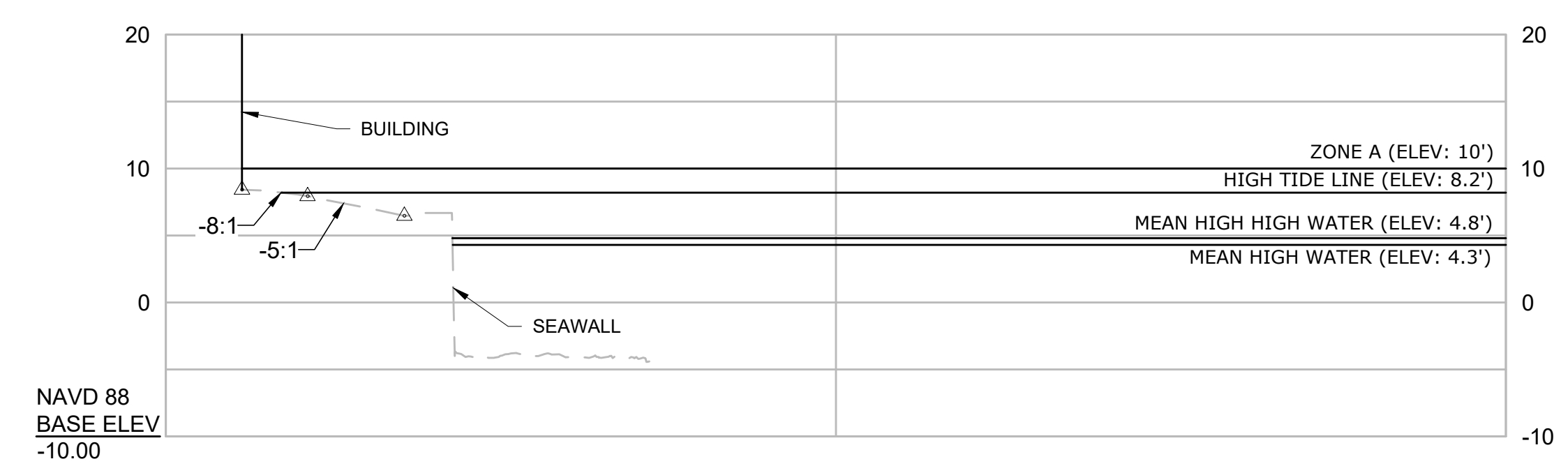
TRANSECT 2



TRANSECT 3



TRANSECT 4



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Department of
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MARK	DATE	DESCRIPTION
PROJECT NO:	M1476-011	
DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-503.dwg	
DRAWN BY:	AGB	
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APPROVED:	DLM	

COASTAL BANK PLAN

SCALE: HORIZ, VERT: 1" = 10'

C-503
SHEET 15 OF 29

Date Saved: 2/3/2022 11:58pm By: Mikesolose
 Tighe & Bond: J:\M1476 Manchester MA Hydro Study\011-Central Street Bridge Drawings - Figures\AutoCAD\Sheet\M1476-011-C-503.dwg

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CONTROL OF WATER NOTES

SCALE: AS NOTED

C-504
SHEET 16 OF 29

EROSION CONTROL NOTES:

- CONTRACTOR MUST FINALIZE AND IMPLEMENT THE EROSION AND SEDIMENT CONTROL PLAN (ESCP).
- THE ESCP SHALL BE UPDATED AS CONSTRUCTION PROGRESSES. IT SHOULD REFLECT CURRENT OWNERSHIP, RESPONSIBILITIES, OPERATIONS AND FINDINGS. THE PLAN SHALL BE REVISED NO LATER THAN 7 DAYS AFTER THE INSPECTION. IF HAZARDOUS CONDITIONS OCCUR THE PLAN NEEDS TO BE MODIFIED BEFORE PROCEEDING WITH WORK. STEPS TO PREVENT THE REOCCURRENCE OF SUCH RELEASES WILL BE IDENTIFIED IN A PLAN REVISION AND IMPLEMENTED.
- MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
- MAINTAIN ALL EROSION CONTROL MEASURES IN GOOD WORKING CONDITION. THIS MAY REQUIRE CLEANING, REPAIRING, REPLACEMENT, AND SEDIMENT DISPOSAL. MAINTENANCE SHALL BE INITIATED WITHIN 24 HOURS OF IDENTIFICATION. SEDIMENT BARRIERS SHOULD HAVE SEDIMENT CLEANED OUT WHEN THE BARRIER IS 50% OF CAPACITY. SOIL AND DEBRIS ON ADJOINING PROPERTIES OR STREETS SHALL BE MINIMIZED. HAZARDOUS MATERIAL SPILLS SHOULD BE REMOVED IMMEDIATELY AND REMEDIAL ACTIONS FOR PREVENTION MUST BE TAKEN. HAZARDOUS MATERIALS SHALL BE CLEANED UP BY REMOVING AND DISPOSING OF CONTAMINATED MATERIALS PROPERLY.
- SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
- THE ESCP MEASURES SHOWN ON THIS PLAN ARE THE BASE REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, UPGRADE THESE MEASURES AS NEEDED TO COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL EROSION AND SEDIMENT CONTROL REGULATIONS.
- EROSION AND SEDIMENT CONTROL MEASURES INCLUDING PERIMETER SEDIMENT CONTROL MUST BE IN PLACE BEFORE VEGETATION IS DISTURBED AND MUST REMAIN IN PLACE AND BE MAINTAINED, CLEANED, REPAIRED OR REPLACED, AND PROMPTLY IMPLEMENTED FOLLOWING PROCEDURES ESTABLISHED FOR THE DURATION OF CONSTRUCTION, INCLUDING PROTECTION FOR ACTIVE STORM DRAIN INLETS AND CATCH BASINS AND APPROPRIATE NON-STORMWATER POLLUTION CONTROLS.
- PHASE CLEARING AND GRADING TO THE MAXIMUM EXTENT PRACTICAL TO PREVENT EXPOSED INACTIVE AREAS FROM BECOMING A SOURCE OF EROSION. CONSTRUCTION ACTIVITIES MUST AVOID OR MINIMIZE UNSTABILIZED EXCAVATION AND CREATION OF BARE GROUND DURING WET WEATHER.
- PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO PREVENT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
- IDENTIFY, MARK, AND PROTECT (BY FENCING OFF OR OTHER MEANS) CRITICAL RIPARIAN AREAS AND VEGETATION INCLUDING ALL TREES AND ASSOCIATED ROOTING ZONES, AND VEGETATION AREAS NOT SPECIFICALLY IDENTIFIED FOR REMOVAL. MARK IN THE FIELD VEGETATIVE BUFFER ZONES BETWEEN THE SITE AND SENSITIVE AREAS (E.G., WETLANDS), AND OTHER AREAS TO BE PRESERVED, ESPECIALLY IN PERIMETER AREAS.
- THE INTENTIONAL WASHING OF SEDIMENT INTO SAWMILL BROOK MUST NOT OCCUR. VACUUMING OR DRY SWEEPING AND MATERIAL PICKUP MUST BE USED TO CLEANUP SEDIMENTS.
- STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY.
- APPLY TEMPORARY AND/OR PERMANENT SOIL STABILIZATION MEASURES ON ALL DISTURBED AREAS AS GRADING PROGRESSES AND FOR ALL ROADWAYS INCLUDING GRAVEL ROADWAYS.
- ESTABLISH CONCRETE TRUCK AND OTHER CONCRETE EQUIPMENT CONTAINED WASHOUT AREAS BEFORE BEGINNING CONCRETE WORK. CONCRETE WASHOUT MUST BE CONTAINED AWAY FROM DRAINAGE AREAS. IT MUST BE CLEARLY MARKED AND ACCESSIBLE.
- ESTABLISH MATERIAL AND WASTE STORAGE AREAS, AND OTHER NON-STORMWATER CONTROLS. DISPOSAL OF MATERIALS AND WASTE SHALL COMPLY WITH STATE AND LOCAL WASTE DISPOSAL. SANITARY WASTE AND OTHER HAZARDOUS WASTE SHALL BE DISPOSED OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
- DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER, DISCHARGE WATER FROM DEWATERING TO THE APPROPRIATE LOCATION AND WITHOUT SEDIMENT.
- ALL SILT-LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS IN A SEDIMENTATION BASIN OR FILTER BAG LOCATED DOWNSTREAM, PRIOR TO RELEASE TO A WATERWAY OR EXISTING DRAINAGE SYSTEM.
- PREVENT TRACKING OF SEDIMENT OUTSIDE OF PROJECT LIMITS USING BMPS SUCH AS: GRAVELED (OR PAVED) EXITS AND PARKING AREAS, GRAVEL ALL UNPAVED ROADS LOCATED ONSITE, OR USE AN EXIT TIRE WASH. THESE BMPS MUST BE IN PLACE PRIOR TO LAND-DISTURBING ACTIVITIES. AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHT-OF-WAYS BEYOND THE PROJECT LIMITS SHALL BE SWEEP AWAY.
- WHEN TRUCKING SATURATED SOILS FROM THE SITE, EITHER USE WATER-TIGHT TRUCKS OR DEWATER LOADS ON SITE.
- BMPS SHOULD BE IMPLEMENTED AND MONITORED THROUGHOUT THE PROJECT. USE BMPS TO PREVENT OR MINIMIZE STORMWATER EXPOSURE TO POLLUTANTS FROM SPILLS; VEHICLE AND EQUIPMENT FUELING, MAINTENANCE, AND STORAGE; OTHER CLEANING AND MAINTENANCE ACTIVITIES; AND WASTE HANDLING ACTIVITIES. THESE POLLUTANTS INCLUDE FUEL, HYDRAULIC FLUID, AND OTHER OILS FROM VEHICLES AND MACHINERY, AS WELL AS DEBRIS, LEFTOVER PAINTS, SOLVENTS, AND GLUES FROM CONSTRUCTION OPERATIONS.
- WRITTEN SPILL PREVENTION AND RESPONSE PROCEDURES, EMPLOYEE TRAINING ON SPILL PREVENTION AND PROPER DISPOSAL PROCEDURES, SPILL KITS IN ALL VEHICLES, REGULAR MAINTENANCE SCHEDULE FOR VEHICLES AND MACHINERY, MATERIAL DELIVERY AND STORAGE CONTROLS, TRAINING AND SIGNAGE, AND COVERED STORAGE AREAS FOR WASTE AND SUPPLIES. HAZARDOUS MATERIALS SHOULD BE STORED AWAY FROM THE STREAM TO ELIMINATE CHANCES FOR ACCIDENTAL SPILL SHALL BE IMPLEMENTED.
- IF A TREATMENT (FOR EXAMPLE, ELECTRO-COAGULATION, FLOCCULATION, FILTRATION, ETC.) FOR SEDIMENT OR OTHER POLLUTANT REMOVAL IS EMPLOYED, SUBMIT AN OPERATION AND MAINTENANCE PLAN (INCLUDING SYSTEM SCHEMATIC, LOCATION OF SYSTEM, LOCATION OF INLET, LOCATION OF DISCHARGE, DISCHARGE DISPERSION DEVICE DESIGN, AND A SAMPLING PLAN AND FREQUENCY) BEFORE OPERATING THE TREATMENT SYSTEM. OBTAIN ENGINEER'S PLAN REVIEW BEFORE OPERATING THE TREATMENT SYSTEM. OPERATE AND MAINTAIN THE TREATMENT SYSTEM ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
- TEMPORARILY STABILIZE SOILS AT THE END OF THE SHIFT BEFORE HOLIDAYS AND WEEKENDS. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT SOILS ARE STABLE DURING EVENTS AT ANY TIME.
- STABILIZING PRACTICES : SEEDING WITH MULCH AND ROLLED EROSION CONTROL MATTING. ANY AREAS NOT SUBJECT TO CONSTRUCTION ACTIVITY FOR 14 DAYS MUST BE STABILIZED IMMEDIATELY. PRESERVE EXISTING VEGETATION IN AREAS NOT DISTURBED DURING CONSTRUCTION. ANY ON SITE STOCK PILES SHALL BE STABILIZED WITHIN 14 DAYS AFTER CONSTRUCTION ACTIVITY HAS CEASED WITH SEDIMENT BARRIERS INSTALLED.
- FINAL STABILIZATION: MEANS THAT ALL SOIL DISTURBING ACTIVITIES AT THE SITE HAVE BEEN COMPLETED AND THAT A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% FOR THE AREA HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES HAVE BEEN EMPLOYED.

BEST MANAGEMENT PRACTICES

INSPECTION AND MAINTENANCE

- SEDIMENT, EROSION CONTROLS, AND BEST MANAGEMENT PRACTICES (BMPS) SHALL BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION AT THE SITE. NO WORK WHICH SHALL DISTURB THE SITE OR CREATE THE POTENTIAL FOR SEDIMENT RELEASE SHALL COMMENCE UNTIL THE SEDIMENT AND EROSION CONTROLS HAVE BEEN INSPECTED AND APPROVED BY THE OWNER, ENGINEER, AND REGULATORY AGENCIES. ALL CONTROLS AND BMPS SHALL BE SUBJECT TO INSPECTION BY THE OWNER, HIS REPRESENTATIVE, AND REGULATORY AGENCIES AT ANYTIME THEREAFTER.
- PERIODIC INSPECTION, MAINTENANCE, AND CLEANING OF TEMPORARY EROSION OF SEDIMENT CONTROL MEASURES AND BMPS SHALL BE REQUIRED. ALL CONTROLS AND BMPS SHALL BE INSPECTED EVERY 7 DAYS AND WITHIN 24 HOURS OF RAINFALL EVENTS OF 0.25 INCHES OR GREATER. ROUTINE INSPECTION AND MAINTENANCE WILL REDUCE THE CHANCE OF POLLUTING STORMWATER BY FINDING AND CORRECTING PROBLEMS BEFORE THE NEXT RAIN EVENT. THE FOCUS OF THE INSPECTION WILL BE TO DETERMINE:
 - WHETHER OR NOT THE MEASURE WAS INSTALLED / PERFORMED CORRECTLY;
 - WHETHER OR NOT THERE HAS BEEN ANY DAMAGE TO THE MEASURE SINCE IT WAS INSTALLED OR PERFORMED; AND
 - WHAT SHOULD BE DONE TO CORRECT ANY PROBLEMS WITH THE MEASURE. EACH MEASURE IS TO BE OBSERVED TO DETERMINE IF IT IS STILL EFFECTIVE.
 IN SOME CASES, SPECIFIC MEASUREMENTS MAY BE TAKEN TO DETERMINE IF MAINTENANCE OF THE MEASURES IS REQUIRED.

SITE MANAGER

- PRIOR TO CONSTRUCTION, A SITE MANAGER WILL BE DESIGNATED BY THE CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION, MONITORING, INSPECTION, AND CORRECTION OF EROSION AND SEDIMENT CONTROL MEASURES.

CONSTRUCTION SITE ENTRANCE

- TO REDUCE THE TRACKING OF SEDIMENT FROM THE CONSTRUCTION SITE ONTO OTHER AREAS OF THE PROPERTY AND/OR PUBLIC ROADS, AS WELL AS THE PRODUCTION OF AIRBORNE DUST, A STABILIZED CONSTRUCTION ENTRANCE IS TO BE ESTABLISHED AT ANY PERMANENT CONSTRUCTION STAGING AREA. THE ENTRANCE IS TO CONSIST OF A 6-INCH THICK PAD OF CRUSHED STONE UNDERLAIN WITH FILTER FABRIC OR A BITUMINOUS CONCRETE APRON. IT IS TO BE REMOVED AND THE AREA RESTORED FOLLOWING CONSTRUCTION.

SITE CLEARING

- DURING SITE CLEARING, EXISTING VEGETATION WITHIN THE OVERALL LIMITS OF CLEARING AND GRUBBING SHALL BE REMOVED, EXCEPT AS OTHERWISE DIRECTED. PRIOR TO ANY SITE CLEARING ACTIVITIES, SEDIMENT CONTROL BARRIERS SHALL BE PLACED ALONG THE OUTER LIMIT OF DISTURBANCE. CLEARING IS TO BE LIMITED TO THOSE AREAS OF PROPOSED WORK. DISTURBED AREAS ARE TO BE KEPT TO A MINIMUM. NO TREE WITH A BREAST HEIGHT DIAMETER OF GREATER THAN 6 INCHES SHALL BE CLEARED FROM AREAS OUTSIDE THE LIMITS OF CLEARING AND GRUBBING WITHOUT PRIOR APPROVAL FROM THE OWNER.

DUST CONTROL

- STANDARD DUST CONTROL MEASURES, INCLUDING SPRAYING AND MISTING SHALL BE USED AS NECESSARY. CALCIUM CHLORIDE SHALL NOT BE ALLOWED ON THIS PROJECT.

STAGING AREAS

- THE CONTRACTOR SHALL COORDINATE LAYDOWN STAGING AREAS FOR STORING EQUIPMENT AND MATERIALS WITH THE OWNER.
- STAGING AREAS SHALL BE SURROUNDED WITH COMPOST FILTER TUBE EROSION BARRIERS ON THE DOWNHILL SIDE.
- DURING AND AFTER CONSTRUCTION, ALL PAVED ROAD AND DRIVEWAY SURFACES ARE TO BE SCRAPED AND BROOMED FREE OF EXCAVATED MATERIALS ON A DAILY BASIS, UNLESS APPROVED BY THE OWNER.

STOCKPILED MATERIALS

- STOCKPILES OF SOIL CREATED DURING CONSTRUCTION ACTIVITIES ARE TO BE SURROUNDED WITH AN EROSION CONTROL BARRIER AROUND THE PERIMETER OF THE STOCKPILE. STOCKPILES OF ERODIBLE MATERIAL ARE TO BE COVERED PRIOR TO INCLEMENT WEATHER WITH A MINIMUM OF 20 MIL POLYETHYLENE SHEETING. STOCKPILES LEFT UNDISTURBED LONGER THAN 14 DAYS SHALL BE SEEDED OR COVERED.

EQUIPMENT FUELING

- EQUIPMENT FUELING AND OTHER ACTIVITIES INVOLVING PETROLEUM, OIL, OR OTHER POTENTIALLY HAZARDOUS SUBSTANCES ARE TO BE PERFORMED AT PRE-APPROVED, DESIGNATED AREAS WITH APPROPRIATE SPILL PREVENTION AND CONTROL MEASURES. PORTABLE SECONDARY CONTAINMENT IS TO BE USED, AND SORBENT MATERIALS ARE TO BE PLACED AROUND THE PERIMETER OF THE FUELING AREA.

CONSTRUCTION DEWATERING

- CONSTRUCTION DEWATERING SHALL BE REQUIRED DURING PORTIONS OF CONSTRUCTION WHICH REQUIRE EXCAVATION OR OTHER ACTIVITIES WHERE GROUNDWATER MAY INTERFERE WITH THE WORK.
- CONSTRUCTION DEWATERING DISCHARGES SHALL BE PRE-TREATED FOR SEDIMENT REMOVAL BY PASSING THROUGH AN APPROPRIATELY SIZED FILTER SOCK, SILT BAG, FRACTIONATION / SEDIMENTATION TANK, OR SEDIMENT TRAP PRIOR TO DISCHARGE, AS NECESSARY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DEWATERING TECHNIQUES AND MAINTAINING DEWATERING PROCEDURES THROUGHOUT THE DURATION OF THE PROJECT.

OUTLET PROTECTION

- APPROPRIATE OUTLET PROTECTION, CONSISTING OF RIPRAP CHANNEL LINING, A LEVEL SPREADER, OR OTHER SUCH MEASURE SHALL BE PROVIDED AT THE OUTLET OF ANY DEWATERING CONDUIT OR STORMWATER CULVERT OR CHANNEL OUTFALL TO REDUCE VELOCITIES AND ENHANCE SEDIMENTATION PRIOR TO DISCHARGE.

LIMITS OF WORK

- THE CONTRACTOR SHALL LINE THE UPGRADIENT BOUNDARY OF WORK AREAS WITH ORANGE SAFETY FENCING BEFORE THE START OF SITE CLEARING ACTIVITIES EXCEPT WHERE CHAIN-LINK FENCING IS NEEDED TO RESTRICT PUBLIC ACCESS.

SURFACE WATER CONTROL

- THE CONTRACTOR MUST MAINTAIN THE SITE FLOWAGE OF SURFACE WATER THROUGH THE WORK AREA IN ACCORDANCE WITH THE SPECIFICATIONS. ALL COFFERDAMS SHALL CONSIST OF NON-ERODIBLE MATERIAL. THE CONTRACTOR SHALL SUBMIT A WATER CONTROL PLAN THAT WILL ADDRESS EMERGENCY MEASURES TO IMPLEMENT IN THE EVENT A STORM OCCURS DURING CONSTRUCTION.

TURBIDITY MONITORING AND CONTROL

- TURBIDITY SHALL BE MONITORED AND CONTROLLED BY THE CONTRACTOR. A TURBIDITY CURTAIN SHALL BE INSTALLED SURROUNDING AREAS OF EXCAVATION AT AND BELOW THE IMPOUNDMENT WATER LINE.
- IF TURBIDITY LEVELS ARE UNACCEPTABLE AS JUDGED BY THE OWNER, ENGINEER, OR REGULATORY AGENCY, ADDITIONAL MEASURES SHALL BE IMPLEMENTED AT NO EXPENSE TO THE OWNER.

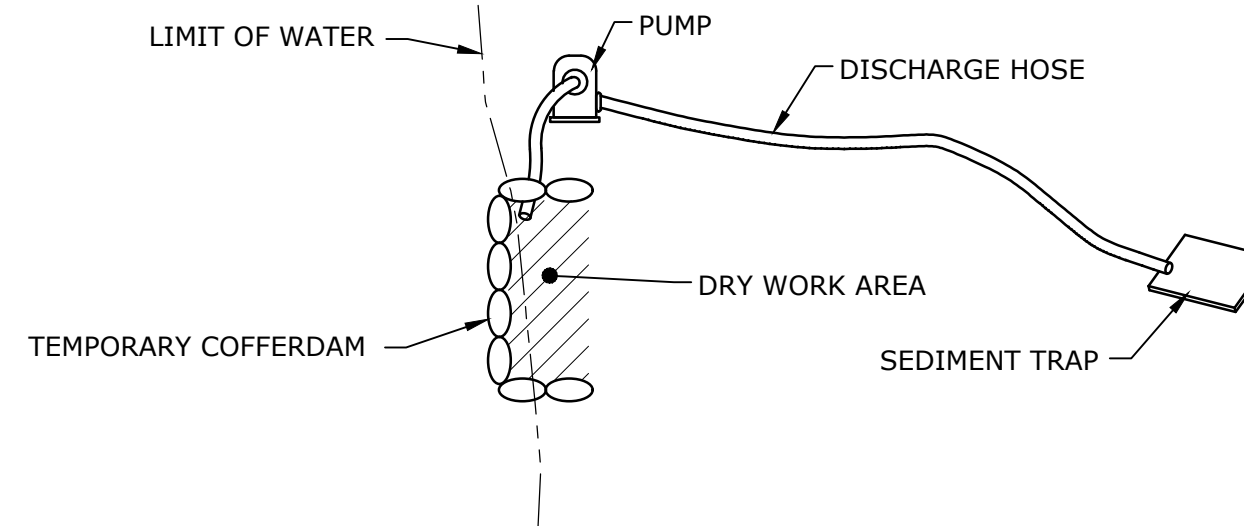
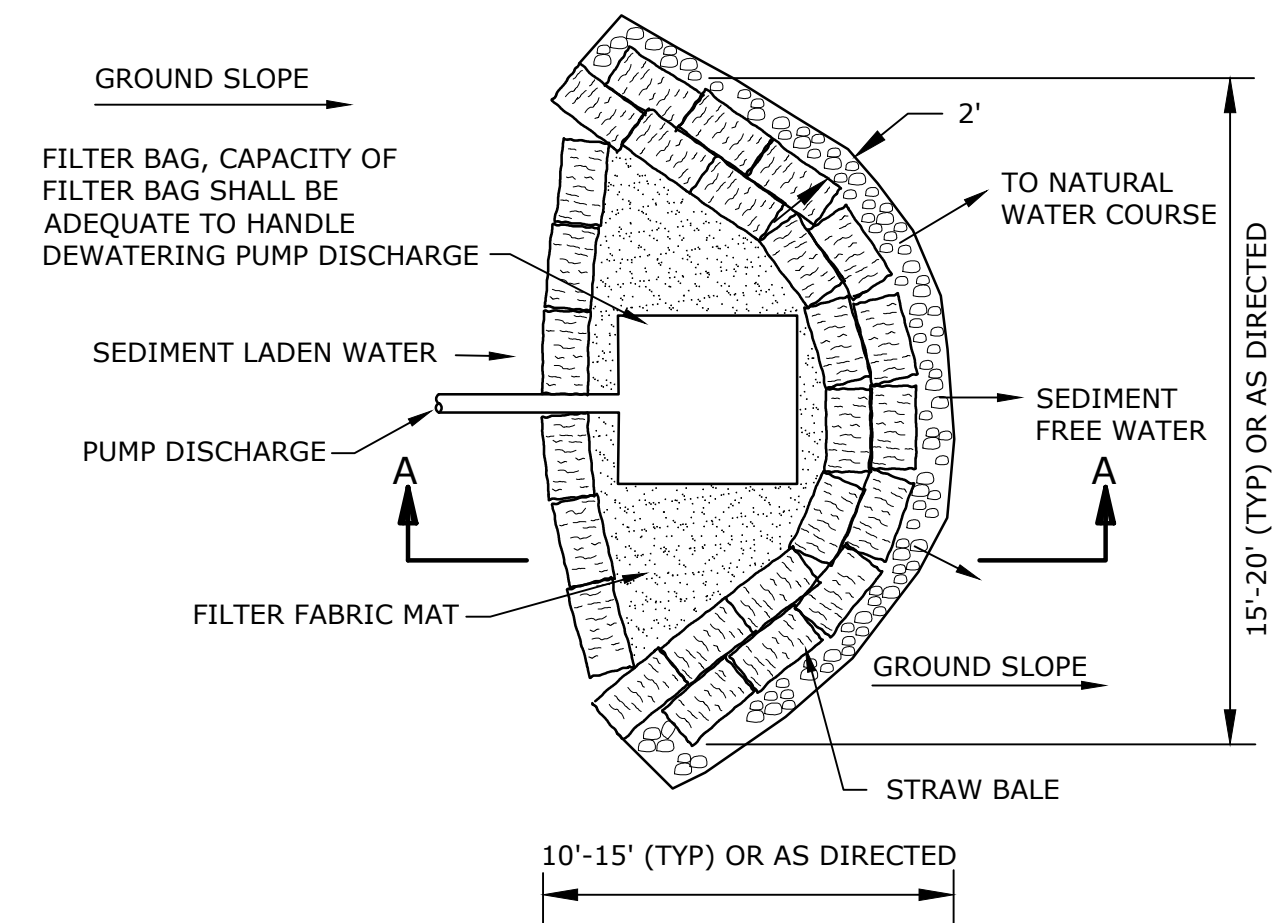
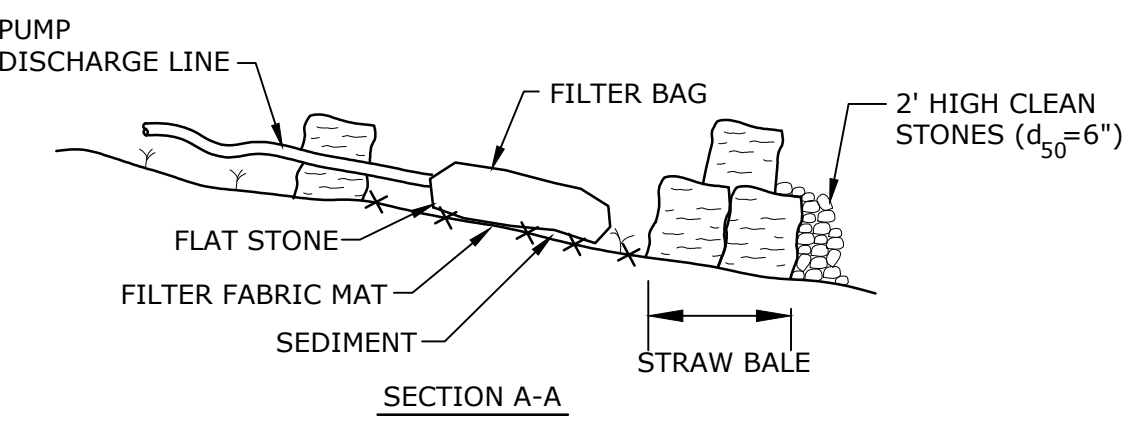
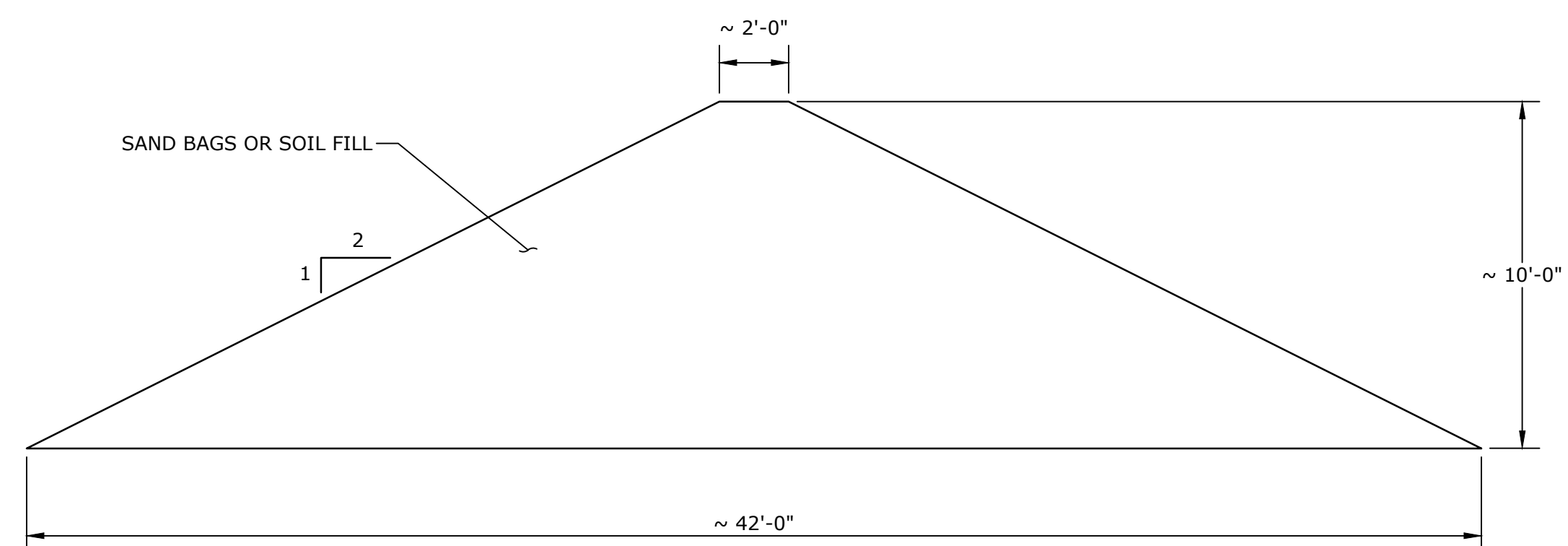
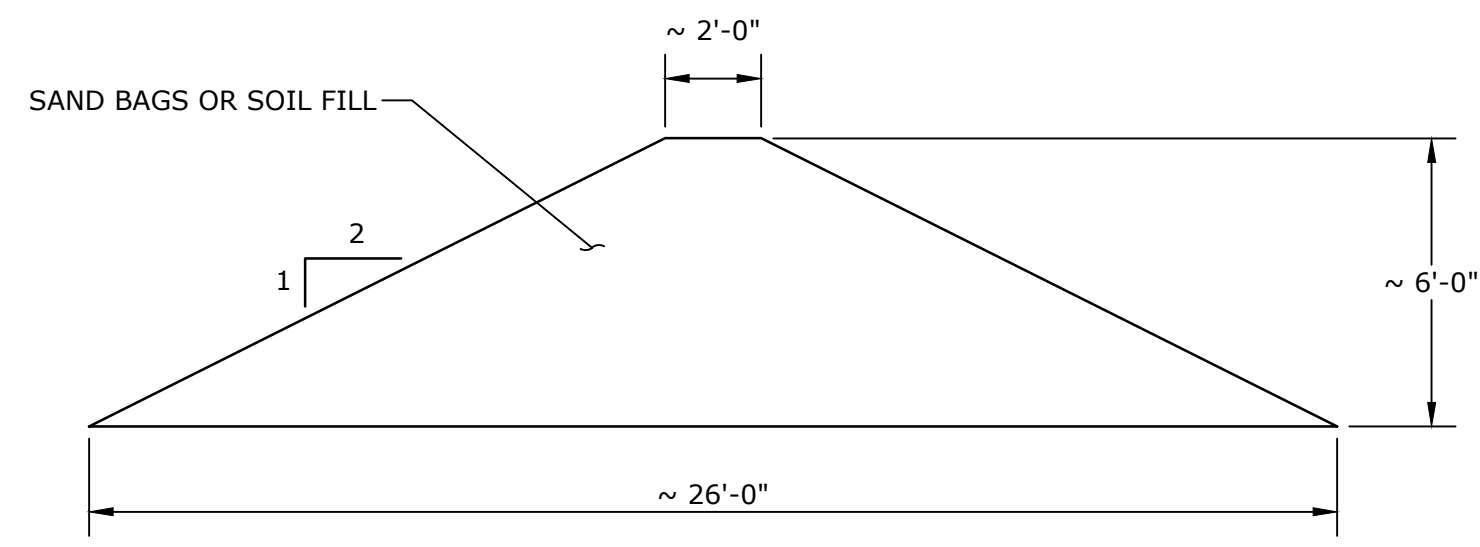
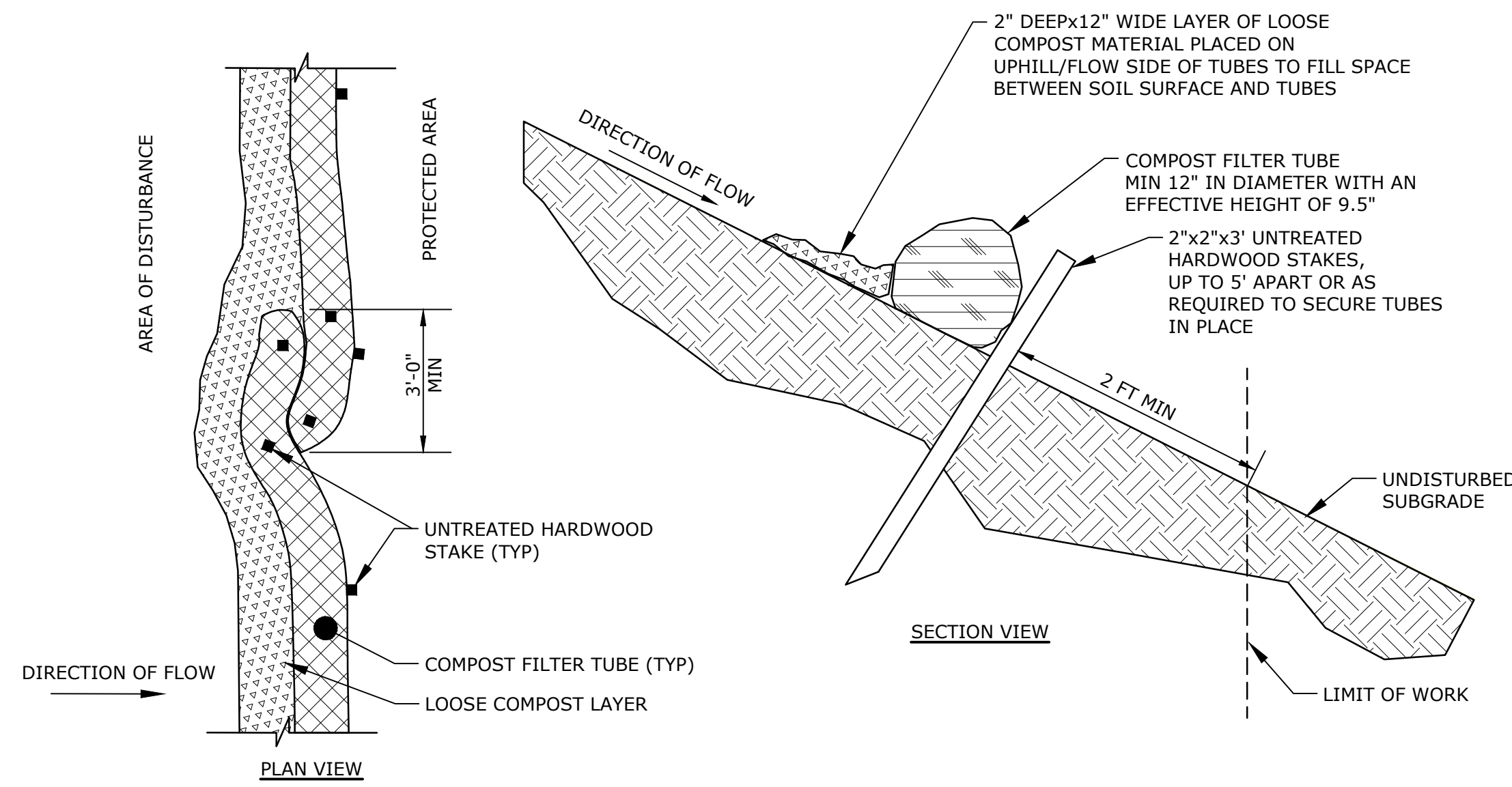
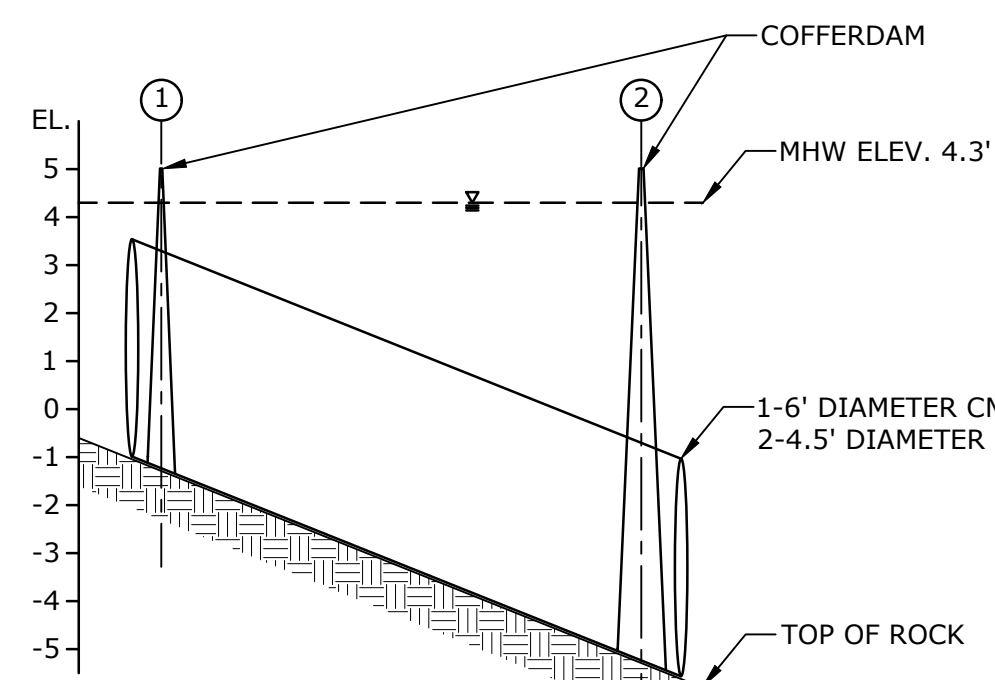
TEMPORARY STABILIZATION

- WHEN NECESSARY, TEMPORARY SLOPE PROTECTION SHALL BE PROVIDED BY INSTALLING SEDIMENT TRAP BARRIERS AT THE TOE OF FILLS OR CUT SLOPES. IF ADDITIONAL STABILIZATION IS NEEDED, THEN THE CONTRACTOR SHALL INSTALL MULCH LOGS, MATTING, SUCH AS STRAW, JUTE, WOOD FIBER, OR BIODEGRADABLE MESH. A TACKIFIER SHALL BE USED ON LOOSE MATERIALS USED FOR TEMPORARY EROSION CONTROL.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN TWO WEEKS, THE AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 100 LBS. PER 1,000 S.F. TO HELP CONTROL EROSION. 100% BIODEGRADABLE EROSION CONTROL BLANKETS OR TWO INCHES OF WOOD CHIP MULCH MAY ALSO BE USED AS TEMPORARY COVER.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN ONE MONTH, THE AREAS SHALL BE TOPSOILED AND SEEDED AS PER THE SPECIFICATIONS AND AT NO ADDITIONAL COST TO THE OWNER.
- LEAVE THE SURFACE OF ALL EXCAVATIONS AND FILLS IN A FIRM AND STABLE CONDITION AT THE END OF EACH DAY. ROLL OR OTHERWISE TREAT THE SURFACE AS NEEDED.

SITE RESTORATION

- STABILIZATION OF DISTURBED AREAS OR NEW SOIL FILLS SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY AND PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF PREVIOUSLY VEGETATED UPLAND AREAS DISTURBED BY CONSTRUCTION ACTIVITIES. RESTORATION OF UPLAND AREAS CONSIST OF REPLACEMENT OF TOPSOIL OR PLACEMENT OF IMPORTED LOAM AS NEEDED SUCH THAT A MINIMUM OF 4 INCHES OF SUITABLE MATERIAL IS PRESENT AND APPROPRIATELY LIMED, FERTILIZED, GRADED, AND SCARIFIED. FIELDS DISTURBED OR COMPACTED BY CONSTRUCTION ACTIVITIES SHALL BE PLOWED TO LOOSEN THE SOIL, HARROWED TO PROVIDE AN EVEN SURFACE, AND APPROPRIATELY PREPARED FOR PLANTING.
- DISTURBED UPLAND AREAS SHALL THEN BE HYDROSEEDED WITH AN APPROVED SEED MIX AT THE RATE RECOMMENDED BY THE MANUFACTURER. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING. SEED MIX SHALL BE DRY SITE RESTORATION SEED MIX UNLESS OTHERWISE NOTED OR AS APPROVED BY THE ENGINEER.
- 100% BIODEGRADABLE EROSION CONTROL BLANKETS MUST BE USED FOR STABILIZATION OF SLOPES IN EXCESS OF 3H:1V AND MAY BE USED IN LIEU OF HYDROSEEDING AT THE CONTRACTOR'S DISCRETION TO PROVIDE ADDITIONAL EROSION PROTECTION.
- FINAL STABILIZATION SHALL BE CONSIDERED COMPLETE WHEN ALL SOIL-DISTURBING ACTIVITIES HAVE BEEN COMPLETED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY PERCENT HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES (SUCH AS THE USE OF MULCHES OR EROSION CONTROL MATTING) HAVE BEEN EMPLOYED ON ALL UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL VEGETATED SURFACES, INCLUDING WATERING, FERTILIZING, REPAIRING EROSION, INVASIVE PLANT REMOVAL, AND RE-SEEDING UNTIL ESTABLISHMENT CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.

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 C:\Users\AutoCAD\Drawings - Figures\AutoCAD\Sheet\M1476-011-C-501.dwg
 Tighe & Bond; J:\M1476-Manchester MA Hydro Study\011-Central Street Bridge\Drawings



- NOTES:**
- DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS AND SHALL DISCHARGE OUTSIDE OF THE WETLAND BOUNDARY AS SHOWN ON SHEET C-001.
 - DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION.

DATUMS FOR 8443970, BOSTON MA (NAVD88)	
MHHW	4.77
MHW	4.33
MSL	-0.30
MLW	-5.16
MLLW	-5.51

COFFERDAMS, PUMPING, DEWATERING, AND STREAM BYPASS NOTES:

- THE DETAILS SHOWN ON THIS SHEET ARE AN EXAMPLE OF ACCEPTABLE METHODS TO USE DURING CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND SUBMITTING A COFFERDAM PLAN, PUMPING AND DEWATERING PLAN FOR REVIEW AND APPROVAL BY THE CONTRACTING AGENCY OR ENGINEER. THE PLAN SHALL INCLUDE SUFFICIENT DETAIL OF MEANS AND METHODS TO SATISFY THE PROJECT SPECIFICATIONS AND PERMIT REQUIREMENTS. IF APPROVED, OTHER METHODS MAY BE USED SUCH AS UTILIZING INFLATABLE BLADDERS, PLATES, OR BARRIERS OF VARIOUS MATERIALS. COFFERDAMS SHALL INCLUDE PLASTIC LINER OR FINE MESH SILT FENCE TO REDUCE TURBIDITY AND FINES FROM ENTERING THE FREE FLOWING PORTION OF LIVE WATER.
- THE CONTRACTING AGENCY IS RESPONSIBLE FOR MEASURING TURBIDITY HOWEVER THE CONTRACTOR SHALL ADHERE TO THE SPECIAL PROCEDURES REGARDING IN-STREAM WORK, TURBIDITY, AND DEWATERING IN THE DESIGN DRAWINGS.
- CONSERVATION MEASURES ARE SUMMARIZED IN THE PLANS AND SHALL BE STRICTLY ADHERED TO.
- THE CONTRACTOR SHALL NOTIFY THE OWNER AND CONTRACTING OFFICER AT LEAST 5 DAYS BEFORE EACH COFFERDAM INSTALLATION DATE. ANTICIPATED COFFERDAM LOCATIONS ARE SHOWN IN THE PLANS.
- FILL MATERIAL FOR BULK BAGS FOR "SUPER SACKS", IF USED, SHALL BE CLEAN, WASHED, AND ROUNDED MATERIAL MEETING STANDARD SPECIFICATIONS FOR DRAIN ROCK, STREAMBED AGGREGATES, STREAMBED SEDIMENTS, OR STREAMBED COBBLES. MATERIAL USED TO FILL BULK BAGS SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PERMITS. IF PERMITS ALLOW, MATERIAL MAY BE DISPOSED OF IN UPLAND AREAS AS DIRECTED BY THE CONTRACTING OFFICER.
- DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
- EXCAVATIONS ASSOCIATED WITH CHANNEL, FLOODPLAIN, AND STRUCTURES SHALL BE DEWATERED.
- WATER SHALL BE PUMPED AND DISCHARGED AWAY FROM THE WORK AREAS TO SEDIMENT TRAPS.
- DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
- ALL PUMP INTAKES SHALL BE SCREENED FOR FISH PROTECTION AS REQUIRED BY NOAA.
- ALL EARTHWORK ACTIVITIES AND STRUCTURE CONSTRUCTION WITHIN THE ORDINARY HIGH WATER CHANNEL SHALL CONFORM TO THE WATER QUALITY STANDARDS ESTABLISHED BY REGULATORY AGENCY PERMITS FOR THIS PROJECT.
- FLOW PIPE SHALL BE INSTALLED AND SUPPORTED AS NECESSARY TO ACCOUNT FOR IRREGULARITIES OF CHANNEL FLOOR.

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

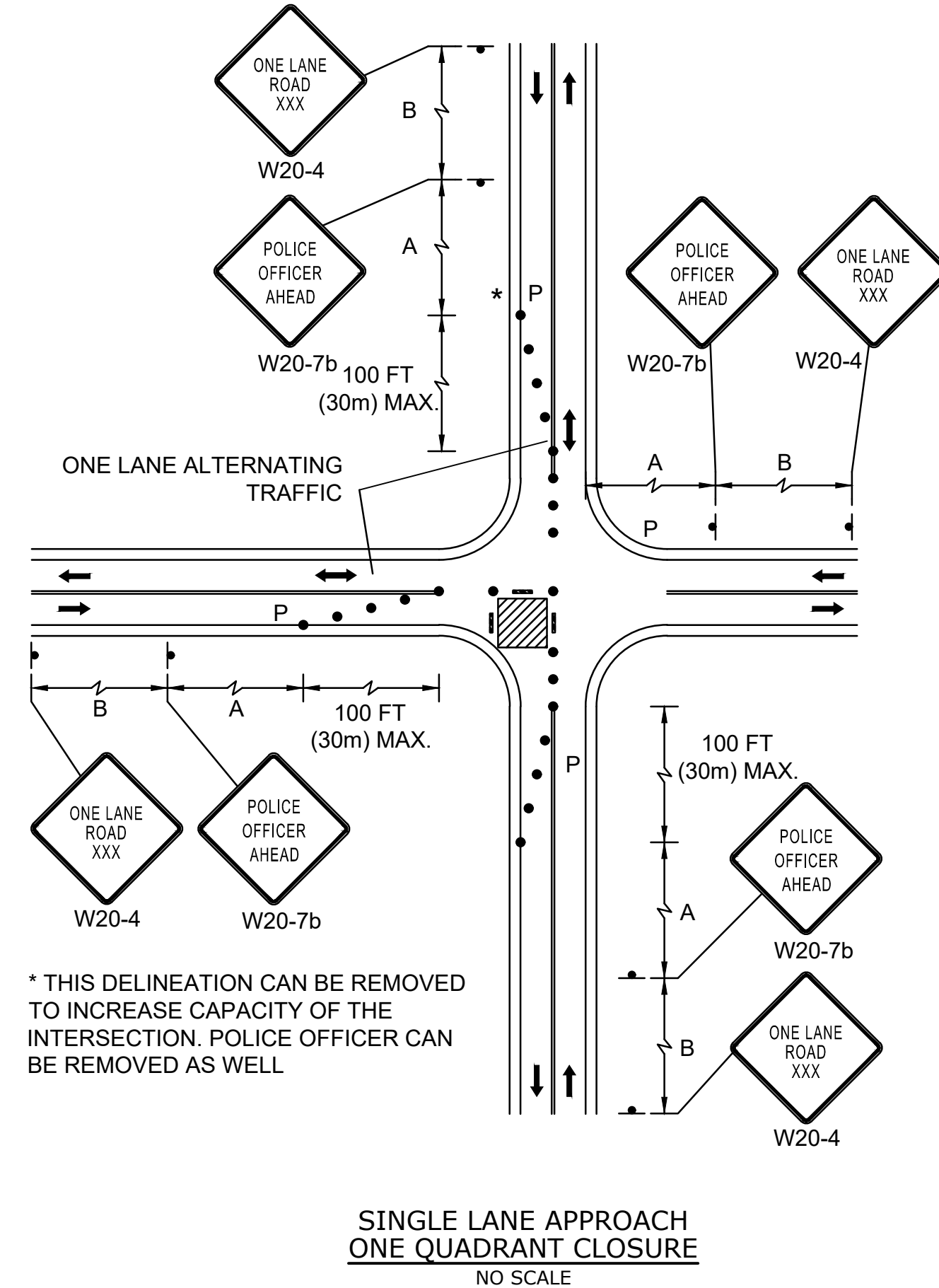
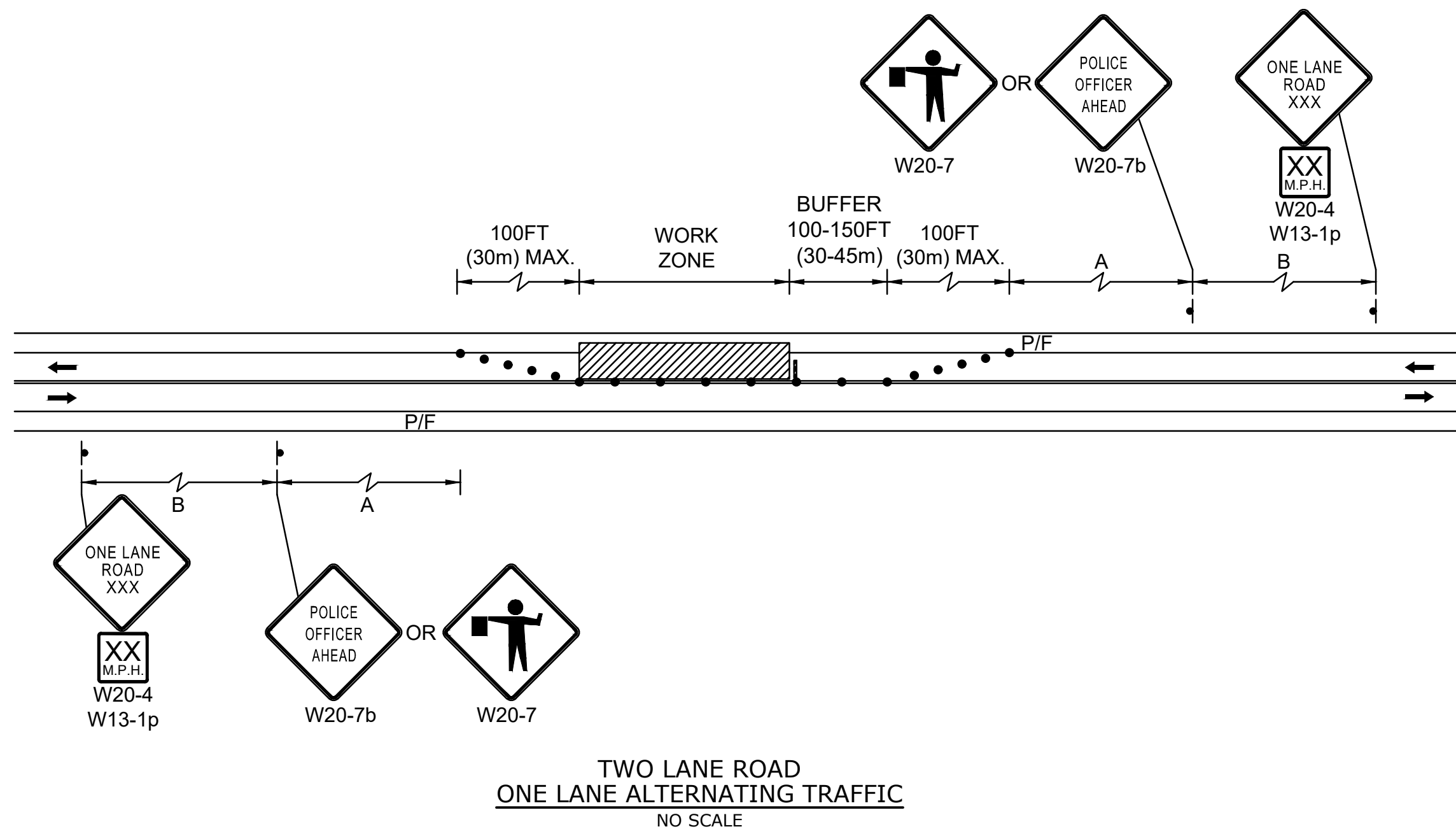
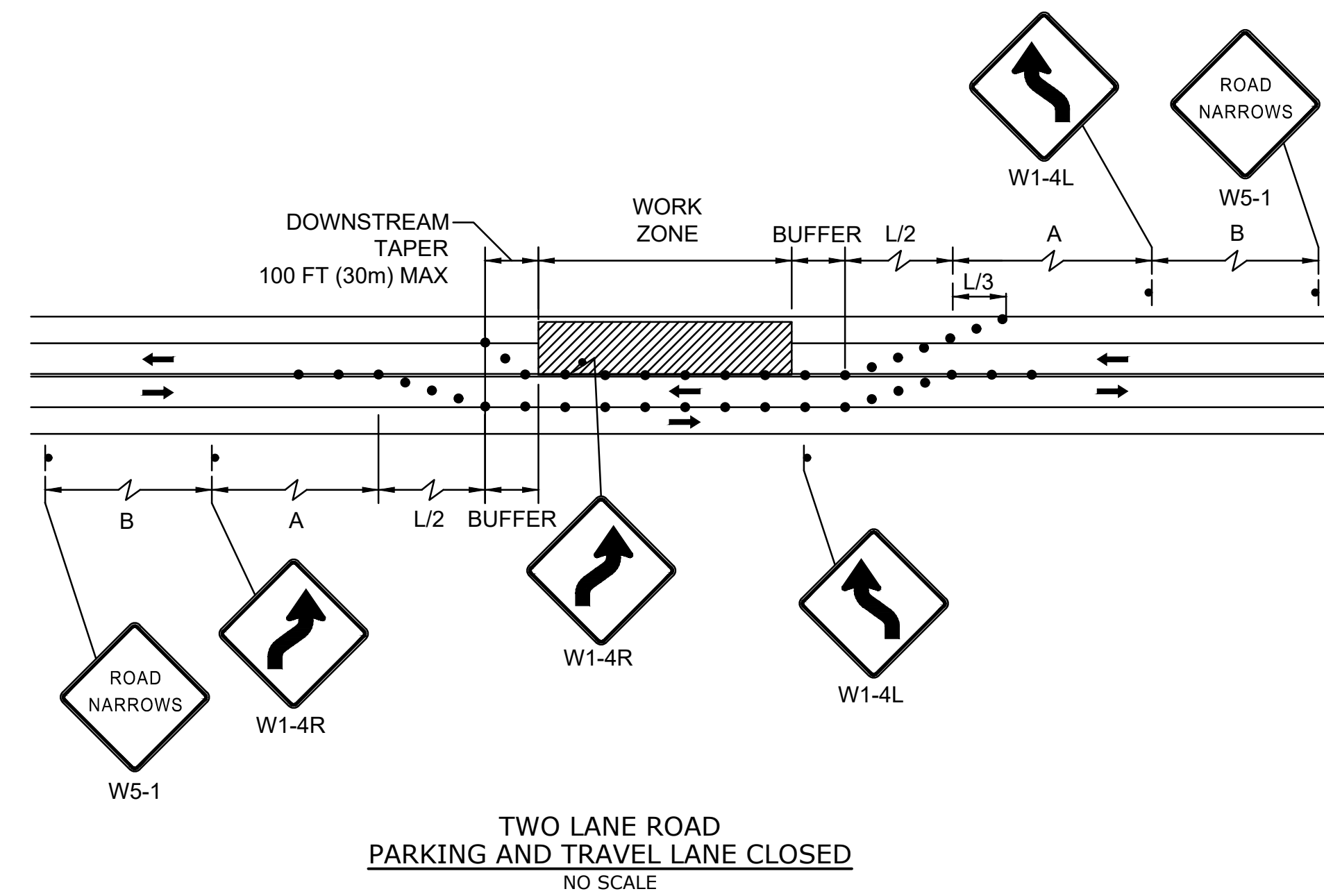
MARK	DATE	DESCRIPTION

PROJECT NO:	M1476 - 011
DATE:	FEBRUARY 2022
FILE:	M1476-011-C-501.dwg
DRAWN BY:	AGB
CHECKED:	BBB
APPROVED:	DLM

CONTROL OF WATER DETAILS

SCALE: AS NOTED

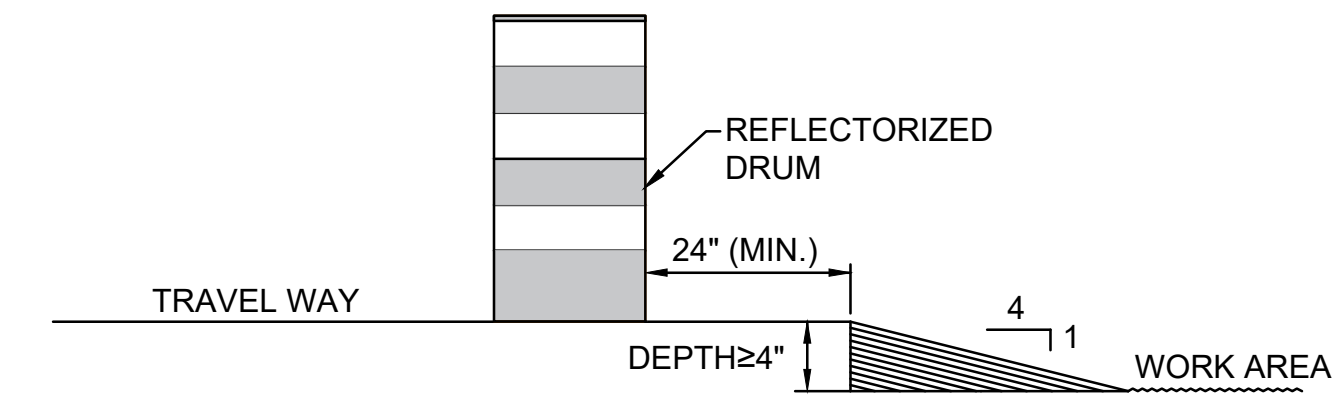
C-505
SHEET 17 OF 29



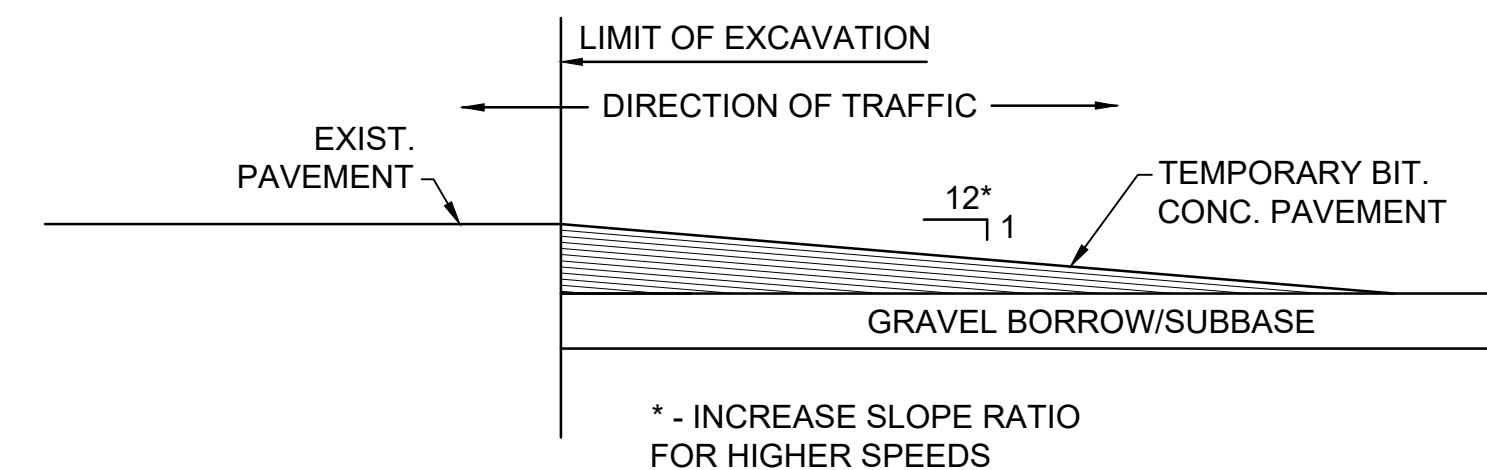
FORMULAS FOR DETERMINING TAPER LENGTHS

SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

WHERE:
L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH

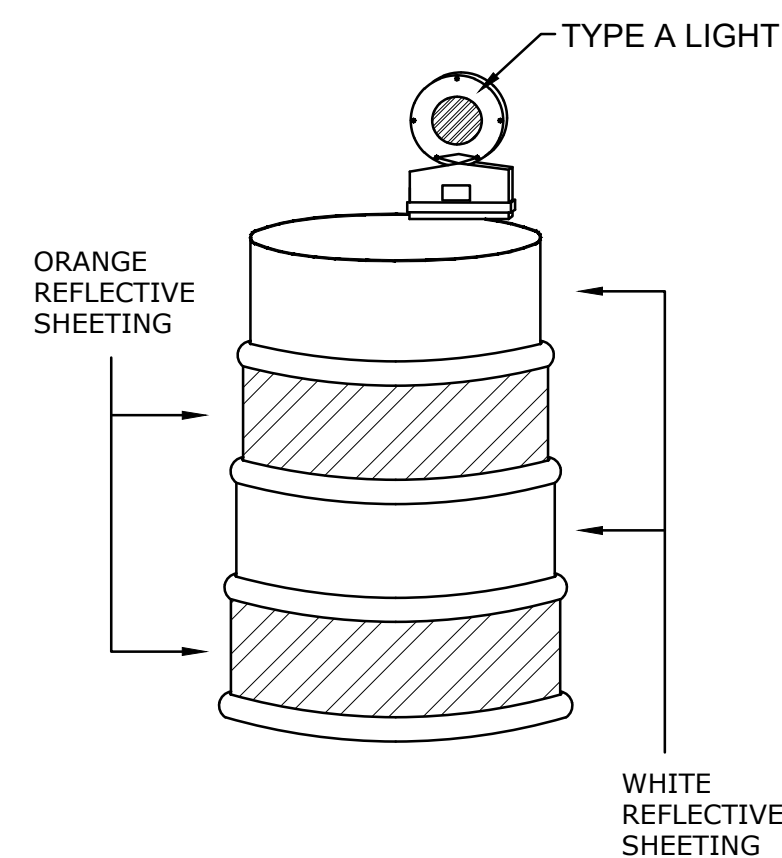


IF "D" IS GREATER THAN 4" THE CONTRACTOR SHALL PLACE FILL MATERIAL AT A 4:1 SLOPE AT THE EDGE OF THE EXCAVATED AREA. SUPPLYING, PLACING AND REMOVING THIS FILL MATERIAL SHALL BE INCIDENTAL TO THE PROJECT AND NOT SEPARATELY MEASURED OR PAID FOR.



NOTES:

- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
- TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
- TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
- NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
- DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
- MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
- ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
- TEMPORARY PEDESTRIAN WALKWAY LOCATION TO BE DETERMINED IN THE FIELD. CONTRACTOR AND ENGINEER TO DETERMINE TREE REMOVAL ALONG DETOUR PATH.
- TEMPORARY PEDESTRIAN WALKWAY TO CONFORM WITH ADA STANDARDS.
- TEMPORARY PEDESTRIAN WALKWAY TO BE RETURNED TO PRECONSTRUCTION CONDITIONS. REPLACE TREES IN KIND.
- CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE AND NON-SLIP SURFACE.
- PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOP STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
- DETECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
- CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
- CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
- THE CURB RAMP WALKWAY EDGE SHALL BE MARKED WITH A CONTRASTING COLOR 2 TO 4 IN. WIDE MARKING. THE MARKING IS OPTIONAL WHERE COLOR CONTRASTING EDGING IS USED.
- WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
- LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
- CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.



NOTES:

- DRUM DESIGN AND APPLICATION SHALL BE AS PER THE CURRENT EDITION OF THE MUTCD.
- DRUMS SHALL BE APPROXIMATELY 36" IN HEIGHT, HAVING A MINIMUM WALL THICKNESS OF 3/32" AND A MINIMUM DIAMETER OF 18" REGARDLESS OF ORIENTATION.
- DRUM MATERIAL MUST BE APPROVED UV RESISTANT, LOW DENSITY, IMPACT RESISTANT, LINEAR POLYETHYLENE (OR APPROVED EQUIVALENT).
- SHEETING SHALL BE APPROVED ORANGE AND WHITE TYPE IV REFLECTORIZED SHEETING CONFORMING TO M9.30.0.
- ALL DRUMS SHALL BE WELL MAINTAINED INCLUDING REMOVAL OF DUST OR ROAD FILM, SO AS NOT TO REDUCE REFLECTIVE EFFICIENCY. WHEN A DRUM LOSTS TARGET VALUE IT SHALL BE REPLACED.
- STORE UNUSED DRUMS IN ONE LOCATION, AWAY FROM ALL TRAFFIC, OR REMOVE FROM SITE ENTIRELY.

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	FEBRUARY 2022	
FILE:	M1476-011-C-701.dwg	
DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

TEMPORARY TRAFFIC CONTROL PLAN - GENERAL

SCALE: AS NOTED

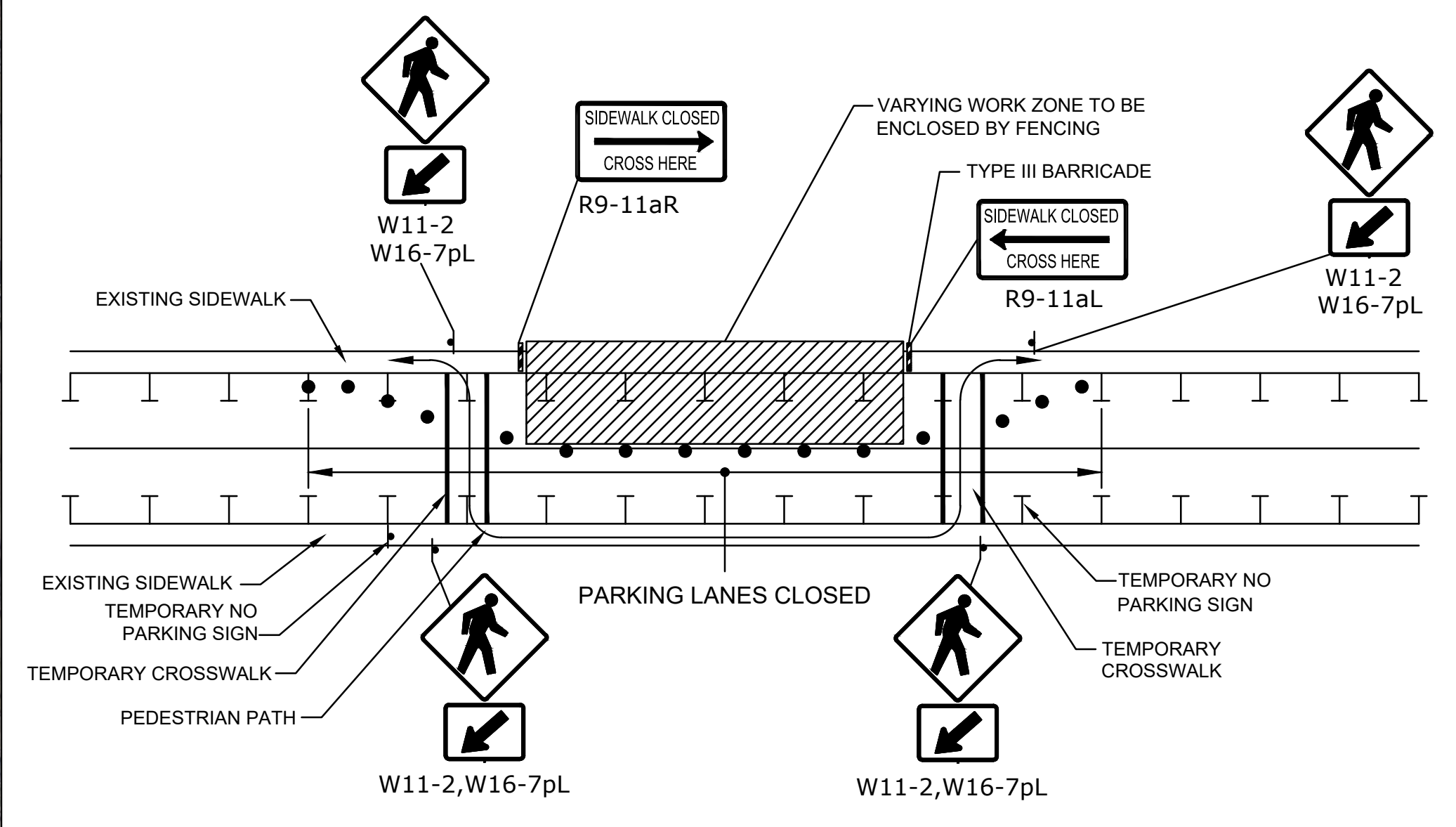
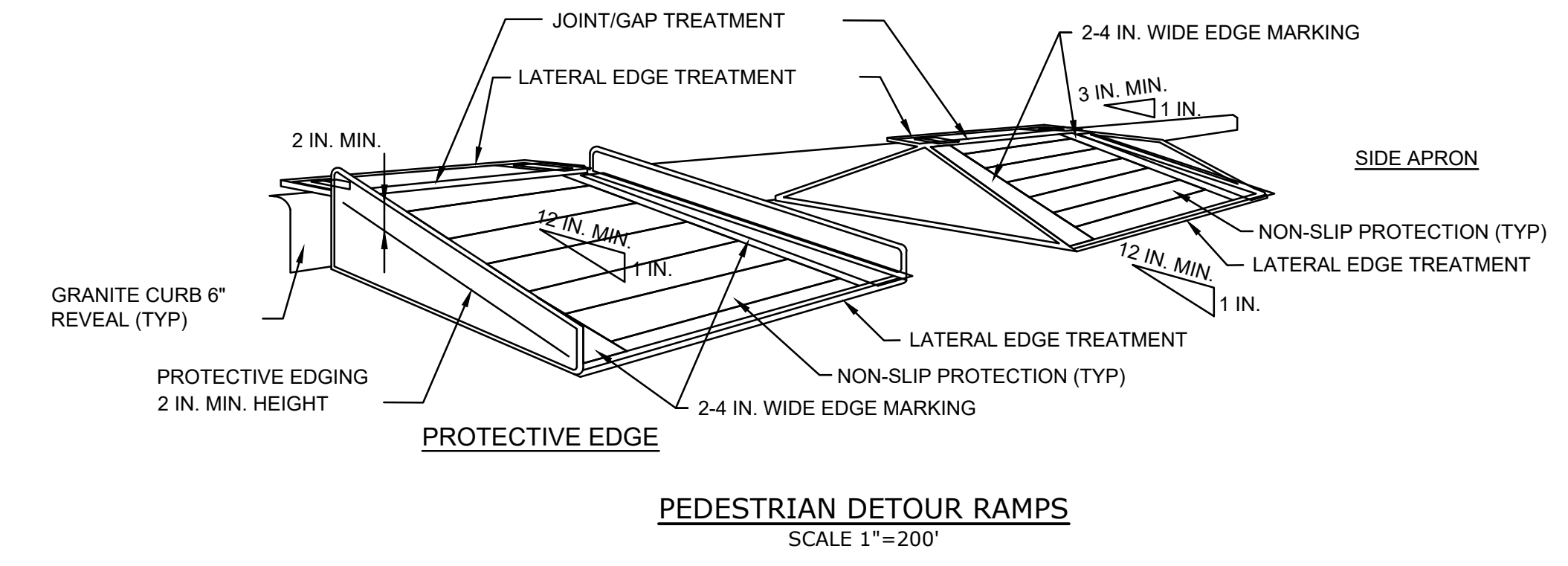


W20-1-a
DETOUR PLAN
SCALE 1"=500'

LEGEND

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- ▨ WORK ZONE
- DIRECTION OF TRAFFIC
- ▩ TYPE III BARRICADE
- TRUCK DETOUR DIRECTION OF TRAFFIC
- CHANGEABLE MESSAGE SIGN
- ▲ SIGN

SIGN LEGEND					
CODE	DESCRIPTION	SIZE	AREA	NO.	TOTAL AREA
W20-1-a	ROAD WORK AHEAD	36"x36"	9 SF	2	18 SF
W20-3	ROAD CLOSED AHEAD	36"x36"	9 SF	2	18 SF
R11-2	ROAD CLOSED	48"x30"	10 SF	2	20 SF
R11-4	ROAD CLOSED TO THRU TRAFFIC	60"x30"	12.5 SF	2	25 SF
M4-10L	DETOUR	48"x18"	6 SF	1	6 SF
M4-10R	DETOUR	48"x18"	6 SF	1	6 SF
M4-9L	DETOUR	30"x24"	5 SF	5	25 SF
M4-9R	DETOUR	30"x24"	5 SF	5	25 SF
M4-8a	END DETOUR	30"x24"	5 SF	2	10 SF
TOTAL =					153 SF



- NOTES
- ADDITIONAL ADVANCE WARNING MAY BE NECESSARY.
 - CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN. VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE.
 - STREET LIGHTING SHOULD BE CONSIDERED WHEN LOCATING CONTROL DEVICES.
 - TEMPORARY CROSSWALKS WITH APPROPRIATE SIGNS SHOULD BE INSTALLED TO CROSS PEDESTRIANS TO THE OPPOSITE SIDE OF THE STREET AS SHOWN IN PEDESTRIAN BYPASS, AND AS DIRECTED BY THE ENGINEER. TEMPORARY CURB RAMPS WILL BE REQUIRED AT ALL TEMPORARY CROSSWALK LOCATIONS.
 - BYPASS IS TO BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DIRECTED BY THE ENGINEER.
 - THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THIS WALKWAY EXCEEDS 200 FEET THEN A 5 FOOT X 5 FOOT PASSING ZONE. (FOR SHORT TERM SETUPS < 10 HOURS, THIS CONDITION MAY BE WAIVED. A NOTE WOULD NEED TO BE INCLUDED IN THE TTCP THAT STATES HOW THE CONTRACTOR SHOULD ADDRESS THIS ISSUE.)
 - TRUCK DETOUR SIGNAGE SHALL BE POSTED DIRECTING TRUCKS TO USE RT. 120 INSTEAD OF PLEASANT STREET.

PEDESTRIAN DETOUR
NO SCALE

100%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

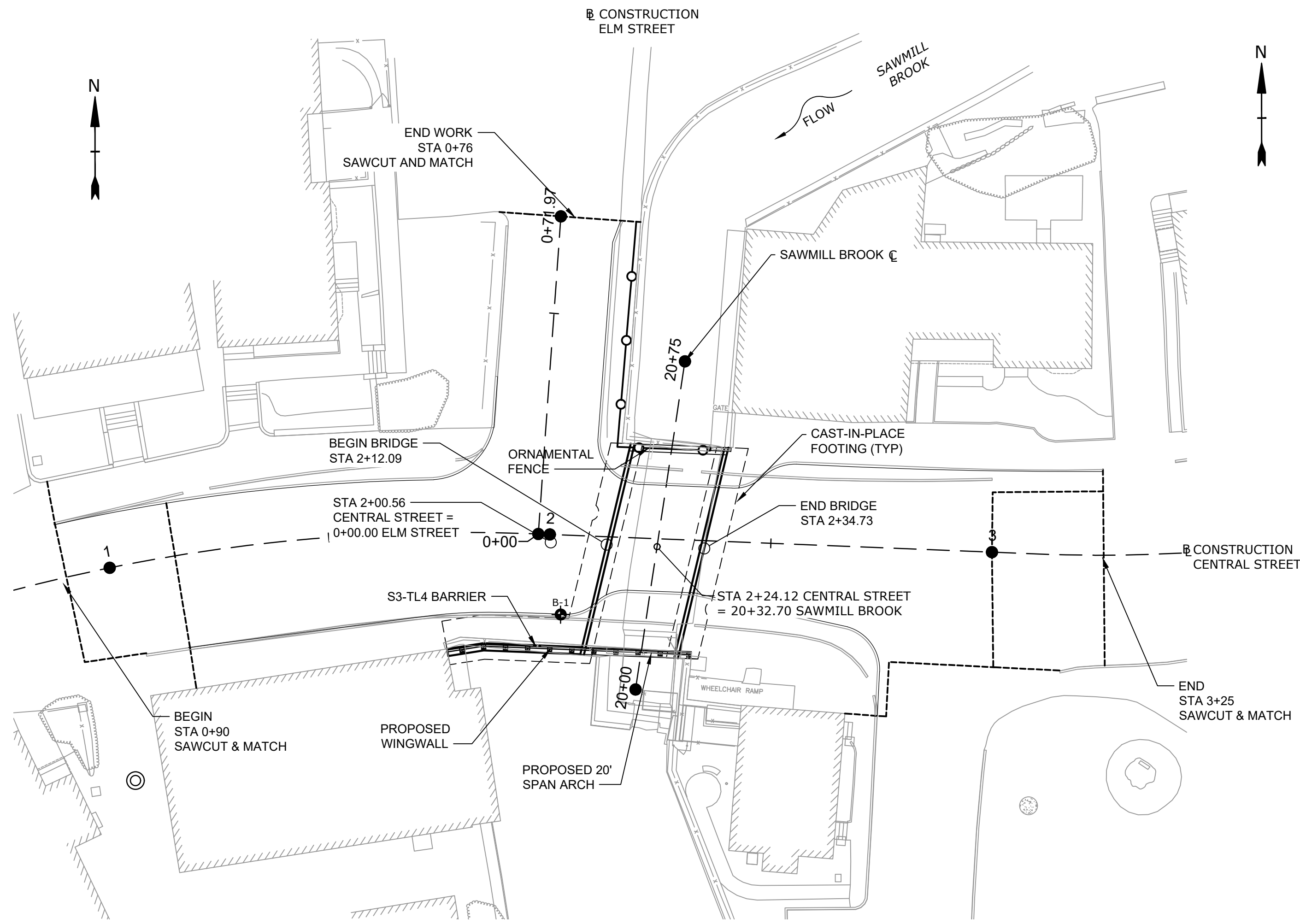
Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
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DRAWN BY:	AGB	
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APPROVED:	DLM	

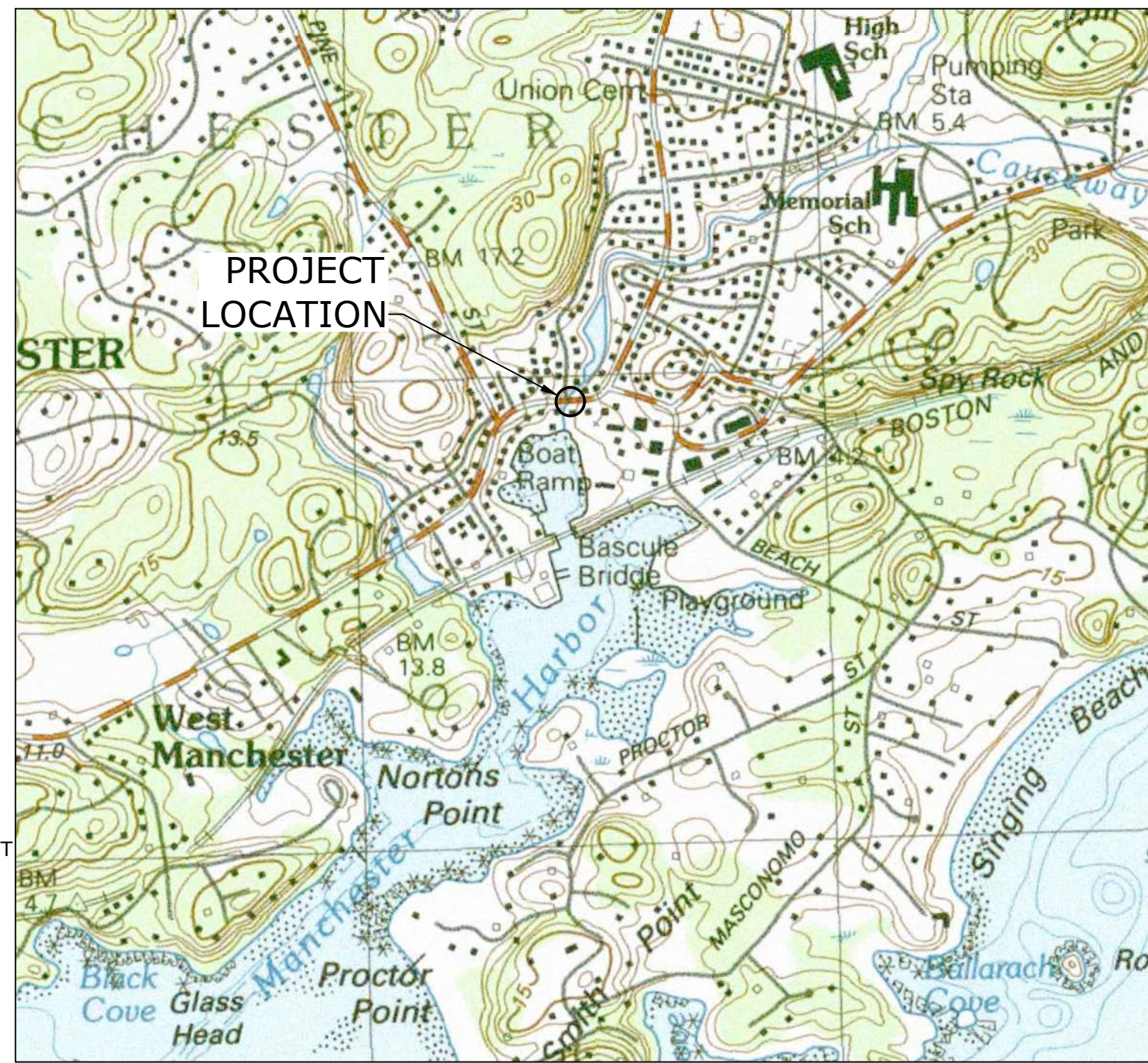
TEMPORARY TRAFFIC CONTROL
PLAN - DETOUR

SCALE: AS NOTED

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 Tighe & Bond, 311 Main Street, Manchester, MA 06102
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KEY PLAN
SCALE: 1" = 20'



LOCUS PLAN
SCALE: 1" = 1000'

BRIDGE DRAWING INDEX

- S-001 BRIDGE KEY PLAN, PROFILES, LOCUS, AND INDEX
- S-002 BRIDGE NOTES
- S-003 BORING LOGS & BORING NOTES
- S-101 GENERAL BRIDGE PLAN AND ELEVATION
- S-102 ABUTMENT PLAN & DETAILS
- S-103 BRIDGE FRAMING AND LAYOUT PLAN
- S-104 BRIDGE SECTIONS & DETAILS
- S-105 MISCELLANEOUS DETAILS

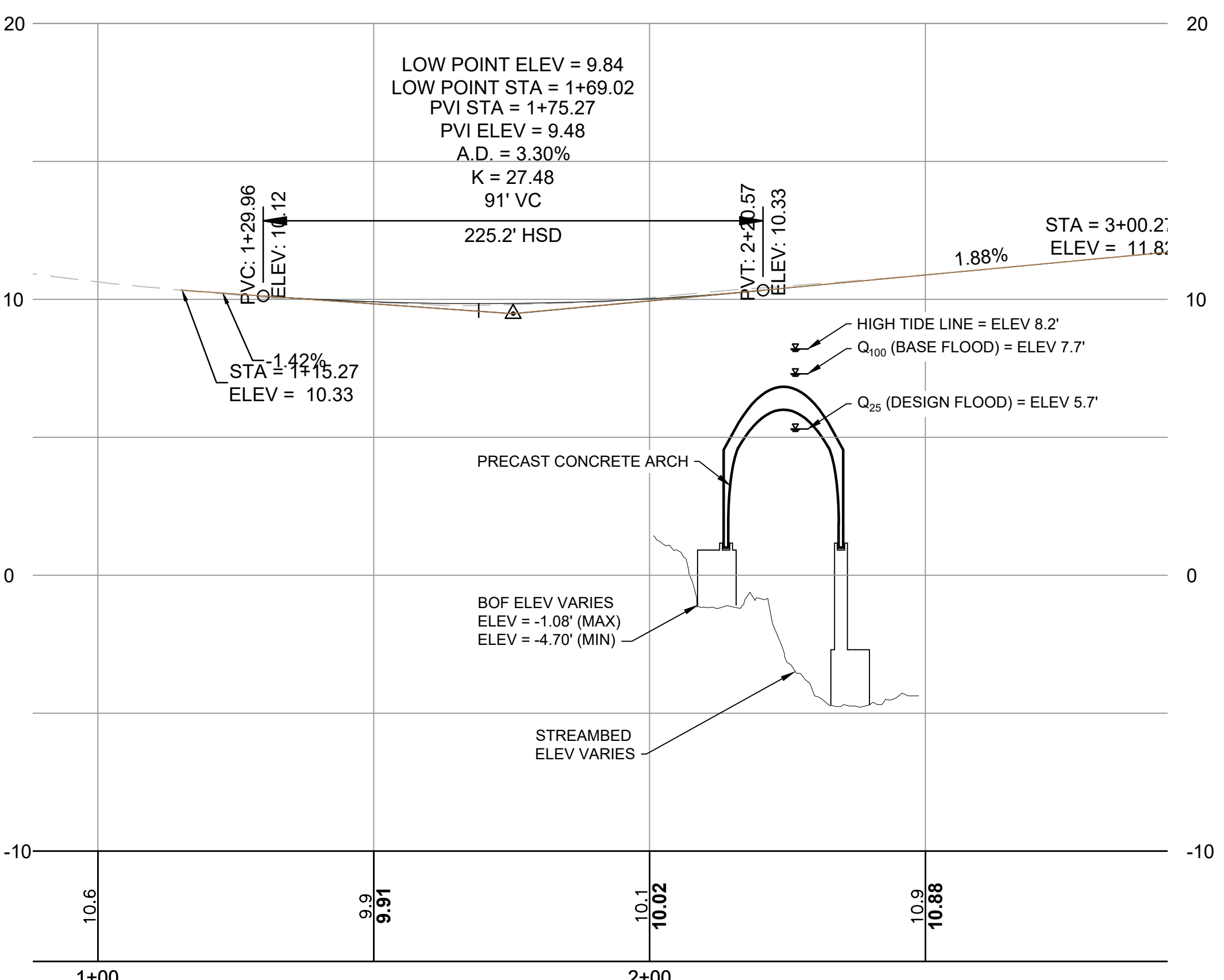
REFERENCE DRAWING INDEX

- R-101 S3-TL4 BARRIER DETAILS
- R-102 PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS

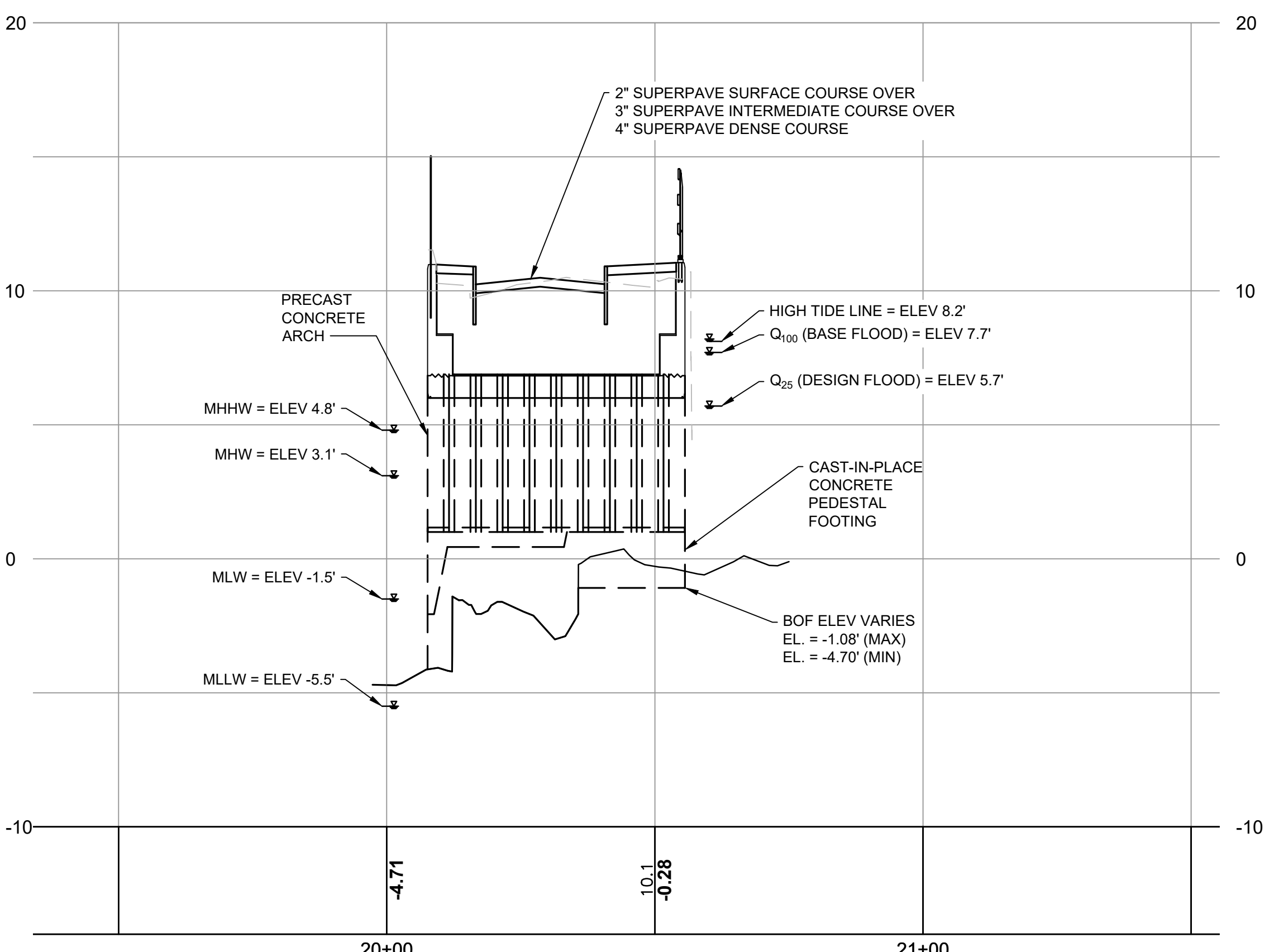
HYDRAULIC DATA	
DRAINAGE AREA	5.0 SQ. MILES
WATER CONTROL FLOOD DISCHARGE (2 YR)	254 CFS
DESIGN FLOOD DISCHARGE (25 YR)	1,363 CFS
DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	4% (25-YEARS)
DESIGN FLOOD VELOCITY (25 YR)	7.5 FPS
DESIGN FLOOD ELEVATION (25 YR)	5.7 FEET
HIGH TIDE LINE	4.8 FEET
MEAN HIGHER HIGH WATER ELEVATION (MHHW)	3.1 FEET
MEAN HIGH WATER ELEVATION (MHW)	-1.5 FEET
MEAN LOW WATER ELEVATION (MLW)	-5.5 FEET
MEAN LOWER LOW WATER ELEVATION (MLLW)	-5.5 FEET
BASE (100-YR) FLOOD DATA	
BASE FLOOD DISCHARGE (100 YR)	2,267 CFS
BASE FLOOD ELEVATION (100 YR)	*7.7 FEET
DESIGN AND CHECK SCOUR DATA	
SCOUR DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	2% (50-YEARS)
DESIGN FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
SCOUR CHECK FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	1% (100-YEARS)
CHECK FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
FLOOD OF RECORD	
DISCHARGE	UNKNOWN
FREQUENCY (IF KNOWN)	N/A
MAXIMUM ELEVATION	N/A
DATE	N/A
HISTORY OF ICE FLOES	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	UNKNOWN

* THE 7.7' ELEVATION IS THE MODELED 100-YEAR PRECIPITATION EVENT DISCHARGE ELEVATION AT THE BRIDGE

- NOTES:
- EXISTING AND PROPOSED UTILITIES NOT SHOWN FOR CLARITY. SEE SHEET C-XXX FOR APPROXIMATE LOCATIONS.



PROFILE - CENTRAL STREET
SCALE: 1" = 20'H, 1" = 8'V



PROFILE - SAWMILL BROOK
SCALE: 1" = 20'H, 1" = 4'V

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

- IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476-011	
DATE:	FEBRUARY 2022	
FILE:	M1476-011-S-001.dwg	
DRAWN BY:	D.BISHOP/AGB	
CHECKED:	BRB	
APPROVED:	DLM	
BRIDGE KEY PLAN, PROFILES, LOCUS AND INDEX		
SCALE:	AS NOTED	
S-001		
SHEET 20 OF 29		

Date Saved: 2/8/2022 10:20:32-21am Bv: Denny Tighe & Bond J:\M1476\Manchester MA Hydro Study\011-Central Street Bridge\Drawings\Figures\AutoCAD\Drawings_S-001.dwg
 DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

Table with 3 columns: MARK, DATE, DESCRIPTION

Table with 3 columns: PROJECT NO, DATE, FILE, DRAWN BY, CHECKED, APPROVED

BRIDGE NOTES SCALE: AS NOTED S-002 SHEET 21 OF 29

DESIGN LOADS AND SPECIFICATIONS:

- 1. DESIGN LOADING: HL-93
2. DESIGN: LOAD AND RESISTANCE FACTOR DESIGN (LRFD) IN ACCORDANCE WITH: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH ED., 2017 AS AMENDED MASSDOT 2020 LRFD BRIDGE DESIGN MANUAL, AS AMENDED
3. SPECIFICATIONS: MASSDOT 2020 STANDARD SPECIFICATIONS AS AMENDED
4. FOUNDATION DATA: ABUTMENTS AND U-WINGWALL: SPREAD FOOTINGS SUPPORTED ON SOUND BEDROCK WITH A NOMINAL BEARING CAPACITY OF 100.0 TSF IN COMBINATION WITH A RESISTANCE FACTOR OF 0.45. PRECAST GUARD TRANSITION: TRANSITION BASE ON CONTROLLED DENSITY FILL (NON EXCAVATABLE) ON COMPACTED GRAVEL BORROW OR UNDISTURBED SOIL.
5. REINFORCING STEEL: AASHTO M31 (ASTM A 615) GRADE 60 ALL BARS SHALL BE HOT-DIPPED GALVANIZED (ASTM A767 & ASTM A1094)
6. CONCRETE: PRECAST ACRH, PEDESTAL FOOTINGS, CURBS/HEADWALLS, GUARD TRANSITIONS, U-WINGWALL, AND U-WINGWALL FOOTINGS: 5000 PSI, 3/4", 685 HP CEMENT CONCRETE
7. SEISMIC: PEAK GROUND ACCELERATION (PGA) = 0.125g SITE CLASS = C SEISMIC DESIGN CATEGORY = A

GENERAL NOTES:

- 1. PLANS OF THE EXISTING BRIDGE ARE NOT AVAILABLE.
2. BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTORS ON 9/8/2018.
3. ALL EXISTING BRONZE DISCS REPRESENTING STATE BENCHMARKS OR SURVEY TRIANGULATION POINTS MUST NOT BE DISTURBED. WHEN THE WORK CALLED FOR INVOLVES DISTURBING A BRONZE DISC THE CONTRACTOR SHALL NOTIFY THE ENGINEER SUFFICIENTLY IN ADVANCE OF THE WORK TO PERMIT THE STATE TO TEMPORARILY RELOCATE THE AFFECTED MARKER.
4. ALL WORK SHALL COMPLY WITH OSHA'S LATEST STANDARDS. ALL REQUIREMENTS OF OSHA'S EXCAVATION STANDARDS SHALL BE PROVIDED BY THE CONTRACTOR INCLUDING, BUT NOT LIMITED TO, THE PROVISION FOR A COMPETENT PERSON ON SITE AND ANY REQUIRED DOCUMENTATION THAT MAY REQUIRE CERTIFICATION BY A PROFESSIONAL ENGINEER.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ALL UTILITIES FUNCTIONING PROPERLY IN THE AREAS UNDER CONSTRUCTION PRIOR TO COMPLETION OF THE PROJECT. ALL PIPES AND STRUCTURES WITHIN THE LIMITS OF THIS CONTRACT SHALL BE LEFT IN A CLEAN AND OPERABLE CONDITION AT THE COMPLETION OF THE WORK. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PREVENT SAND AND SILT FROM DISTURBED AREAS FROM ENTERING THE SYSTEM. CONTRACTOR IS RESPONSIBLE FOR DAMAGE SUSTAINED TO ANY EXISTING UTILITIES AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE REPAIRS TO THE REQUIREMENTS OF THE TOWN OR RESPECTIVE UTILITY COMPANY.
6. ANY AND ALL DEMOLISHED BUILDING MATERIALS, STRUCTURES, PIPES, PAVEMENT, CURBING, SURPLUS MATERIAL, AND SITE RUBBLE SHALL BE DISPOSED OF BY THE CONTRACTOR OFF-SITE AT HIS EXPENSE AND IN ACCORDANCE WITH ALL APPLICABLE STATE AND FEDERAL ENVIRONMENTAL REGULATIONS.
7. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES TO ENSURE THAT DEBRIS DOES NOT FALL ON ANY ROADWAY, RAILROAD, OR WATERWAY BELOW THE EXISTING STRUCTURE. ALL COSTS INCLUDING ERECTION, MAINTENANCE AND REMOVAL OF TEMPORARY STRUCTURES OR OTHER SUCH APPROVED METHODS, SHALL BE SUBSIDIARY TO THE APPROPRIATE ITEMS OF WORK BEING PERFORMED.
8. ALL MATERIALS AND METHODS ARE TO COMPLY WITH THE MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, DATED 2021, AND ITS LATEST REVISIONS.
9. ALL DISTURBED AREAS SHALL BE LOAMED & SEEDED UNLESS OTHERWISE SPECIFIED. OVER EXCAVATE LOAM & SEED AREAS AS REQUIRED TO MEET GRADE.
10. IF THERE ARE REVISIONS TO APPROVED PLANS, THE CONTRACTOR SHALL SUBMIT THESE CHANGES TO THE DESIGNER OF RECORD FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. ONCE THESE REVISIONS ARE APPROVED BY THE MUNICIPALITY'S DESIGNER OF RECORD, THEY SHALL THEN BE SUBMITTED TO MASSDOT FOR FILING.
11. ALL DIMENSIONS ARE HORIZONTAL AND VERTICAL, AND ARE GIVEN AT 68 DEGREES FAHRENHEIT.
12. ALL WORK PERFORMED BY THE CONTRACTOR SHALL COMPLY WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS AND REQUIREMENTS.
13. THE CONTRACTOR SHALL REVIEW AND UNDERSTAND ALL APPLICABLE ENVIRONMENTAL PERMITS AND ENSURE THAT ALL CONSTRUCTION CONDITIONS ARE MET.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION SAFETY, AND MEANS AND METHODS TO PERFORM AND COMPLETE THE WORK.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE TO PRIVATE OR PUBLIC PROPERTY OUTSIDE THE LIMITS OF CONSTRUCTION SHOWN ON THE PLANS CAUSED BY THE CONTRACTOR, AT THE SOLE COST TO THE CONTRACTOR.
16. THE CONTRACTOR MUST COORDINATE ALL WORK WITH THE TOWN OF MANCHESTER-BY-THE-SEA, ALL UTILITY COMPANIES, THE ENGINEER, AND ANY AFFECTED ABUTTERS. WORK SHALL NOT PROCEED WITHOUT WRITTEN APPROVAL FROM THE TOWN OF MANCHESTER-BY-THE-SEA.
17. THE CONTRACTOR SHALL SUBMIT LITERATURE (MANUFACTURER'S LITERATURE, CUT SHEETS, APPLICATION PROCEDURES, ETC.) FOR ALL PRODUCTS PROPOSED FOR USE ON THE PROJECT, FOR APPROVAL BY THE ENGINEER. APPROVAL OF MATERIALS SHALL BE IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION AS AMENDED, SUBSECTION 5.03 AND SECTION 6.00, CONTROL OF MATERIALS.
18. DETAIL OR SHOP DRAWINGS SHALL BE SUBMITTED AND APPROVED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION AS AMENDED, SUBSECTION 5.02, PLANS AND DETAIL DRAWINGS.

- 19. TAKE ALL NECESSARY MEASURES AND PROVIDE ALL NECESSARY CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE AND STRENGTH TO PREVENT ACCESS TO ALL OPEN EXCAVATIONS AT THE COMPLETION OF EACH DAY'S WORK.
20. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.
21. SHEAR KEYS SHALL BE 3" HIGH BY ONE-THIRD THE WIDTH OF THE CONCRETE ELEMENT, CENTERED, WITH 3" MIN. CLEAR EACH SIDE.
22. PEEL AND STICK BARRIER MEMBRANE SHALL BE 2' WIDE WITH PROTECTION BOARD (SUBSIDIARY) AND PLACED CENTERED OVER ALL HORIZONTAL AND VERTICAL EXPANSION AND CONSTRUCTION JOINTS.
23. APPLY PAVEMENT JOINT ADHESIVE ALONG ALL LONGITUDINAL JOINTS BETWEEN PAVEMENT PASSES AND ALONG BRIDGE CURB LINES AND EXPANSION JOINT ARMORING PRIOR TO PLACING ALL PAVEMENT COURSES.
24. FOR SURVEY CONTROLS SEE SHEETS C-001 TO C-004 (CIVIL SHEETS).
25. FOR BORING NOTES SEE SHEET S-003.
26. FOR HYDRAULIC DATA SEE SHEET S-001.
27. FOR ROAD CLOSURE TRAFFIC MANAGEMENT PLAN SEE SHEET C-702 (CIVIL SHEETS).

BRIDGE REMOVAL NOTES:

- 1. THE CONTRACTOR'S METHOD FOR REMOVAL OF THE EXISTING BRIDGE SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE PRIOR TO THE COMMENCEMENT OF ANY REMOVAL OPERATIONS.
2. REMOVAL OF EXISTING BRIDGE STRUCTURE SHALL INCLUDE THE COMPLETE REMOVAL OF THE ARCH, FOOTINGS, HEADWALLS, AND WINGWALL. REFER TO SHEET C-005 (CIVIL SHEETS) FOR DEMOLITION PLAN.
3. REFER TO SHEET [FILL-IN FOR FINAL DESIGN] (CIVIL SHEETS) FOR WATER CONTROL SEQUENCING.

FOUNDATION NOTES:

- 1. FOUNDATION MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.
2. CONCRETE SHALL NOT BE PLACED IN WATER OR ON FROZEN GROUND.
3. BOTTOM OF FOUNDATION ELEVATIONS PROVIDED ON DRAWINGS SHALL BE CONSIDERED MINIMUM DEPTHS. CONTRACTOR SHALL REMOVE UNSUITABLE MATERIAL AS REQUIRED.
4. ALL FINISHED EXCAVATIONS SHALL BE VERIFIED AND APPROVED BY THE ENGINEER PRIOR TO PLACEMENT OF FORMWORK FOR CONCRETE FOUNDATION.
5. ALL EXCAVATIONS FOR FOOTINGS SHALL BE FINISHED BY HAND FOR THE LAST 6". ALL FINISHED EXCAVATIONS SHALL BE INSPECTED BY THE ENGINEER PRIOR TO ANY CONCRETE PLACEMENT.
6. ALL BACKFILL UNDER OR ADJACENT TO ANY PORTION OF THE STRUCTURE SHALL BE PLACED IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS.
7. PRIOR TO PLACEMENT OF FOOTINGS, REVIEW IN-SITU CONDITIONS WITH THE OWNER'S DESIGNATED ENGINEER.

GEOTECHNICAL DESIGN PARAMETERS

- 1. MINIMUM EMBEDMENT FOR FROST PROTECTION = 4 FEET BELOW ADJACENT GROUND SURFACE.
2. FACTORED STRENGTH LIMIT STATE BEARING RESISTANCE = 45.0 TONS PER SQUARE FOOT
a. THE BRIDGE DESIGNER SHALL VERIFY THE BEARING RESISTANCE BASED ON THE FINAL BRIDGE AND WINGWALL FOUNDATION DIMENSIONS AND EMBEDMENT
3. MAXIMUM ALLOWABLE SETTLEMENT = 1 INCH TOTAL, 1/2 INCH DIFFERENTIAL
4. MINIMUM LATERAL EARTH PRESSURES FOR RESTRAINED ARCH WALLS:
a. STATIC = 61 POUNDS PER SQUARE FOOT PER FOOT (PSF/FT) AS AN EQUIVALENT FLUID PRESSURE, 200 PSF/FT MINIMUM
b. SURCHARGE = 0.5 TIMES THE VERTICAL SURCHARGE LOAD UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL. THE MINIMUM VERTICAL SURCHARGE SHALL BE AN AASHTO HL-93 VEHICULAR LOAD.
c. SEISMIC = 3.9H^2 DISTRIBUTED AS AN INVERSE TRIANGLE OVER THE HEIGHT OF THE WALL
5. MINIMUM LATERAL EARTH PRESSURES FOR UNRESTRAINED WING WALLS:
a. STATIC = 35 PSF/FT AS AN EQUIVALENT FLUID PRESSURE, 200 PSF/FT MINIMUM
b. SURCHARGE = 0.28 TIMES THE VERTICAL SURCHARGE LOAD UNIFORMLY DISTRIBUTED OVER THE HEIGHT OF THE WALL. THE MINIMUM VERTICAL SURCHARGE SHALL BE AN AASHTO HL-93 VEHICULAR LOAD. THE DESIGN SHALL ACCOUNT FOR SLOPING GROUND SURFACE ABOVE THE WALLS.
c. SEISMIC = 3.9H^2 DISTRIBUTED AS AN INVERSE TRIANGLE OVER THE HEIGHT OF THE WALL
6. MINIMUM BACKFILL UNIT WEIGHT = 130 POUNDS PER CUBIC FOOT (PCF)
7. MAXIMUM BACKFILL ANGLE OF INTERNAL FRICTION = 32 DEGREES
8. MAXIMUM COEFFICIENT OF FRICTION FOR CONCRETE ON CLEAN, SOUND BEDROCK = 0.70 (DELTA= 35 DEGREES)
9. SITE CLASS = C
10. DESIGN PEAK SEISMIC GROUND ACCELERATION MODIFIED BY THE SHORT-PERIOD SITE FACTOR (A_s) = 0.103
11. DESIGN SPECTRAL RESPONSE ACCELERATION AT 0.2-SECOND PERIODS (S_0.2) = 0.202
12. DESIGN SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIODS (S_1) = 0.068

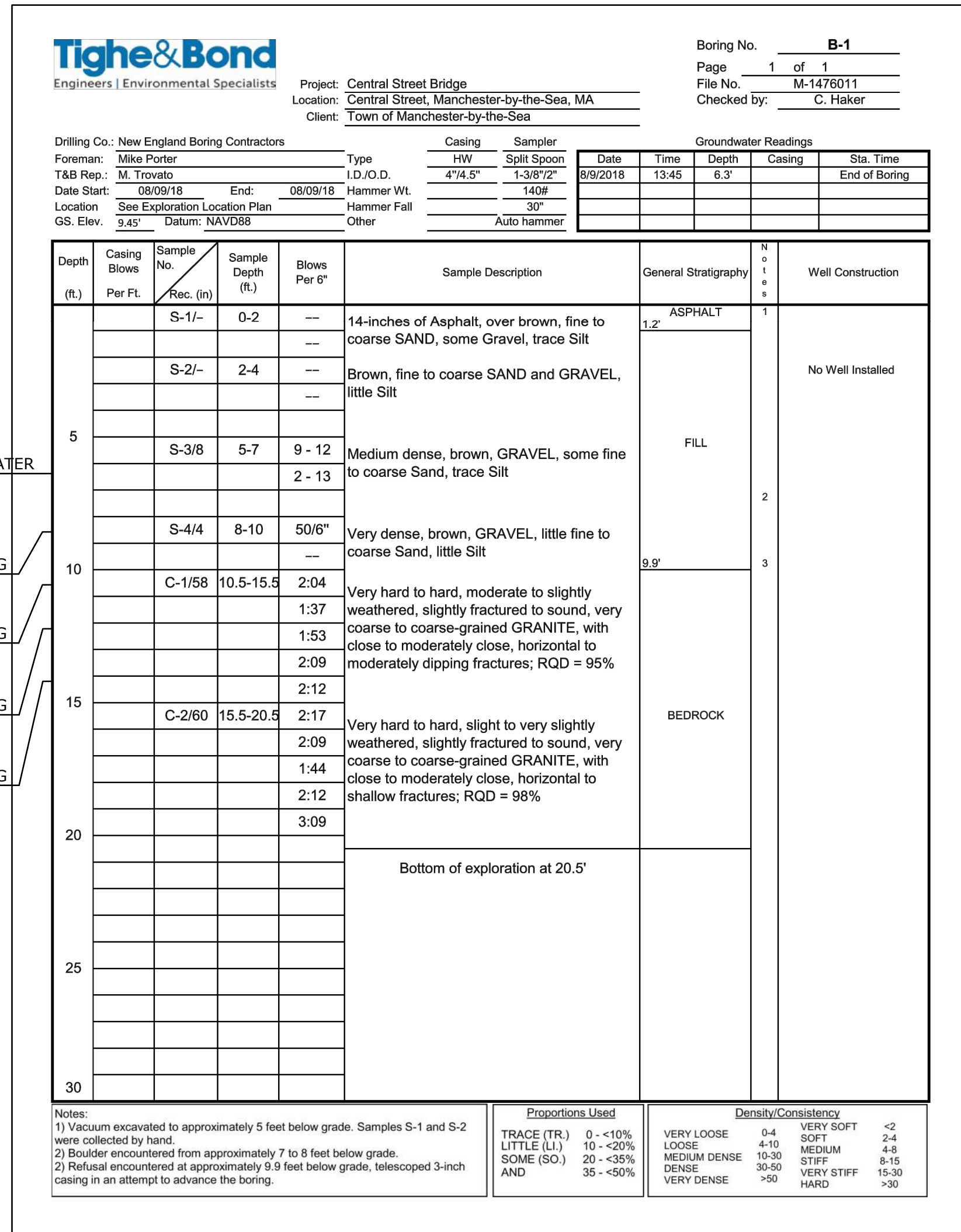
PRECAST CONCRETE BRIDGE STRUCTURE NOTES:

- 1. ITEM 995.01, BRIDGE STRUCTURE - STRUCTURE NO. 1, SHALL INCLUDE THE PRECAST CONCRETE ARCH, CURBS/HEADWALLS, PEDESTAL FOOTINGS USED TO SUPPORT THE RIGID FRAME, U-WINGWALL, AND WINGWALL FOOTING. JOINT MATERIALS, MEMBRANE, AND ANY OTHER MATERIALS REQUIRED FOR INSTALLATION OF THE PRECAST CONCRETE BRIDGE OR WINGWALL STRUCTURE SHALL BE SUBSIDIARY.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE MUNICIPALITY'S DESIGNER OF RECORD FOR REVIEW AND ACCEPTANCE FOR REVIEW TO ENSURE CONFORMANCE WITH THE CONTRACT DOCUMENTS. SHOP DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED PRIOR TO FABRICATION FOR ALL PRECAST CONCRETE ELEMENTS. SHOP DRAWINGS SHALL SHOW JOINT DETAILS AND REINFORCEMENT SIZE AND LOCATION.
3. CHANGES OR MODIFICATIONS DURING THE FABRICATION PROCESS MUST BE SUBMITTED TO THE MUNICIPALITY'S DESIGNER OF RECORD FOR ACCEPTANCE AND INCORPORATED INTO THE FINAL AS-BUILT DRAWINGS.
4. DIMENSIONS SHOWN FOR THE PRECAST CONCRETE ELEMENTS ARE ASSUMED AND ARE BELIEVED TO BE PRACTICABLE. NO ADJUSTMENTS TO QUANTITIES OR PAYMENTS WILL BE MADE AS A RESULT OF PROVIDING PRECAST UNITS SIZED DIFFERENTLY THAN SHOWN ON THE PLANS.
5. THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST UNITS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER.
6. JOINTS BETWEEN ABUTTING PRECAST UNITS SHALL BE MECHANICALLY CONNECTED, WATERTIGHT, GROUTED, AND MEMBRANED.
7. JOINTS BETWEEN ABUTTING PRECAST ARCH, WINGWALL, AND CURB/HEADWALL ELEMENTS SHALL BE MECHANICALLY CONNECTED, WATER TIGHT, AND MEMBRANED.
8. WATERPROOF MEMBRANE SHALL BE PROVIDED OVER THE STRUCTURE ACROSS THE ENTIRE ROADWAY WIDTH.
9. MEMBRANED SURFACES TO BE BACKFILLED AGAINST SHALL BE PROTECTED BY A PROTECTION BOARD.
10. EXPOSED CONCRETE SURFACES SHALL BE TREATED WITH WATER REPELLENT (SILANE/SILOXANE).
11. PRECAST CONCRETE CURB/HEADWALL ANCHORAGES, CURB, U-WINGWALL, AND ARCH SECTIONS SHALL BE DESIGNED TO ACCOUNT FOR ALL EARTH PRESSURE, LIVE LOAD SURCHARGES, AND BRIDGE RAILING LIVE LOAD AS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR NCHRP 350 TL-2 TEST LEVEL.
12. WEEP HOLES SHALL BE PLACED 1'-0" (TYP.) ABOVE THE TOP OF THE PEDESTAL FOOTING AND ONE (1) WEEP PROVIDED ON BOTH SIDES OF EACH ARCH OR WINGWALL UNIT OR 10'-0" (MAX.) SPACING ALONG FOOTING.
13. FOOTINGS SHALL HAVE A KEYWAY WITH THE SPECIFIED DIMENSIONS. GROUT SHALL BE PLACED AROUND THE BOTTOM OF THE ARCH OR WINGWALL AND TO THE TOP OF THE KEYWAY.
14. TOP SURFACES OF FOOTING UNITS SHALL BE SET UNIFORMLY TRUE & LEVEL TO A TOLERANCE OF +/- 1/8". PRECAST UNITS SHALL UNIFORMLY BEAR ON SUPPORTING MATERIAL.
15. ANY UNSUITABLE MATERIALS SUCH AS BOULDERS, ROOTS, ORGANIC SOILS, SILT/CLAY, OR FRACTURED BEDROCK ENCOUNTERED AT THE PROPOSED BOTTOM OF EXCAVATION ELEVATION SHALL BE REMOVED AND REPLACED WITH CONCRETE, AS DIRECTED BY THE ENGINEER.
16. DEWATERING SHALL BE REQUIRED AT EACH FOUNDATION LOCATION TO CONTROL THE WATER INFLOW AND ADEQUATELY DEWATER THE FOOTING EXCAVATION. SUMP PUMPING AREAS AROUND THE ENTIRE PERIMETER SHALL BE REQUIRED TO ADEQUATELY CONTROL THE GROUNDWATER WITHIN THE EXCAVATION AREAS. DEWATERING SHALL BE CONTINUOUS UNTIL THE PRECAST CONCRETE ARCH AND WINGWALLS ARE BACKFILLED EVENLY ON BOTH SIDES TO THE ELEVATIONS OF THE SURROUNDING WATER TABLE, UNLESS OTHERWISE DIRECTED.
17. ANY PROPOSED DEWATERING AND SHORING PROCEDURES SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND ACCEPTANCE.
18. WATER PUMPED FROM DEWATERING LOCATIONS SHALL BE FILTERED ADEQUATELY TO REMOVE FINE MATERIALS PRIOR TO RETURNING THE WATER TO THE RIVER/BROOK. ACTUAL LOCATION OF SEDIMENTATION BASIN TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.
19. ANY FOUNDATION MATERIALS WEAKENED AS A RESULT OF INSUFFICIENT CARE WHILE MAINTAINING A DEWATERED CONDITION SHALL BE REMOVED AND REPLACED WITH CONCRETE AT NO EXPENSE TO THE OWNER.
20. REINFORCEMENT SHALL HAVE A 2" MINIMUM CLEAR COVER.
21. A CORROSION INHIBITOR CONCRETE ADDITIVE SHALL BE USED FOR ALL CONCRETE.
22. DATE TO BE PLACED ON THE UPSTREAM FACE AND DOWNSTREAM FACE OF THE CONCRETE HEADWALLS. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HEADWALL IS CONSTRUCTED. BOTH HEADWALLS SHALL FEATURE THE SAME DATE.

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

- 1. IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

COMMONWEALTH OF MASSACHUSETTS MassDOT, Highway Division CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING DISTRICT 4 BRIDGE ENGINEER DATE



BORING LOG B-1

BORING LOCATIONS		
BORING	STATION	OFFSET
B-1	0+52.3	RT. 16.2'

BORING NOTES:

- LOCATION OF BORINGS SHOWN ON SHEET S-001 THUS: B-1
- BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND TO SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 1/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
- ALL BORINGS WERE MADE IN SEPTEMBER 2018.
- BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE.
- THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
- THE WATER LEVELS RECORDED IN THE TABLE ARE THOSE MEASURED ON THE DATES GIVEN AND DO NOT NECESSARILY REPRESENT GROUND WATER LEVEL AT TIME OF CONSTRUCTION. IT SHOULD BE NOTED THAT GROUNDWATER LEVELS CAN FLUCTUATE WITH TIDE, SEASON, PRECIPITATION, AND NEARBY CONSTRUCTION OR OTHER BELOW GRADE ACTIVITIES, SUCH AS EXCAVATION, DEWATERING, WELLS, INFILTRATION BASINS, ETC.
- SEE SHEET S-002 FOR GEOTECHNICAL DESIGN PARAMETERS.
- ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR DESIGN AND ESTIMATING PURPOSES. PRESENTATION OF THE INFORMATION IN THE CONTRACT IS INTENDED TO PROVIDE THE CONTRACTOR ACCESS TO THE SAME DATA AVAILABLE TO THE OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

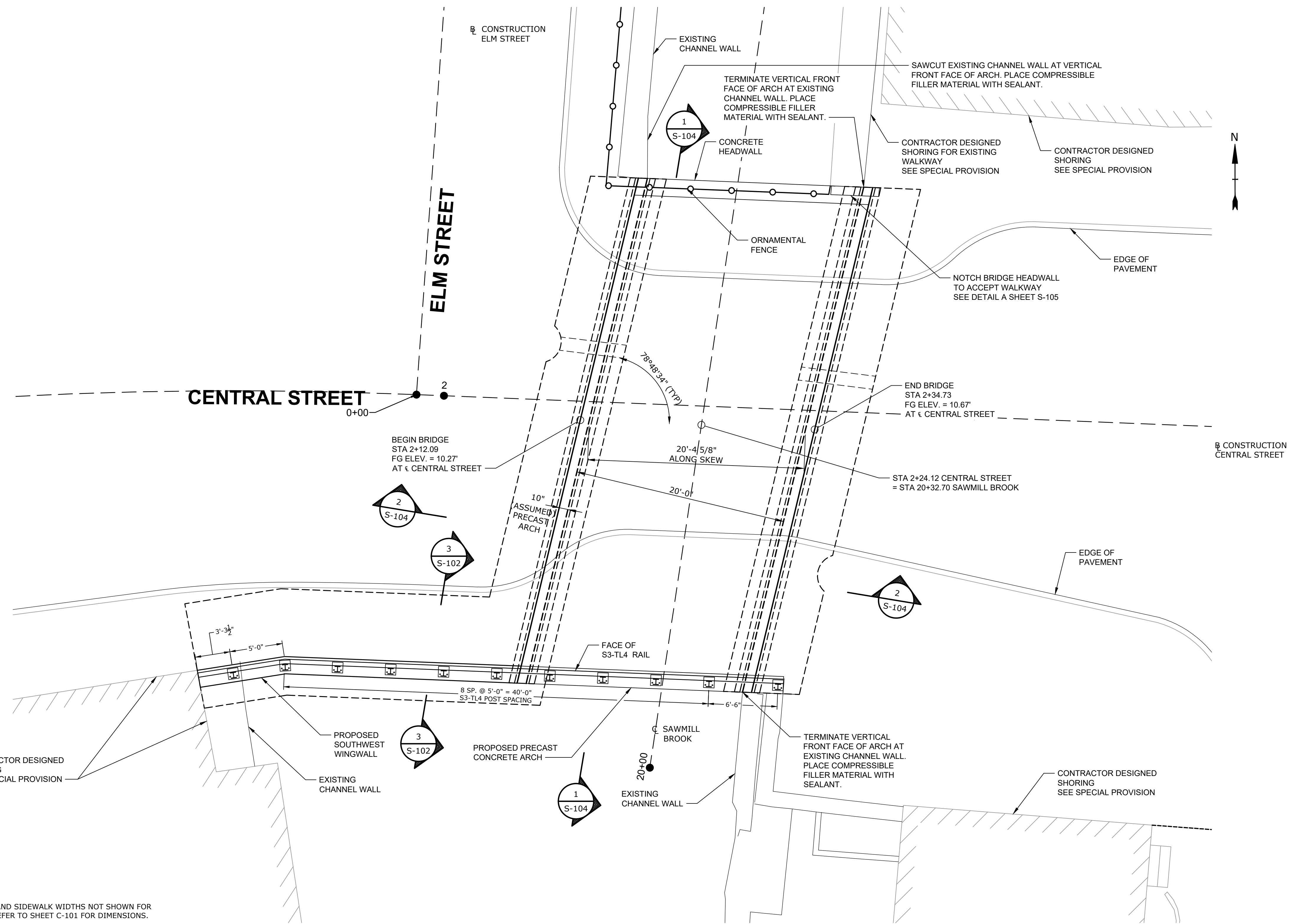
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DATE:	FEBRUARY 2022
FILE:	M1476-011-S-003.dwg
DRAWN BY:	D.BISHOP/AGB
CHECKED:	BRB
APPROVED:	DLM

BORING LOGS AND BORING NOTES	
SCALE:	AS NOTED
S-003	
SHEET 22 OF 29	

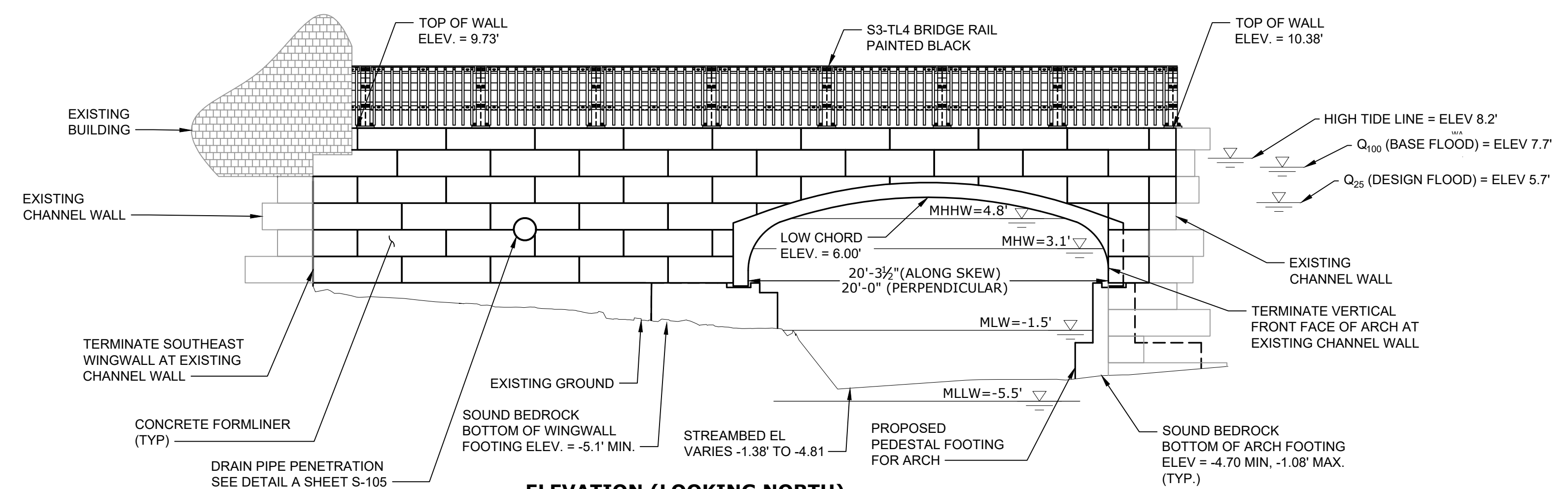
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____



GENERAL BRIDGE PLAN
3/16" = 1'-0"

NOTE:
1. ROADWAY AND SIDEWALK WIDTHS NOT SHOWN FOR CLARITY. REFER TO SHEET C-101 FOR DIMENSIONS.



ELEVATION (LOOKING NORTH)
3/16" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

**100%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

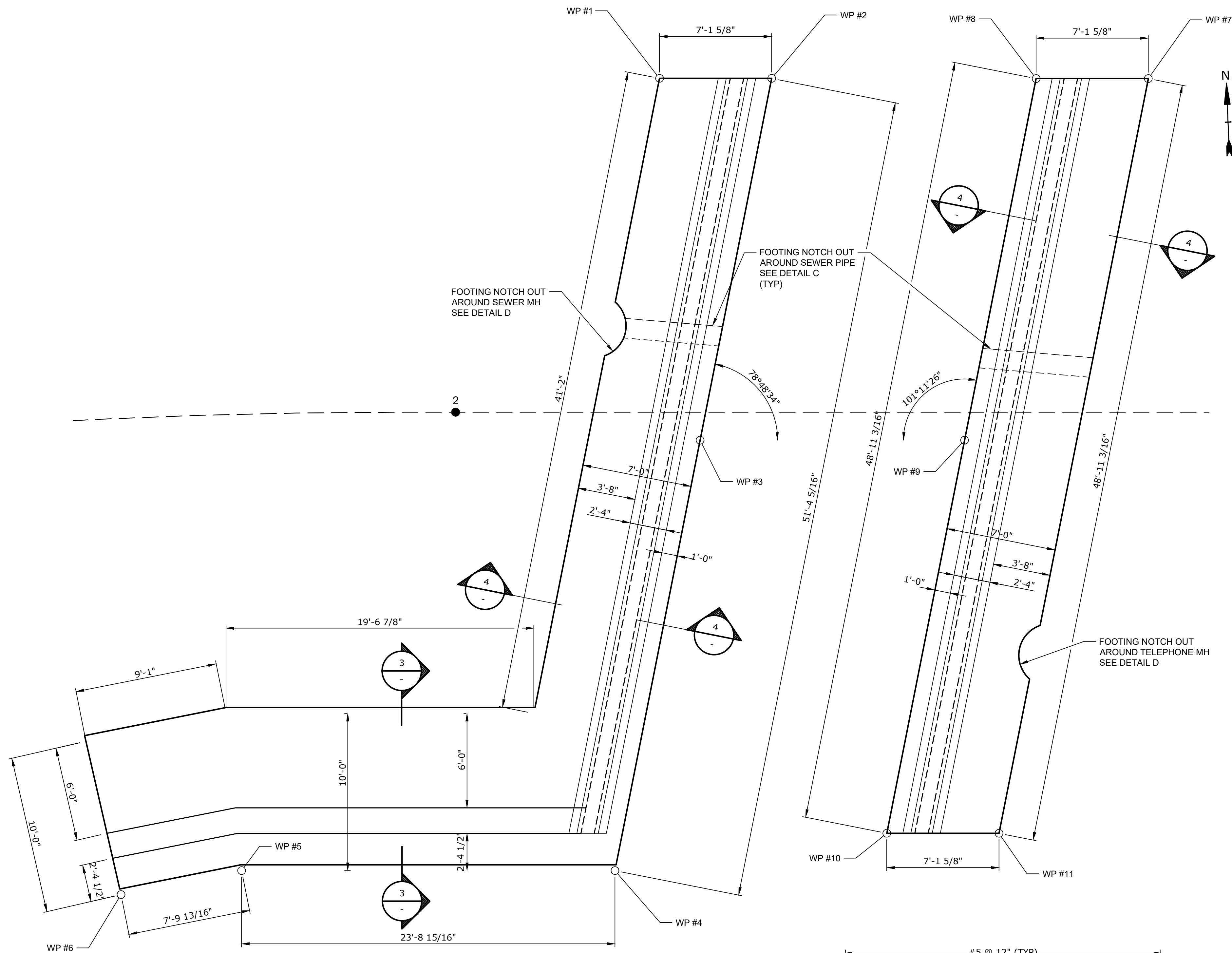
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DATE:	FEBRUARY 2022	
FILE:	M1476-011-S-101_103.dwg	
DRAWN BY:	D.BISHOP/AGB	
CHECKED:	BRB	
APPROVED:	DLM	

GENERAL BRIDGE PLAN
AND ELEVATION

SCALE: AS NOTED

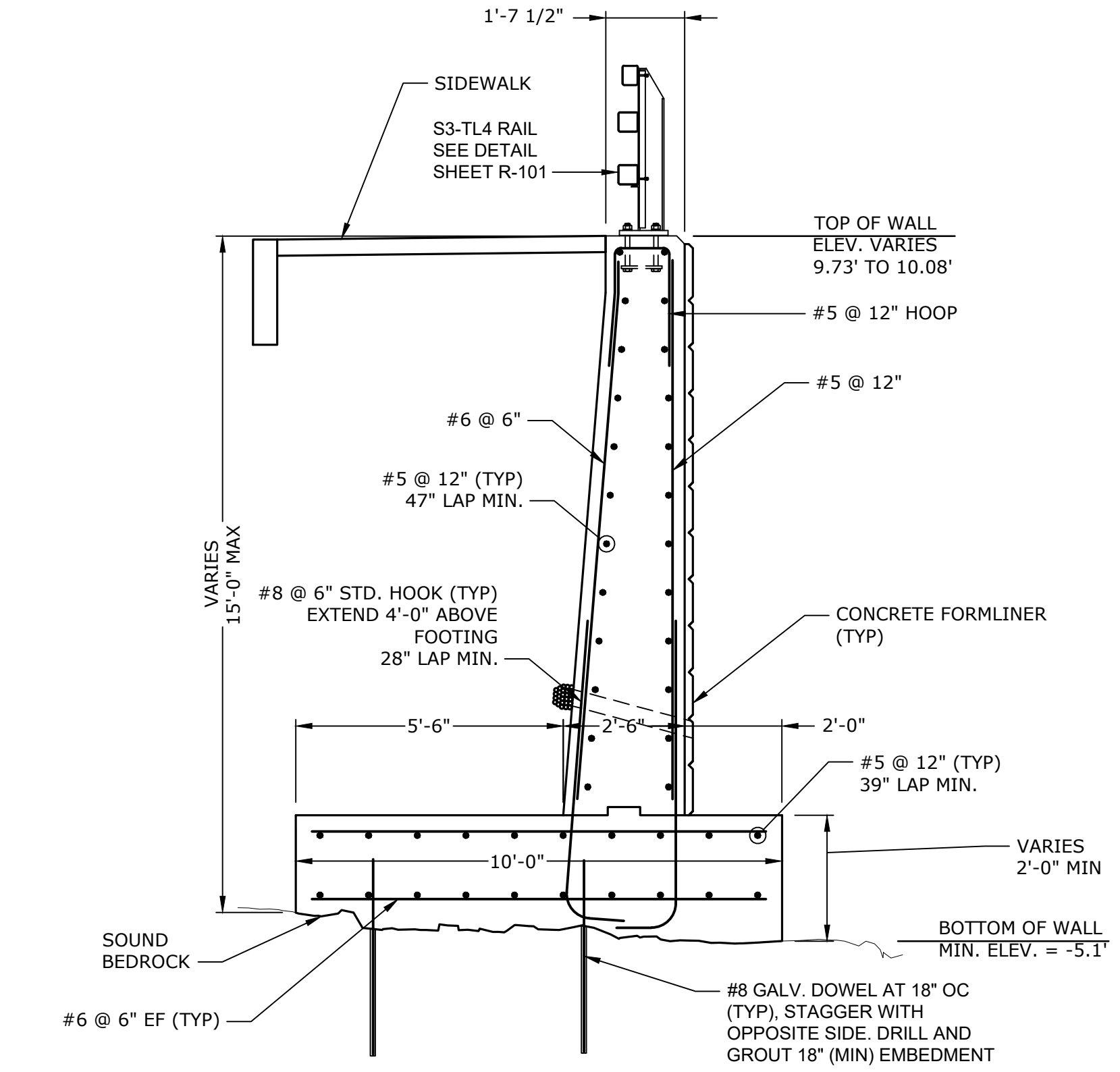
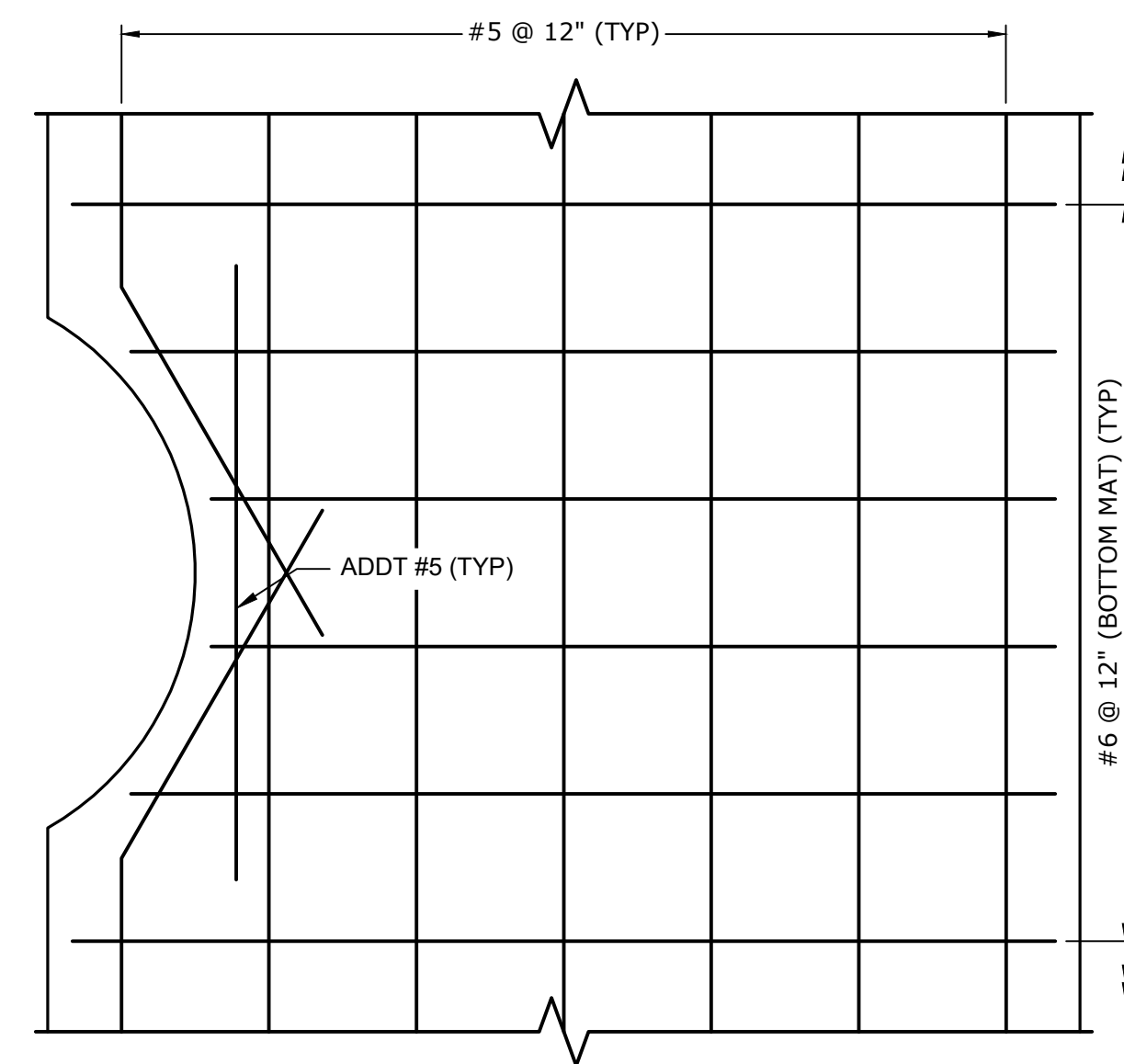
S-101
SHEET 23 OF 29

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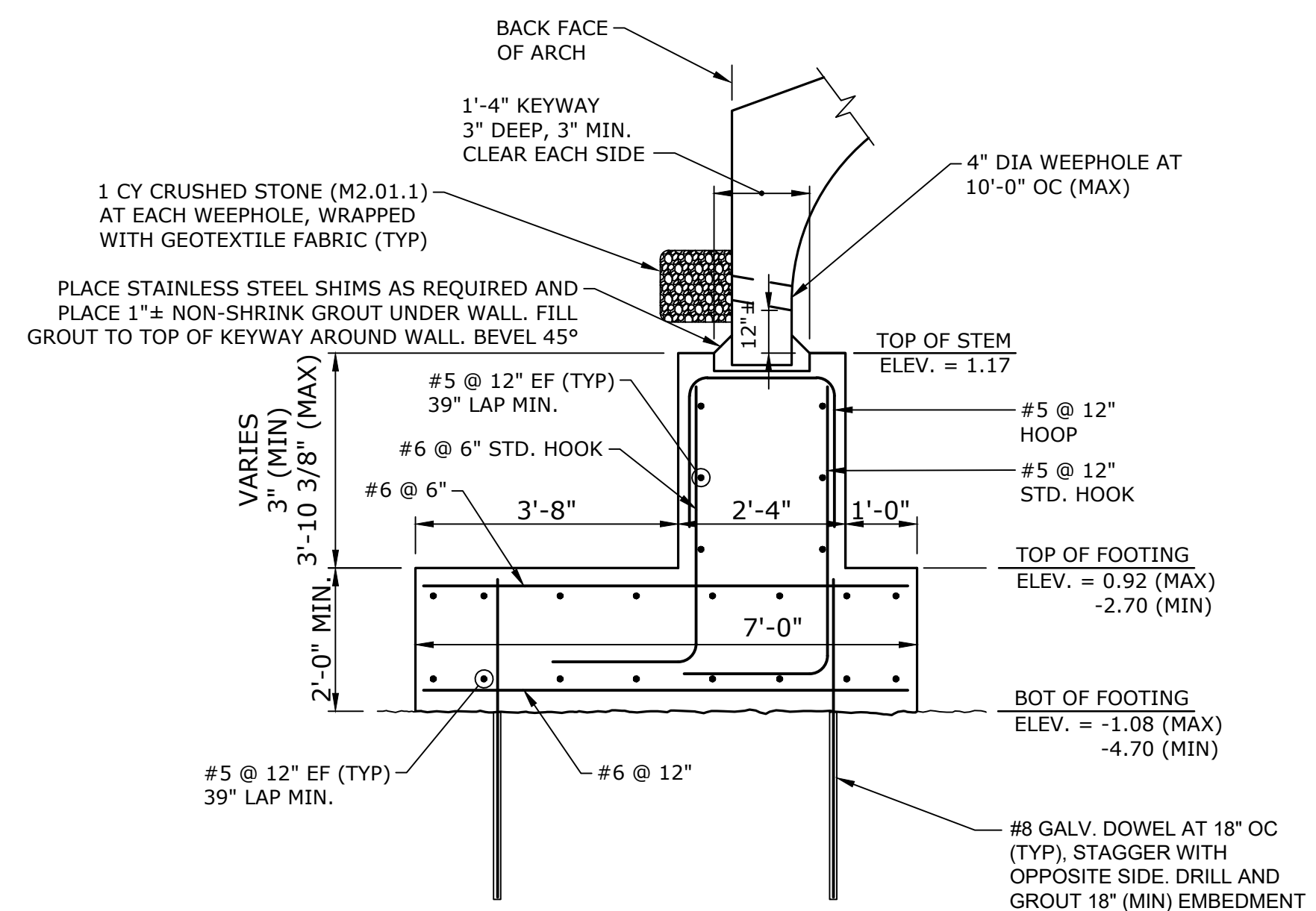


WORKING POINT	STATION	OFFSET	NORTHING	EASTING
WP #1	2+12.70	LT 23.01	3,035,515.57	852,008.64
WP #2	2+19.83	LT 23.01	3,035,515.29	852,015.77
WP #3	2+15.28	-	3,035,492.48	852,010.30
WP #4	2+09.86	RT 27.38	3,035,465.71	852,003.88
WP #5	1+85.19	RT 27.13	3,035,466.67	851,980.05
WP #6	1+76.96	RT 28.32	3,035,465.45	851,972.28
WP #7	2+43.78	LT 23.00	3,035,514.32	852,039.71
WP #8	2+36.65	LT 23.00	3,035,514.60	852,032.58
WP #9	2+32.10	-	3,035,491.80	852,027.45
WP #10	2+27.15	RT 25.00	3,035,467.02	852,021.17
WP #11	2+34.29	RT 25.00	3,035,466.74	852,028.30

ABUTMENT PLAN
SCALE: 1/4" = 1'-0"

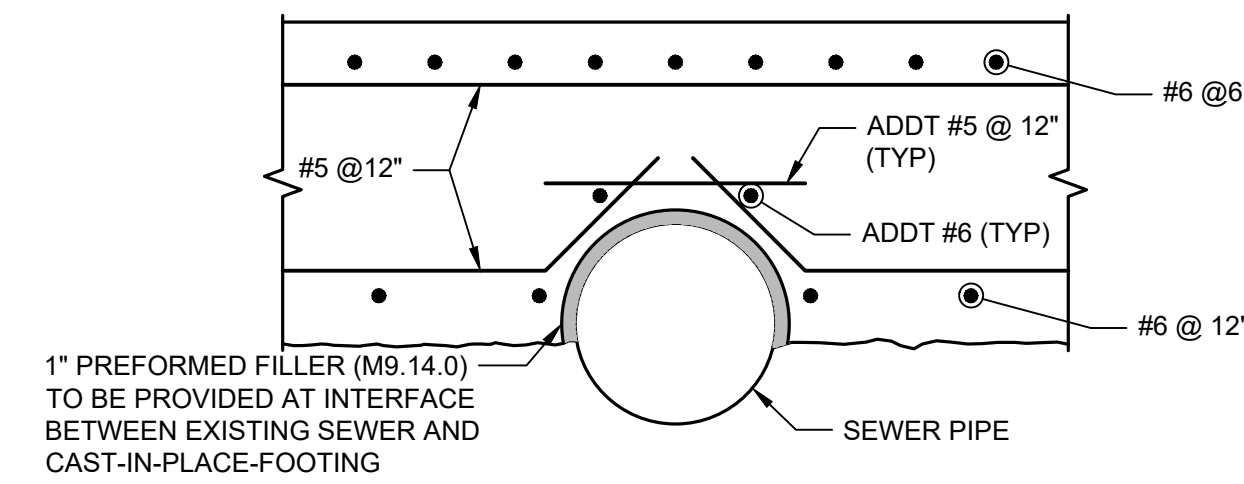


SOUTHWEST WINGWALL
SECTION 3
3/8" = 1'-0"



TYPICAL CAST-IN-PLACE ABUTMENT SECTION
SECTION 4
1/2" = 1'-0"

- CAST-IN-PLACE FOOTING NOTES:**
- THE PRECAST CONCRETE ARCH UNITS SHALL BE INSTALLED ON CAST-IN-PLACE CONCRETE FOOTINGS. THE FOOTING DESIGN PROVIDED HEREIN IS BASED ON LRFD METHODOLOGIES AND THE FOLLOWING NOMINAL REACTIONS FROM THE ARCH:
 - VERTICAL DEAD LOAD (COMPONENTS) = 1.86 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - VERTICAL DEAD LOAD (WEARING SURFACE) = 1.04 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - VERTICAL LIVE LOAD = 5.30 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - IF THE CONTRACTOR'S FINAL DESIGN OF THE ARCH DEVIATES FROM THE RANGE PROVIDED ABOVE TO BETTER SUIT THE CONTRACTOR'S MEANS AND METHODS, THE ENGINEER WILL PROVIDE NEW FOOTING DESIGN DRAWINGS DETAILING REVISED FOOTINGS TO ACCOMMODATE THE FINAL ARCH DESIGN PROVIDED BY THE CONTRACTOR. ADDITIONAL ENGINEERING FOR REVISED FOOTING DESIGN TO SUIT THE CONTRACTOR'S MEANS AND METHODS SHALL BE AT THE CONTRACTOR'S SOLE COST.



DETAIL C
NO SCALE

- DETAIL NOTE:**
- ONLY BOTTOM MAT REINFORCING SHOWN FOR CLARITY. DETAIL SIMILAR FOR TOP MAT REINFORCING.

DETAIL D
NO SCALE

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 4 BRIDGE ENGINEER DATE

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

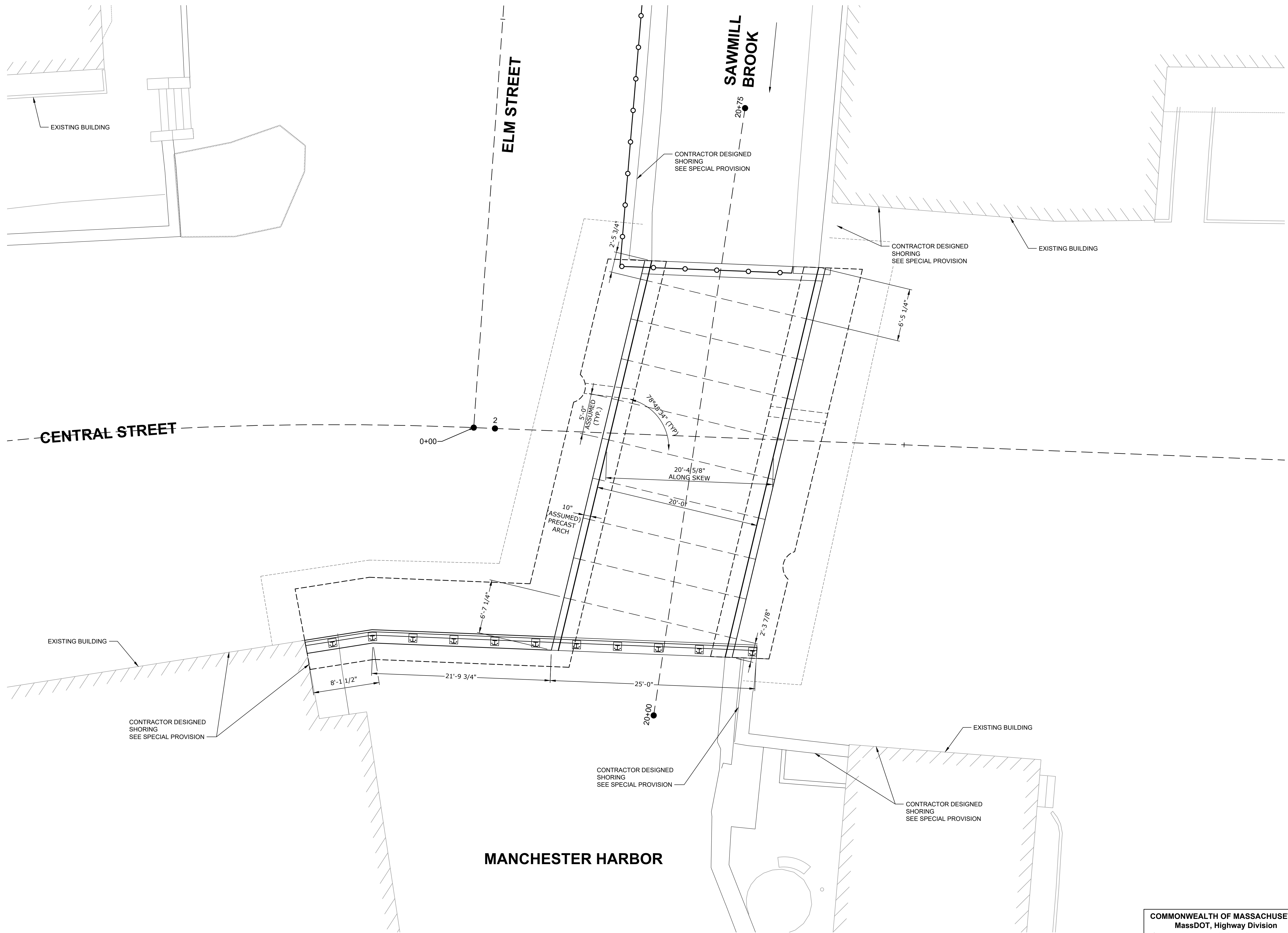
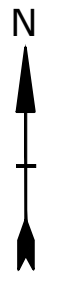
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DATE:	FEBRUARY 2022	
FILE:	M1476-011-S-101_103.dwg	
DRAWN BY:	D.BISHOP/AGB	
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APPROVED:	DLM	

ABUTMENT PLAN & DETAILS

SCALE: AS NOTED

S-102
SHEET 24 OF 29

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 Tighe & Bond 330 Main Street, Suite 101, Manchester, MA 06105
 File: M1476-011-S-101_103.dwg



MANCHESTER HARBOR

BRIDGE FRAMING AND LAYOUT PLAN
3/16" = 1'-0"

**100%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

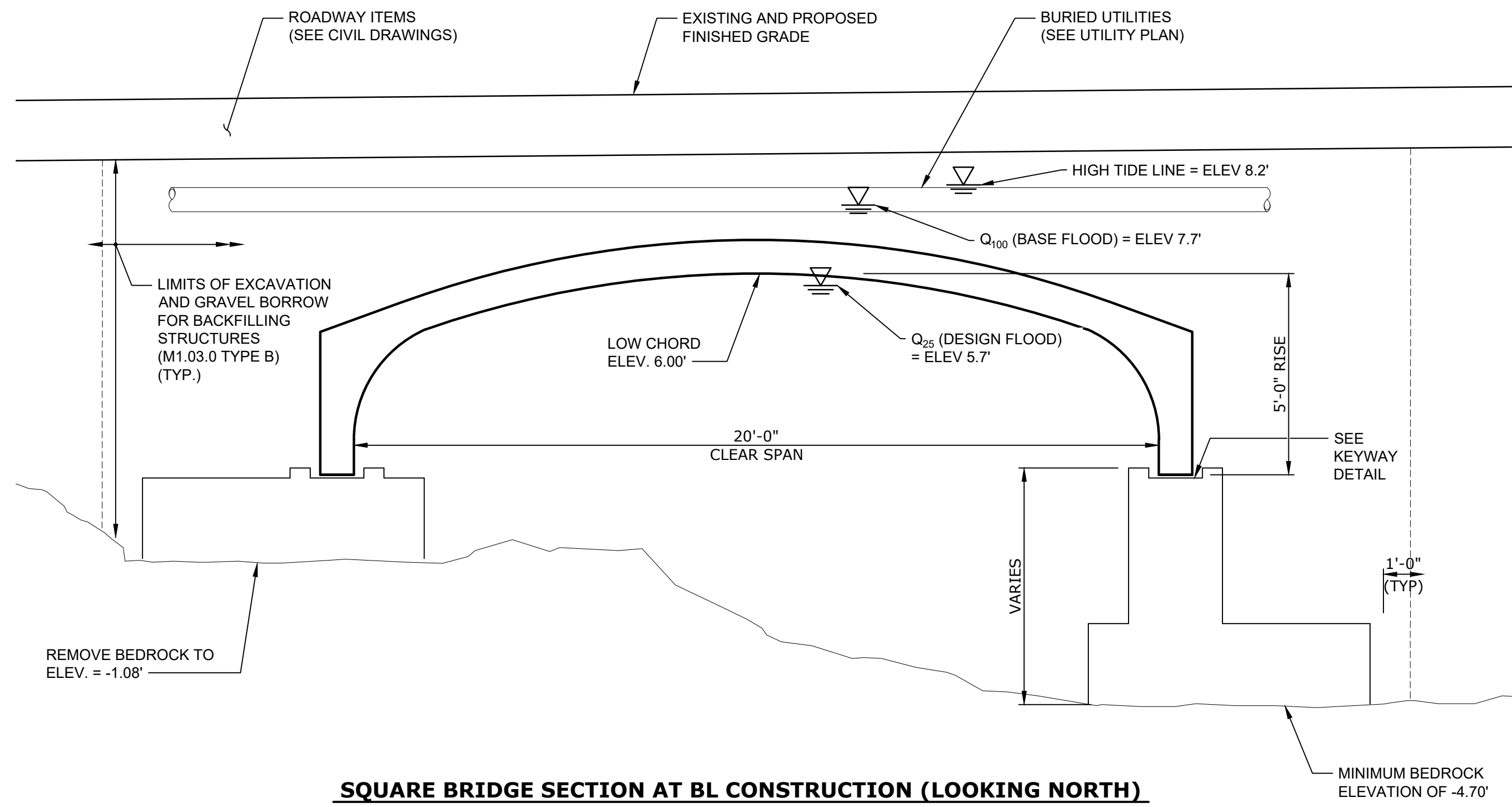
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FILE:	M1476-011-S-101_103.dwg
DRAWN BY:	D.BISHOP/AGB
CHECKED:	BRB
APPROVED:	DLM

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
DISTRICT 4 BRIDGE ENGINEER DATE

BRIDGE FRAMING AND
LAYOUT PLAN
SCALE: AS NOTED
S-103
SHEET 25 OF 29

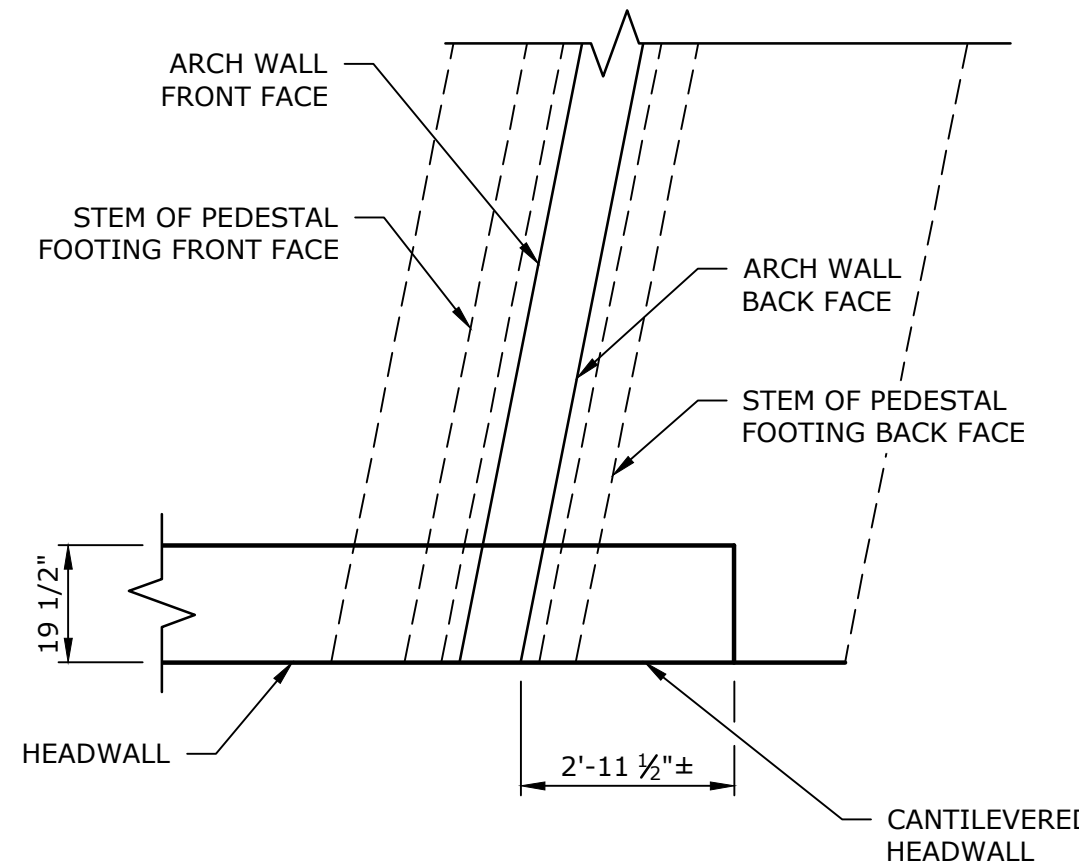
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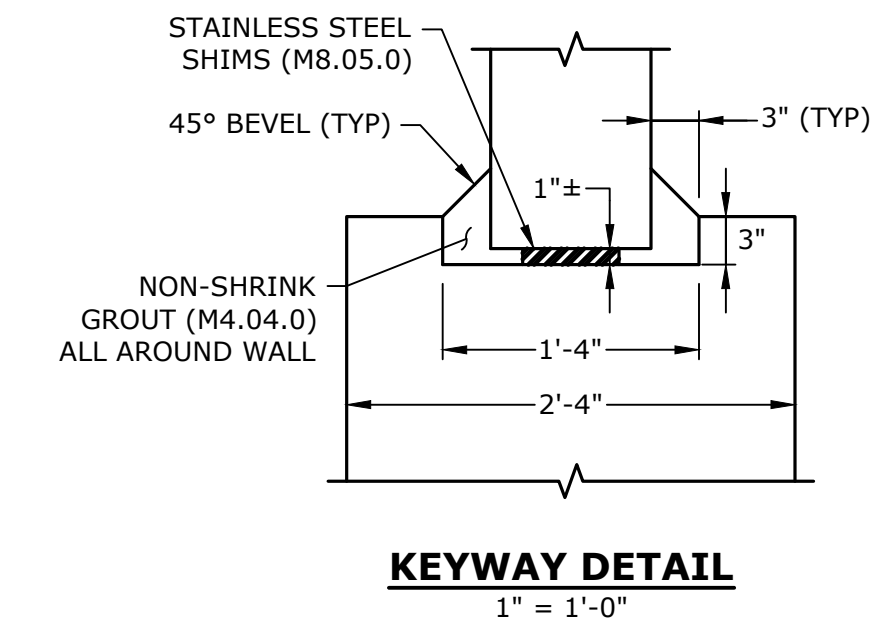
SQUARE BRIDGE SECTION AT BL CONSTRUCTION (LOOKING NORTH)

SECTION 2
3/8" = 1'-0"

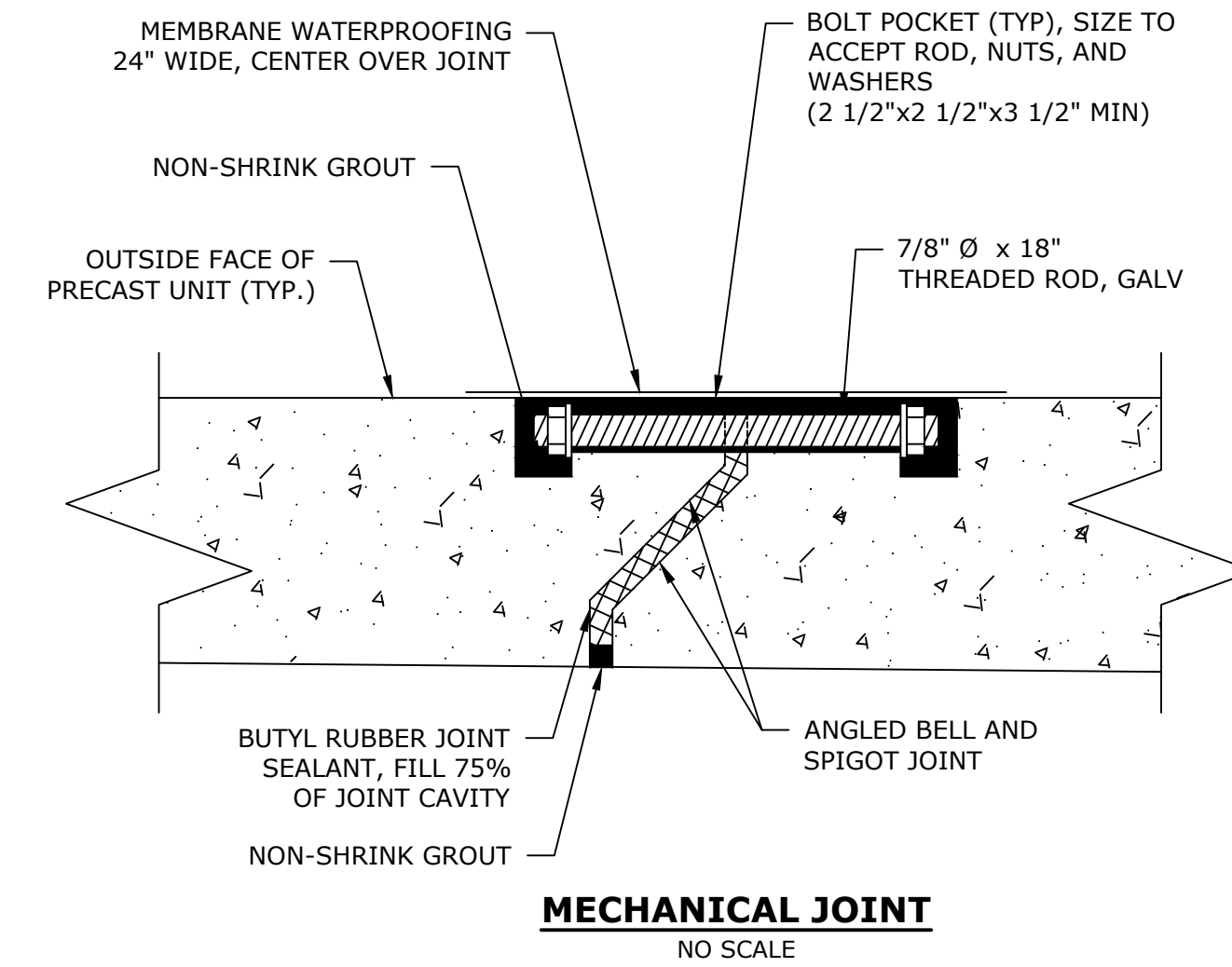
- NOTE:**
- SECTION REFLECTS MAXIMUM AND MINIMUM ANTICIPATED BEDROCK ELEVATIONS. CONTRACTOR TO EVALUATE FIELD CONDITIONS AFTER DEMOLITION OF EXISTING BRIDGE AND REPORT TO ENGINEER PRIOR TO CASTING OF ARCH FOOTINGS.



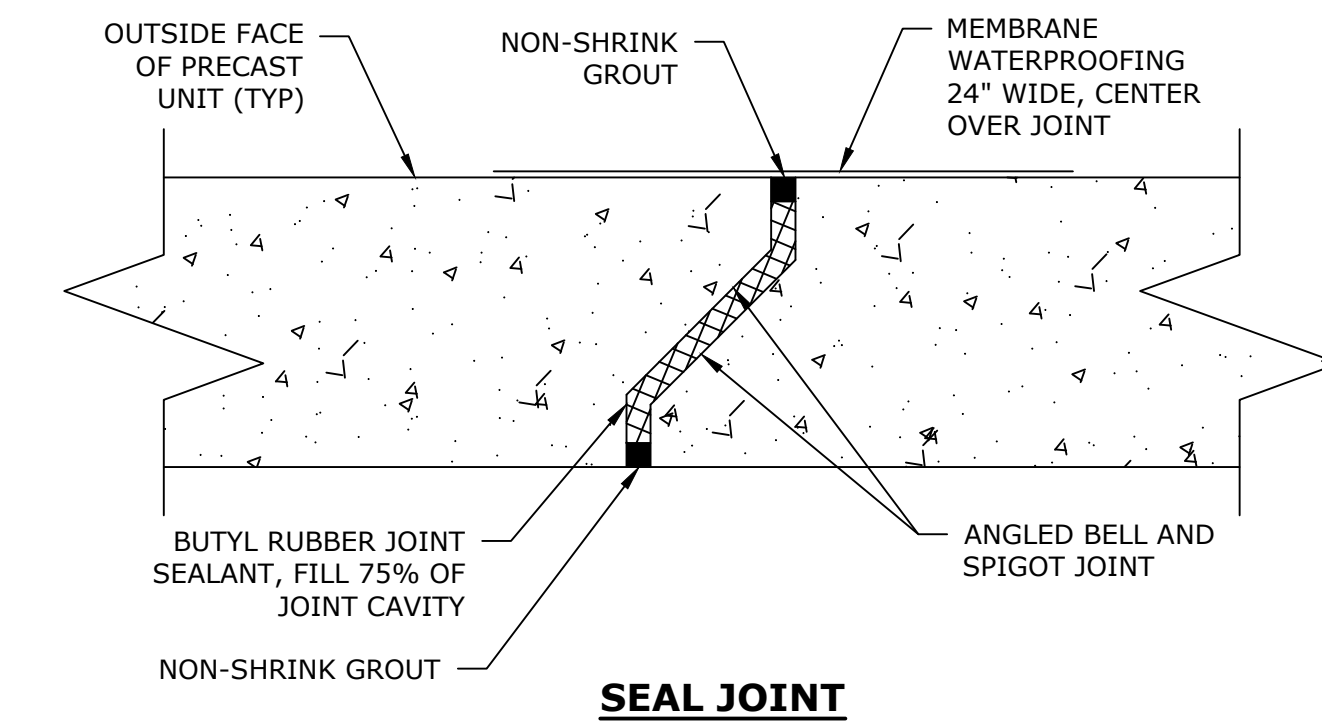
HEADWALL EXTENSION DETAIL
SCALE: 3/8" = 1'-0"



KEYWAY DETAIL
1" = 1'-0"



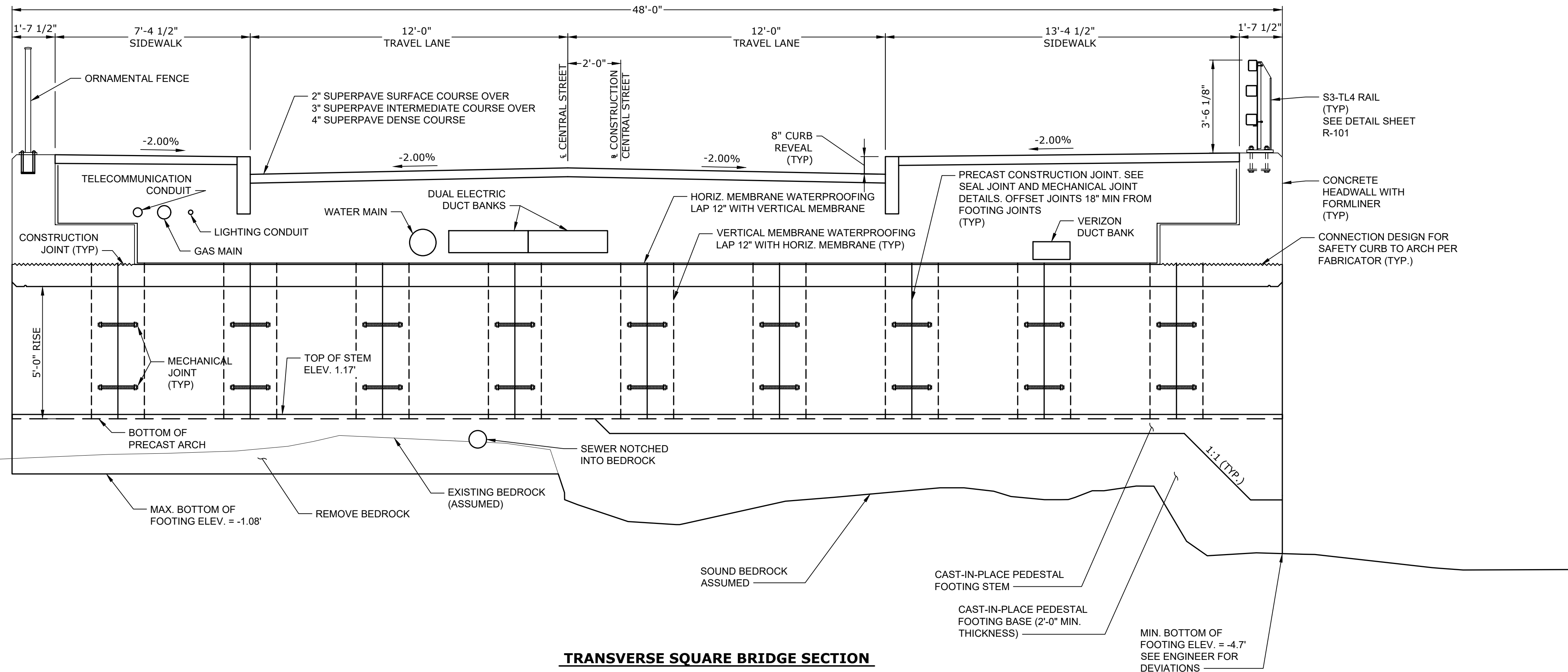
MECHANICAL JOINT
NO SCALE



SEAL JOINT
NO SCALE

JOINT SEALANT NOTES:

- PROVIDE BUTYL RUBBER JOINT SEALANT (AASHTO M-198) BETWEEN PRECAST CONCRETE UNITS.
- PROVIDE A MINIMUM OF 7 MECHANICAL CONNECTORS BETWEEN EACH ARCH UNIT (3 ON TOP AND 2 ON EACH SIDE).
- ALL BOLT POCKETS SHALL BE FILLED WITH NON-SHRINK GROUT.
- PEEL AND STICK BARRIER MEMBRANE SHALL BE PLACED IN 2-FOOT WIDE STRIPS, CENTERED OVER THE TOP AND/OR SIDES OF EACH JOINT.



TRANSVERSE SQUARE BRIDGE SECTION

SECTION 1
3/8" = 1'-0"

**COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**

DISTRICT 4 BRIDGE ENGINEER DATE

**100%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

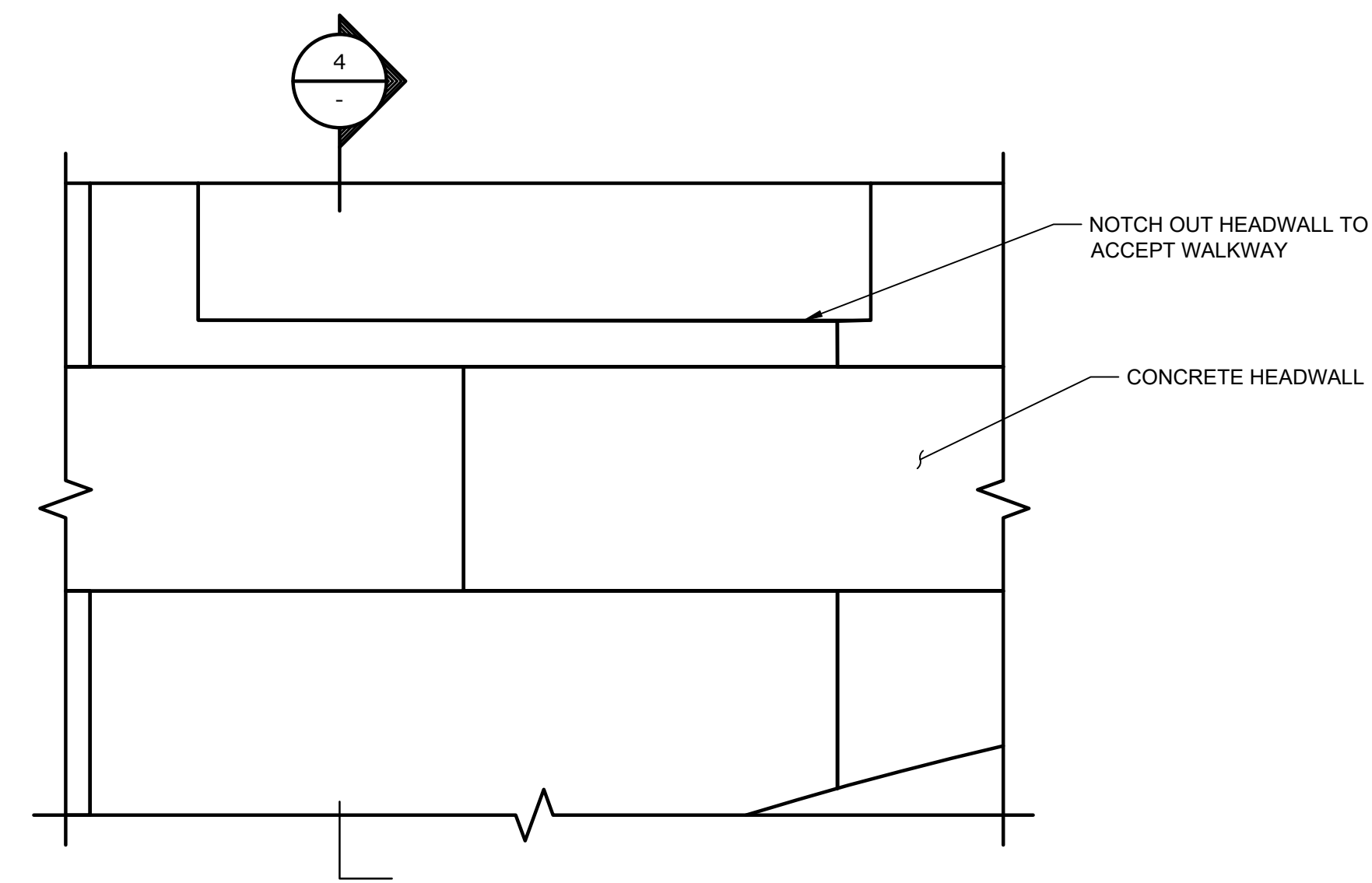
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DATE:	FEBRUARY 2022
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DRAWN BY:	D.BISHOP/AGB
CHECKED:	BRB
APPROVED:	DLM

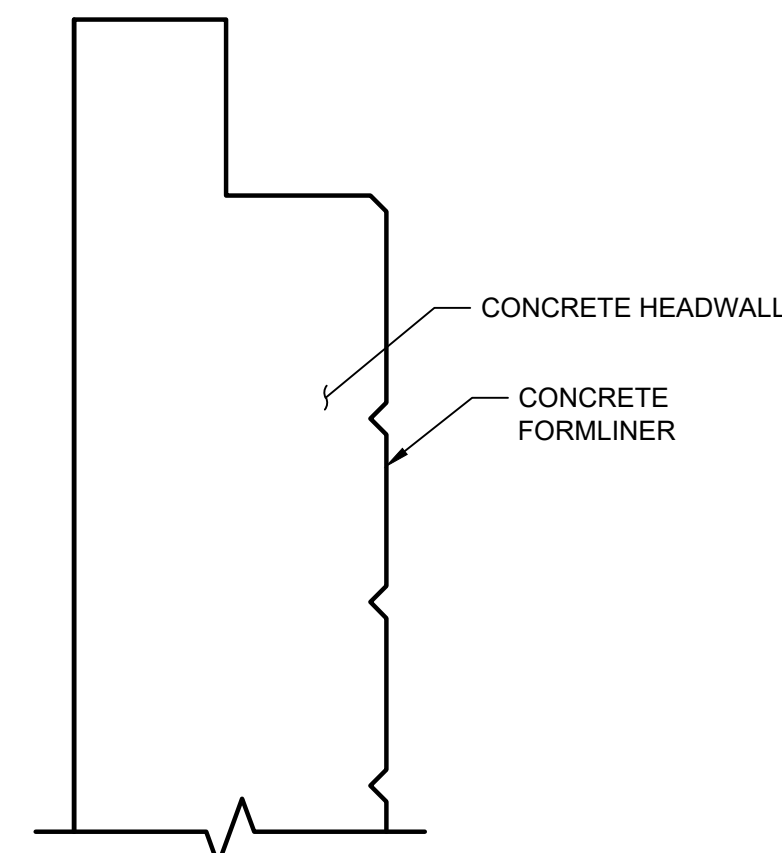
BRIDGE SECTIONS & DETAILS

SCALE: AS NOTED

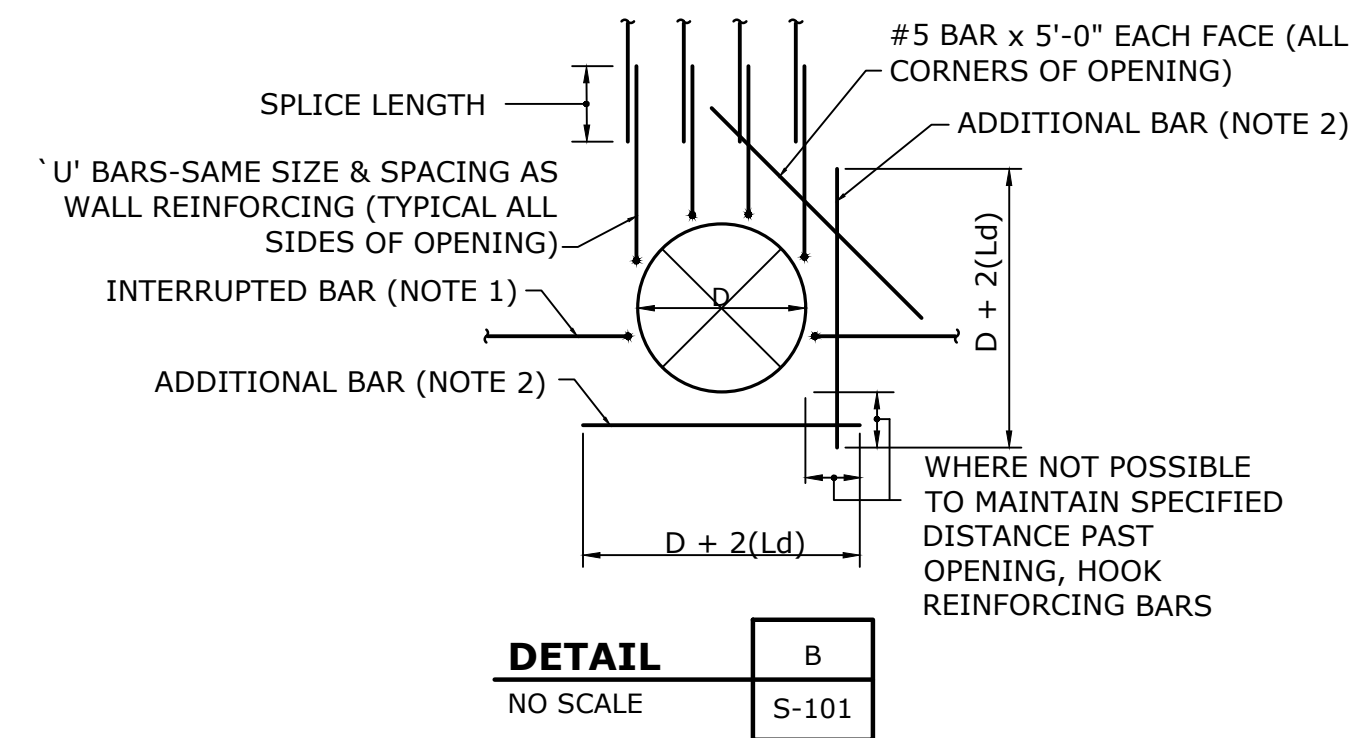
S-104
SHEET 26 OF 29



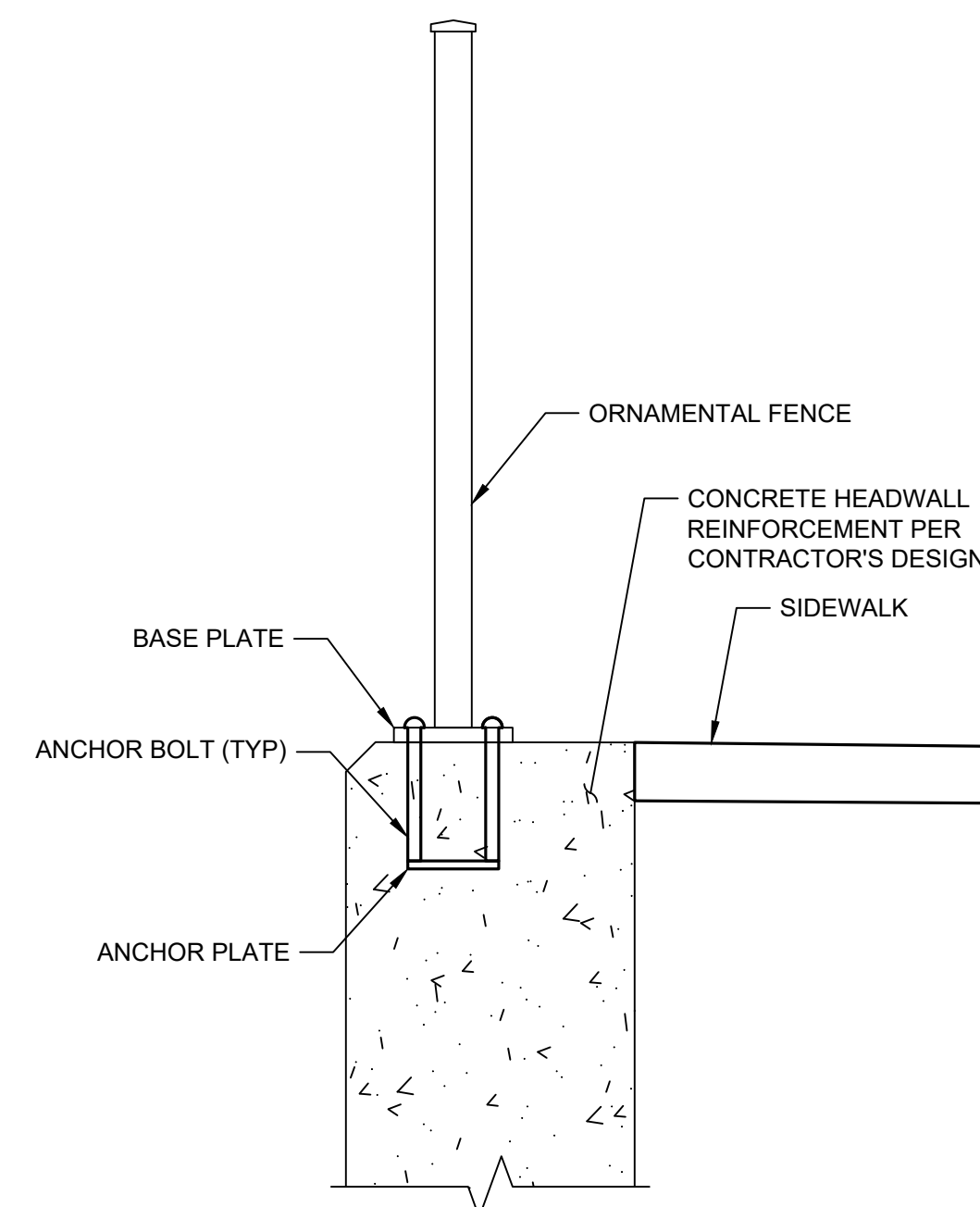
DETAIL A
1" = 1'-0" S-101



SECTION 4
1" = 1'-0"



- NOTES:**
1. FOR SLAB OR WALL APPLICATION WITH A CONCRETE THICKNESS LESS THAN 12 INCHES, 180° OR 90°, HOOK BARS MAY BE USED IN LIEU OF 'U' BARS.
 2. PROVIDE ADDITIONAL BARS USING NOT LESS THAN ONE HALF OF INTERRUPTED BARS AT EACH SIDE OF OPENING AT 3" ON CENTER.



ORNAMENTAL FENCE POST ANCHORAGE (ON BRIDGE)
SCALE: 1" = 1'-0"

**100%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION

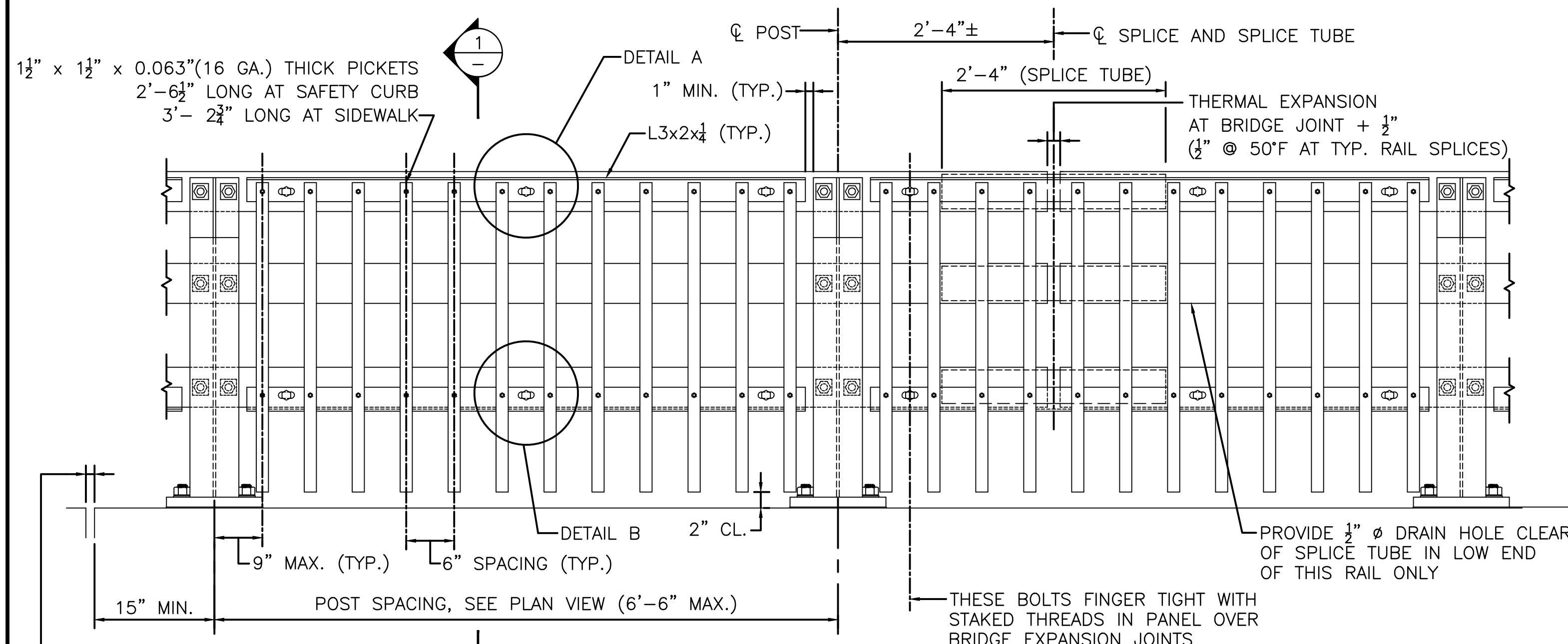
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DRAWN BY:	DRF/AGB
CHECKED:	BRB
APPROVED:	DLM

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
DISTRICT 4 BRIDGE ENGINEER DATE

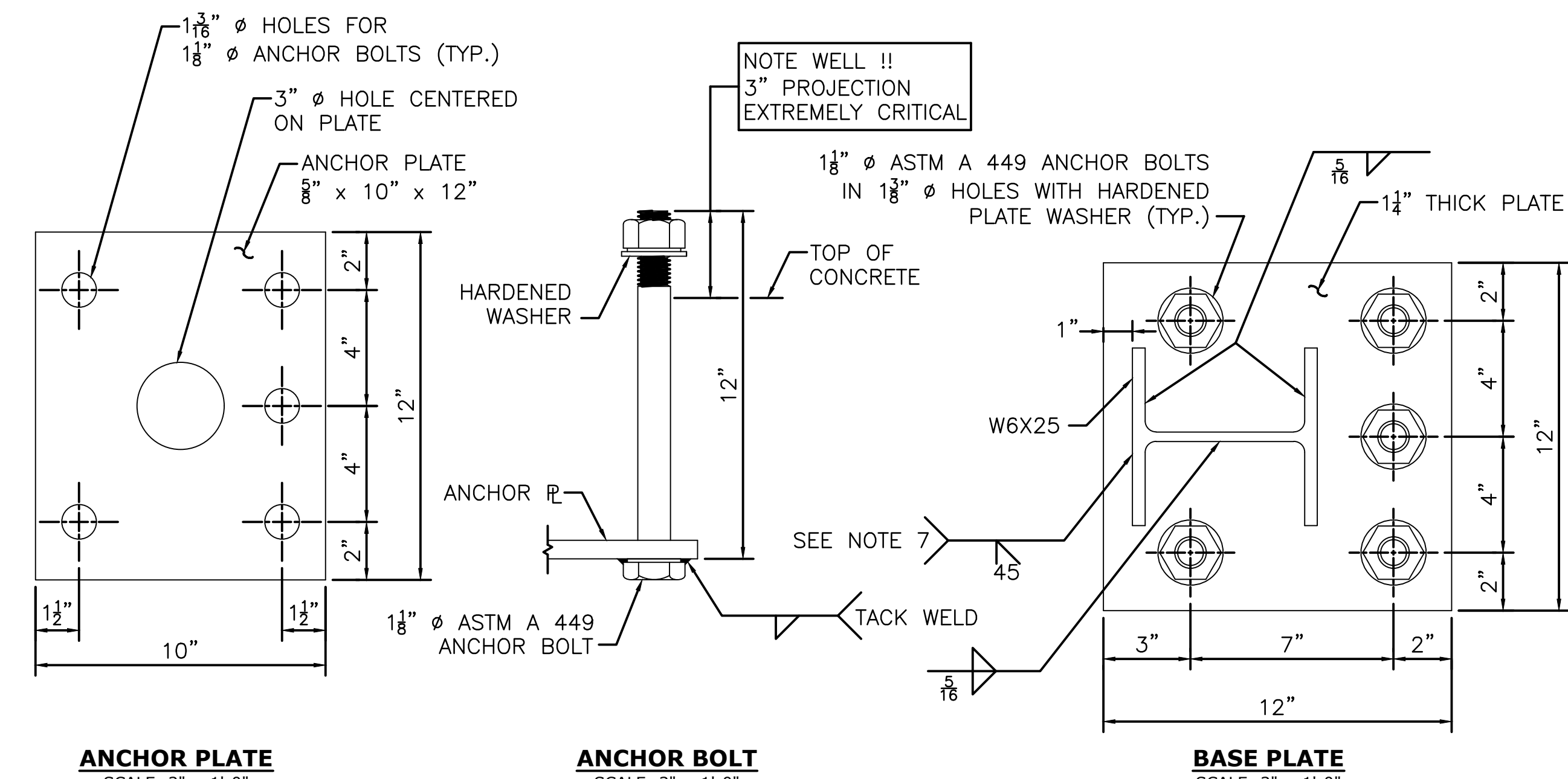
MISCELLANEOUS DETAILS

SCALE: AS NOTED

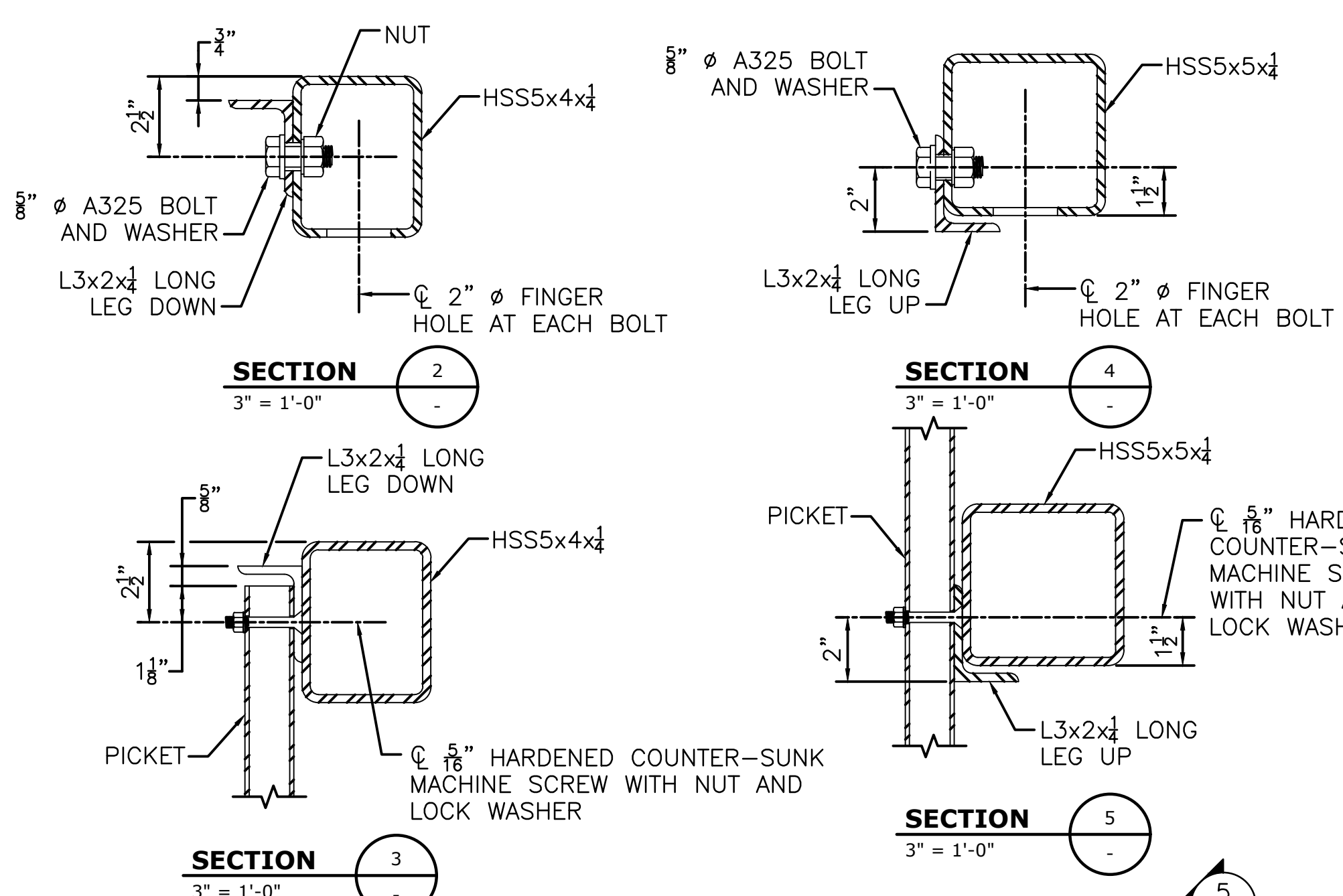
S-105
SHEET 27 OF 29



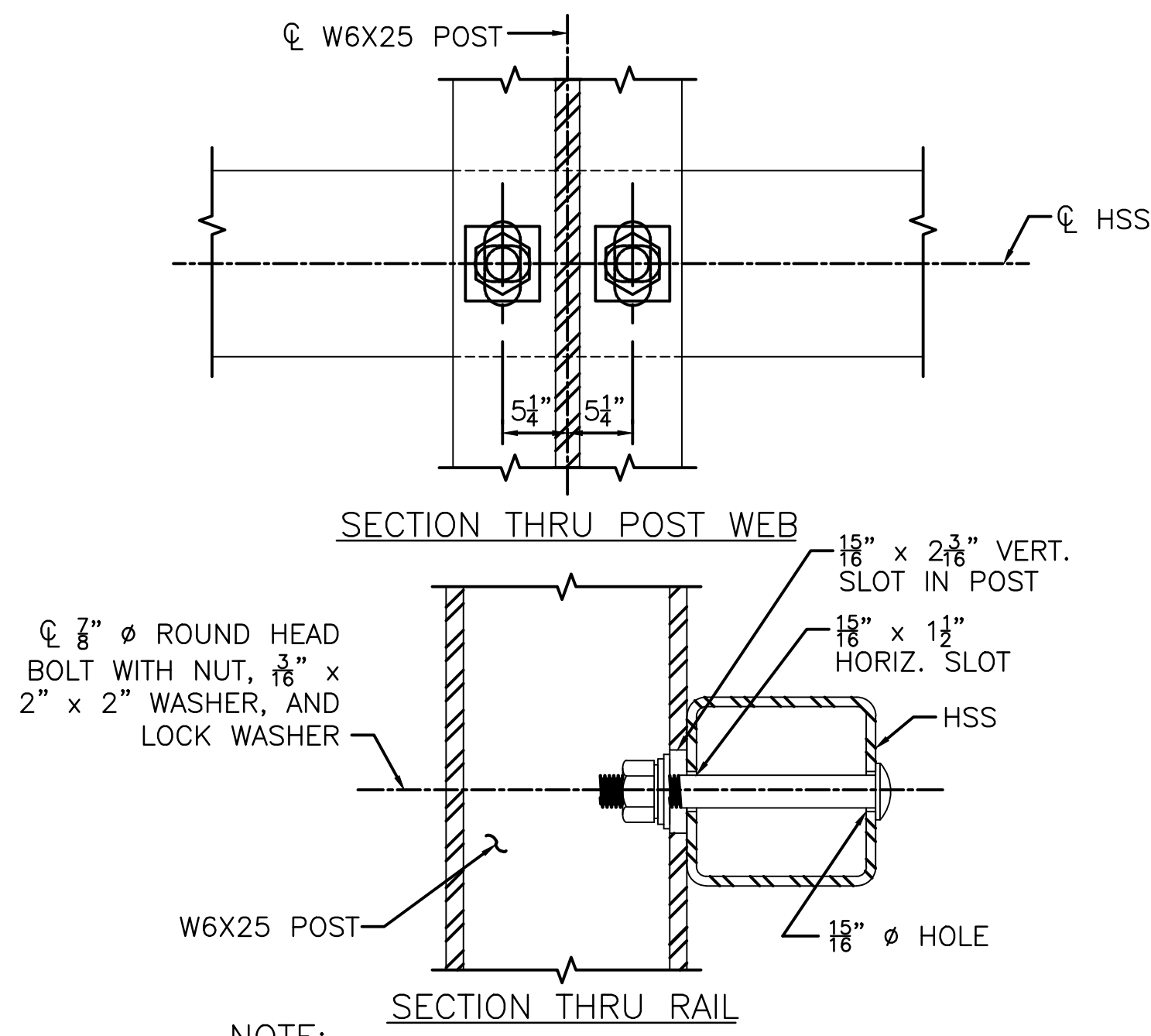
BRIDGE RAILING ELEVATION
SCALE: 1" = 1'-0"



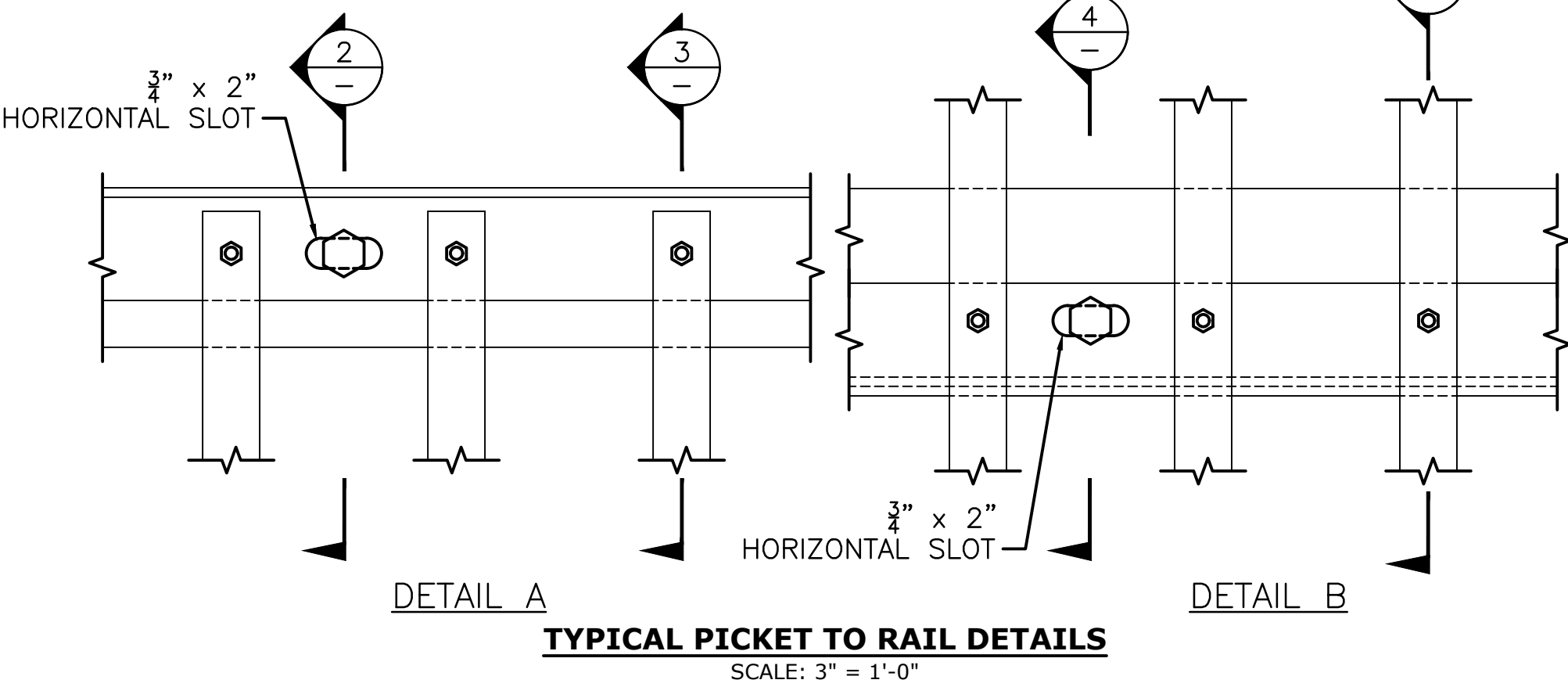
ANCHOR PLATE SCALE: 3" = 1'-0"
ANCHOR BOLT SCALE: 3" = 1'-0"
BASE PLATE SCALE: 3" = 1'-0"



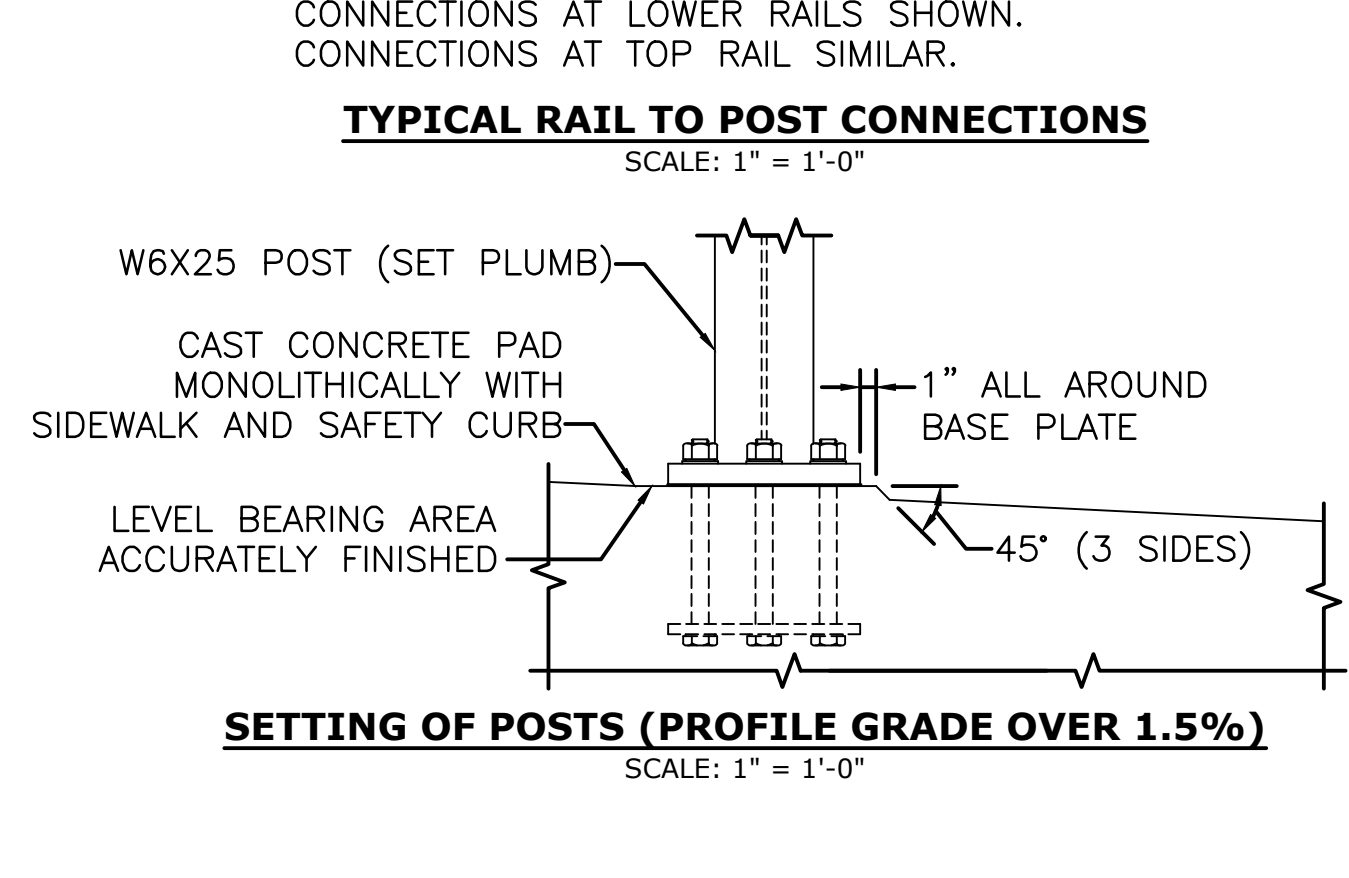
SECTION 2 3" = 1'-0"
SECTION 3 3" = 1'-0"
SECTION 4 3" = 1'-0"
SECTION 5 3" = 1'-0"



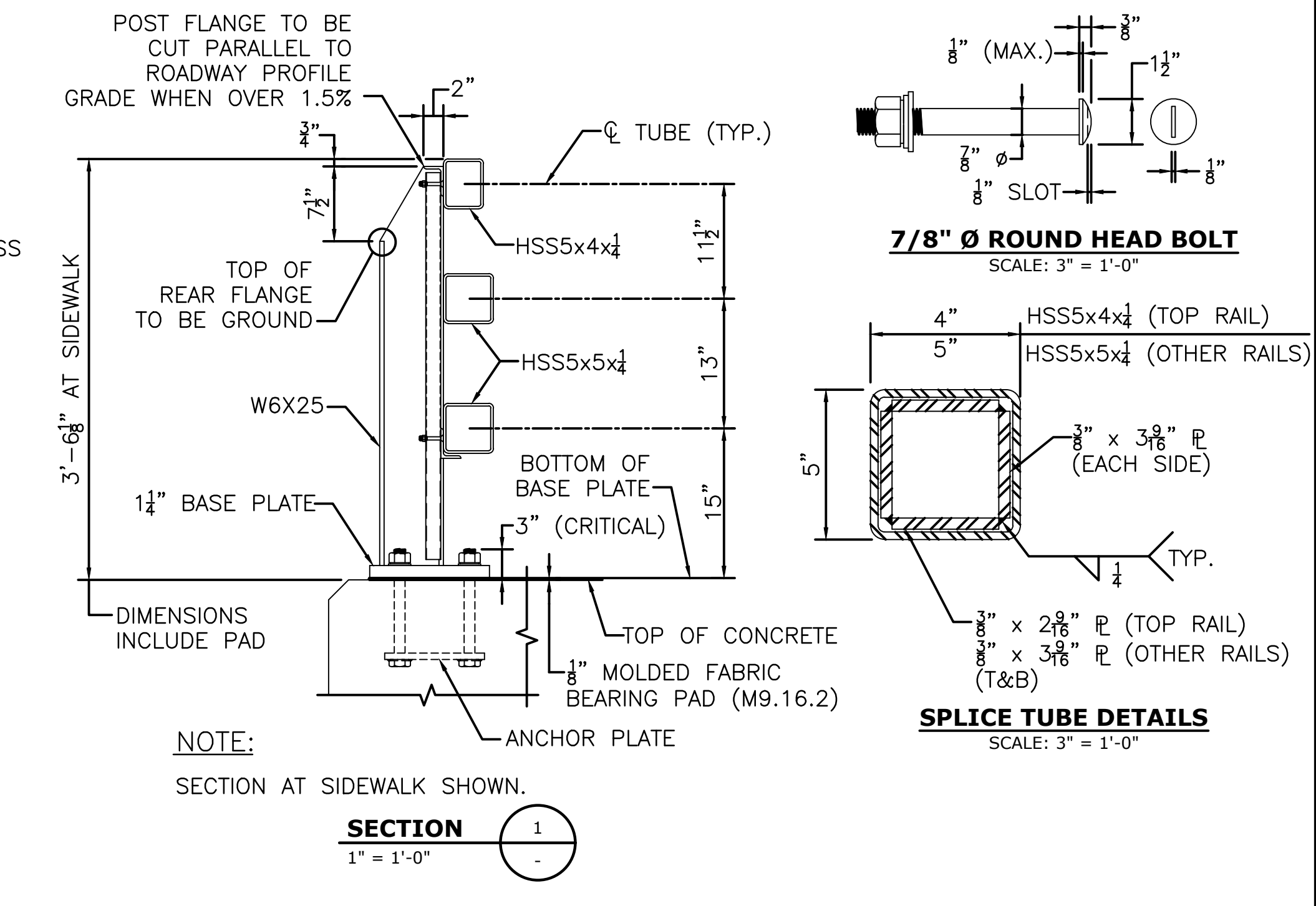
SECTION THRU POST WEB
SECTION THRU RAIL
TYPICAL RAIL TO POST CONNECTIONS
SCALE: 1" = 1'-0"



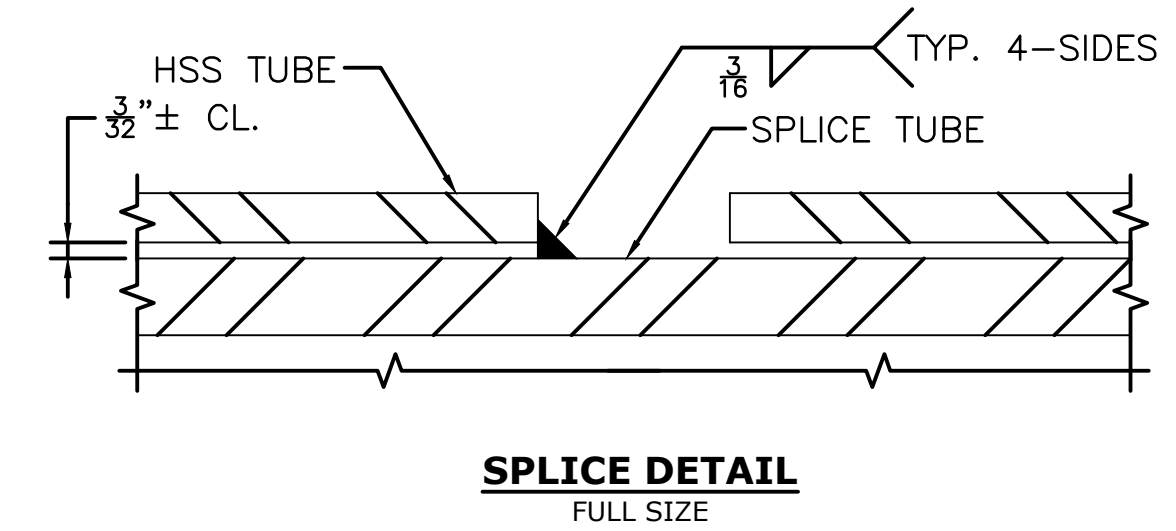
TYPICAL PICKET TO RAIL DETAILS
SCALE: 3" = 1'-0"



SETTING OF POSTS (PROFILE GRADE OVER 1.5%)
SCALE: 1" = 1'-0"



SECTION 1
1" = 1'-0"



SPlice DETAIL
FULL SIZE

- RAILING NOTES:**
- RAIL POST AND BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 50. HOLLOW RAILING STRUCTURAL TUBING (HSS) SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 500 WITH A CERTIFIED $F_y = 50$ KSI MINIMUM. THE MINIMUM HORIZONTAL BENDING RADII OF THE HSS TUBING SHALL BE 8 FEET. PICKET CARRIER ANGLES, ANCHOR PLATES, AND SPlice TUBE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 36. PICKET TUBING SHALL CONFORM TO ASTM A 513 WITH $F_y = 36$ KSI MIN. OR A 500 GRADE B.
 - ALL STEEL (EXCEPT THE 5/8" ANCHOR PLATE AND FASTENERS) SHALL BE GALVANIZED AND PAINTED DARK BRONZE (FEDERAL STD. 595B COLOR NO. 10045). ANCHOR PLATE SHALL BE GALVANIZED ONLY. HEADS OF 7/8" ϕ ROUND HEAD BOLTS SHALL BE PAINTED TO MATCH RAIL.
 - ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
 - RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR (4) POSTS WITHOUT SPlices WHERE POSSIBLE. RAILS SHALL BE SPliced IN THE PANELS OVER EXPANSION JOINT.
 - ENDS OF TUBE SECTIONS SHALL BE SAWED. GRIND SMOOTH EXPOSED EDGES. ALL CUT ENDS SHALL BE TRUE AND SMOOTH.
 - ALL POSTS TO BE PLUMB WHEN PROFILE GRADE EXCEEDS 1.5%. FOR PROFILE GRADES LESS THAN 1.5%, POSTS SHALL BE SET PERPENDICULAR TO GRADE.
 - POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK-GOUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.
 - 7/8" ϕ ROUND HEAD BOLTS SHALL CONFORM TO THE CHEMICAL AND PHYSICAL REQUIREMENTS OF AASHTO M 164.

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.
MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL PART II CONVENTIONAL CONSTRUCTION S3-TL4 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

100% Drawings Not For Construction

Central Street Bridge Replacement

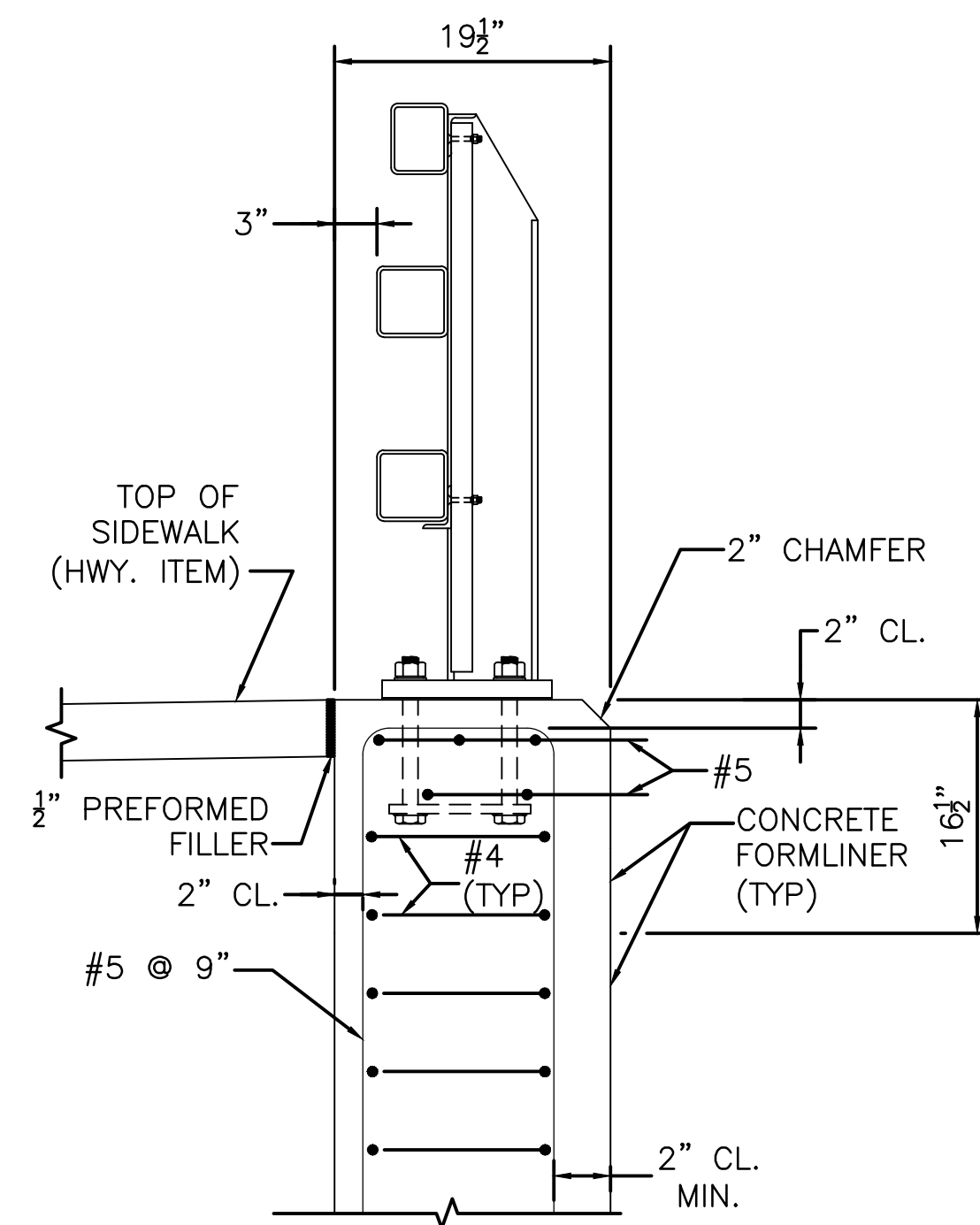
Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

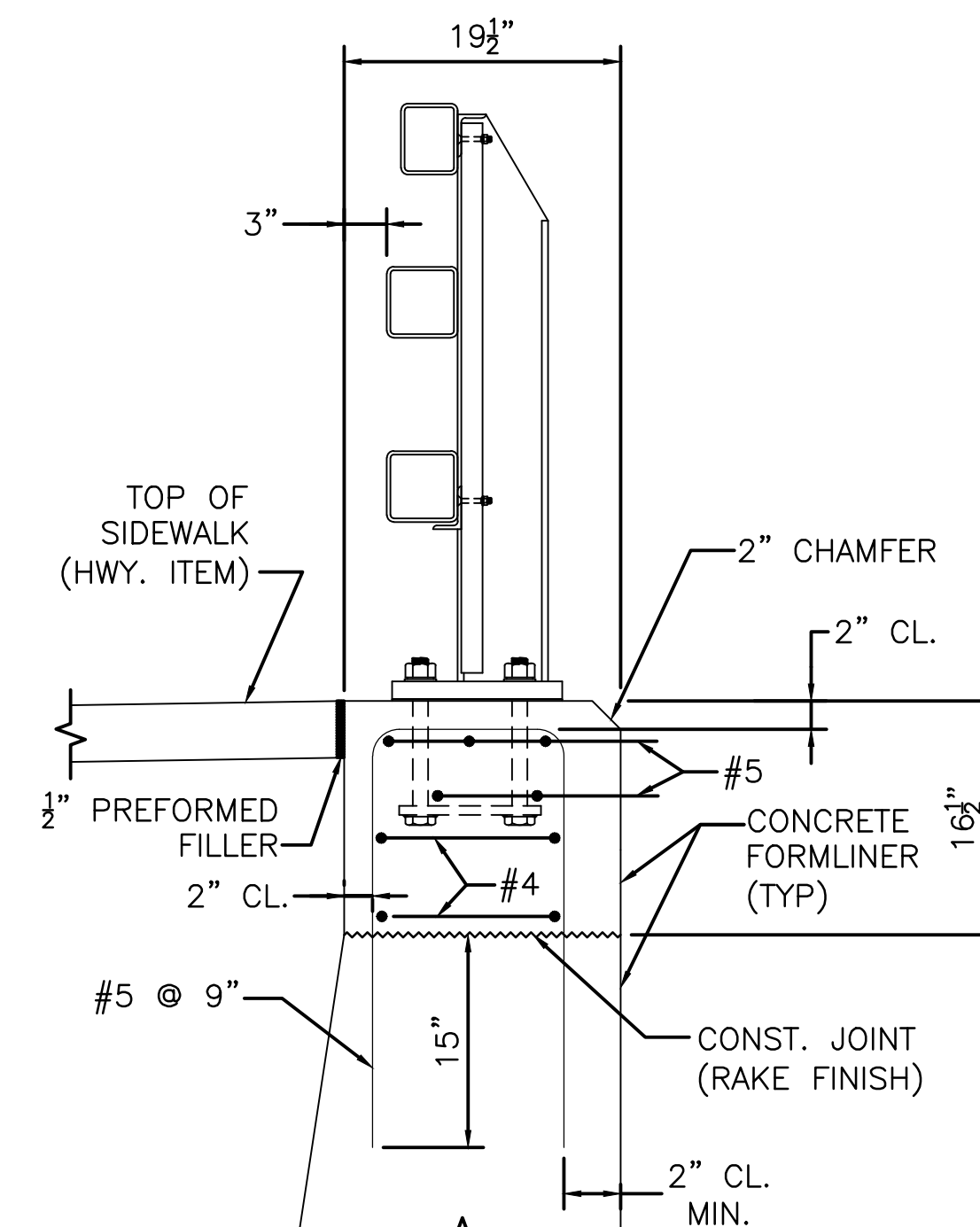
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DATE:	FEBRUARY 2022	
FILE:	M1476-011-R-101_R-104.dwg	
DRAWN BY:	DRF/AGB	
CHECKED:	BRB	
APPROVED:	DLM	
S3-TL4 BARRIER DETAILS		
SCALE:	AS NOTED	
R-101		
SHEET 28 OF 29		

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S3-TL4 BARRIER SECTION THRU BARRIER AT SIDEWALK (MASSDOT 9.2.7)
SCALE: 1" = 1'-0"



S3-TL4 BARRIER TOP OF U-WINGWALL DETAILS AT SIDEWALK (MASSDOT 9.3.12)
SCALE: 1" = 1'-0"

NOTES:

1. CONTRACTOR'S FABRICATOR IS RESPONSIBLE FOR DESIGN OF S3-TL4 CONNECTION TO HEADWALL AND HEADWALL CONNECTION TO PRECAST CONCRETE ARCH.
2. THIS STANDARD MASSDOT DETAIL SHOWS ADDITIONAL MINIMUM REINFORCEMENT FOR A CONNECTION TO A SLAB. IT MAY BE ASSUMED THAT THE SLAB IS THE TOP OF THE CONTRACTOR DESIGNED PRECAST ARCH.
3. CONTRACTOR'S FABRICATOR IS RESPONSIBLE FOR HEADWALL DESIGN.

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL
PART II CONVENTIONAL CONSTRUCTION
PRECAST HIGHWAY GUARDRAIL
TRANSITION AND S3-TL4 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

100% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
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DRAWN BY:	DRF/AGB	
CHECKED:	BRB	
APPROVED:	DLM	

PRECAST HIGHWAY GUARDRAIL
TRANSITION AND S3-TL4
BARRIER DETAILS

SCALE: AS NOTED

R-102
SHEET 29 OF 29

APPENDIX C4

Annotated Bibliography with Hyperlinks

Central Street Improvements, Sawmill Brook and Central Pond Restoration
Linked Reference List (click on item to view or download)

Planning Document References

- 1 [Massachusetts Historic Commission \(11/11/1989\) National Register of Historic Places Registration Form, Manchester Village Historic District, Report.](#)
- 2 [Federal Emergency Management Agency \(7/16/2014\) FIRM Maps , Essex County, Report.](#)
- 3 [Massachusetts Executive Office of Energy and Environmental Affairs \(3/1/2018\) Massachusetts Statewide and Major Basins Climate Projections , Supplemental Guidebook, Report.](#)
- 4 [Manchester-by-the-Sea \(4/17/2018\) Multi-Hazard Hazard Mitigation Plan, 5-year Update, Plan.](#)
- 5 [Manchester-by-the-Sea \(4/17/2018\) Critical Asset Risk and Vulnerability Assessment, , Report.](#)
- 6 [Manchester-by-the-Sea \(6/15/2018\) Municipal Vulnerabilty Preparedness, Community Resilience Building Workshops Summary of Findings, Report.](#)
- 7 [Massachusetts Executive Office of Energy and Environmental Affairs \(9/1/2018\) Massachusetts State Hazard Mitigation and Climate Adaptation Plan, , Plan.](#)

Natural Resource References

- 8 [Chase, B. \(12/2006\) Rainbow smelt \(Osmerus mordax\) spawning habitat on the Gulf of Maine coast of Massachusetts, Mass. Div. Mar. Fish TR-30, Technical Report.](#)
- 9 [Chase, B. \(1/2009\) The Spawning Habitat of Anadromous Rainbow Smelt: Trouble at the Tidal Interface, American Fisheries Society Symposium 69:682, Article.](#)
- 10 [US Fish & Wildlife Service \(2/1/2016\) US Fish & Wildlife Service Threatened and Endangered Species Fact Sheet, Small Whorled Pogonia, Fact Sheet.](#)

Central Street Improvements, Sawmill Brook and Central Pond Restoration
Linked Reference List (click on item to view or download)

- 11 [US Fish & Wildlife Service \(12/1/2020\) Official Species List, Project Name: Central Street Bridge Replacement and Central Pond/Sawmill Brook Restoration, Report.](#)
- 12 [US Fish & Wildlife Service \(12/1/2020\) National Wetlands Inventory Map , Manchester-by-the-Sea Central Street Bridge and Central Pond Area, Figure.](#)
- 13 [MassWildlife NHESP \(12/3/2020\) Project Area Relative to NHESP Mapped NLEB Habitat, MA Northern Long-eared Bat Winter Hibernacula, Figure.](#)
- 14 [Tighe & Bond \(12/7/2020\) Project Area Relative to Massachusetts Historic Commission Inventory Areas and Points, MACRIS Map, Figure.](#)

Feasibility Assessment References

- 15 [Tighe & Bond \(6/23/2015\) Sawmill Brook Central Street Seawall, Tide Gate & Culvert Observations, , Memo.](#)
- 16 [Tighe & Bond \(6/18/2018\) Sawmill Brook Flood Mitigation and Restoration Project, Task 2: Hydrologic Monitoring and Flushing Studies, MET Grant Report.](#)
- 17 [Tighe & Bond \(6/18/2018\) Sawmill Brook Flood Mitigation and Restoration Project, Task 3: Sediment Characterizations and Sediment Transport Studies, MET Grant Report.](#)
- 18 [Tighe & Bond \(1/14/2019\) Geotechnical Evaluation for Retaining Wall Improvements, Sawmill Brook- Central Pond Restoration, to Greg Federspiel, Town Administrator Technical Letter Report.](#)
- 19 [Tighe & Bond \(1/28/2019\) Coastal Resiliency Criteria for Manchester, to Greg Federspiel, Town Administrator, Memo.](#)
- 20 [Tighe & Bond \(1/28/2019\) Sawmill Brook Restoration Project Summary of Preliminary Concepts and Alternatives Recommendations, to Susan Beckmann, Chair, Manchester Board of Selectmen, Memo.](#)
- 21 [Tighe & Bond \(1/30/2019\) Sawmill Brook Restoration Project Review of Technical Feasibility of Tide Gate Removal, to Susan Beckmann, Chair, Manchester Board of Selectmen, Memo.](#)

Central Street Improvements, Sawmill Brook and Central Pond Restoration
Linked Reference List (click on item to view or download)

- 22 [Manchester Board of Selectmen \(2/19/2019\) Central Pond, Dam and Culvert Review, Recommendations for Preferred Alternate, Meeting Minutes.](#)
- 23 [Manchester-by-the-Sea Historic District Commission \(4/4/2019\) Central Street Bridge Replacement Project, to Board of Selectmen, Letter.](#)
- 24 [Tighe & Bond \(6/27/2019\) Sawmill Brook Central Pond Restoration , Phase 1: Planning and Design, MVP Case Study Report.](#)

Hydrologic Modeling References

- 25 [Tighe & Bond \(2/15/2016\) Sawmill Brook Culvert and Green Infrastructure Analysis, Task 4 Final Report: Evaluation of Locations for Flood Mitigation, CZM Grant Report.](#)
- 26 [Tighe & Bond \(2/15/2016\) Sawmill Brook Culvert and Green Infrastructure Analysis, Task 4 Final Report: Evaluation of Locations for Flood Mitigation - Appendicies, CZM Grant Report.](#)
- 27 [Tighe & Bond \(8/22/2019\) Central Street Bridge Replacement Hydrologic and Hydraulic Analysis, , Technical Memo.](#)

Engineering Design References

- 28 [Tighe & Bond \(5/1/2019\) Restored Sawmill Brook, Architectural Rendering, Graphic.](#)
- 29 [Tighe & Bond \(8/23/2019\) Central Street Bridge Replacement, Basis of Design Memo, Report.](#)
- 30 [Tighe & Bond \(3/28/2020\) Sawmill Brook- Central Pond, Permit Drawings, Plans.](#)
- 31 [Tighe & Bond \(4/1/2020\) Sawmill Brook Central Pond Restpration Project, Task 2: Living Shoreline Design, Technical Memo.](#)
- 32 [Tighe & Bond \(6/20/2020\) Sawmill Brook Central Pond Restoration , Phase 2: Permitting and Final Design, MVP Case Study Report.](#)

Central Street Improvements, Sawmill Brook and Central Pond Restoration
Linked Reference List (click on item to view or download)

33 [Tighe & Bond \(9/9/2020\) Central Street Bridge, Permit Drawings, Plans.](#)

Permitting References

34 [Manchester-by-the-Sea Finance Committee \(4/15/2013\) Annual Report 2013, Article 18. Funding appropriated to study the replacement and enlargement of Central Street Culvert/Tide Gate, Document.](#)

35 [Tighe & Bond \(12/2/2019\) Central Street Bridge Reconstruction & Central Pond/ Sawmill Brook Restoration Project, ENF Narrative, Report.](#)

36 [Tighe & Bond \(12/2/2019\) Site Photographs, Central Street Bridge and Pond \(Manchester-by-the-Sea\), ENF Appendix B, Report.](#)

37 [Tighe & Bond \(12/2/2019\) Transmittals of the Central Street Bridge Replacement and Central Pond/Sawmill Brook Restoration Project ENF, to BUAR, Mashpee-Wampanoag Tribe THPO, and Wampanoag Tribe of Gay Head THPO, Memo.](#)

38 [Lisa Berry Engler, Director, CZM \(12/30/2019\) EEA-161128, Central Street Bridge Reconstruction and Central Pond/Sawmill Brook Restoration Project, Manchester-by-the-Sea, Review Comments on the Referenced ENF, Memo.](#)

39 [Tighe & Bond \(5/15/2020\) 401 Water Quality Certification Application, Central Pond / Sawmill Brook Restoration Project, Application.](#)

40 [Manchester-by-the-Sea Conservation Commission \(6/4/2020\) Order of Conditions, Central Pond Restoration Project DEP File #039-0824, Authorization.](#)

41 [Manchester-by-the-Sea Conservation Commission \(11/18/2020\) Order of Conditions, Central & Elm St DEP File #039-0832, Authorization.](#)

Central Street Improvements, Sawmill Brook and Central Pond Restoration
Linked Reference List (click on item to view or download)

Public Outreach Reference

- 42 [Tighe & Bond \(6/21/2018\) Sawmill Brook Flood Mitigation and Restoration Project, Task 4: Public Outreach, MET Grant Report.](#)
- 43 [Tighe & Bond \(10/18/2018\) Sawmill Brook Central Pond Restoration Project, FY 19 MVP Action Grant Kickoff, Slides.](#)
- 44 [Tighe & Bond \(12/1/2020\) Summary of Grants, Public Outreach and Articles 2014-2020, , Summary.](#)

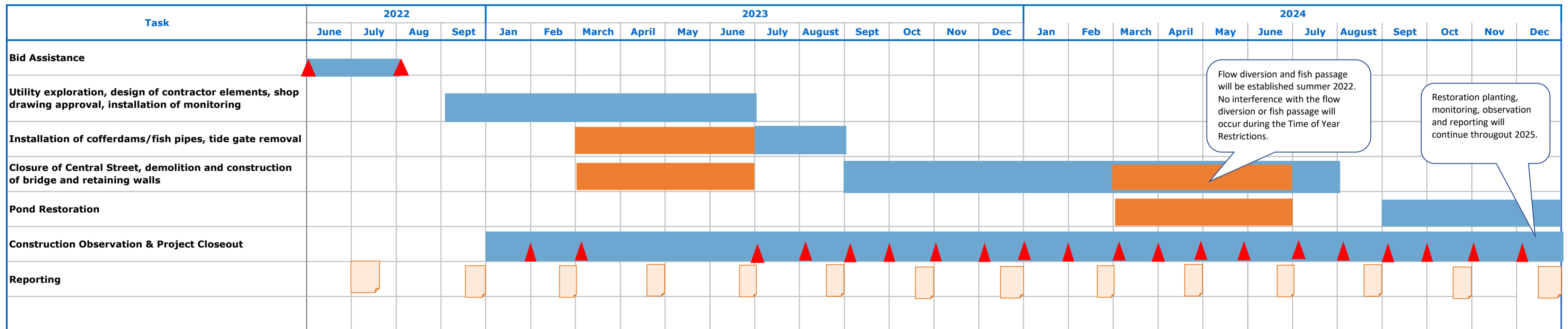
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APPENDIX D

APPENDIX D1

Central Street Bridge & Pond Restoration Schedule

Manchester-by-the-Sea Central Street Bridge Replacement and Central Pond/Sawmill Brook Restoration- Preliminary Project Schedule



Flow diversion and fish passage will be established summer 2022. No interference with the flow diversion or fish passage will occur during the Time of Year Restrictions.

Restoration planting, monitoring, observation and reporting will continue throughout 2025.

- ▲ Meetings/ Award
- Task duration
- Time of Year Restriction for Inwater Work

APPENDIX D2

Opinion of Probable Construction Costs

ENGINEER'S OPINION OF PROBABLE COST

**Central Street Bridge Improvements and Sawmill Brook Restoration
Manchester-by-the-Sea, MA**

Prepared By: DLM/GCB
 Date Prepared: 24-Nov-20
 Project No.: 221476-015
 Construction _____
 Change Order _____
 % Complete _____

Conceptual _____
 Preliminary (w/o plans) _____
 Design Development @ 75%

Item No.	Quantity	Units	Item Description	Unit Cost ¹	Total Cost
CENTRAL STREET BRIDGE IMPROVEMENTS					
B1	1	LS	Demolition of Bridge No. 1	\$ 175,000	\$ 175,000
B2	670	CY	Earth Excavation	\$ 45	\$ 30,150
B3	700	CY	Bridge Excavation	\$ 55	\$ 38,500
B4	200	CY	Class B Rock Excavation	\$ 150	\$ 30,000
B5	3	EA	Drainage Structure Removed	\$ 600	\$ 1,800
B6	380	CY	Gravel Borrow	\$ 45	\$ 17,100
B7	550	CY	Gravel Borrow for for Backfilling Structures and Pipes	\$ 45	\$ 24,750
B8	1540	SY	Fine Grading and Compacting	\$ 4	\$ 6,160
B9	2	EA	Catch Basin	\$ 4,000	\$ 8,000
B10	2	EA	Manhole	\$ 3,000	\$ 6,000
B11	1	EA	Special Manhole (Stormwater Treatment Unit)	\$ 15,000	\$ 15,000
B12	3	EA	Sanitary Sewer Manhole	\$ 4,500	\$ 13,500
B13	5	EA	Frame and Cover	\$ 800	\$ 4,000
B14	2	EA	Frame and Grate - Munciple Standard	\$ 800	\$ 1,600
B15	2	EA	12 Inch Hood	\$ 500	\$ 1,000
B16	50	FT	6 Inch Polyvinyl Chloride Sanitary Sewer Pipe	\$ 95	\$ 4,750
B17	250	FT	15 Inch Polyvinyl Chloride Sanitary Sewer Pipe	\$ 120	\$ 30,000
B18	30	FT	12 Inch Corrugated Plastic Pipe	\$ 80	\$ 2,400
B19	50	FT	15 Inch Corrugated Plastic Pipe	\$ 85	\$ 4,250
B20	20	FT	6 Inch Ductile Iron Water Pipe (Rubber Gasket)	\$ 120	\$ 2,400
B21	150	FT	12 Inch Ductile Iron Water Pipe (Rubber Gasket)	\$ 150	\$ 22,500
B22	500	LB	Ductile Iron Fittings for Water Pipe	\$ 8	\$ 4,000
B23	1	EA	12 Inch Gate and Gate Box	\$ 3,750	\$ 3,750
B24	120	CY	Dense Graded Crushed Stone for Sub-base	\$ 75	\$ 9,000
B25	100	SY	Pavement Micromilling	\$ 5	\$ 500
B26	120	TON	Superpave Surface Course - 12.5 (SSC - 12.5)	\$ 130	\$ 15,600
B27	210	TON	Superpave Intermediate Course - 19.0 (SIC - 19.0)	\$ 135	\$ 28,350
B28	600	FT	Curb Removed and Reset	\$ 30	\$ 18,000
B29	80	FT	Guardrail - TL-2 (Single Faced)	\$ 34	\$ 2,720
B30	3	EA	Guardrail End Treatment, TL-2	\$ 3,750	\$ 11,250
B31	3	EA	Transition to Bridge Rail	\$ 4,200	\$ 12,600
B32	250	FT	Sedimentation Fence	\$ 6	\$ 1,500
B33	100	FT	Floating Silt Fence	\$ 35	\$ 3,500
B34	200	SY	Cement Concrete Sidewalk	\$ 65	\$ 13,000
B35	20	SY	Cement Concrete Wheelchair Ramp	\$ 95	\$ 1,900
B36	1	LS	NPDES Stormwater Pollution Prevention Plan	\$ 5,000	\$ 5,000
B37	120	LF	12 Inch Reflectorized White Line	\$ 3	\$ 300
B38	580	LF	4 Inch Reflectorized Yellow Line	\$ 2	\$ 1,160
B39	1	LS	Temporary Bridge	\$ 65,000	\$ 65,000
B40	1	LS	Control of Water, Structure No. 1	\$ 150,000	\$ 150,000
B41	1	LS	Bridge Structure, Bridge No. 1	\$ 765,000	\$ 765,000
B42	1	LS	Wall Structure, Wall No. 1	\$ 450,500	\$ 450,500
B43	1	LS	Maintenance of Traffic - Central Street Detour (During Closure)	\$ 10,000	\$ 10,000
B44	1	LS	Maintenance of Traffic - Central Street Phasing (Temp. Signal)	\$ 60,000	\$ 60,000
B45	1	LS	Elm Street Shoring system	\$ 65,000	\$ 65,000
B46	1	LS	Temporary Utility Relocation - Water	\$ 20,000	\$ 20,000
B47	1	LS	Temporary Utility Relocation - Sewer	\$ 50,000	\$ 50,000
B48	1	LS	Temporary Utility Relocation - Gas	\$ 20,000	\$ 20,000
B49	1	LS	Temporary Utility Relocation - Electric	\$ 50,000	\$ 50,000
B50	1	LS	Temporary Building Access	\$ 75,000	\$ 75,000
B51	1	LS	Underpinning/Shoring and Monitoring Adjacent Structure No. 1	\$ 100,000	\$ 100,000
B52	1	LS	Underpinning/Shoring and Monitoring Adjacent Structure No. 2	\$ 100,000	\$ 100,000
B53	1	LS	Underpinning/Shoring and Monitoring Adjacent Structure No. 3	\$ 100,000	\$ 100,000
B54	1	LS	Maintenance of Traffic - Elm Street Closure (EMS Service)	\$ 150,000	\$ 150,000
B56	1	LS	Utility Relocation (Gas, Electric, Cable)	\$ 185,000	\$ 185,000
			CENTRAL STREET BRIDGE REPLACEMENT SUBTOTAL:		\$ 2,986,490

ENGINEER'S OPINION OF PROBABLE COST

**Central Street Bridge Improvements and Sawmill Brook Restoration
Manchester-by-the-Sea, MA**

Prepared By: DLM/GCB
 Date Prepared: 24-Nov-20
 Project No.: 221476-015
 Construction _____
 Change Order _____
 % Complete _____

Conceptual _____
 Preliminary (w/o plans) _____
 Design Development @ 75%

Item No.	Quantity	Units	Item Description	Unit Cost ¹	Total Cost
POND RESTORATION/BIOSTABILIZATION					
P1	0.66	A	Site Preparation	\$ 30,000	\$ 19,800
P2	1010	CY	Unclassified Excavation	\$ 40	\$ 40,400
P3	1	EA	Tree Removal	\$ 2,000	\$ 2,000
P4	140	FT	Remove and Replace Guardrail	\$ 70	\$ 9,800
P5	1	EA	Remove & Reset Transformer	\$ 15,000	\$ 15,000
P6	2	EA	Remove Light Pole and Abandon Utilities	\$ 2,000	\$ 4,000
P7	1	EA	Remove Utility Pole and Abandon Utilities	\$ 2,000	\$ 2,000
P8	590	CY	Redistribute Sediment from Wall/Riprap Construction	\$ 50	\$ 29,500
P9	1	LS	Cofferdam	\$ 75,000	\$ 75,000
P10	1	LS	Turbidity Curtain	\$ 3,000	\$ 3,000
P11	270	FT	Erosion Control Barrier	\$ 10	\$ 2,700
P12	290	SY	Construction Access	\$ 10	\$ 2,900
P13	450	SY	Construction Mat	\$ 20	\$ 9,000
P14	1	LS	Stormwater Improvements	\$ 50,000	\$ 50,000
P15	710	FT	5,000 psi Block Retaining Wall	\$ 410	\$ 291,100
P16	1	LS	Access Stairs	\$ 15,000	\$ 15,000
P17	810	TON	Crushed Stone	\$ 45	\$ 36,450
P18	2580	CY	Drainage Material	\$ 35	\$ 90,300
P19	10	FT	12" Pipe	\$ 80	\$ 800
P20	2630	SF	Existing Wall Repair	\$ 24	\$ 63,120
P21	310	CY	2'-3' Boulders	\$ 150	\$ 46,500
P22	100	CY	Type I Riprap	\$ 60	\$ 6,000
P23	200	CY	Type II Riprap	\$ 60	\$ 12,000
P24	50	TON	Hot Mix Asphalt Binder Course	\$ 130	\$ 6,500
P25	40	TON	Hot Mix Asphalt Top Course	\$ 130	\$ 5,200
P26	2	EA	Bollard	\$ 1,250	\$ 2,500
P27	40	FT	Wood Guard Fence	\$ 160	\$ 6,400
P28	400	FT	Split Rail Fence	\$ 55	\$ 22,000
P29	1000	SY	Loam & seed	\$ 12	\$ 12,000
P30	1725	CY	Excavation (Rootwads)	\$ 30	\$ 51,750
P31	1160	SY	Seeding & Erosion Protection	\$ 5	\$ 5,800
P32	80	HR	Backhoe (small) with Operator (biostab)	\$ 96	\$ 7,680
P33	80	HR	Dump Truck (single axle) with Driver	\$ 96	\$ 7,680
P34	80	HR	Dump Truck (tri-axle) with Driver	\$ 112	\$ 8,960
P35	80	HR	Skid Loader with Operator	\$ 96	\$ 7,680
P36	2	TN	Sediment Trap	\$ 1,000	\$ 2,000
P37	270	LF	Silt Fence	\$ 8	\$ 2,160
P38	40	HR	Construction Dewatering During tidal (biostab & gravity wall)	\$ 375	\$ 15,000
P39	1325	CY	Gravel Borrow Fill (gravity wall)	\$ 35	\$ 46,375
P40	332	TN	Boulder Toe and Misc. Stabilization	\$ 60	\$ 19,920
P41	36	EA	Type 1 & 2 Logs (Root Wads & Bank Jam)	\$ 930	\$ 33,480
P42	12	EA	Type 4 Logs	\$ 200	\$ 2,400
P43	0.6	AC	Streamside Landscaping	\$ 7,200	\$ 4,320
P44	1600	EA	Central Pond Marsh Spartina Planting (2'O.C.)	\$ 1	\$ 1,360
P45	442	EA	Live Stakings	\$ 3	\$ 1,459
P46	0.2	AC	Low Bush Planting (300 bare root seedlings)	\$ 1,600	\$ 320
P47	60	EA	Balled and Burlap Trees (1.5" diameter)	\$ 150	\$ 9,000
P48	1200	SY	Jute fiber erosion control blanket	\$ 2	\$ 1,800
P49	800	SY	Coir fiber erosion control blanket	\$ 5	\$ 3,688
P50	1	LS	Outfall Dissipation	\$ 3,500	\$ 3,500
			POND RESTORATION/BIOSTABILIZATION SUBTOTAL:		\$ 1,117,302

ENGINEER'S OPINION OF PROBABLE COST

**Central Street Bridge Improvements and Sawmill Brook Restoration
Manchester-by-the-Sea, MA**

Prepared By: DLM/GCB
 Date Prepared: 24-Nov-20
 Project No.: 221476-015
 Construction _____
 Change Order _____
 % Complete _____

Conceptual _____
 Preliminary (w/o plans) _____
 Design Development @ 75%

Item No.	Quantity	Units	Item Description	Unit Cost ¹	Total Cost
CONSTRUCTION SUBTOTAL:					\$ 4,103,792
			Mobilization (5%)		\$ 205,190
			General Conditions (10%)		\$ 410,379
CONSTRUCTION TOTAL:					\$ 4,719,360
MONITORING					
	50	HRS	Year 1 - pictures/field measurements inc. vegetation-Report	\$ 205	\$ 10,250
	70	HRS	Year 2 - Survey structures, picture, measurements-Report	\$ 205	\$ 14,350
	50	HRS	Year 3 - pictures/field measurements inc. vegetation - Report	\$ 205	\$ 10,250
	70	HRS	Year 4 - Survey structures, picture, measurements-Report	\$ 205	\$ 14,350
	40	HRS	Year 6 - pictures/field measurements inc. vegetation - Report	\$ 205	\$ 8,200
MONITORING SUBTOTAL:					\$ 57,400
ENGINEERING & OTHER SERVICES					
			Public Outreach (Website updates, 4 public meetings, press releases)		\$ 50,000
			Letter of Map Revision (LOMR)		\$ 39,000
			Historic and Architectural Survey		\$ 10,058
			Architectural Observation (1% of Central Street Bridge)		\$ 29,865
			Construction Phase Services (10%)		\$ 471,936
ENGINEERING SUBTOTAL:					\$ 550,859
TOTAL CAPITAL COST					\$ 5,327,619
CONTINGENCY (5%)					\$ 266,381
TOTAL CAPITAL COST WITH CONTINGENCY					\$ 5,594,000
PRE-AWARD COSTS					\$ 7,000
TOTAL WITH PREAWARD COSTS ADDED					\$ 5,601,000
Notes:				\$ 4,419,299	Action #1
1. Unit prices are based on Mass DOT Weighted Bid Prices as of June 2019				\$ 1,174,702	Action #2

APPENDIX D3
Maintenance Schedule and Costs

Annual Maintenance Costs

Annual Maintenance for Bridge/ Culvert

Item	Quantity	Unit	Unit Cost	Total
Painting	20	HR	50 /HR	\$ 1,000
Clear Debris	20	HR	50 /HR	\$ 1,000
Clean Catch basins	2	EA	500 /EA	\$ 1,000
Subtotal				\$ 3,000

Annual Maintenance for Restoration- Assume volunteer effort for planting

Item	Quantity	Unit	Unit Cost	Total
Central Pond Marsh Spartina Planting (2'O.C.)	320	EA	0.85 /EA	\$ 272
Live Stakings	88.4	EA	3.3 /EA	\$ 292
Low Bush Planting (300 bare root seedlings)	0.04	AC	1600 /AC	\$ 64
Balled and Burlap Trees (1.5" diameter)	6	EA	150 /EA	\$ 900
Debris Removal	20	HR	50 /HR	\$ 1,000
Subtotal				\$ 2,528
Total				\$ 5,528.00

Operation and Maintenance Schedule

Bridge/ Culvert O&M Details

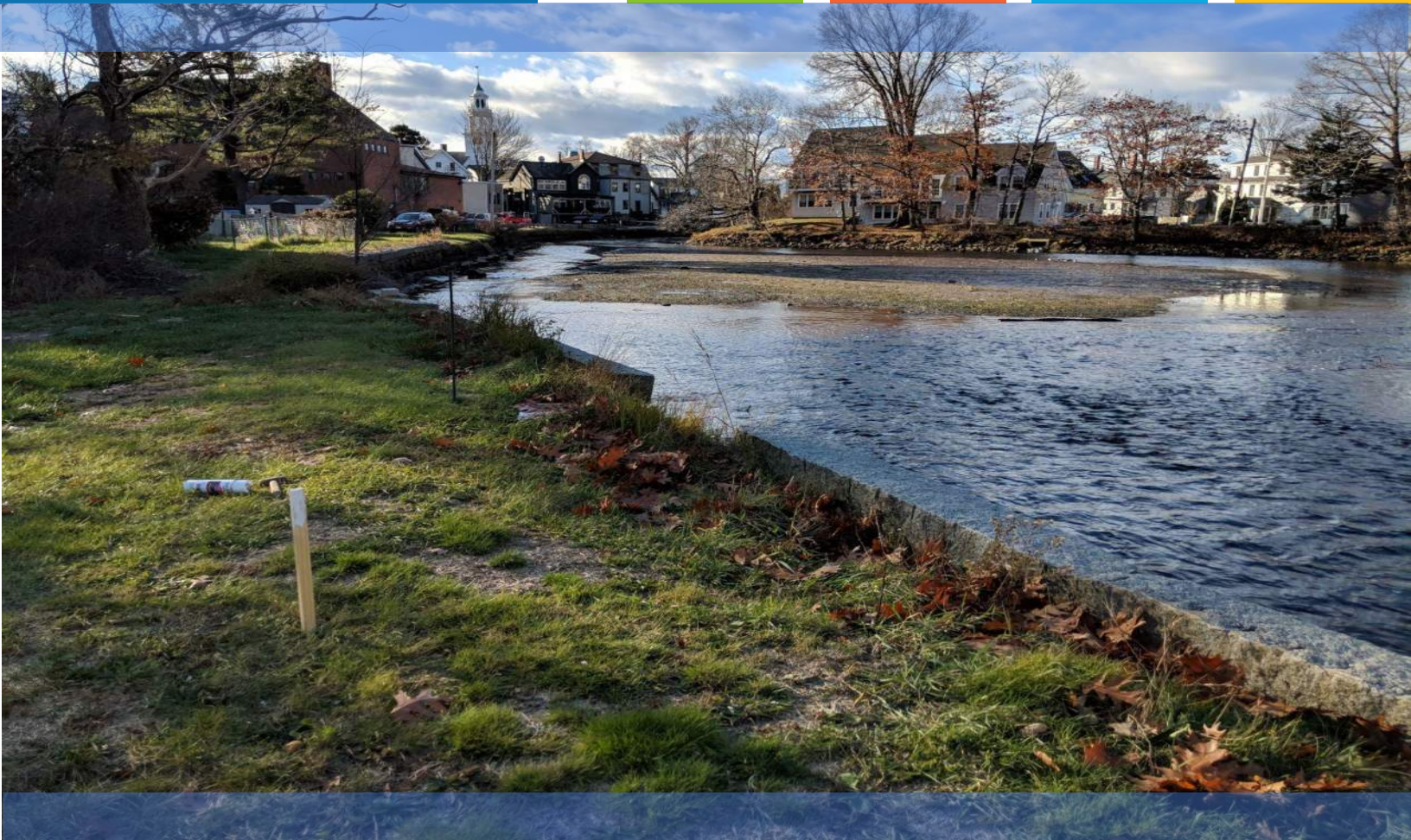
Description	Frequency
Painting Superstructure	Annual or as needed
General cleanup trash and debris	Post major storm event and quarterly
Removal sediment from catchbasins	Annual

Pond/Brook O&M Details

Description	Frequency
Revegetation of Saltmarsh	Annual in the Fall
Revegetation of Living Shorelines	Annual in the Spring
Removal of debris from woody structure	Post major storm event and quarterly
General cleanup of trash and debris	Post major storm event and quarterly

APPENDIX D4

Restoration Monitoring & Maintenance Plan



Central Pond/Sawmill Brook Restoration Project
Central Street, Manchester-by-the-Sea

WETLAND MONITORING & RESTORATION MAINTENANCE PLAN

Town of Manchester-by-the-Sea
10 Central Street
Manchester-by-the-Sea, Massachusetts

May 2021

Tighe&Bond

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Section 1

Introduction

This *Wetland Enhancement and Restoration Plan* design has been developed by Tighe & Bond on behalf of the Town of Manchester-by-the-Sea (Town) for the proposed ecological restoration at Sawmill Brook and Central Pond in Manchester by the Sea. The Town is seeking to rehabilitate and/or replace the existing retaining wall sections on Central Pond and Sawmill Brook, construct a living shoreline in other areas of the Pond for slope protection and ecological enhancement, place structural elements in the Pond to improve stability, habitat, and to promote natural stream geomorphologic processes, and plantings to promote the establishment of native tidal wetland plants. This work is part of a larger tidal restoration project that also includes the replacement of the Central Street Bridge and removal of the tide gate structure at that bridge. All Waters of the United States (WotUS) within the project area limits will be targeted for restoration and/or enhancement, as described in the following sections of this report. In addition, this report includes a monitoring and operational plan to ensure the long-term success of this project.

1.1 Central Pond Restoration Project DEP File # 039-0824 - Order of Conditions Monitoring Requirements

The Central Pond Restoration Order of Conditions (OOC) preconstruction requirements and special conditions requires a monitoring plan, among other documents. The full OCC is included in Appendix B. Following are numbered items from the OCC that are addressed within this restoration planning document. This wetland restoration plan extends the monitoring plan to five years based on the requirements from the US Army Corps of Engineers Section 404 permit, found in Attachment C.

Manchester Conservation Commission General and Special Conditions:

B. Pre-Construction Requirements:

12. c) Apex Jam Structures. Construction details for the Apex Jam Structures similar to those provided for “Bank Treatment A- Rootwad detail’ and Bank Treatment C – Encapsulated Soil Lift” shall be provided by the applicant and shall include anchoring details if the structures are to be anchored. In addition, a Monitoring Plan specific to the Apex Jam Structures shall be provided detailing bank/ access protection during construction, who is responsible for monitoring effectiveness of the Structures, and who is responsible for removing woody debris that collects on the apex jams.

- Section 4.3.2 details the maintenance of the apex jams in perpetuity. Section 5 addresses the initial monitoring of the apexes and the effectiveness of the structures. Section 5.2 details the quantitative measurements that will be used to evaluate the effectiveness.

12. e) Monitoring. The applicant shall establish fixed photographic monitoring locations and submit photo-documentation of existing conditions. The fixed

locations shall be used to photo-document construction, final project conditions and restoration of disturbed areas.

- Section 5 within the plan discusses the monitoring of the area following the completion of construction. It describes the qualitative (Section 5.1) and quantitative (Section 5.2) methods of monitoring. Section 5.1 details the photo documentation, stating that a benchmark will be set on each stream bank approximately every 500 feet through the reach providing monumentation for fixed position coordinates which comparison photo documentation can occur.

C. Special Conditions

14. Western bank living shoreline plantings and those mitigation plantings installed into the 30-foot No Disturb Zone shall be monitored for two growing seasons to guarantee at least an 85% survivorship. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plan monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five(5) years following the issuance of a Certificate of Compliance.

- Section 4.2.2 details out the shrub replacement for the western bank living shoreline. Section 5 within the plan discusses the monitoring of the area following the completion of construction and ensuring the 85% survivorship of the plantings within the western bank living shoreline.

15. Western bank streambank stabilization components including root wads and apex jams shall be monitored for erosion and scour for two years. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plan monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.

- Section 5 within the plan discusses the monitoring of the area following the completion of construction. It describes the qualitative (Section 5.1) and quantitative (Section 5.2) methods of monitoring.

16. A monitoring plan for invasive species management shall be submitted to the Conservation Administrator for approval. The monitoring plan shall include details for removing invasive species if found in the planting area. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.

- Section 4.2.1 details out the invasive species management within the project area. Invasive species will be removed via mechanical means, unless permission is obtained from the Town to apply herbicides.

Section 2

Evaluation of Existing Conditions

2.1 General

The project is located within Sawmill Brook/Central Pond in Manchester-by-the-Sea, Massachusetts. Sawmill Brook and associated tributaries have a watershed area of approximately five square miles which drains much of the central portion of Manchester-by-the-Sea. The mouth of Sawmill Brook drains through a narrow small bridge and tide gate under Central Street. The tide gate has been open since February 27, 2018. The main area known as Central Pond extends upstream from Central Street Bridge to Knights Circle.

The Pond is relatively flat, with a shallow gradient from ranging from three feet (NAVD88) where Sawmill Brook enters Central Pond to 0.2 feet at the Central Street bridge inlet. Two main "islands" are present at low tide; one triangular feature at the entrance to the pond and one kidney shaped feature in approximately the center.

Sediment accumulation has been noted along the shoreline on the western bank of the pond and to the north of the pond, and eroded banks have been observed predominantly along the eastern bank of the pond, due to collapse of retaining walls. Wall types found around Central Pond include granite block, poured concrete, brick, field stone and shale revetment and combinations of the above. The eastern shoreline is cut sharply into the Pond, with the wall defining the eastern bank boundary. The eastern shoreline is completely lined with wall structures ranging from three to five feet in height, with the tallest walls adjacent to Central Street along the channel that parallels Elm Street. These walls support the fill slopes that contain residential and commercial properties.

The western shoreline has a more gradual slope, and includes several shoals formed from finer sediments deposited as Sawmill Brook flows under low water flow, gathering in pockets along the shore. Aggradation has formed of a central bar from the center to the eastern third of the pond and propagation of saltwater cordgrass (*Spartina alterniflora*) has occurred since the removal of the flap on the tide gate structure. Three stormwater discharge outfalls along the western shore are also sources of sediment from street runoff. Walls along the western shoreline vary from loose cobbles and revetment to low fieldstone.

2.2 Waters of the United States

Waters of the United States (WotUS) were delineated by Tighe & Bond on April 18 and 19, 2018. Resource areas were delineated in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0, USACE, January 2012).

WotUS identified at the site were limited to the Mean High Water (MHW) marks associated with this segment of Sawmill Brook, a navigable waterway subject to tidal action. Note that the Sawmill Brook and Central Pond are both in transition from inland wetland resource areas to coastal resource areas and that as the restoration of tidal influence

improves with removal of the tide gate, areas that may have previously been inland resource areas are now being characterized as coastal resource areas.

The National Wetlands Inventory (NWI) Map classifies the wetlands (using the Cowardin et al. (1979) system for wetlands and deep-water habitats) within the project area include:

- E1UBL, Estuarine Subtidal Unconsolidated Bottom, Tidal Salt
- R5UBH, Riverine Unknown Perennial Unconsolidated Bottom, Permanently Flooded

The majority of the project area within the limits of Central Pond is identified on the NWI map as E1UBL. The Sawmill Brook is identified on the NWI map as R5UBH.

2.3 Hydrology

The Sawmill Brook is shown as a perennial stream on the USGS topographic map (Marblehead North, Massachusetts; 1985). The project area is within a tidal portion of Sawmill Brook as the mouth of coastal rivers mapping indicates that the tide gate and bridge at Central Street is the mouth of the coastal river.

The mean high water (MHW) mark was determined following a review of available tide charts, tidal datum, and hydraulic modeling. The MHW marks on the project plans are approximately elevation 4.33 feet (NAVD88). Mean Higher-High Water (MHHW) is approximately 4.77 feet (NAVD 88). Mean Lower-Low Water (MLLW) in the bay is estimated to be approximately -5.51 feet (NAVD88) based on the NOAA long-term tide water level monitoring station for Boston, MA (ID 8443970). With the tide gate open the upstream bridge invert would become the control, so MLLW would need to be greater than the elevation of the upstream bridge invert, -0.2 feet for current tide elevations to have affect in the stream further upstream. Tighe & Bond used data loggers upstream of Central Street from November 27, 2017 to May 4, 2018 to monitor water levels. Based on available data when the tide gate was open, MLW would be at approximately 1.5 feet within the pond.

Tighe & Bond observed areas below the MHW during low tide conditions. Observations during these low tide conditions included the establishment of cordgrass (*Spartina alterniflora*) within the tidal flats. No shellfish or other submergent aquatic vegetation were observed. The land below the MHW associated with Central Pond consists of a mixture of fine-grained sandy sediment and organic muck. The land below MHW within Sawmill Brook, south of Central Pond, consist of primarily rock, gravel, and cobble with limited deposits of coarse sand.

2.4 Soil Survey

According to the USDA NRCS [online] Soil Survey of Essex County (MA606), Massachusetts, the project as area is mapped as Water (1), Boxford silt loam (220B), and Merrimac fine sandy loam (254B). Brief descriptions of these soil units follow. The current sediment and soil profile in the Central Pond are a blend of accretion of sediments from tides and aggradation from terrestrial flows that has taken decades to produce.

Boxford Silt Loam (220B) consists of areas where the slope is three to eight percent that are moderately well drained. The parent materials are soft silty and clayey lacustrine deposits or marine deposits over lacustrine deposits. The most extensive areas of this map unit are found along the western shoreline of Central Pond/Sawmill Brook. A water table may be present in the within two to three feet. Minor soils and included areas comprise about 10 percent of the unit.

Merrimac fine sandy loam (254B) This map unit consists of moderate slopes (3 to 8 percent) of excessively drained. Parent material consists of loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and glaciofluvial deposits. This unit is most extensively mapped on the eastern shoreline of Central Pond/Sawmill Brook. Minor soils comprise about 10 percent of this unit.

2.5 Functions and Values

Alterations of the hydrology and banks at Central Pond/Sawmill Brook in the project area limit the wetlands functions and values of the current system. Based the Corps' *"The Highway Methodology Workbook Supplement: Wetlands Functions and Values,"* the WotUS within the project area provide a number of functions and values, including:

- Groundwater Recharge/Discharge
- Floodflow Alteration
- Sediment/Toxicant Retention
- Nutrient Removal/Retention/Transformation
- Sediment/Shoreline Stabilization
- Wildlife Habitat
- Visual Quality/Aesthetics

The goals of the restoration seek to improve many of these functions and values particularly shoreline stabilization. In addition, the restoration includes the removal of a tide gate which currently inhibits fish passage. The restoration will significantly improve fish habitat by improving fish passage conditions at this transition from Sawmill Brook to Manchester Harbor.

Section 3 Enhancement & Restoration Area Design

A primary purpose of the Central Pond Restoration project is the ecological enhancement of wetland areas currently impacted by erosion, slope failure, and sediment/debris fill and to improve stability, habitat, and to promote natural stream geomorphologic processes within Central Pond. Wetland enhancement and restoration will be completed concurrently with the proposed shoreline stabilization work. While areas of Central Pond will need to be impacted to implement the shoreline stabilization, this provides a unique opportunity to restore and/or otherwise enhance this wetland system to provide increased functions and values through added habitat complexity.

Enhancement and restoration efforts are comprised of several elements:

- restoration of the channel and associated in-stream habitat
- improvement of Central Pond bank stability
- installation of an apex jam for habitat complexity and stability
- planting with native species to restore and enhance habitat
- creation of a living shoreline adding complexity and habitat at the edge of the project area

3.1 Enhancement and Restoration Details

Enhancement will involve the installation of a woody apex jam and of rootwads, coir logs and/or coir-wrapped soils lifts to stabilize undercut or dissipate energy in high-energy sections and the in areas below OHW. Mudflat areas will be enhanced with native plantings with coir logs and/or blankets in some areas to improve the habitat structure in the intertidal area and stabilize sediments in the portions of the Central Pond outside of the create a diverse wetland complex with a native vegetative community structure that is designed to provide improved habitat.

Appropriate structures are necessary to allow time for riparian and marsh vegetation to establish, prevent later channel movement, dissipate flow energy, and provide instream and overhead cover for fish. Toe wood uses appropriately sized wood to stabilize streambanks at high velocity-high shear locations on outer bends. The structure will dissipate the anticipated high bank shear once the stream planform stabilizes with the pools anticipated to develop along the outer bank. Toe wood design uses embedded large wood as structure to dissipate bank stresses. Wood is often found in systems that have deposited themselves from upper watershed riparian recruitment. These structures add flow resistance to prevent streambank erosion and contains native planted vegetation on the upper part of the bank. The logs are buried deep and counter-buttressed with fill and vegetation to avoid the buoyancy factor ensuring that the wood remains intact throughout the various flow regimes.

Bank stabilization along the western shoreline of Central Pond will be achieved through the placement of rootwads, coir logs and/or coir wrapped soil lifts to stabilize undercut or dissipate energy in high-energy sections of the stream channel. Native plants appropriate for the planting zones (tidal elevations) will be inserted into these logs and/or soil lifts. Planting zones will be established based on the ability of the plant to thrive in the brackish zone at the toe upward through the upland zone of the upper bank. The proposed plantings include plantings at the top of the slope, at elevations above MHHW, to reduce the existing top of bank erosion.

Habitat complexity will be encouraged through rootwads to help create deep scour pools and near bank shear dissipation. Large rootwads will extend into the channel on an outside bend of the western shoreline. Rootwads are placed roughly thirty-five degrees from bank facing upstream to the channel atop the toe, or inserting a key log placed longitudinally in the channel toe (rootwad facing upward). The bank will require some excavation to bury the trees using buried rock ballast and native backfill.

The bank will then be regraded and planted with native woody plants installed to encourage riparian vegetation. The coir logs will be secured and then top-dressed with loam and planted with plugs. The loam will be covered with coir blankets and then overseeded and planted as shown on the planting plans. Appropriate structures are necessary to allow time for riparian and marsh vegetation to establish, prevent later channel movement, dissipate flow energy, and provide instream and overhead cover for fish. Planting in the living shoreline areas will occur during construction of those elements as a critical component of those structures.

Planting on the tidal flats will include smaller areas of initial planting (test plots) with follow up monitoring to determine if the elevation of the tidal flat is high enough to allow for *Spartina alterniflora* to survive the high tide inundation periods. Smaller planting areas can also be used to determine if the addition of plants helps retain sediment in Central Pond. Typical species that will be used for the plantings are listed below in Section 3.6.

3.2 Waters of the U.S. Impact Calculations

There will be a total impact area of 26,522 sf within land below MHW for this project as a result of the living shoreline and restoration of the tidal wetland. Of this total impact area, a portion of the land below MHW will be converted to a tidal wetland (approximately 11,300 sf depending on vegetation growth). There is a conversion of land below MHW to a tidal wetland as a result of this project due to the stream restoration, native plantings, and living shoreline installation. Table 3-1 presents an overview of net gains and losses in WotUS at the site.

TABLE 3-1
Waters of the U.S. Impacts, Creation, and Net Loss/Gain

WotUS Type	Existing Areas to be Impacted		Proposed Area Post-Construction	Net Loss (-)/Gain (+)
	Temporary	Permanent		
Tidal Wetland	0 sf	0 sf	11,300 sf	+ 11,300 sf
Land Below MHW	10,997 sf	15,525 sf	15,222 sf	- 11,300 sf
Bank	95 lf	1,430 lf	1,525 lf	

3.3 Wetland & Channel Area Hydrology

The hydrology of the proposed enhancement and restoration area has been designed to guide the system towards pre-tide gate conditions to the extent practicable. The hydrology is driven both by inputs from the tidal flow, and by stream flows. The system is influenced both by the tidal cycle and the variations in freshwater flows from Sawmill Brook. The proposed approach of adding large wood structures and plantings will allow some channel migration towards the center of the relic pond area for the channel to establish natural equilibrium. This area will also provide floodplain area for higher storm and tidal events. It is expected that any channel migration will likely be slow and over long periods of time. Therefore, riparian and tidal planting, at appropriate elevations, in these areas will provide root mass, depth, and density creating soil stability through the use of native vegetation and enhance habitat creation.

3.4 Hydric Soil and Sediment Structure

The existing soils within the footprint of the impacted jurisdictional areas consist of a blend of accretion of sediments from tides and aggradation from terrestrial flows that has taken decades to produce. No amendments are proposed to the existing soil in the pond area and excavated materials (dredge) required for construction and installation of material such as root wads are proposed to be reused onsite to the extent practicable.

3.5 Wetland Area Community Type

The Estuarine Subtidal Unconsolidated Bottom (E1UBL) is proposed to be vegetated and converted to an Estuarine Intertidal Emergent (EIEM1) wetland. As there is no existing wetland vegetation of value, stockpiling and transplanting is not proposed. This area will be planted with plugs as described in Section 3.6. A list of live planting species proposed is provided in the herbaceous species section in Table 3-2 below.

3.6 Proposed Wetland Plant Community

The proposed plantings for the impacted wetland areas consist of a mix of woody and herbaceous plant species. Live plantings are summarized in Table 3-2. The planting locations are shown on the planting plans.

TABLE 3-2

List of Proposed Native Plantings by Community Type

	Common Name	Scientific Name	Indicator Status ¹
Tidal Marsh	Smooth cordgrass	<i>Spartina alterniflora</i>	OBL
	Three-square club-bulrush	<i>Schoenoplectus pungens</i>	OBL
Higher Wetland Elevations to Wetland Boundary	Switch panicgrass	<i>Panicum virgatum</i>	FAC
	Seaside goldenrod	<i>Solidago sempervirens</i>	FACW
	Maritime marsh-elder	<i>Iva frutescens</i>	FACW
	Coastal sweet pepperbush	<i>Clethra alnifolia</i>	FAC
	Swamp rose-mallow	<i>Hibiscus mosheutos</i>	OBL
	Eastern false willow	<i>Baccharis halimifolia</i>	FACW

¹Lichvar, R.W. 2013. *The National Wetland Plant List: 2018 wetland ratings*. Phytoneuron 2013-49: 1-241. Northcentral and Northeast subregion.

3.7 Functions and Values

Successful enhancement and restoration of the altered areas is anticipated to provide improved and additional functions and values, including:

- Groundwater Recharge/Discharge
- Floodflow Alteration
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention

- Nutrient Removal/Retention/Transformation
- Wildlife Habitat
- Shoreline Stabilization
- Recreation
- Educational/Scientific Value
- Visual Quality/Aesthetics

The restoration seeks improve many of these functions and values as detailed in Sections 3.3, 3.4, 3.6, and 3.8. In addition, the proposed project includes a new staircase to allow public access to Central Pond and improve recreation and educational opportunities within the area.

3.8 Goals and Criteria for Enhancement and Restoration Success

A number of goals and supporting criteria will be considered to evaluate the relative of success of the enhancement and restoration areas. These factors will be the focus of post-construction monitoring events and will serve to inform the degree of permit compliance and/or need to implement contingencies or other adaptive management measures. Project goals are summarized below in bold, as well as the general supporting criteria that will be used to evaluate achievement of each goal. Sections 4 and 5 provide additional detail on the success criteria and associated construction oversight, monitoring, and reporting.

- **Provide Bank Stability**
 - As-built drawings and post-construction photos will document completion of this goal demonstrating that grading, coir logs, fiber blanketing, seeding, and live staking were installed as depicted on project plans.
 - Photo-documentation over the 5-year monitoring period of the restored banks will provide additional proof of meeting this objective. Signs of erosion, undercutting, slumping, or scouring will be the focus of monitoring to document channel stability.
- **Restore Channel**
 - As-built drawings, specifically cross-sections and channel profiles, will demonstrate the stream channel conditions via post-construction elevations.
 - Measure the width/depth ratio of the channel over the 5-year monitoring period.
 - Measure the bank erosion through the bank height ratio and floodplain connectivity under low tide over the 5-year monitoring period.
- **Restoration of Aquatic In-Stream Habitat**
 - As-built drawings, specifically cross-sections and channel profiles, will demonstrate the restoration of in-stream habitat.
 - Permanent photo plots will be established within various reaches of the channel to document in-stream habitat over the 5-year monitoring period.

- Signs of wildlife use or in-stream plant establishment will also be documented and reported over the 5-year monitoring period.
- Measure the pool/riffle ratio within Sawmill Brook.
- Aerial photographs will also be utilized, as available, to document potential indicators of hydrology within the restored channel associated with the in-stream habitat.
- **Vegetation Monitoring**
 - Post-construction (Year 0) monitoring by a wetland scientist will verify that all plantings have been installed as proposed on the planting plan.
 - The 5-year monitoring plan outlined in Section 5 will quantitatively and qualitatively document establishment of native vegetation within the wetland enhancement areas.
 - Replace western bank living shoreline plantings below an 85% survival rate and if there is more than 10 lf along the bank of no active growth for shrub and tree plantings for five growing seasons.
 - Additional colonization/recruitment of native plants will also serve as a metric of success, should that be documented during monitoring.
- **Management of Invasive Plant Species**
 - Maintain control of invasive plants over the monitoring period with 5% cover or less over the restoration area.
 - The 5-year monitoring plan outlined in Section 5 will quantitatively and qualitatively document invasive vegetation within the wetland enhancement areas.
 - Remove any invasive species within the project boundaries during the monitoring period.
- **Creation of Diverse Habitat**
 - As built-drawings will document establishment of channel habitat, scrub-shrub/emergent marsh wetland areas, and upland riparian areas.
 - Post-construction (Year 0) observations will verify native plantings installed as proposed on project plans to create varying vegetation communities.
 - The 5-year monitoring plan will document improvements in habitat structure.

Section 4 Plan Implementation

4.1 Construction-Phase

A designated wetlands specialist will monitor enhancement and restoration area construction activities in the field. At a minimum, the wetland specialist (*i.e.*, Environmental Monitor) shall have a minimum of five (5) years of experience with wetlands enhancement and restoration. If scheduling allows, it is recommended this plan be implemented during either the early or late growing season, depending on the construction schedule in order to avoid seasonal high temperatures and/or low precipitation rates that might adversely affect the viability of seed germination.

4.1.1 Construction Sequence

The following steps represent the anticipated sequence of actions necessary to complete the wetland enhancement and channel restoration in accordance with this plan. Minor variations may be necessary to adjust to field conditions such as weather.

1. Install erosion and sedimentation controls and establish work areas
2. Schedule and conduct site walks with pertinent regulatory agencies to inspect construction-phase BMPs
3. Complete site preparation on east and west sides of the pond prior to initiating in-pond work, including temporary and permanent access routes
4. Install apex jam, utilizing approved temporary matting for construction access
5. Install coffer dams and turbidity curtain or other water control elements
6. Perform grading and install bank habitat features as shown in the plans while removing the existing upstream bank
7. Construct wood structures in main channel as shown in plans
8. Restore and rebuild the wall in segments
9. Remove coffer dam, temporary stream access points and in-channel BMPs
10. Restore disturbed areas in-kind and revegetate areas with plantings as described above and depicted on the plantings plan
11. Remove erosion and sedimentation controls pending approval from the Manchester-by-the-Sea Conservation Commission
12. Manual planting of tidal marsh grasses on tidal flat beginning with test plots

4.2 Maintenance & Contingencies

While the vegetation becomes established, maintenance may be required. Typical maintenance activities could include providing irrigation (e.g., watering in) woody and herbaceous species or, over time, the hand-removal of non-native and/or invasive species.

4.2.1 Invasive Species Control

As with any recently disturbed soil surface, there is the potential for colonization by non-native and/or invasive plant species. Monitoring of this area will be required following completion of construction, and the environmental monitor will search for and document establishment of any invasive plants (*i.e.* Phragmites and Japanese knotweed) and make recommendations for their removal and any other corrective actions, as needed. Invasive species will be removed via mechanical means, unless permission is obtained from the Town to apply herbicides.

In addition, construction period invasive species control measures will be implemented. Construction vehicles and equipment are recommended to be clean and free of any plant or soil debris prior to entering the project site, and are recommended to be cleaned prior to leaving the site to prevent the introduction or off-site transport of invasive plant fragments or seed. In addition, items such as boots or other personal equipment are also recommended to be cleaned prior entering or leaving the site.

4.2.2 Shrub Replacement

Should any shrubs appear to be dead or dying, recommendations for their replacement will be made by the Environmental Monitor. It is recommended plant materials are replaced within two to three weeks of the recommendation for their replacement, so that they are planted during the active growing season and have increased chances of becoming established. Timely shrub replacement will also serve to offset any temporal loss in habitat value that would otherwise occur from retaining dead or dying shrubs on site.

4.2.3 Apex Jam

The apex jam will be monitored and maintained by the Town of Manchester-by-the-Sea following the completion of construction. The apex jam will be monitored on an annual basis, with inspections occurring after major flood events and as needed. Urban and woody debris that collects within the apex jams will be removed during low tide utilizing best management practices to limit the impact on nearby areas.

4.2.4 Gravity Retaining Walls

The retaining walls will be monitored and maintained by the Town of Manchester-by-the-Sea following the completing of construction. The retaining walls will be monitored on an annual basis, with inspections occurring at low tide after major precipitation events or as needed. Any erosion in front of the wall or subsidence behind the wall will be noted.

Section 5 Monitoring

The Sawmill Brook/Central Pond plan will include both physical and biological response components. The physical habitat section will focus on the interaction of alluvial sediment, flow and wood, while the biological component will focus on the relationships between wood habitats and non-wood habitats as well as succession of vegetation planted or seeded post construction. Physical and biological monitoring parameters used for engineered logjam effectiveness. The structures focus primarily on two types, bar apex jams (BAJs) and meander bank or deflector jams (DJs). These concepts of engineered logjams (ELJs) are based on the design for natural logjams. The jams are intended to be stable and capable of influencing channel morphology, stream habitat and riparian conditions. The stability is attributed to the presence of one or more pieces of large "key" pieces of wood. An ELJ monitoring plan is suggested as part of the quantitative data monitoring with the goal of understanding both stability and effectiveness of the ELJ techniques as a restoration component. Physical and biological parameters, methodology and frequency of measurements are summarized in Table 5-1. Greater detail is provided for both physical and biological methods and metrics in Table 5-2 in the Quantitative section.

Baseline morphology, hydraulic summary and biological parameters will be recorded for pre-existing condition, design, as-built baseline and compared to data taken during the monitoring period.

TABLE 5-1 Monitoring Parameters, Methodology and Frequency Table

Type	Parameter	Methodology	Frequency
Physical	<i>Topography/Sediment Storage</i>	Survey/LiDAR/air photo analysis, meander progression	Annually spot upstream & downstream of reach
	<i>Substrate</i>	Wolman Pebble Counts	~Biennial
	<i>Habitat</i>	Classify & Survey Scour Pool, Woody Vegetation on Structure	~Biennial
	<i>ELJs</i>	Snag/Jam Enumeration & Location (GIS)	~Annual
	<i>Hydrology Events</i>	Rainfall Data and Runoff	~Biennial
Biological	<i>Primary Productivity</i>	Artificial Substrate/Direct Sampling Techniques	~Annual Growing Season
	<i>Vegetation Development</i>	Low Flow Survey	~Annual Growing Season
	<i>Flotsam on Structures</i>	Low Flow Survey & Decay	~Annual
	<i>Macroinvertebrates</i>	IBI Scoring	~Biennial

Monitoring will be required at the end of the growing season following construction (Year 0) and then for four full growing seasons following completion of construction (Years 1 through 4). The timing of the proposed monitoring events will allow for documentation of conditions within this area at the beginning and end of the growing season each year. Monitoring will be conducted by a qualified wetland scientist. A report will be prepared following each monitoring event and submitted to the Corps for their review, as well as the local Conservation Commission, and will include a quantitative and qualitative assessment of vegetation cover and species present within these areas. The qualitative vegetation assessment will document if the required 85% cover of native plant species is being achieved. Vegetation cover goals in the intertidal area will be reassessed pending the results of test plot plantings.

Prior to the start of construction, permanent photo plots will be established and GPS-located at several locations within this area. Photos will be taken at each plot from a consistent direction during construction and monitoring visits to provide visual documentation of the vegetation establishment over time. These photos will be included as part of the monitoring report.

Should any plants be observed to be dead or dying during monitoring, recommendations for their replacement will be made. Should areas of exposed soil become identified, recommendations for additional applications of seed and/or biodegradable matting will be made. The monitor will also survey for and document the presence of any invasive plant species and make recommendations for their removal, to prevent establishment of invasive plants within either area.

5.1 Qualitative Methods

These protocols for consideration of this project are those that are used typically for stream (restoration) projects. Specific checklists would include Revegetation Treatments (RT), Vegetation Control and Removal (VC), and Land Use Treatments (LU). RT include components that are in conjunction with instream and bank changes including bioengineering bank stabilization monitoring. A benchmark will be set on each stream bank approximately every 500 feet through the reach providing monumentation for fixed position coordinates which comparison photo documentation can occur during qualitative monitoring.

5.2 Quantitative Methods

These protocols involve attributes that are appropriate indicators of change in site conditions as a result of vegetation succession or revegetation efforts. Goals might include increase of native woody cover on the targeted areas.

Documenting changes in site conditions is critical in determining whether a project is at risk of increasing changes that require remediation or restoration. In addition to documenting beneficial effects, systematic monitoring may also highlight inadvertent effects that require more attention. The information obtained through monitoring provides critical feedback to project stakeholders and potential need to grantors.

The following table (Table 5-2) depicts the function based metrics considered for quantitative monitoring through a minimum period of five (5) years. This is a minimum suggestion considering the site and that geomorphic change is likely to continue for longer.

TABLE 5-2 Monitoring Metrics Table

Functional Category	Function-Based Parameters	Metrics (Units)
Hydrology	Reach Runoff	Land Use Coefficient (Dimensionless)
		BMP Outfall protection Rainfall Gage Data producing terrestrial bankfull and larger events
Hydraulics	Floodplain Connectivity	Bank Height Ratio (ft/ft)
		Bankfull Depth (ft) Entrenchment Ratio (ft/ft) Width/Depth Ratio (ft/ft)
Geomorphology	Large Woody Debris (BAJ/BJ)	LWD Index (Dimensionless)
		# Pieces (# Pieces per jam) Dominant BEHI/NBS
	Lateral Migration	Percent Streambank Erosion (%)
		Percent Armoring (%)
	Bed Material Characterization	Size Class Pebble Count Analyzer D50
		Pool Spacing Ratio (ft/ft) Pool Depth Ratio (ft/ft)
	Profile and Bed Form Diversity Pattern	Aggradation Ratio (ft/ft)
		Channel Beltwidth Radius of Curvature Meander/Width Ration (ft/ft)
		Water Surface Slope
	Riparian Vegetation	Effective Vegetated Riparian Area (%)
Canopy Cover (%)		
Herbaceous Vegetation Cover (%) Woody Stem Basal Area (sqm/hectare)		

5.3 Monitoring Schedule – Construction & Post-Construction Phases

The environmental monitor will be present on-site to perform or observe the following tasks:

- Observe grading, planting, and seeding of the restoration/enhancement area.
- Observations will include the proper test plots of the tidal wetland vegetation and installation of woody plants as outlined in Section 3 of this Plan.

- Post-Construction Monitoring - Observe restoration/enhancement areas at the end of the construction year growing season (Year 0) to determine vegetation development and to collect data for annual documentation and reporting (see following sections) relative to regulatory compliance.

Observations and data collected during this site inspection will be documented on the approved monitoring form, as well as in color photographs of each area. These materials will support the second annual monitoring report provided to the Corps and the Town Conservation Commission (see Sections 5.2 and 5.3 for details).

- Observe the restoration/enhancement area over five full growing season following project completion to determine vegetation development and to collect data for annual documentation and reporting (see following sections) relative to regulatory compliance (*i.e.*, Year 1, 2, 3, 4, and 5).

Observations and data collected during these site inspections will be documented on the approved monitoring form, as well as in color photographs of each area. These materials will support the annual monitoring reports provided to the Corps (see Sections 5.2 and 5.3 for details). These observations will be made two (2) times during the growing season each year. The first will be conducted during the early-to-mid growing season (e.g. June/July) and the second during the mid-to-late growing season (e.g. September/October).

TABLE 5-3 Monitoring Table

Attribute Monitored	Quantitative Method Suggested: Years 1,3, and 5	Qualitative Methods Suggested: Years 2 and 4
Terrestrial Tree or Shrub Cover	Transects, floodplain forest composition	Pictures take from monumented location(s) of study plot(s)
Wetland Herbaceous cover	Transects, gap intercept	Pictures take from monumented location(s) of study plot(s)
Stream Channel Morphology	Bankfull width, cross-section, longitudinal profile, aggradation, degradation	Sediment probing to refusal depth, Pictures capturing movement of slide islands
Bank Stability	Transects, cross-section, loss of soil, lack of native vegetation	Pictures taken from monumented location to track erosion or bank recession both upland and river bank
Woody Debris	Increasing, decreasing, movement in channel	Pictures capturing movement of slide islands

Riffle and Pool dimensions	Pool depth and location, longitudinal profile	Sediment probing to refusal depth, bankfull width changes at transects
Water Quantity	Stream flow, bankfull, groundwater, surface storm runoff from pipe discharge	Erosion captured from two storm outfalls, surface changes due to runoff
Invasive vegetation	Transects of non-vegetated areas being seeded by knotweed and phragmites both prevalent in reach	Pictures of transects capturing succession
Habitat Use	Birds, benthic	Pictures of use evolution

5.4 Documentation

Monitoring reports will include, at a minimum, the following information:

- Narrative description of activities performed to date and observations of the restoration/enhancement area (e.g., rate of vegetation growth, relative cover, presence/absence of non-native and/or invasive species), as well as recommended corrective actions, if necessary.
- Copies of monitoring forms (see Appendix A of this Plan for a sample form).
- Detailed evaluation of vegetation cover, soils and hydrology for two (2) reference plots within the restoration/enhancement area.
- Qualitative assessment and documentation of entire restoration and enhancement area outside of the detailed reference plots (i.e., photographs, species observed, and average planting survival rates).
- Digital color photographs of each reference plot as well as the overall restoration/enhancement area.
- Assessment of field findings relative to success criteria.

5.5 Reporting

Annual reports will be submitted to the Corps and the local Conservation Commission no later than December 15th of each calendar year for a period of five years. The first annual report will document the implementation of this Plan. The subsequent reports will document the relative success of the restoration/enhancement areas over current and previous full growing seasons.

\\Tighebond.com\data\Data\Projects\M\M1476 Manchester MA Hydro Study\014-Sawmill_Central PondPermit\Task 2- Living Shoreline\Monitoring Plan\Sawmill Brook Monitoring Plan Report_Final 5.6.21.docx

Tighe&Bond

APPENDIX A

File #: _____

Project Name: _____

Permittee Name: _____

Permittee Address: _____

Person Completing Form: _____

Date of Monitoring Event: _____

Purpose of Monitoring Event: _____

Weather Conditions: _____

Wetland Resoration Area ID: _____

VEGETATION & COVER¹: **Hydrophytic/Non-Hydrophytic**

% Cover Herbaceous Vegetation _____

% Cover Shrubs _____

% Cover Trees _____

% Cover Vines _____

% Cover Native Vegetation _____

% Cover Non-Native Vegetation^{1,2} _____

HYDROLOGY¹:

Bank Height Ratio (ft/ft) _____

Bankfull Depth (ft) _____

Entrenchment Ratio (ft/ft) _____

SOILS¹:

OTHER OBSERVATIONS:

Large Woody Debris (BAJ/BJ) _____

% Streambank Erosion _____

% Armoring _____

¹ Refer to attached floristic inventory

² Refer to attached Replacement Area site sketch (below) for location of vegetation cover types



Tighe&Bond

APPENDIX B



MANCHESTER-BY-THE-SEA

CONSERVATION COMMISSION • TOWN HALL
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 526-4397 FAX (978) 526-2001

4 June 2020

Greg Federspiel, Town Administrator
Town Hall
10 Central Street
Manchester, MA 01944

HAND DELIVERY

Re: Order of Conditions Central Pond Restoration Project DEP File #039-0824

Dear Greg:

Enclosed is the Order of Conditions for restoration of tidal flows to Central Pond to stabilize the shore with retaining wall repair/replacement, and to construct a living shoreline to improve ecological conditions and coastal resiliency within Riverfront, Land Under Ocean, Coastal Beach, Coastal Bank, Land Subject to Coastal Storm Flowage, and the 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers at 0 Elm Street (map 53, lot 28) which was approved by the Manchester Conservation Commission on 5/5/2020.

Before any work may begin, you must wait 10 business days (the appeal period) after which the Order must be recorded at the Registry of Deeds in its entirety. Once the Order is recorded, please submit proof of recording to me prior to the commencement of work.

Please review the Order carefully as it will govern how the work must be performed in order to be in compliance with the Massachusetts Wetlands Protection Act and the Manchester Wetlands By-Law. Please note that this order includes several pre-construction conditions, **including a pre-construction meeting between your contractors and me prior to the commencement of work** (see Standard and Special Conditions, Section B).

The Order is valid for three years from the original issuance date, except where otherwise specified. Requests for extensions must be received at least 30 days prior to the expiration date. Also note that ANY deviation from the plans contained or required in the Order of Conditions will require a *de minimis* change request, an amendment to the order(s) or submittal of a new application. As always, any other applicable permits required from any other Board or Department (state or local) will have to be obtained prior to commencement of work..

Please be advised that once work has been completed and the plantings have been monitored for two growing seasons, you should promptly seek a Certificate of Compliance from this office. Recording the Certificate of Compliance will clear the title for this property from the Order.

Please let me know if you have any questions or if I may be of further assistance.

Sincerely,



Chris Bertoni
Manchester Conservation Administrator

cc: Richard Canavan, Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
DEP Northeast Regional Office (electronic copy only - filed eDEP)
/file

Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 - Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
and Manchester Gen. Wetlands Bylaw

Provided by MassDEP:
 MassDEP File #:039-0824
 eDEP Transaction #:1200120
 City/Town:MANCHESTER

A. General Information

1. Conservation Commission MANCHESTER
 2. Issuance a. OOC b. Amended OOC

3. Applicant Details

a. First Name GREGORY b. Last Name FEDERSPIEL
 c. Organization TOWN OF MANCHESTER
 d. Mailing Address 10 CENTRAL STREET
 e. City/Town MANCHESTER f. State MA g. Zip Code 01944

4. Property Owner

a. First Name b. Last Name
 c. Organization
 d. Mailing Address
 e. City/Town f. State g. Zip Code

5. Project Location

a. Street Address CENTRAL STREET, EAST OF ELM STREET
 b. City/Town MANCHESTER c. Zip Code 01944
 d. Assessors 53 e. Parcel/Lot# 28
 Map/Plat#
 f. Latitude 42.57532N g. Longitude 70.73622W

6. Property recorded at the Registry of Deed for:

a. County b. Certificate c. Book d. Page
 SOUTHERN ESSEX 881 173

7. Dates

a. Date NOI Filed : 4/13/2020 b. Date Public Hearing Closed: 5/5/2020 c. Date Of Issuance: 6/4/2020

8. Final Approved Plans and Other Documents

a. Plan Title: b. Plan Prepared by: c. Plan Signed/Stamped by: d. Revised Final Date: e. Scale:
 SEE ATTACHED
 DOCUMENT CENTRAL
 POND
 RESTORATION_STANDARD
 AND SPECIAL
 CONDS_039-0824

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 5 - Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 MassDEP File #:039-0824
 eDEP Transaction #:1200120
 City/Town:MANCHESTER

a. <input type="checkbox"/> Public Water Supply	b. <input checked="" type="checkbox"/> Land Containing Shellfish	c. <input checked="" type="checkbox"/> Prevention of Pollution
d. <input type="checkbox"/> Private Water Supply	e. <input checked="" type="checkbox"/> Fisheries	f. <input checked="" type="checkbox"/> Protection of Wildlife Habitat
g. <input checked="" type="checkbox"/> Ground Water Supply	h. <input checked="" type="checkbox"/> Storm Damage Prevention	i. <input checked="" type="checkbox"/> Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b. The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a).

_____ a. linear feet

Inland Resource Area Impacts:(For Approvals Only):

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	_____ a. linear feet	_____ b. linear feet	_____ c. linear feet	_____ d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
6. <input type="checkbox"/> Land under Waterbodies and Waterways	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
	_____ e. c/y dredged	_____ f. c/y dredged		
7. <input type="checkbox"/> Bordering Land Subject to Flooding	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
Cubic Feet Flood Storage	_____ e. cubic feet	_____ f. cubic feet	_____ g. cubic feet	_____ h. cubic feet

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<input type="checkbox"/> Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	25062	25062		
	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	23594	23594		
	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	1468	1468		
	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts:

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
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10. Designated Port Areas Indicate size under Land Under the Ocean, below

11. <input checked="" type="checkbox"/> Land Under the Ocean	2030	2030		
	a. square feet	b. square feet		
	3046	3046		
	c. c/y dredged	d. c/y dredged		

12. Barrier Beaches Indicate size under Coastal Beaches and/or Coastal Dunes below

13. <input checked="" type="checkbox"/> Coastal Beaches	24492	24492	0	
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment

14. <input type="checkbox"/> Coastal Dunes				
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment

15. <input checked="" type="checkbox"/> Coastal Banks	1525	1525		
	a. linear feet	b. linear feet		

16. <input type="checkbox"/> Rocky Intertidal Shores				
	a. square feet	b. square feet		

17. <input type="checkbox"/> Salt Marshes				
	a. square feet	b. square feet	c. square feet	d. square feet

18. <input type="checkbox"/> Land Under Salt Ponds				
	a. square feet	b. square feet		

	c. c/y dredged	d. c/y dredged		

19. <input type="checkbox"/> Land Containing Shellfish				
	a. square feet	b. square feet	c. square feet	d. square feet

20. Fish Runs Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above

	c. c/y dredged	d. c/y dredged		

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which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..

10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"
[or "MassDEP"]
File Number : "039-0824"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

19. The work associated with this Order(the "Project") is (1) is not (2) subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;
- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period

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- BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv.* all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v.* any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: *i.*) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and *ii.*) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.
- g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with

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all applicable federal, state, and local laws and regulations.

- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions:

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No

2. The Conservation Commission hereby (check one that applies):

a. DENIES the proposed work which cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order or Conditions is issued. Which are necessary to comply with a municipal ordinance or bylaw:

b. APPROVES the proposed work, subject to the following additional conditions.

I. Municipal Ordinance or Bylaw	MANCHESTER GENERAL WETLANDS BY- LAW	2. Citation XVII
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3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:
SEE ATTACHED DOCUMENT CENTRAL POND RESTORATION_STANDARD AND SPECIAL CONDS_039-0824

Manchester Conservation Commission

**Central Pond Restoration Project Standard and Special Conditions
Ecological Restoration Limited Project
Order of Conditions (DEP File #039-0824)**

Massachusetts Wetlands Protection Act M.G.L. C. 131 §40 and the Manchester General Wetlands By-Law

DEP File:	#39-0824
Applicant/Owner:	Gregory Federspiel
Project Location:	Central & Elm Streets Map: 53 Lot: 28
Project Description:	This is an Ecological Restoration Limited Project – 310 CMR 10 24(8)(e)(1) – within Riverfront, Coastal Bank, Coastal Beach, Land Under Ocean, and Land Subject to Coastal Storm Flowage. Restoration includes construction of a living shoreline at the western side of the pond (Sawmill Brook), planting native tidal wetland and salt marsh plants, and replacing existing retaining walls along the eastern shore.
Summary of Permitted Activities:	<ul style="list-style-type: none"> • Bank Restoration - Western shoreline – bioengineering (install living shoreline) as shown on the Approved Plan and described in the NOI narrative (Section 3) • Bank Restoration - Eastern shoreline – replace the existing retaining wall as shown on the Approved Plan (including existing wall on 19 Central Street parcel, by permission) and described in the NOI narrative. Includes dredging to allow for new footers only (Section 3) • Tidal marsh planting as shown on the Approved Plan and described in the NOI narrative (Section 3)
Approved Plans and Documents	<ul style="list-style-type: none"> • “Permit Set Central Pond Restoration [2018/01]”; prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; signed, dated 3/28/2020, and stamped by David. L. Loring, PE, EVN SP, LEED AP; scale 1” = 20’; 16 Sheets • “Central Pond / Sawmill Brook Restoration Project Notice of Intent”; prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; dated March 30, 2020. • Document: “Technical Memorandum Task 2: Living Shoreline Design Sawmill Brook Central Pond Restoration Project”; prepared by Troy Barry & David L. Loring, PE, EVN SP, LEED AP; dated March 25, 2020; 7 pages, including 4 site plans (C-01, C-02, C-101, C-102), NOI Appendix D. • Document: “Letter re: EEA# 16127 Environmental Notification Form”, comments prepared by Daniel J. Mc Kiernan, Acting Director, Division of Marine Fisheries; dated 12/30/19, NOI Appendix F. • Document: “Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form”, prepared by Kathleen A. Theoharides; dated January 10, 2020, 8 pages. • Document: “Memorandum”; prepared by Lisa Berry Engler, Director, CZM; prepared for Kathleen A. Theoharides, Secretary, EEA; dated December 30, 2019; re: EEA-1628, Central Street Bridge Reconstruction and Central Pond / Sawmill Brook Restoration Project, Manchester-by-the-Sea.

Findings

1. The Manchester Conservation Commission (MCC) finds that the site on which the work is proposed contains resource areas subject to the Massachusetts Wetlands Protection Act, M.G.L. c. 131, sec. 40 (the Act) and its Regulations, 310 CMR 10.00 and the Manchester General Wetlands By-Law which are significant to the protection of interests identified in the Act and the By-Law, specifically:
 - a. Riverfront Area (total of 314,437 sf; proposed alteration of 25,062 sf)
 - b. Land Under Ocean (1,280 sf permanent, 750 sf temporary, 3,046 cubic yards dredged)
 - c. Coastal Beach (14,245 sf permanent, 10,247 temporary)
 - d. Coastal Bank (1,525 linear feet)
 - e. Land Subject to Coastal Storm Flowage (39,000 sf temporary)
 - f. 30 foot No Disturbance Zone as protected under the By-Law (8,317 sf, including temporary impacts for safe construction access for seawall replacement and as a result of the proposed bioengineering)
 - g. 50 foot No Build Zone as protected under the By-Law (temporary impact of 2,086 sf for the gravel access construction road)

The project is not known to be within or adjacent to Estimated Habitat of rare or endangered species.

2. The wetland depictions appearing on the Approved Plan(s) is confirmed for this project only and shall be reconfirmed and/or re-delineated for subsequent filings.
3. The project as permitted is an Ecological Restoration Limited Project. The project is for the purposes of restoring or enhancing a wetland resource area in addition to the square footage listed above. The project proposes salt marsh plantings; however, the total area in square feet of Salt Marsh is pending trial plantings.
4. The project as permitted allows an alteration in Riverfront Area of 25,062 square feet (23,594 sf within 100 feet; 1,468 sf between 100 feet and 200 feet).
5. The project as permitted allows an alteration of up to 1,280 square feet of permanent alteration and 750 square feet of temporary alteration in Land Under Ocean; and 3,046 cubic yards of dredging to install footers for the wall replacement in Land Under Ocean.
6. The project as permitted allows an alteration of up to 14,245 square feet of permanent alteration and 10,247 square feet of temporary alteration in Coastal Beach.
7. The project as permitted allows an alteration of up to 1,525 linear feet of Coastal Bank.
8. The project as permitted allows a temporary alteration of 39,000 in Land Subject to Coastal Storm Flowage.
9. The MCC finds that the resources listed above are significant to the protection of the following interests as defined in the Act and its Regulations and the Manchester General Wetlands By-Law :
 - a. Groundwater supply
 - b. Flood control
 - c. Storm Damage Prevention
 - d. Prevention of Pollution
 - e. Fisheries
 - f. Land Containing Shellfish
 - g. Protection of Wildlife Habitat

Specific Findings under the Manchester General Wetlands By-Law and its regulations

1. In addition to those interests protected under the Act and its Regulations, the MCC finds that the resource areas and their buffer zones are significant to the protection of the following interests:
 - a. Water quality

- b. Erosion and sedimentation control
2. The MCC grants a waiver as requested in the “Notice of Intent” prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; dated March 20, 2020, sections 5.3.2.1 and 5.3.3.1, and as shown on the Approved Plans for the following:
 - a. Installation of a temporary safe construction access for the wall replacement in the 30-foot No Disturb Zone;
 - b. Bioengineering associated with the installation of the living shoreline in the 30-foot No Disturb Zone; and
 - c. Construction of the temporary gravel access road in the 50-foot No Build Zone as needed on each side of the pond. No other structures are proposed for the 50-foot No Build Zone.

The MCC grants the waiver under the by-law for the following reasons:

- a. The applicant has satisfied the requirement of demonstrating, by clear and convincing evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Disturb Zone. The applicant has also satisfied the requirement of demonstrating, by a preponderance of credible evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Build Zone.
- b. The project on the whole (Preferred Alternative, Section 4.1.6 of the NOI) will provide free-flowing water in a continuous stream, will replace a failing seawall along the east bank, will provide for spot treatment of areas susceptible to erosion along the west bank with toe protection and living shoreline components.
- c. The project overall will increase habitat diversity and restored naturalized landscape with the establishment of the living shoreline and salt marsh plantings.
- d. The project overall will provide improved bank stabilization for the Town of Manchester and abutters to the project area.
- e. The proposed impacts to the 30-foot No Disturb Zone and 50-foot No Build Zone are temporary disturbance for construction access. After construction, the 50-foot No Build Zone will be restored to the existing conditions; the 30- No Disturb Zone will be planted with native vegetation through the top of the living shoreline.

General and Special Conditions

A. General Conditions

1. The term “Applicant” as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The MCC shall be notified in writing within 30 days of all transfers of title of any portion of property that take place prior to the issuance of the Certificate of Compliance.
2. With respect to all conditions the MCC designates the Conservation Administrator as its agent with full powers to act on its behalf in administering and enforcing this Order.
3. This document shall be included by reference in all contracts, plans and specifications dealing with the activity that is the subject of this Order, and that are created or modified after the issuance date of this Order, along with a statement that this Order shall supersede any conflicting contractual arrangements, plans or specifications.

4. It is the responsibility of the applicant to complete any review required by all agencies with jurisdiction over the activity that is the subject of this Order, and to procure all required permits or approvals. These reviews, permits and approvals may include but are not limited to the following:
 - a. Review by the U.S. Army Corps of Engineers for any Category 2 or Individual Permit Activity, and procurement of any permits or approvals identified by the Corps including but not limited to a Section 404/10 Pre-Construction Notification.
 - b. Review by the DEP and procurement of any permits or approvals identified by the DEP, including but not limited to 401 Water Quality Certification for dredging more than 100 cubic yards of Land Under Water, Chapter 91 License.
 - c. Review by the Massachusetts Natural Heritage and Endangered Species Program for any projects within estimated and/or priority habitat and any permits or approvals identified by the Program.
 - d. Review by Massachusetts Office of Coastal Zone Management for a Federal Consistency Review.
 - e. Review by local Planning Boards, Boards of Health, Zoning Boards, and Building Inspectors, and procurement of any permits or approvals required by these boards or agencies.
5. The MCC shall be informed of all changes that may be made to the Plan(s) of Record by any other Board, Commission or Authority or as a result of changes by the Applicant. All changes shall require additional approvals from the MCC.
6. The MCC reserves the right to impose additional conditions on this project, including but not limited to, additional or modified erosion/siltation controls during the project, if it deems that site conditions warrant such measures to mitigate potential impacts.
7. Members and agents of the MCC shall have the right to enter and inspect the property to evaluate compliance with this Order, the Wetlands Protection Act, Wetlands Protection Bylaw, and to require submittal of any data deemed necessary by the MCC for that evaluation.
8. The site engineer or contractor shall have a copy of this Order of Conditions and the final approved plans at the site and available for inspection during all phases of construction. It is the applicants' responsibility to provide the contractors with a set of the approved documents, plans, and this Order, and to ensure that the contractors are aware of the Order's provisions, and that they follow them. If the conditions of the Order are not clear, the MCC or its Administrator shall be asked to clarify them.
9. **Any change in the plans approved under this Order, including those due to review by other boards or resulting from the aforementioned conditions, must be submitted to the MCC in writing for approval prior to implementation.** The MCC will then decide whether the change is substantial enough to require a new Notice of Intent filing or a request for an amendment to this Order of Conditions. Any errors found in the plans or information submitted by the applicant shall be considered as changes.
10. If any changes are made in the above-described plan(s) which may or will alter an area subject to protection under the Wetlands Protection Act, 310 CMR 10.00 or the Manchester Wetlands By-Law, the applicant shall inquire from the MCC or its Administrator, prior to implementing the change in the field, whether the change is significant enough to require the filing of a new Notice of Intent. Any errors in the plans or information submitted by the applicant shall be considered changes and the above procedures shall be followed.

B. Pre-Construction Requirements

11. This Order shall be recorded at the Registry of Deeds in its entirety. The form provided at the end of WPA Form 5 shall be completed and stamped at the Registry of Deeds after the expiration of the 10-day appeal period and within 30 days of the issuance if no request for appeal has been filed with the Department of Environmental Protection. This form shall be returned to the MCC within 21 days of recording **and prior to commencement of any activities subject to the Order of Conditions.**

12. Prior to the commencement of work on each specific Approved Activity of this project (western shoreline, eastern shoreline, tidal marsh plantings):
 - a) Erosion controls (filter sock) shall be installed per the Approved Plan. The filter sock shall consist of biodegradable materials only.
 - b) The applicant or owner shall provide the name, address, and phone number of a contact person responsible for compliance with this Order.
 - c) Apex Jam Structures. Construction details for the Apex Jam Structures similar to those provided for 'Bank Treatment A – Rootwad detail' and 'Bank Treatment C – Encapsulated Soil Lift' shall be provided by the applicant and shall include anchoring details if the structures are to be anchored. In addition, a Monitoring Plan specific to the Apex Jam Structures shall be provided detailing bank /access protection during construction, who is responsible for monitoring effectiveness of the Structures, and who is responsible for removing woody debris that collects on the apex jams.
 - d) Cofferdams. Construction details, choice of material shall not be left up to the discretion of the contractor. Construction details and choice of material shall be provided by the applicant prior to construction and approved by MCC.
 - e) Monitoring. The applicant shall establish fixed photographic monitoring locations and submit photodocumentation of existing conditions. The fixed locations shall be used to photo-document construction, final project conditions and restoration of disturbed areas.
 - f) The Applicant or his designee shall install a sign no less than 2 square feet or more than 3 square feet, visible from the street reading “**MA DEP File #39-0824**”, and not placed on a living tree.
13. Once all of the above pre-construction requirements stated in Conditions #11 and #12 have been fulfilled, the Conservation Administrator shall be contacted at least 48 hours prior to the start of work on each specific Approved Activity of this project in order to schedule a pre-construction meeting at the site. The Administrator may be contacted by email at: bertonic@manchester.ma.us or by phone at [978-526-4397](tel:978-526-4397).

C. Special Conditions

14. Western bank living shoreline plantings and those mitigation plantings installed in the 30-foot No Disturb Zone shall be monitored for two growing seasons to guarantee at least an 85% survivorship. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plant monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.
15. Western bank streambank stabilization components including root wads and apex jams shall be monitored for erosion and scour for two years. A monitoring plan shall be submitted to the Conservation Administrator for approval. Monitoring reports shall be submitted after the first year and again after the second year. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.
16. A monitoring plan for invasive species shall be submitted to the Conservation Administrator for approval and include monitoring of invasive species for at least two years. The monitoring plan shall include details for removing invasive species if found in the planting area. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
17. Prior to any construction that is not on property owned by the Town of Manchester, permission for access shall be obtained, this Order made part of the permission, and kept on file with the Manchester Department of Public Works.

18. **Time-of-Year Restriction.** Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordox*), and habitat for American eel (*Anguila rostrata*). The proposed work may impact passage. In-water work and silt-producing work shall be avoided from March 1 to June 30 of any year.
19. The MCC shall receive monitoring reports and sediment test results as shall be required by the 401 Water Quality permitting process.
20. The contractor selected for this restoration project shall be familiar with the principles and installation of large woody debris for use in restoration and stabilization projects.
21. Bioengineering structures / living shoreline implementation / tide marsh plantings installation shall be overseen by a qualified Environmental Monitor or equivalent with design knowledge and experience with bank restoration and stabilization projects.
22. In case of a major storm event, the site shall be secured beforehand in such a way to protect Sawmill Brook, including covering of any stockpiles of soil; installation of erosion control mats over areas of exposed soil; and removal of any debris, equipment, materials, etc. that could potentially enter the brook.
23. These special conditions shall survive in perpetuity beyond the issuance of a Certificate of Compliance: 16.

D. Project Period

24. The erosion control devices shall function throughout the project to prevent erosion and sedimentation. They shall be inspected and maintained routinely by the applicant or his contractor throughout the duration of the project and after every storm event of 1/2 inch of precipitation or more. Breaks in the line shall be immediately repaired to prevent siltation into the wetlands. Additional erosion controls shall be available on site for such repairs.
25. If soils are to be disturbed for longer than two months, a temporary cover of rye or other grass (conservation mix) shall be established to prevent erosion. Once final grading is completed, loaming and seeding of each area shall be completed promptly. Vegetative cover, either temporary or permanent, shall be established prior to winter. If the season is not appropriate for plant growth, exposed soils shall be stabilized with jute netting, staked mulches, or other U. S. Natural Resource Conservation Service methods.
26. The limit of work shall be the erosion control devices beyond which no work may occur. The MCC reserves the right to require additional erosion controls and storm damage prevention measures at any time if it deems necessary.
27. The contractor or responsible party shall have an appropriately sized spill containment kit on site whenever vehicles or mechanized equipment is operating or present. The kit shall be sized to accommodate the total volume of fluids in the largest piece of equipment present. Appropriately trained personnel shall also be present and have access to this material. The contractor or responsible party shall be required to have additional absorbent materials (pads) and additional length of boom on site.
28. Equipment fuel storage and refueling and lubrication operations shall be situated least 100 feet from any wetland resource area.
29. Heavy equipment shall be stored in an upland area at least 100 feet from any wetland resource area when not in use or overnight.
30. Absolutely no washing of trucks or other equipment shall take place within 100 feet of the resource areas.
31. Only clean fill may be used in connection with this project. Any fill used in connection with this project shall not contain trash, refuse, rubbish, or debris, including but not limited to lumber, brick, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
32. Any excavated materials resulting from the work shall be moved outside the 100-foot buffer zone at the end of each day.

33. Stockpiled earth and other materials or debris shall be located outside of the 100-foot buffer zone of the resource areas(s).
34. All stumps, brush, and debris shall be removed from the site, including existing and construction debris. This material shall be disposed of promptly and properly at an off-site facility licensed to receive the material. Records as to the destination of all materials including stumps, brush, and excess fill shall be kept and supplied to the Commission if requested.
35. Any refuse material generated through the project construction will be removed to an approved landfill, and in no case will these materials be allowed to be buried or disposed of on site or on abutting property.
**REMOVAL MUST BE DONE WEEKLY DURING THE CONSTRUCTION PHASE OF THE PROJECT.
REFUSE MUST NOT BE ALLOWED TO ENTER ANY WETLAND AREAS.**
36. No blasting shall be permitted under this Order of Conditions. If it is discovered during the course of work that blasting will be necessary, the applicant shall file for an Amended Order of Conditions with plans and evidence describing the blasting activities.
37. If weather conditions cause the terrain to be excessively soft, the MCC may halt work until dry conditions permit work to continue without excessive churning of the soil.
38. The construction-period coffer dam shall be removed properly upon completion of construction.

E. Post Project

39. After the completion of construction, the applicant shall submit the following to the MCC:
 - a. A completed Request for a Certificate of Compliance – WPA form 8A.
 - b. A letter from a Registered Professional Engineer certifying compliance of the project with this Order of Conditions, and detailing any deviations that exist and their potential effect on the project. **A statement that the work is in “substantial compliance” with no detailing of the deviations shall not be accepted.**
 - c. An “As-Built” plans stamped and signed by a Registered Professional Engineer or Land Surveyor showing post-construction conditions. This plan shall note any deviations from the Approved Plans and include at a minimum:
 1. All wetland resource area boundaries with associated buffer zones and regulatory setback areas taken from the plan(s) approved in this Order of Conditions;
 2. Locations and elevations of all stormwater management conveyances, structures and best management designs, including foundation drains, constructed under this Order within any wetland resource area or buffer zone;
 3. Distances from any structures constructed under this Order to wetland resource areas - “structures” include, but are not limited to, all buildings, septic system components, wells, utility lines, fences, retaining walls, and roads/driveways;
 4. Wetland resource replication areas constructed under this order.
 - d. Pre-construction, during construction and post-construction photographs demonstrating compliance with this Order, including established vegetation where required, shall be submitted to the MCC.

F. Perpetual Conditions The following conditions shall run with the land and be binding in perpetuity on all successors in title and assigns of the applicant; they are ongoing and do not end upon completion of this project or the issuance of a Certificate of Compliance; they shall be the responsibility of the owner of record of this property.

40. **Additional Alteration Prohibited:** There shall be no additional alterations of the jurisdictional buffers and resource areas without the express permission from the MCC through a Request of

Determination of Applicability or a Notice of Intent application. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.

41. The applicant is required to maintain the Bank Restoration on the western and eastern banks. Should maintenance in the future require a design change to accommodate unforeseen changes in the stream regime and/or bank stability, the applicant shall file with MCC for this change. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
42. There shall be no alteration within the restoration and mitigation areas, except as may be required to maintain the area in its restored or mitigated condition.
43. Use of toxic substances for lawn and garden maintenance presents a hazard to groundwater and resource areas. Use of pesticides and herbicides is therefore permanently prohibited at this site within 100 feet of the resource area.
44. The use of de-icing chemicals (such as sodium chloride, potassium chloride or any other chemicals) is to be limited to the amount necessary to maintain public safety. The Applicant shall assume the responsibility of informing any snow removal contractors working on the property of this requirement.
45. Any hazardous materials (e.g., gasoline, lubricants, etc.) shall be stored securely above the 100-year flood elevation.
46. In areas of restoration planting, the 30-foot No Disturb Zone shall be allowed to grow naturally and shall not be mowed or altered in any way without express permission from the MCC through a Request for Determination of Applicability or a Notice of Intent application.
47. Only organic, slow-release, water-insoluble fertilizers shall be used within 50 feet of the resource areas.
48. In addition to these perpetual conditions, these special conditions shall survive in perpetuity beyond the issuance of a Certificate of Compliance: 16.

[Remainder of page left intentionally blank.]



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0824
 MassDEP File #
 1200120
 eDEP Transaction #
 MANCHESTER
 City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

6/4/2020
 1. Date of Issuance

Please indicate the number of members who will sign this form.

6

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

By Vote on 5/5/20, the individuals listed below have authorized the Conservation Administrator to sign on their behalf pursuant to the signature authorization recorded with the Southern Essex Registry of Deeds in Book 38501 Page 530. They also intend for their typed names below to serve as their electronic signatures for any entity (MassDEP) that accepts electronic signatures.

Signatures:

/Sarah Oseasohn/

/Stephen Gang/

/Joseph Puopolo/

/Olga Hayes/

/Henry Oettinger/

/David Lumsden/

Christine Bertoni, Conservation Administrator,
 duly authorized (Book 38501, Page 530)

by hand delivery on

by certified mail, return receipt requested, on

6/4/2020
 Date

 Date



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:

039-0824

MassDEP File #

1200120

eDEP Transaction #

MANCHESTER

City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0824
 MassDEP File #
 1200120
 eDEP Transaction #
 MANCHESTER
 City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

 Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

 Conservation Commission

Please be advised that the Order of Conditions for the Project at:

 Project Location

 MassDEP File Number

Has been recorded at the Registry of Deeds of:

 County

 Book

 Page

for: _____
 Property Owner

and has been noted in the chain of title of the affected property in:

 Book

 Page

In accordance with the Order of Conditions issued on:

 Date

If recorded land, the instrument number identifying this transaction is:

 Instrument Number

If registered land, the document number identifying this transaction is:

 Document Number

 Signature of Applicant



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number:

Request for Departmental Action Fee Transmittal Form

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address	b. City/Town, Zip
c. Check number	d. Fee amount

2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

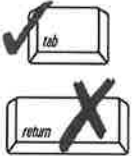
Name

Mailing Address

City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

4. DEP File Number:

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
**Request for Departmental Action Fee
Transmittal Form**

DEP File Number:

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Tighe&Bond

APPENDIX C



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

Gregory Federspiel
Town Administrator
Town of Manchester-by-the-Sea
10 Central Street
Manchester-by-the-Sea, MA 01944

March 26, 2021

Re: **401 WATER QUALITY CERTIFICATION**
Application for BRP WW 08, Minor project dredging

At: Central Pond, at 0 Elm Street, Manchester-by-the-Sea, MA

401 WQC Transmittal №: X285965
Wetlands File №: NE 039-0824
EOEEA File №: 16127
ACOE Application №: NAE-2019-02827

Dear Mr. Federspiel:

The Department has reviewed your application for a Water Quality Certificate (WQC) as referenced above. In accordance with the provisions of Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 *et seq.*), MGL c.21, §§ 26-53, and 314 CMR 9.00, the Department has determined there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law.

The waters of Manchester Harbor are designated in the Massachusetts Surface Water Quality Standards as Class SB. Such waters are designated "as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation." Anti-degradation provisions of these Standards require that "existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." In addition, Manchester Harbor has been designated for Shellfishing pursuant to 314 CMR 4.00.

Project Background

The project is located at Central Pond where Sawmill Brook discharges to Manchester Harbor at 0 Elm Street, Manchester-by-the-Sea, MA (Figure 1). The Town proposes improvements to the retaining walls along eastern bank of Central Pond and restoration of a channel through pond sediments using natural in-stream processes and bioengineering techniques. The project is intended to address property and infrastructure damage due to flooding, degradation of water quality and habitat of inland and coastal waterways, and improve fish passage in the watershed.

Project Description

The project proposes improvement dredging of 3,047 cubic yards of sediment as part of a tidal restoration of Central Pond in Manchester-by-the-Sea, MA. The improvement dredging will facilitate replacement of the retaining walls along the eastern shoreline, construction of a shoreline with placement of stabilization elements along the western shoreline, and reconfiguration of the pond bottom. Dredge sediments will be re-used on the project site for restoration with native plantings in the Sawmill Brook intertidal area and low flow channels along the shores.

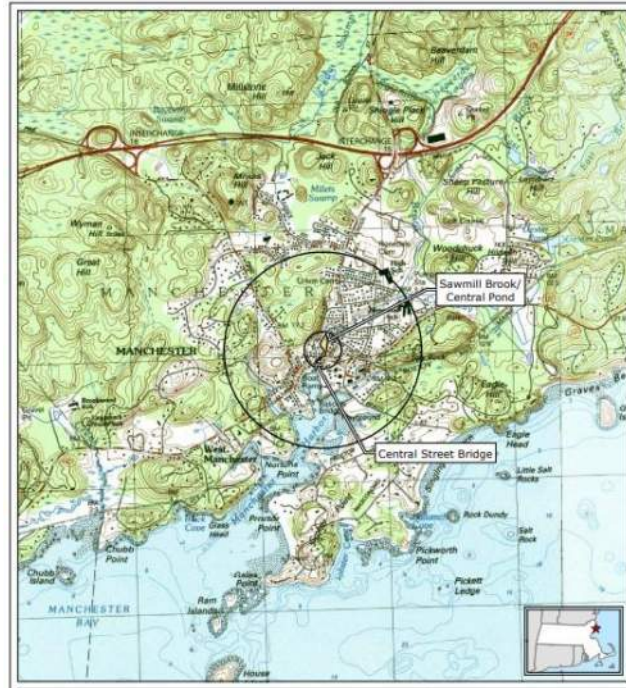


Figure 1. Locus for Central Pond/Sawmill Brook, Manchester-by-the-Sea.^{1 2}

Sediment Dewatering

The Town has authorized temporary stockpile and dewatering of dredged sediment at the Manchester Compost Site at 198 School Street prior to being transported off-site for reuse. Stockpiles will be surrounded by appropriate erosion controls. Town Hall parking lot at 10 Central Street is also authorized for staging materials as needed during construction.³ The dewatering and disposal of sediment is anticipated to be for the duration of construction. The method of dewatering sediments, collecting dewatered effluent, and the method of disposal will be described in the dredged material dewatering plan and sediment stockpile management plan to be submitted by the applicant and approved by MassDEP.

Sediment Sampling Data

Five sediment samples were collected for grain size analysis. (i.e. POND, STREAM UP, STREAM DOWN, WALL SED-1, WALL SED-2). Two samples (WALL SED-1, WALL SED-2) were dated 3/31/2020 and the remaining samples were dated 1/23/2018. Results of the gradation analysis showed between 20.1% and

¹BRP WW 08 Minor Water quality Certification Application: Improvement Dredging of Central Pond /Sawmill Brook Restoration, Central Street, Manchester-by-the-Sea, Massachusetts. Prepared by Tighe and Bond for the Town of Manchester-by-the-Sea, Board of Selectmen. Dated May, 2020.

² Based on USGS Topographic Map for Marblehead North, MA Revised 1985. Contour Interval Equals 3-Meters. Circles indicate 500-foot and half-mile radii.

³ Letter from Gregory Federspiel, Town Administrator, Manchester-by-the-Sea to Alice Smith. Re: Central Pond Restoration Project, Manchester-by-the-Sea, Massachusetts. 401 WQC (Transmittal #X285965) Potential Sediment Stockpile and Dewatering Locations, November 23, 2020.

54.7% of particles in the sediment samples do not pass the No. 200 U.S. Standard Series Testing Sieve. In accordance with 314 CMR 9.07(2), chemical testing was conducted.⁴

Laboratory analysis detected low concentrations of metals, PCBs, and PAH's. Concentrations above the MCP Reportable Concentrations for Soils (RCS-1) were reported for the following sediment samples:

- STREAM DOWN: benzo(a)pyrene (2.10 mg/kg), lead (167 mg/kg)
- WALL SED-1: benzo(a)pyrene (3.64 mg/kg), acenaphthylene (2.20 mg/kg), and dibenzo(a,h)anthracene (0.983 mg/kg).⁵

Dredged Material Disposal or Reuse

The project proposes to reuse dredge sediment onsite to the extent practicable for restoration purposes. Dredge sediments unsuitable for re-use onsite will be transported to either the Aggregate Industries Saugus Quarry or at an approved Massachusetts Landfill for disposal. The volume and on-site location of sediments with contaminant levels exceeding RSC-1 standards for re-use will be shown on the dredged material plan. The plan shall also show a) the volume and on-site location of sediments intended for re-use/restoration and b) the intended on-site destination of re-use sediments. The dredge sediment plan will to be submitted by the applicant, approved by MassDEP, and provided to the contractors for construction period guidance.

Time of Year Restriction (TOY) for In-Water Work

The Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordax*), and habitat for American eel (*Anguilla rostrata*). MassDEP incorporates recommendations from Massachusetts Division of Marine Fisheries (DMF) into this permit that no in-water and silt producing work be conducted from March 1 through June 30 of any year to protect fish habitat.⁶ Work will occur behind coffer dams to minimize unconfined silt in water.

Rare Species and Rare Wildlife Habitat

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) Atlas, 14th Edition, effective August 1, 2017, indicates that the Central Pond Restoration project is not located within designated Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife and will not require review pursuant to the Massachusetts Endangered Species Act.

Public Notice

The public notice was published in The Manchester Cricket, a newspaper of general circulation within Manchester-by-the-Sea, on May 22, 2020. The Department did not receive any comments during the 21-day public comment period, which ended on June 15, 2020.

Section 61 Findings:

Pursuant to M.G.L. Chapter 30, Sections 61 to 62I inclusive [the Massachusetts Environmental Policy Act ("MEPA")], the Central Pond Restoration project was required to file an Environmental Notification Form ("ENF") (301 CMR 11.01 (2)(b)(3)). The ENF was submitted for review on December 2, 2019 and published in the Environmental Monitor on December 11, 2019 (EEA #16127). The Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form was issued on

⁴ Tighe Bond, May 2020, 401 WQC Application Central Pond/Sawmill Brook Restoration Project Central Street, Manchester-by-the-Sea, Appendix D – Environmental Information, TABLE 1 Sediment Analytical Results Sawmill Brook Central Pond Restoration Project Manchester-by-the-Sea, Massachusetts.

⁵ IBID, see Footnote #4.

⁶ See Letter from Daniel McKiernan, MA Division of Marine Fisheries, dated December 30, 2019, RE: EEA #16127 Environmental Notification Form.

January 10, 2020. It was determined that the project does not require an Environmental Impact Report (EIR) and that no additional MEPA review was warranted.⁷

Therefore, based on information currently in the record, the Department grants a 401 Water Quality Certification for this project subject to the following conditions to maintain water quality, to minimize impact on waters and wetlands, and to ensure compliance with appropriate state law. The Department further certifies in accordance with 314 CMR 9.00 that there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law. Finally, the Department has determined that upon satisfying the conditions and mitigation requirements of this approval, the project provides a level of water quality necessary to protect existing uses and accordingly finds that the project to be implemented satisfies the Surface Water Quality Standards at 314 CMR 4.00.

Conditions

1. The Contractor shall take all steps necessary to assure that the proposed activities will be conducted in a manner that will avoid violations of the anti-degradation provisions of the Massachusetts Surface Water Quality Standards that protect all waters, including wetlands.
2. Prior to the start of work or any portion of the work thereafter, the Department shall be notified of any change(s) in the proposed project or plans that may affect waters or wetlands. The Department will determine whether the change(s) require a revision to this Certification.
3. Dredging in accordance with this Certification may begin following the 21-day appeal period, once all other permits have been received, and once outside the all Time of Year restrictions.
4. All work shall be performed in accordance with the following documents and plans:
 - Application for the 401 WQC, Transmittal Form # X285965, dated May 2020.
 - Plan entitled “Town of Manchester-by-the-Sea, Massachusetts CENTRAL POND RESTORATION” consisting of sixteen (16) sheets, various scales, dated March 28, 2020, Sheet G-001, General Notes, Legend & Abbreviations is Revised to 10/15/2020, prepared by Tighe and Bond, and signed and stamped by David L. Loring Civil, registered PE No. 39818. MassDEP shall be notified if there are modifications and or deletions of work as specified in the plans. Depending on the nature and the scope of any change, approval by the Department may be required.
 - Order of Conditions issued pursuant to the Massachusetts Wetlands Protection Act (M.G.L. Chapter 131, § 40) by Town of Manchester-by-the-Sea, MA Conservation Commission for MassDEP File Number NE 039-0824, dated 06/04/2020.
5. The Department shall be notified, attention Alice Smith 617-292-5854, one week prior to the start of in-water work so that Department staff may inspect the work for compliance with the terms and conditions of this Certification.

⁷ Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, (EEA #16127), Central Street Bridge Reconstruction and Central Pond/Sawmill Brook Restoration Project, January 10, 2020.

6. The applicant and its contractor shall allow agents of the Department to enter the project sites to verify compliance with the conditions of this Certification.
7. The Certification remains in effect for the same duration as the federal permit that requires it or five years from the date of issuance of this Certification whichever comes first.
8. The applicant may request an extension of the 401 dredging permit in accordance with 314 CMR 9.09(3) providing that the annual dredging activities summary report is submitted to the Department.
9. Best Management Practices (BMPs) such as coffer dams or a silt curtain shall be deployed surrounding the dredge area to minimize turbidity. At a minimum, the silt curtain shall be bottom-weighted to minimize the degree of lifting/flailing or billowing and shall be of suitable material/grade appropriate based on the velocity of the current at the site. Intermediate vertical floats or other means shall be placed on the silt curtain to lift the bottom of the silt curtain at low tide so that the bottom edges of the curtain remain close to the mudline at low tide but do not rake the sediment in areas subject to tidal influence. Dredging shall be carried out using a closed, environmental bucket if the sediment does not consist solely of gravel/stone/sand or densely compacted silt/clay.
10. No later than 21 days prior to commencement of dredging activity, a dredged material dewatering plan and sediment stockpile management plan shall be submitted to the Department for review and approval. At a minimum, the dewatering plan shall include but not be limited to the location of the dewatering and stockpile activities, the type of containment, method of dewatering (i.e. mechanical or by gravity), method of collecting the dewatered effluent, the method of disposal, and a confirmation that no dewatering or stockpile activities will occur near drainage systems (e.g. catch basins, conveyances) that discharge to wetlands or waters.
11. No later than 21 days prior to commencement of dredging activity, the name and contact information for the project site manager designated by the applicant and contractor responsible for installation, monitoring, inspection, and correction of erosion control measures shall be provided to MassDEP.
12. Dredged material with chemical concentration exceeding MCP RC S1 criteria shall be backfilled at the SAME LOCATION onsite and relatively clean sediment may be reused at other areas. If the dredge material is disposed at an upland facility, the Department shall be notified in writing of the name and location of the upland licensed facility accepting the dredged material for disposal or reuse as daily cover material. If the licensed facility is located out of state, documentation shall be provided to the Department that the dredged material disposal/reuse has been approved and will be accepted by the receiving State in accordance with 314 CMR 9.07(13)(b). The dredged material shall not be transported to the facility without concurrence of the Department.
13. A Dredged Material Tracking Form (DMTF) or Material Shipping Record (MSR) shall be used to track the dredged material to the licensed upland facility. A fully executed copy of the DMTF or MSR shall be provided to the Department within 30 days of final shipment to the reused location or facility.
14. Best Management Practices (BMPs) shall be implemented during transportation of the dredged material to the licensed receiving facility. At a minimum, when transported upon public roadways, all dredged material shall have no free liquid as determined by the Paint Filter Test or other suitably analogous methodology acceptable to the Department, and a tarpaulin or other means shall be used to cover the dredged material during transport.

15. Within 21 days of the effective date of this Certification, the applicant shall submit to the Department for review and approval the following information regarding location of final placement and use of dredged material:
 - a. a United States Geological Survey Topographic Map showing the location of the property;
 - b. a site plan showing the reuse locations for dredged material;
16. Within 30 days of the completion of the initial dredging and any future maintenance dredging to be conducted, a bathymetric survey of the site, depicting post-dredge conditions shall be conducted. At a minimum, the survey shall include an overlay of the dredge footprint (i.e. top of slope) with sufficient coordinates in the Massachusetts State Plane (e.g. longitude and latitude) to clearly delineate the dredge footprint. The survey shall be sent within five working days after its completion to the Department and a copy shall be sent to the Massachusetts Coastal Zone Management office, attention: Robert Boeri.
17. Within 30 days of completion of the construction of the project, the applicant shall provide a set of construction photographs depicting completed project to the Wetlands and Waterways Program in the Boston Office, attn: David Wong and Alice Smith. The photographs shall be marked or labeled with the WQC transmittal number and wetlands file number of the project and include low tide images of the island plantings, retaining wall on eastern shore, low flow channels, bio-engineered western shoreline.
18. In order to protect the migratory habitat for rainbow smelt (*Osmerus mordax*), and habitat for American eel (*Anguilla rostrata*) in Sawmill Brook and Central Pond, no in-water or silt producing work shall be conducted from March 1 through June 30 of any year as recommended by the Massachusetts Division of Marine Fisheries (DMF)⁸. Work shall occur behind coffer dams and/or silt curtains to minimize unconfined silt in water.
19. The Applicant shall utilize stabilized construction entrances, vehicle wash down pads, perimeter erosion controls, and re-vegetation of disturbed areas with native plantings and seed mixes to minimize potential water quality impact resulting from construction activities.
20. Storing, servicing, or cleaning equipment, or washing/rinsing of trucks or equipment, shall be performed outside wetland resource areas and away from Center Pond and Sawmill Brook. Adequate pollutant controls shall be used to prevent fuels, lubricants, hydraulic fluids, or other pollutants associated with these activities from discharging into the pond and brook.
21. During the project period, there shall be no discharge or spillage of fuel, oil or other pollutants into any part of Center Pond or Sawmill Brook. The applicant shall take all reasonable precautions to prevent the release of pollutants by ignorance, accident or vandalism.
22. In case of a storm event, the site shall be secured beforehand to protect Sawmill Brook and Center Pond. This includes site specific erosion and sediment control measures including but not limited to covering stockpiles of dredge sediments, and using erosion control measures to prevent discharge of suspended sediments into the pond and brook; installation of erosion control mats over-areas of exposed soils that provide access to the pond and brook for equipment; and removal of debris, equipment, materials, that are in or could potentially enter the brook.

⁸ According to a letter from Daniel J. McKiernan Acting Director, Massachusetts Division of Marine Fisheries, to Kathleen Theoharides, Secretary EOEEA, dated December 30, 2019.

23. The applicant, or its contractor, shall make every effort to complete the project within the permitted timeframe. Should the applicant, or their contractor, fail to complete the project and wish to request an amendment to the Certification for incursion into the no-dredge period, the written request shall be received by the Department by January 15. The following information shall be included in the request:
- a. project location and transmittal number,
 - b. the date on which dredging started,
 - c. the number of days and hours per day the dredge operated,
 - d. expected daily average production rate and the actual daily average production rate,
 - e. an explanation of why the project failed to remain on schedule,
 - f. an account of efforts made to get the project back on schedule,
 - g. a plan depicting the areas that remain to be dredged,
 - h. the number of cubic yards that remain to be dredged,
 - i. an accurate estimate of the number of days required to complete the project,
 - j. an evaluation of the impact of continued dredging on the species of concern,
 - k. a description of any efforts that will be made to minimize the impacts of the project on the species of concern.

The Department will share the information with other resource agencies and a decision to grant or deny the amendment shall be made by February 1. Requests for amendment received after January 15 will be considered at the Department’s discretion.

24. No later than four weeks after issuance of this water quality certification, the applicant shall submit a notification procedure outlining the reporting process to MassDEP for incidents relating to dredging activities that impact surrounding resource areas and habitats including, but not limited to, observed dead or distressed fish or other aquatic organisms, observed oily sheen on the surface of the water, a sediment spill, a turbidity plume beyond the deployed BMPs, and a barge or equipment accident/spill. If at any time during implementation of the project such an incident occurs, the applicant shall immediately notify MassDEP and all site related activities impacting the water shall cease until the source of the problem is identified and adequate mitigating measures are deployed to the satisfaction of MassDEP.

This certification does not relieve the applicant of the obligation to comply with other applicable state or federal statutes or regulations. Any changes made to the project as described in the previously submitted Notice of Intent, 401 Water Quality Certification application, or supplemental documents will require further notification to the Department.

NOTICE OF APPEAL RIGHTS

401 WQC Appeal Process (314 CMR 9.10):

Certain persons shall have a right to request an adjudicatory hearing concerning certifications by the Department when an application is required:

- a. the applicant or property owner;
- b. any person aggrieved by the decision who has submitted written comments during the public comment period;
- c. any ten (10) persons of the Commonwealth pursuant to M.G.L. c.30A where a group member has submitted written comments during the public comment period; or

- d. any governmental body or private organization with a mandate to protect the environment, which has submitted written comments during the public comment period.

Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice. To request an adjudicatory hearing pursuant to M.G.L. c.30A, § 10, a Notice of Claim must be made in writing, provided that the request is made by certified mail or hand delivery to the Department, with the appropriate filing fee specified within 310 CMR 4.10 along with a DEP Fee Transmittal Form within twenty-one (21) days from the date of issuance of this Certificate, and addressed to:

Case Administrator
Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108.

A copy of the request shall at the same time be sent by certified mail or hand delivery to the issuing office of the Wetlands and Waterways Program at:

Department of Environmental Protection
One Winter Street, 5th Floor
Boston, MA 02108.

A Notice of Claim for Adjudicatory Hearing shall comply with the Department's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6), and shall contain the following information pursuant to 314 CMR 9.10(3):

- a. the 401 Certification Transmittal Number and DEP Wetlands Protection Act File Number;
- b. the complete name of the applicant and address of the project;
- c. the complete name, address, and fax and telephone numbers of the party filing the request, and, if represented by counsel or other representative, the name, fax and telephone numbers, and address of the attorney;
- d. if claiming to be a party aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found at 314 CMR 9.02;
- e. a clear and concise statement that an adjudicatory hearing is being requested;
- f. a clear and concise statement of (1) the facts which are grounds for the proceedings, (2) the objections to this Certificate, including specifically the manner in which it is alleged to be inconsistent with the Department's Water Quality Regulations, 314 CMR 9.00, and (3) the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written Certification; and
- g. a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant, the owner (if different from the applicant), the conservation commission of the city or town where the activity will occur, the Department of Environmental Management (when the certificate concerns projects in Areas of Critical Environmental Concern), the public or private water supplier where the project is located (when the certificate concerns projects in Outstanding Resource Waters), and any other entity with responsibility for the resource where the project is located.

The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars (\$100) must be mailed to:

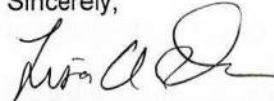
Commonwealth of Massachusetts
Department of Environmental Protection
Commonwealth Master Lockbox
P.O. Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. The Department may waive the adjudicatory-hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Failure to comply with this certification is grounds for enforcement, including civil and criminal penalties, under MGL c.21 §42, 314 CMR 9.00, MGL c. 21A §16, 310 CMR 5.00, or other possible actions/penalties as authorized by the General Laws of the Commonwealth.

If you have questions about this decision, please contact Alice Smith 617-292-5854.

Sincerely,



Lisa Rhodes
Wetlands Program Chief

enclosure: Communication for Non-English Speaking Parties - 310 CMR 1.03(5)(a)
Material Shipment Record (MSR)

cc:

Chris Bertoni, Conservation Administrator, Conservation Commission, 10 Central Street Manchester-by-the-Sea, MA 01944-1399
Jill Provencal and Phil DiPietro, MassDEP NERO, 205B Lowell Street, Wilmington, MA 01887
Richard Canavan Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
Gabrielle Belfit Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
Paul Maniccia and Christine Jacek, Regulatory/Enforcement Division, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751
Edward Reiner and Phil Colarusso, US EPA, 5 Post Office Square, Suite 100, Boston, MA 02109
Tay Evans, Division of Marine Fisheries, 30 Emerson Avenue, Gloucester, MA 01930
Kaitlyn Shawn and Mike Johnson, National Marine Fisheries Services, 55 Great Republic Drive, Gloucester, MA 01930
Robert Boeri, MA CZM, 251 Causeway Street, Suite 800, Boston, MA 02114
Amy Hoenig and Melany Cheeseman, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581



Massachusetts Department of Environmental Protection
One Winter Street, Boston MA 02108 • Phone: 617-292-5751
Communication For Non-English Speaking Parties - 310 CMR
1.03(5)(a)



1 English:

This document is important and should be translated immediately. If you need this document translated, please contact MassDEP's Diversity Director at the telephone numbers listed below.



2 Español (Spanish):

Este documento es importante y debe ser traducido inmediatamente. Si necesita este documento traducido, por favor póngase en contacto con el Director de Diversidad MassDEP a los números de teléfono que aparecen más abajo.



3 Português (Portuguese):

Este documento é importante e deve ser traduzida imediatamente. Se você precisa deste documento traduzido, por favor, entre em contato com Diretor de Diversidade da MassDEP para os números de telefone listados abaixo.



4(a) 中國（傳統） (Chinese (Traditional): 本文件非常重要，應立即翻譯。

如果您需要翻譯這份文件，請用下面列出的電話號碼與MassDEP的多樣性總監聯繫。



4(b) 中国（简体中文） (Chinese (Simplified):

本文件非常重要，应立即翻译。如果您需要翻译这份文件，请用下面列出的电话号码与MassDEP的多样性总监联系。



5 Ayisyen (franse kreyòl) (Haitian) (French Creole):

Dokiman sa-a se yon bagay enpòtan epi yo ta dwe tradui imedyatman. Si ou bezwen dokiman sa a tradui, tanpri kontakte Divèsite Direktè MassDEP a nan nimewo telefòn ki nan lis pi ba a.



6 Việt (Vietnamese):

Tài liệu này là rất quan trọng và cần được dịch ngay lập tức. Nếu bạn cần dịch tài liệu này, xin vui lòng liên hệ với Giám đốc MassDEP đa dạng tại các số điện thoại được liệt kê dưới đây.



7 ប្រទេសកម្ពុជា (Kmer (Cambodian):

ឯកសារនេះគឺមានសារៈសំខាន់និងគួរត្រូវបានបកប្រែភ្លាម។ ប្រសិនបើអ្នកត្រូវបានបកប្រែឯកសារនេះសូមទំនាក់ទំនងឆ្នោតជាសាយភាយ MassDEP នៅលេខទូរស័ព្ទដែលបានរាយខាងក្រោម។



8 Kriolu Kabuverdianu (Cape Verdean):

Es documento é importante e deve ser traduzido imidiatamente. Se bo precisa des documento traduzido, por favor contacta Director de Diversidade na MassDEP's pa es numero indicode li d'boche.



9 Русский язык (Russian):

Этот документ является важным и должно быть переведено сразу. Если вам нужен этот документ переведенный, пожалуйста, свяжитесь с директором разнообразия MassDEP по адресу телефонных номеров, указанных ниже.



10 العربية (Arabic):

هذه الوثيقة الهامة وينبغي أن تترجم على الفور. اذا كنت بحاجة الى هذه الوثيقة المترجمة، يرجى الاتصال مدير التنوع في PMassDE على أرقام الهواتف المدرجة أدناه.



11 한국어 (Korean):

이 문서는 중요하고 즉시 번역해야 합니다. 당신이 번역이 문서가 필요하면 아래의 전화 번호로 MassDEP의 다양성 감독에 문의하시기 바랍니다



12 հայերեն (Armenian):

Այս փաստաթուղթը շատ կարևոր է եւ պետք է թարգմանել անմիջապես. Եթե Ձեզ անհրաժեշտ է այս փաստաթուղթը թարգմանվել դիմել MassDEP բազմազանությունը տնօրեն է հեռախոսահամարների թվարկված են ստորև.



13 فارسی (Farsi (Persian)):

این سند مهم است و باید فوراً ترجمه شده است. اگر شما نیاز به این سند ترجمه شده، لطفاً با ما تماس تنوع مدیر PMassDE در شماره تلفن های ذکر شده در زیر.



14 Français (French):

Ce document est important et devrait être traduit immédiatement. Si vous avez besoin de ce document traduit, s'il vous plaît communiquer avec le directeur de la diversité MassDEP aux numéros de téléphone indiqués ci-dessous.



15 Deutsch (German):

Dieses Dokument ist wichtig und sollte sofort übersetzt werden. Wenn Sie dieses Dokument übersetzt benötigen, wenden Sie sich bitte Diversity Director MassDEP die in den unten aufgeführten Telefonnummern.



16 Ελληνική (Greek):

Το έγγραφο αυτό είναι σημαντικό και θα πρέπει να μεταφραστούν αμέσως. Αν χρειάζεστε αυτό το έγγραφο μεταφράζεται, παρακαλούμε επικοινωνήστε Diversity Director MassDEP κατά τους αριθμούς τηλεφώνου που αναγράφεται πιο κάτω.



17 Italiano (Italian):

Questo documento è importante e dovrebbe essere tradotto immediatamente. Se avete bisogno di questo documento tradotto, si prega di contattare la diversità Direttore di MassDEP ai numeri di telefono elencati di seguito.



18 Język Polski (Polish):

Dokument ten jest ważny i powinien być natychmiast przetłumaczony. Jeśli potrzebujesz tego dokumentu tłumaczone, prosimy o kontakt z Dyrektorem MassDEP w różnorodności na numery telefonów wymienionych poniżej.



19 हिन्दी (Hindi):

यह दस्तावेज़ महत्वपूर्ण है और तुरंत अनुवाद किया जाना चाहिए. आप अनुवाद इस दस्तावेज़ की जरूरत है, नीचे सूचीबद्ध फोन नंबरों पर MassDEP की विविधता निदेशक से संपर्क करें.



Massachusetts Department of Environmental Protection
 Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

A. Location Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Provide the following information on the location where the waste was generated:

Release name (optional) _____

Street _____

Location aid _____

City/Town _____

State _____

Zip code _____

2. Date/Period of generation: _____

From _____

To _____

3. U.S. EPA ID number: _____

4. 21E release: _____

Yes No

5. List additional tracking documents associated with this document:

Important: This form is not to be used for the shipment of remediation wastes subject to management under section 310 CMR 40.0035 of the Massachusetts Contingency Plan nor is it to be used in lieu of a hazardous waste manifest for hazardous waste or recyclable materials subject to the Massachusetts Hazardous Waste Regulations 310 CMR 30.000.

B. Generator Information

1. Provide the following generator information:

Name of organization _____

Contact name _____

Title _____

Street address _____

City/Town _____

State _____

Zip code _____

Telephone number(including extension) _____

C. Owner and/or Operator Information

1. If the owner and/or operator is different from the generator as indicated in Section B, provide the following information:

Check applicable: owner operator

Name of organization _____

Contact name _____

Title _____

Street address _____

City/Town _____

State _____

Zip code _____

Telephone number _____

Ext. _____



Massachusetts Department of Environmental Protection
Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

D. Transporter/Common Carrier Information

1. Provide the following information:

Transporter/Common carrier name _____

Hazardous waste license number (if applicable) _____

Licensing state (if applicable) _____

Contact person _____

Title _____

Street _____

City/Town _____

State _____

Zip code _____

Telephone number _____

Ext. _____

E. Receiving Facility Information

1. Provide the following information on the receiving facility:

Operator/Facility name _____

Contact person _____

Title _____

Street _____

City/Town _____

State _____

Zip code _____

Telephone number _____

Ext. _____

2. Type of facility:

asphalt batch/cold mix

asphalt batch/hot mix

landfill/disposal

landfill/ daily cover

thermal processing

landfill/structural fill

other(specify): _____

3. Permit number: _____



Massachusetts Department of Environmental Protection
Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

F. Description of Material

Check all that apply:

1. a. soil dredge material fill

b. Description: _____

c. Classification: MIT USDA USAEC ASEE

2. Other(describe): _____

3. Type of contamination:

a. gasoline diesel fuel #2 oil #4 oil
 #6 oil waste oil kerosene jet fuel

b. Debris:
 demolition vegetative inorganic

c. Other(describe): _____

4. Constituents of concern (check all that apply):

As HVOCs
 Cd PATH
 Cr VOCs
 Pb PAHs
 Hg BNAs
 Na TPH
 PCBs Other(describe): _____

5. Analyses performed (check all that apply):

As PATH
 Cd VOCs
 Cr PAHs
 Pb BNAs
 Hg TPH
 Na TCLP (inorganic)
 PCBs TCLP (organic)
 HVOCs Other(describe): _____

6. Screening performed:

Type

Instrument used

Constituents



Massachusetts Department of Environmental Protection
Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

F. Description of Material (cont.)

7. Estimated volume of materials:

Cubic yards Tons Other(specify units)

8. Contaminant source (check one):

- transportation accident
- dust
- other(describe): _____

9. Indicate which waste characterization support documentation is attached:

- site history information
- sampling and analytical methods/procedure
- laboratory data
- field screening data

If supporting documentation is not appended, provide an attachment stating the date and in connection with what document such information was previously submitted to the facility.

G. Qualified Environmental Professional Opinion

"I have personally examined and am familiar with the information contained on and submitted with this form. Based on this information, it is my opinion that the testing and assessment actions undertaken were adequate to characterize the waste, and that the facility or location can accept wastes with the characteristics described in this submittal. I am aware that significant penalties including, but not limited to, possible fines and imprisonment may result if I willfully submit information which I know to be false, inaccurate, or materially incomplete."

Name of Organization

Name of Professional

Title

Telephone number _____
Ext.

Signature

Date (MM/DD/YYYY)

License Number¹

Seal²:

¹A license number is required for all Qualified Environmental Professional completing this form. A Qualified Environmental Professional is licensed or certified in a discipline related to environmental assessment (i.e., engineering, geology, soil science, or environmental science) by a state or recognized professional organization.

²A seal is **not** required for a **Licensed Site Professional** as defined in M.G.L. 21A, s. 19, holding a valid license issued by the Board of Registration of Hazardous Waste Site Cleanup Professionals pursuant to M.G.L. c. 21A, § 19 through 19J. A seal is required for all other Qualified Environmental Professionals as defined in 1 above.



Massachusetts Department of Environmental Protection
Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

H. Certification of Generator

"I certify under penalties of law that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification, and that, based on my inquiry of those individuals immediately responsible for obtaining the information contained herein is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information."

Signature

Date (MM/DD/YYYY)

Name (Print)

I. Acknowledgment of Receipt by Receiving Facility

Receiving Facility

Representative (Print)

Title

Signature

Date (MM/DD/YYYY)



**Massachusetts Department of Environmental Protection
Bureau of Air & Waste**

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

J. Load Information

Note:
Make additional copies of this page as necessary.

Load#: _____

Signature of transporter _____

Receiving facility _____

Date received _____

Time received _____

Date of shipment _____

Time of shipment _____

Truck/Tractor registration _____

Trailer registration _____

Load size (cubic yards/tons) _____

Load#: _____

Signature of transporter _____

Receiving facility _____

Date received _____

Time received _____

Date of shipment _____

Time of shipment _____

Truck/Tractor registration _____

Trailer registration _____

Load size (cubic yards/tons) _____

Load#: _____

Signature of transporter _____

Receiving facility _____

Date received _____

Time received _____

Date of shipment _____

Time of shipment _____

Truck/Tractor registration _____

Trailer registration _____

Load size (cubic yards/tons) _____

K. Log Sheet Volume Information


Total volume this page (cubic yards/tons) _____

Total carried forward (cubic yards/tons) _____

Total carried forward and this page (cubic yards/tons) _____

Page _____ of _____



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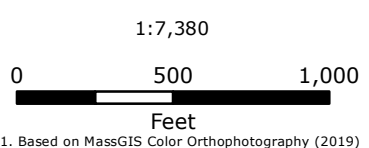
APPENDIX D5
Staging and Access Areas



- LEGEND**
- Potential Stockpile Locations
 - Manchester Parcels
 - Town Boundary
 - ↔ Potential Access Points

Tighe & Bond

**Attachment #15
Project Impact Area**



1. Based on MassGIS Color Orthophotography (2019)

**CENTRAL STREET BRIDGE IMPROVMENTS
CENTRAL POND RESTORATION PROJECT
STAGING AND
POTENTIAL STOCKPILE LOCATIONS**

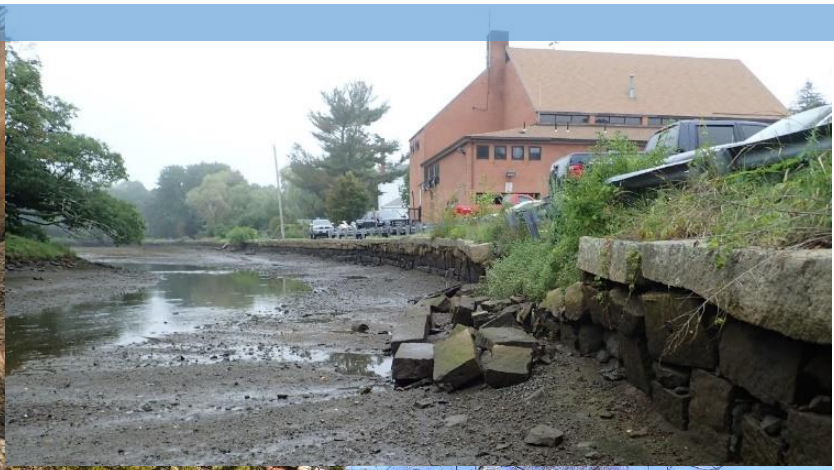
Manchester, Massachusetts
November 2020

Tighe&Bond

APPENDIX E

APPENDIX E1

ENF Alternatives Discussion



Central Street Bridge Reconstruction and
Central Pond / Sawmill Brook Restoration Project
Manchester-by-the-Sea, Massachusetts

Environmental Notification Form

Town of Manchester-by-the-Sea

December 2019

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- Central Street Bridge Reconstruction Project (6 sheets)
- MassDOT Plan of Topographic Survey of Central Street (4 sheets)
- Central Pond Restoration Project (6 sheets)
- Central Pond Restoration Project – Cross Sections (2 sheets)

Appendix D Sediment Sampling Technical Memorandum

Appendix E Massachusetts Historic Commission Correspondence

J:\M\M1476 Manchester MA Hydro Study\011-Central Street Bridge\Permitting\MEPA ENF\doc\4 - ENF Narrative MBTS Central St Bridge & Pond.docx

Section 4

Alternatives Analysis

Several repair and improvement alternatives were considered for the Central Street bridge, tide gate, and Central Pond / Sawmill Brook, and the most feasible solution is presented as the proposed project in the ENF. Factors considered in the evaluation of alternatives include environmental impacts, public safety, climate change resiliency, and rainbow smelt spawning condition improvements.

As the existing Central Street bridge is in deteriorating condition and is physically associated with the tide gate and adjacent Central Pond / Sawmill Brook, off-site alternatives would not meet project goals and were therefore not considered. On-site alternatives considered for the project included a no action alternative, repair or replacement of the Central Street culvert/bridge in conjunction with tide gate removal, and alternatives for the restoration of Central Pond or Sawmill Brook.

4.1 No Action Alternative

The no action scenario would result in no immediate direct costs, but will result in increasing safety and functionality concerns over time, if deterioration of the bridge and tide gate is allowed to continue at the current pace. Impacts from flooding associated with the tide gate and lack of stormwater improvements would continue to negatively affect adjacent property owners and rainbow smelt spawning conditions. As the no action alternative does not meet project goals of addressing failing infrastructure, reducing flooding and increasing resiliency, and improving habitat conditions and possibility for rainbow smelt, it is not preferred.

4.2 Central Street Bridge and Tide Gate Alternatives

During a June 2015 in-water walk-through to view existing conditions, the Central Street bridge signs of advanced deterioration were observed, including separation of joints, cracked blocks, wall seepage, and foundation undermining. Emergency repairs were made in June 2016 to temporarily stabilize the existing arch barrel and footing, but continued deterioration due to water seepage, scour, settling, and stone separation is inevitable without major repairs or replacement. The existing tide gate and bridge at Central Street impede flow from Sawmill Brook, especially during coastal storm events, resulting in localized flooding.

In both of the below alternatives, the existing tide gate is proposed to be removed as it has been identified by DMF, DER, and NOAA as an impediment to rainbow smelt fish passage, and the existing, deteriorated bridge is proposed to be rehabilitated or replaced to address public safety concerns. Alternatives for the bridge structure are limited by depth to bedrock, the presence of buildings immediately adjacent to the bridge and roadway, and constraints imposed by numerous utilities on the site.

Additional alternatives for bridge rail types and configurations, wingwall façades, and bridge structure types that will meet the Town Historic Commission's aesthetic needs while adhering to AASHTO Roadside Design Guide and the MassDOT Bridge Manual and highway standards are under consideration, and will be further refined during the design and permitting processes.

Section 4 Alternatives Analysis

4.2.1 Rehabilitate Bridge and Culvert Structure, Remove Tide Gate

Rehabilitating the existing bridge and culvert structure and removing the tide gate structure is anticipated to result in improved hydraulic capacity, habitat restoration, improvements to aesthetics and water quality, and a reduction in upstream flooding due to the removal of the tide gate.

However, rehabilitation would only provide a temporary solution to the continued deterioration of the bridge and culvert structure, would not allow for implementation of pedestrian and traffic safety improvements, and would not maximize the bridge opening for the brook.

4.2.2 Replace Culvert with Bridge, Remove Tide Gate (Preferred)

The Town has identified the existing narrow roadway width of the Central Street bridge as a safety issue with respect to pedestrian, bicycle, and automobile traffic. Although options to widen the roadway are limited due to abutting businesses, even a modest increase in roadway width may improve safety. Replacing the existing culvert with a precast concrete bridge structure and removing the existing tide gate is anticipated to result in improved hydraulic capacity, habitat restoration, improvements to aesthetics and water quality, improvements to roadway safety, and a reduction in upstream flooding. Concerns with the replacement alternative include temporary water quality impacts, a change in hydrology and increased tidal range relative to existing conditions, a shift in species, and temporary water quality impacts.

4.2.3 Bridge Alternatives Comparison

Table 4-1 below compares the benefits and impacts of the Central Street Bridge alternatives. The environmental impacts of the rehabilitation and replacement alternatives are both temporary impacts associated with construction period impacts, with no permanent impacts due to the reuse of the existing structure footprint based on existing site constraints.

Table 4-1
Summary of Central Street Bridge Alternatives

	Rehabilitation of Existing Bridge/Culvert Structure	Replacement of Culvert with Larger Span Bridge (Preferred)	No Action
Description of Work Required	Remove tide gate Repair existing culvert/bridge structure	Remove tide gate Replace existing culvert/bridge with 20-foot wide precast concrete bridge structure	None
Hydraulic Capacity / Resiliency	Would improve hydraulic capacity through removal of tide gate but would not increase structure opening	Would improve hydraulic capacity, increase structure opening, and incorporate potential future sea level rise	Would not improve
Habitat Restoration	Would improve through removal of tide gate	Would improve through removal of tide gate	Would not address rainbow smelt spawning conditions

Section 4 Alternatives Analysis

	Rehabilitation of Existing Bridge/Culvert Structure	Replacement of Culvert with Larger Span Bridge (Preferred)	No Action
Aesthetics	Would improve	Would improve	Would not improve
Upstream Flooding	Anticipated to reduce upstream flooding	Anticipated to reduce upstream flooding	Impacts from upstream flooding would continue to affect property owners
Public Safety	Would not improve upon existing narrow roadway width, would only be a temporary solution due to deteriorating condition of structure	Would improve pedestrian, bicycle, and automobile safety and address deterioration of structure	Increased safety concerns over time as deterioration continues
Environmental Impacts - Narrative	Temporary resource area and water quality impacts during construction Change in hydrology Increased tidal range Shift in species relative to existing conditions	Temporary resource area and water quality impacts during construction Change in hydrology Increased tidal range Shift in species relative to existing conditions	Short term: none, but will need to continue repairs and eventually rehabilitate or replace
Environmental Impacts - Temporary (sf)	15,195 (Coastal Bank, Land Under Water, Riverfront Area, LSCSF)	15,195 (Coastal Bank, Land Under Water, Riverfront Area, LSCSF)	Short term: none but will need to continue repairs and eventually rehabilitate or replace
Environmental Impacts - Permanent (sf)	None – would utilize existing structure and associated footprint	None – reconstruction is located within the overall footprint of the existing bridge and roadway	Short term: none but will need to continue repairs and eventually rehabilitate or replace

4.3 Bank Stabilization Alternatives

The wall along the south-eastern section of the Pond, extending from behind 19 Central Street to the Fire Station, is in poor condition, with two wall sections that have collapsed, and approximately 400 feet in need of extensive repair. In other areas, there is land subsidence, erosion, and deterioration of the existing wall. Bank stabilization is proposed to occur during the overall restoration of Central Pond / Sawmill Brook, with the goals of protecting existing residences and buildings, preventing wall collapse and subsidence, decreasing sedimentation into the Pond, improving public access where possible, and implementing green solutions where feasible.

Bank stabilization alternatives considered include green gabions, segmental block wall, and living shoreline, which are summarized in Table 4-2 below.

Section 4 Alternatives Analysis

Table 4-2

Summary of Central Pond / Sawmill Brook Bank Treatment Alternatives

	Living Shoreline	Segmental Block Wall	Green Gabions
Public Access	Open	Limited – access can be provided at key spots	Limited
Permitting	Moderate	Complex	Moderate
Cost per LF	\$300	\$900	\$700
Resiliency / Sustainability	Small storm erosion	50–75 year service life	50-75 year service life
Maintenance Requirements	Debris/litter, plant maintenance, shoreline grading	Debris/litter	Debris/litter, growth maintenance
Feasibility	East bank – low West bank - high	East bank – high West bank - moderate	East bank – moderate West bank - moderate
Environmental Impacts (Narrative)	Temporary and permanent impacts from installation of bioengineered stabilization solution (TBD)	Temporary impacts from dredging for retaining wall repairs and reconstruction Permanent impacts from installation of rip-rap wall erosion protection	Temporary impacts from construction access and installation Permanent impacts from installation of rip-rap wall erosion protection
Environmental Impacts (sf)		Temporary: 109,400 (Coastal Bank, Land Under Water, Riverfront Area) Permanent: 7,600 (Land Under Water)	Temporary: 109,400 (Coastal Bank, Land Under Water, Riverfront Area) Permanent: 7,600 (Land Under Water)

Based on site conditions that include the presence of existing houses and buildings directly abutting the existing stone wall on the east bank, the repair of the existing wall is preferred on the east side, and installation of a living shoreline is preferred for the west bank due to the low slope and feasibility of use. As the project progresses through the design and permitting process, additional details regarding the bank stabilization design will be developed.

4.4 Central Pond / Sawmill Brook Restoration Alternatives

The goals of the proposed Central Pond / Sawmill Brook restoration portion of the project include improving conditions relative to flood mitigation, fish passage, aesthetics, channel conditions, wildlife habitat, wall stability, and public access.

During the feasibility study for restoration of Central Pond performed under a grant from MET, alternatives for the restoration of Central Pond were developed based on bank stabilization, stormwater drainage, stream bed improvements, wetland and riparian impacts and restoration, diadromous fish run and habitat improvement, and public access considerations. All potential alternatives provide for full passage tidal exchange.

4.4.1 Maintain Low Level Impoundment at Central Pond

In this alternative, Central Pond would be improved in order to maintain a permanent low level water impoundment with a cross-channel berm upstream of Central Street bridge where the channel expands. This alternative would maximize the water feature, but would likely require high construction and maintenance costs with a high level of permitting complexity and relatively low ecological benefits relative to restoration of Sawmill Brook as a tidal stream.

4.4.2 Restore Sawmill Brook to Low Level Pools with Low Level Riffles

In this alternative, Sawmill Brook would be restored to low level pools impounded by low level riffle structures. The pool and riffle alternative would provide fish passage improvements, a naturalized landscape, flood mitigation, an increased water feature, and some sediment management, and is between the tidal stream and pond alternatives in terms of construction maintenance and maintenance costs. Permitting complexity for this alternative is anticipated to be complex, with high potential ecological benefits and moderate project complexity.

Feedback received from project partners during the planning process is that the results of this alternative would be uncharacteristic of more natural streams in the area, and should be avoided.

4.4.3 Restore Sawmill Brook to Unrestricted Tidal Stream (Preferred)

Restoring Sawmill Brook to an unrestricted tidal stream would provide free flowing water in a continuous stream, and would require:

- Replacement of the retaining wall along the east side of the pond
- Spot treatment of areas susceptible to erosion along the west side of the pond with soft bank toe protection measures
- Planting of vegetation in the pond bottom to stabilize sediment and encourage establishment of a healthy plant community

This alternative would require relatively low construction and maintenance costs relative to Central Pond improvements, would have high ecological benefits in terms of maximizing fish passage, improving water quality, providing flood mitigation, providing diverse wildlife habitat, and resulting in a restored naturalized landscape.

4.4.4 Central Pond / Sawmill Brook Alternatives Comparison

Table 4-3 below compares the benefits and impacts of the Central Pond / Sawmill Brook restoration alternatives. As all alternatives include the necessary repair and replacement work on the walls, the environmental impacts all include the minimum impacts from repair and replacement of the eastern block wall and installation of a bioengineered living shoreline on the eastern side.

Table 4-3
Summary of Central Pond / Sawmill Brook Alternatives

	Maintain Low Level Impoundment at Central Pond	Restore Sawmill Brook to Low Level Pools with Riffles	Restore Sawmill Brook to Unrestricted Tidal Stream (Preferred)
Description of Work Required	Installation of cross-channel berm upstream of Central Street bridge Eastern shore: replacement and repair of existing retaining walls Western shore: implementation of bioengineered stabilization solutions	Installation of rock riffle structures Eastern shore: replacement and repair of existing retaining walls Western shore: implementation of bioengineered stabilization solutions	Re-establishment of native salt marsh and utilization of natural in-stream processes with adaptive management Eastern shore: replacement and repair of existing retaining walls Western shore: implementation of bioengineered stabilization solutions
Feasibility	Low	Moderate-high	High
Permitting	Complex	Complex	Moderate
Public Benefits	Maximize water feature Flood mitigation (25-year)	Diversity wildlife habitat Increase water feature Improve fish passage Naturalize landscape Flood mitigation (25-year)	Diversify wildlife habitat Improve water quality Maximize fish passage Naturalize landscape Flood mitigation (25-year)
Sustainability	Moderate	Moderate	High
Ecological Benefits	Low	High	High
Complexity / Maintenance	High	Moderate	Low
Environmental Impacts – Narrative	Temporary impacts from retaining wall repairs and reconstruction Permanent impacts from installation of rip-rap wall erosion protection and footprint of cross-channel berm. Berm would result in permanent flooding of 1-2 feet and prevent fish passage	Temporary impacts from dredging for retaining wall repairs and reconstruction Permanent impacts from installation of rip-rap wall erosion protection and footprint of 3 riffle structures	Temporary impacts from plantings, retaining wall repairs and reconstruction Permanent impacts from installation of rip-rap wall erosion protection
Estimated Environmental Impacts (sf)	Temporary: 109,400 (Coastal Bank, LUW, LSCSF/Riverfront Area) Permanent: 8,100 (LUW), 3 acres permanently pooled	Temporary: 1,925 lf (Coastal Bank) 39,000 (LSCSF/Riverfront Area) Permanent: 8,500 (Land Under Water)	Temporary: 1,925 lf (Coastal Bank) 39,000 (LSCSF/Riverfront Area) Permanent: 7,600 (LUW)

4.5 Preferred Alternative

4.5.1 Project Details

The proposed condition improvements include removing the tide gate and replacing the existing Central Street culvert with a 20-foot wide arch culvert. The proposed culvert would maintain the existing upstream and downstream invert elevations (-0.2 feet NAVD88, and -4 feet NAVD88, respectively), and provide a constant low chord elevation of 6 feet NAVD88.

Removal of the tide gate and enlargement of the culvert will improve fish passage and increase the hydraulic capacity of Sawmill Brook reducing upstream flooding. Removing the tide gate will also limit the hydraulic pressure behind the seawall and reduce safety concerns. Restoration of the seawall and guard rail will improve traffic safety. Stream restoration will improve habitat and aesthetics in the downtown area. The public location is also ideal for educational signage about Sawmill Brook's natural history.

The proposed restoration design for the Central Pond area of Sawmill Brook includes reestablishing the native salt marsh within the interior sections of the mud flats, replacing and repairing existing retaining walls along the eastern shore, and implementing bioengineered solutions to stabilize the western shoreline. The goal of the design is to take advantage of the natural in-stream processes to reestablish a channel through the sediments in Central Pond, followed by adaptive management, if needed. This process will begin, to some extent, with the removal of the tide gate in fall 2020. With this approach, the stream channel would stabilize naturally and reach equilibrium. Adaptive management would be employed to address issues that may arise, such as:

- Adjustment of the stream thalweg (low flow centerline) if the channel were to develop too close to the east or west embankments
- Active plantings of native species to revegetate the former pond to facilitate salt marsh establishment and/or invasive plant management
- Actively promote habitat enhancements if natural processes are not developing

Stream restoration will also improve fish passage and overall habitat value. The public will benefit from this project as it will fortify stream banks currently overtopping and eroding, provide more flood storage to lessen flood events, and create an aesthetically pleasing new habitat in the downtown area to enhance resident's opportunity to observe the natural environment.

Alternatives for embankment stabilization/restoration along the east and west sides of Central Pond are still under development and presently include segmental retaining walls consisting of mechanically stabilized earth walls and/or gravity walls and gabion walls. Poor wall drainage is likely one of the factors contributing to the existing wall failures, so improved drainage features will be included in the final selected option with the goal of improved wall performance and longevity. Living shoreline bioengineering is planned for sections on the western shore.

4.5.2 Climate Change / Resiliency Considerations

Tighe & Bond performed a hydrologic and hydraulic (H&H) analysis for existing Central Street bridge/culvert and tide gate conditions using HEC-RAS, a 1-dimensional hydraulic modeling program available from the Army Corps of Engineers.

HEC-RAS was used by Tighe & Bond to develop a model as part of the 2018 Sawmill Brook Feasibility Study, and was further refined as part of the current project design. The hydraulic performance under existing conditions was evaluated for the 2-, 10-, 25-, 50-, 100-, and 500-year return frequency storm events. The MassDOT Bridge Manual (2013) indicates that the hydraulic design flood return frequency for an Urban Minor Arterial or Rural Major Collector is the 25-year return frequency storm event with a recommended 2-feet of freeboard.

The hydraulic analysis was based on hydrologic analysis of the watershed of Sawmill Brook upstream of Central Street Bridge as part of 2016 Sawmill Brook and Green Infrastructure Analysis that included the 25-, 50-, and 100-year frequency storm events using the U.S. Army Corps of Engineers HEC-HMS software. The 2-, 10-, and 500-year return frequency discharge peak flows were added to the existing HEC-HMS model. The 2016 Sawmill Brook and Green Infrastructure Analysis included climate change projections that predict stream flows in 2100 for the 25-, 50-, and 100-year frequency storm events. These projected values are not required as part of the MassDOT Chapter 85 guidelines but were considered as part of the design process. The drainage area upstream of the Central Street Bridge was determined to be approximately five square miles.

The hydraulic model was developed using the surveyed topographic data and LiDAR elevation data available from MassGIS. The hydraulic model was performed for Mean Higher High Water (MHHW) downstream tidal condition of 4.77 feet NAVD88 based on the NOAA Long Term Tide Water Level Monitoring Station ID: 8443970. MHHW is the technical term used by NOAA to describe the average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch (19 year tidal cycle). The 25-year frequency storm event was also evaluated for Mean Sea Level (MSL) conditions and MHHW conditions in 2100 using the 0.012 feet/year increase recommended in the LFRD Bridge Manual to incorporate sea level rise (SLR). The H&H analysis included additional scenarios to incorporate future climate change conditions, as summarized in Table 4-4 below.

Table 4-4

H&H Results Upstream of Existing Central Street Bridge with Closed Tide Gate

Storm Return Frequency ¹	Peak Discharge (cubic feet per second)	Upstream Peak Water Surface Elevation (feet, NAVD88)	Freeboard (feet) ²	Distance to Top of Road (feet)
2-Year	254	6.4	-0.4	4.2
10-Year	924	11.2	-5.2	-0.6
25-Year	1,363	11.8	-5.8	-1.2
25-Year MHHW MassDOT SLR	1,363	11.9	-5.9	-1.3
25-year MSL MassDOT SLR	1,363	11.8	-5.8	-1.2
50-Year	1,772	12.4	-6.4	-1.8
100-Year	2,267	12.5	-6.5	-1.9
500-Year	3,078	12.6	-6.6	-2.0

¹ Tidal boundary condition is MHHW unless stated otherwise.

² Freeboard measured as the vertical difference between the crown of the arch (low chord) and the upstream peak water surface elevation.

The existing tide gate crest elevation is at 4.6 feet, which is below MHHW. The 2018 Sawmill Brook Feasibility Study found, through modeling and field measurements, that the tide gate increased water surface elevations upstream of Central Street during storm events, and water levels in the pond were found to exceed the tide levels during extreme high tides. The tide gate is proposed to be removed due to hydraulic and fish passage considerations.

Proposed conditions hydraulic modeling was performed for the MHHW downstream tidal condition of 4.77 feet NAVD88 and evaluating the 25-year frequency storm event for MSL conditions and MHHW conditions in 2100 incorporating SLR. The proposed conditions assumed a low chord elevation of 6.0 feet and an arch with a clear span of 20 feet with an opening of 185 square feet. The upstream end of the culvert will be partially filled with stream bed material and/or limited by bedrock resulting in an effective opening of approximately 94 square feet. The model results are summarized in Table 4-5 below.

Table 4-5

H&H Results Upstream of Proposed 20-foot Span Arch Bridge

Storm Return Frequency ¹	Peak Discharge (cubic feet per second)	Upstream Peak Water Surface Elevation (feet, NAVD88)	Freeboard (feet) ²	Distance to Top of Road (feet)
2-Year	254	4.7	1.3	5.9
10-Year	924	4.8	1.2	5.8
25-Year	1,363	5.6	0.4	5.0
25-Year MHHW MassDOT SLR	1,363	5.7	0.3	4.9
25-year MSL MassDOT SLR	1,363	1.8	4.2	8.8
50-Year	1,772	6.6	-0.6	4.0
100-Year	2,267	7.7	-1.7	2.9
500-Year	3,078	10.9	-4.9	-0.3

¹ Tidal boundary condition is MHHW unless stated otherwise.

² Freeboard measured as the vertical difference between the crown of the arch (low chord) and the upstream peak water surface elevation.

Due to the elevation of the existing road and site constraints, the proposed low chord elevation of the replacement bridge is at 6.0 feet NAVD88. The MHHW tidal elevation is currently 4.77 feet NAVD88, so two feet of freeboard would not be feasible during MHHW design conditions. Using the MassDOT recommendation for potential sea level rise, it is anticipated that 0.3 feet of freeboard would be provided if the peak of the design 25-year frequency storm event in 2100 occurred during MHHW tidal conditions, and 4.2 feet of freeboard would be provided if the design 25-year frequency storm event occurred during MSL conditions.

The H&H analysis found that the hydraulic design of removing the tide gate and replacing the existing bridge/culvert structure with the enlarged bridge structure exceeds MassDOT minimum requirements based on not overtopping Central Street during the 50-year return frequency storm event while incorporating projections for potential future SLR, and would result in significant reductions in water surface elevation in comparison with existing conditions under the 25 and 50-year storm events.

4.5.3 Project Phasing

The overall project consists of three general phases:

1. Removal of the tide gate structure, demolition of the existing Central Street Bridge and reconstruction with a concrete arch culvert with an approximate span of 20 feet
2. Repair, replacement, and stabilization of stone retaining walls along Central Pond
3. Central Pond / Sawmill Brook Restoration

Removal of the tide gate, demolition of the existing Central Street bridge, bridge reconstruction, and retaining wall repair and replacement are anticipated to occur prior to the Central Pond / Sawmill Brook restoration project.

4.6 Construction Methodology & Mitigation

The proposed project will be performed with measures to minimize potential construction disturbances. As noted below, in some instances specific construction means and methods will be determined by the contractor. Due to construction safety concerns, the contractor will be responsible for providing public safety protection measures, including safety signage and observation to ensure that the public stays at a safe distance from active equipment and does not enter potentially unsafe active work areas.

4.6.1 Erosion & Sedimentation Control

Best Management Practices (BMPs) will be implemented for the project to limit the footprint of project disturbance. BMPs will include:

- Sediment filter bags at pump discharges to collect sediment if sediment is mobilized by pumping, should pumping be necessary
- Erosion control barriers, such as compost filter tubes, or silt fence and straw bale barriers, between upland limits of work and sensitive resource areas
- Limiting footprints of work to the minimum necessary to meet project goals
- Project contractors will be required to maintain reserve supplies of erosion control barriers on-site to make repairs as necessary

Supplemental and/or alternative construction BMPs may be required during work, depending on site and weather conditions.

4.6.2 Site Access and Construction Staging

For the bridge reconstruction, access to the proposed work area will be from Central Street. Staging of equipment and materials will likely be handled in the municipal parking lot along Church Street. Should this happen, existing parking on Church Street will be impacted temporarily. Final location of staging and material handling will be further defined during later stages of design development.

For the pond project, access to the retaining wall and pond bottom will occur generally from the east side of the pond via existing paved parking areas. Plantings in the pond bottom will be performed by hand. Streambank stabilization measures required along the western portion of the pond may be installed by heavy machinery operating from anchored timber or composite mats in the pond bottom. Areas disturbed for construction access will be restored to pre-construction conditions.

4.6.3 Site Stabilization

The areas of construction will remain in a stable condition at the close of each construction day via the use of appropriate erosion and sedimentation control measures. Erosion control measures will be inspected at the close of each construction day and maintained or reinforced as necessary. All erosion and sedimentation control measures will be inspected, cleaned, or replaced during construction and will remain in place until such time as stabilization of all areas that may impact jurisdictional areas is permanent. Upon completion of construction, the impoundment level will recover naturally when pumping ceased and disturbed upland areas will be loamed and seeded and mulched, paved, or otherwise stabilized as required to match pre-construction conditions.

APPENDIX E2

Board of Selectmen Alternatives Selection



MANCHESTER-BY-THE-SEA

BOARD OF SELECTMEN • TOWN HALL
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 526-2000 FAX (978) 526-2001

MINUTES OF THE BOARD OF SELECTMEN

February 19, 2019

6:00 p.m.

Town Hall, Room 5

MEMBERS PRESENT: Chairperson, Ms. Beckmann, Mr. Boling, Ms. Jaques, Ms. Driscoll and Mr. Steinert

MEMBERS ABSENT:

STAFF PRESENT: Town Administrator, Mr. Federspiel, BOS Clerk, Ms. Hunter, BOS/TA Executive Assistant, Ms. Nathan, Interim Fire Chief Beardsley, Town Moderator, Mr. Wilson, DPW Director, Mr. Dam, DPW Manager Mr. Desrosiers and Grant Administrator, Ms. Riley

GUESTS: VHB Consultant, Ms. Domigan

PRESS: Mr. Cronin, *Gloucester Times*

At 6:00 p.m. Ms. Beckmann called the BOS Business Meeting to order noting the meeting was being video/audio-taped by a volunteer from Cape Ann TV (1623 Studios) and audio-taped by Ms. Hunter and asked if anyone in the audience was taping the meeting, to please inform the Board of Selectmen. Additionally, Ms. Beckmann asked those present to please turn off or silence their cell phones.

Ms. Beckmann asked if there were any comments or statements for the Board not on the agenda. There were none.

Ms. Beckmann extended the Boards best wishes for a speedy recovery to Paul Clark who took a difficult fall this week. Mr. Clark has been and will continue to be a great asset to the Community.

1. Central Pond, Dam & Culvert

Ms. Beckmann stated there has been a thorough review of the Central Pond, Dam & Culvert presented at the previous Board meeting and this evening the Board would vote to move the project forward.

Mr. Federspiel indicated the project has been under study for several years and through the work of Ms. Riley the Town has been awarded grants in the amount of \$400K and \$500K to support the project. This evening the Board would vote to approve one of the three proposed designs presented by Tighe & Bond at the February 4, 2019 meeting.

- 1) Low Level water impoundment – maintain permanent low-level water impoundment with a cross-channel berm upstream of Central Street bridge where channel expands
- 2) Stream with pools and riffles – stream restoration connecting low level pools impounded by low level riffle structures
- 3) Stream Restoration – unrestricted free flow water provides continuous low-level stream

Mr. Federspiel and Mr. Dam agreed construction will likely begin in a year with a lengthy permitting process taking place over the upcoming year.

Ms. Riley stated she supported the natural option of Stream Restoration as did Ms. Lamothe who represented the Stream Team.

Ms. Driscoll recognized Ms. Riley for her dedication and work on the project and on behalf of the Town.

Mr. Steinert stated he was concerned for the number of people affected by the project and believes additional information, further education and detailed maps need to be made available to help property owners who are unaware of the scope of the project.

Ms. Beckmann stated of the 3 options she supported the Stream Restoration (natural option) and if further study is warranted after completion of the project the results will be evaluated and additional consideration given to the project. Ms. Jaques expressed concern for flooding up stream and thought it important to study additional culverts in the community – while recognizing the need to start with the Central Pond Dam and Culvert.

Ms. Driscoll moved to approve the Stream Restoration option presented at the last meeting, Mr. Boling seconded the motion. The motion passed unanimously.

2. DPW Updates: Complete Streets and Compost Facility

Complete Streets:

Mr. Federspiel stated the full report and historical summary of the Complete Streets effort is on the Town's web site. In 2017 the Town went through the process of identifying and prioritizing projects for consideration, the final plan listed 18 potential projects from which 8 projects were selected for construction funding consideration. 4 were awarded funding.

The intersections and projects are:

- 1) Beach Street at Union Street
- 2) Central Street at Union Street and School Street
- 3) Washington Street, Summer Street and Sea Street
- 4) Sidewalk from Masconomo Park to Singing Beach

Mr. Dam introduced Ms. Domigan from VHB Consulting who reviewed the scope of work for the 3 intersections and sidewalk from Masconomo Park to Singing Beach.

The objective of the proposed work is to improve pedestrian and vehicular safety at each intersection and to meet Federal and State safety standards. In the process of meeting these objectives at Beach and Union Streets there will be a loss of 3 parking spaces and at Central, Union and School Streets an additional 3 parking spaces will be lost.

All intersection will add ADA Ramps, Curb Extensions and Cross Walks with Stop Lines – White and 6-foot Reflectorized White Lines and Yellow Lines. Additionally, at Central, Union and School Streets and Washington, Summer and Sea Street additional Sign Posts and/or Flex-Posts will be added.

The Town has advanced the design work and developed more accurate cost estimates which have resulted in a near doubling in costs from the original rough estimates provided by a State consultant. The grant awarded is \$242K which is insufficient to complete all the proposed work.

Mr. Steinert asked if the Consulting Firm had developed an analysis of the economic impact of the loss of parking spaces. Ms. Domigan stated the Firm's objective was to work from an engineering perspective and to follow State and Federal regulations. They were guided by MUTCD and UVC standards as Civil Engineers. The loss of parking spaces followed Federal and State standards for safety and in order for the Town to receive State or Federal funding these standards needed to be met.

Mr. Boling provided some history of the Town's downtown vision and the goals of the Downtown Improvement Program. The first DIP project many years ago proposed removing quite a lot of parking, and provoked strong objections from the residents, so was modified. After the first project, the BOS tasked the DIP with looking at a few intersections, including Central/School and the Union St intersections, which have long had pedestrian and traffic issues. Six years ago, the direction to the DIP was that it was important not to remove parking. However, Mr. Boling is beginning to wonder if we should give up some parking now to get these improvements, given that we are undertaking a more global parking study of the town as a priority project. It is time to bite the bullet and take a hit for a safer Central and School Street intersection.

Ms. Jaques agreed that safety is paramount especially with bigger cars moving faster.

Ms. Crosby, owner of the building on the corner of Central, Union and School would like the pedestrian issue to be addressed without a bump out. She also expressed concern for the loss of additional parking spaces. Mr. Butler, resident of the building, cited safety issues and concern for large trucks navigating the corner. He recommended banning trucks from turning up School Street.

Ms. Lamothe, 21 Walker Street and avid walker stated she thought the bump out in front of the Post Office improved pedestrian safety significantly and thought more bump outs would help in Town.

Ms. Beckmann thanked residents and presenters. She indicated she agreed with Mr. Boling about the intersection at Central, Union and School Streets. Ms. Beckmann will schedule a Public Forum for the March 4, 2019 meeting of the Board.

Mr. Dam will proceed with developing complete estimates for all proposed projects. Mr. Harrison, School Street resident and member of the Pike and Pedestrian Committee stated he was surprised by this meeting. There have already been several Board and Committee meetings, as well as public meetings at the Community Center. He recommended moving ahead and meeting the deadline for grant funding.

Mr. Boling requested Mr. Dam estimate both options for the Washington, Summer and Sea Street intersection with an understanding he would defer to Public Safety and DPW recommendations for the intersection.

Compost:

Mr. Dam stated the initial grant awarded for the Regional Facility will not cover the project costs and further study needs to be completed to define cost savings and overall feasibility of the project. Additionally, the Town may need to request an extension of the awarded grant while additional options are reviewed.

3. Fire Operations Fine-Tuning

Interim Chief Beardsley indicated progress is being made on the recommendations that resulted from the After-Action Report on the University Lane fire.

- Simultaneous dispatch of DPW sanders with Fire Trucks – Completed
- ID by Dispatch of primary and secondary hydrants – In Progress
- DPW ID water mains and flows – Completed to be shared with Fire and Dispatch
- Utilize District 5 Dispatch in large events – Completed share with Dispatch
- Review storm response considerations for each area of Town – Underway
- Trim roadsides for fire truck clearance needs – Still to Do (may need funds to hire tree company for larger trees and branches)
- Continue additional storm staffing – Completed
- Tankers – new agreement with Essex to send tanker truck in place of ladder truck upon first sign of structural fire
- Prioritization of pipe projects with DPW – Will present more aggressive Capital Plan for consideration at ATM.
- New Training – Chief is working with staff on new training re: use of tankers and portable “ponds” to shuttle additional water to a fire scene.

Mr. Steinert thanked the Chief for his work on behalf of the Town and asked for data specific to how many residents are impacted by low water flow. The Chief deferred the question to Mr. Dam who indicated he would have to follow up on the question.

Ms. Beckmann stated she thought excellent progress had been made and would look forward to the final report and the road map to future safety.

Mr. Boling asked the Chief by what factor does a tanker truck make up for the shortfall in water flow of 500 GPM? Chief Beardsley replied that a 3,000 sq. ft. home fire would require 9,000 gallons of water. Additional factors would also need to be taken into consideration – but the tanker truck would make a significant difference.

4. Petition Articles

Ms. McGovern, 115 Beach Street – read her presentation on **Citizens Petition to remove fluoride from public drinking water** in MBTS. 803 residents voted no in 1982 while 1,180 residents voted to add fluoride.

In 2019 there is more information about the harmful effects of fluoridated water. A group of residents asked the Board of Selectmen to end fluoridation in January 2018 and the Board deferred their decision to the Board of Health. The Board of Health suggested bringing the issue to Town Meeting.

The Citizens Petition to remove fluoride is requesting the Board of Selectmen to reconsider their position and Petition the State for a Home Rule Exemption to Chapter 111, Section BC to remove the fluoride from the Town water.

Gary Gilbert, Magnolia Ave., presented his petition for a new town bylaw, Section 43: **Food Ware and Polystyrene Reduction by-Law** – Polystyrene food containers and plastic utensils form a significant portion of the solid waste going into landfills, they are not biodegradable and will remain in our landfills for centuries and that portion of them that makes their way into the oceans will break down into dangerous microplastics which harm and kill marine life and may affect human health.

The purpose of the by-law is to reduce the usage of polystyrene and plastic products by all food-related establishments in the Town of MBTS.

The Board is interested in assuring that all businesses utilizing banned products have sufficient notice to convert to compliant containers, straws and utensils. Mr. Gilbert has spoken to most businesses using “take-out” containers in Town and he is sure that some are already in compliance and have limited inventory of non-compliant “take-out” items. He will be in contact with businesses he has not yet spoken to. Mr. Gilbert has requested the by-law be implemented within a 3-month time frame instead of 6 as originally proposed.

Ms. Jaques expressed concern about the possible increase costs to local businesses and would like to know who may be most significantly impacted by the change. Mr. Gilbert has a comprehensive spreadsheet of cost comparisons and compliant company products from other communities and he can provide the information to businesses and the Board.

Mr. Boling had 2 points on the Article on the administration side. Section 43 B exemptions are provided by the BOH and the Police Department is the enforcement arm of the by-law. He asked if the BOH and the Police Department have been informed and what the process was for a business requesting an exemption? Mr. Gilbert will follow up with Mr. Federspiel and the Town Departments who may be involved.

Mr. Gilbert stated that DPW may be more able to address the engineering aspects of exemptions. Ms. Beckmann indicated there may be questions at Town Meeting and she would like for the Board to be prepared. Mr. Wilson mentioned to Mr. Gilbert that the Article printed in the Town Warrant should be as clear as possible and if Mr. Gilbert would like to meet to discuss the final Article, he is available.

Mr. Federspiel asked the Board about the possibility of an additional Article for the Warrant. New legislation allows the Town to impose a local room tax on transient home rentals. This local option allows the Board to impose up to a 6% local room tax as well as a 3% transient guest impact fee. The Board elected not to pursue this for the Spring town meeting, but will consider putting it in front of voters at Fall Town Meeting.

5. Board Training Update

The two training sessions held were well received. Following feedback provided, sessions and materials will be updated with trainings scheduled annually in September.

The Planning Board will hold a public hearing on the Draft Master Plan on 2/25. Most of the concerns raised by members have been addressed through some minor revisions to the Draft. On March 11, 2019 Mr. Federspiel will attend the Planning Board meeting to review roles and expectations for how the Town Planner interacts with the Planning Board.

6. FY 2020 Budget Update/Discussion

- Health Insurance costs have decreased for the Town by 3.9% which results in a \$50K savings.
- The Town had an increase of 4 students to North Essex Regional Agricultural & Technical School for an increase of approximately \$50K.
- Mr. Federspiel outlined the 3 primary areas of Budget change: 1) Capital Budget increase to address water flow 2) Staffing re: community engagement and 3) estimated receipts and the option of keeping the tax rate at 1 ½ vs. 2 ½ %.
- Mr. Federspiel would like to finalize the Budget at the March 4, 2019 meeting with a vote and recommendation.
- The Board decided to schedule a meeting to review the Budget on Tuesday, February 26, 2019.

Proposed Capital Budget Change:

Proposal for upgrading water pipes from Magnolia Avenue eastward in response to the fire on University Lane. Hydrants in this area of Town produce no more than 500 GPM. Additional capital funds to accomplish more of this in the coming year could come from the general fund reserve and enterprise reserves.

The originally proposed capital plan for FY 20 had \$100K for water pipe upgrades and \$280K from the general fund for sewer plant and pipe upgrades. It is proposed the Town use the sewer fund balance in the amount of \$280K and redirect \$280K general fund money to water pipes. In addition, the Town could add \$350K from the water fund balance and take \$500K from the general fund balance.

The water pipe replacement project would increase to \$1.23M to improve flows in the eastern portion of Town. This proposal would correct about half of the low flow areas. With a similar effort in FY 21 the Town should be able to correct the remaining eastern portion of Town.

The Board asked how this proposal played into the Town's overall plan? Mr. Federspiel responded it is consistent with the plan – it is speeding the plan up. The Board also asked how Mr. Federspiel determined this was the appropriate amount of work to do? He replied it was determined in conjunction with the DPW Director. While an aggressive plan, the sense is it can be handled in light of the need.

Ms. Beckmann stated this is a significant amount of work. And asked was work proposed being shifted away from a different project to address this need? Mr. Federspiel replied no, this work was planned for but in a more phased way.

Full Budget Update Discussion was rescheduled for February 26, 2019.

7. Consent Agenda

- BOS Minutes – February 4, 2019
- Approval of Special Events Permit: Half Marathon By-the-Sea (9.22.19), Cape Ann Kids Ride (9.28.19) and Halloween Fright Raiser (10.25.19)

Ms. Jaques moved to approve the Consent Agenda with 2 edits (exasperate to exacerbate and Mr. to Ms. and "he to she"), Ms. Driscoll seconded the motion. The motion passed unanimously.

8. Correspondence

- Letter – France Caudill, Re: Central Pond Restoration
- Correspondence from MMA Re: Statewide Essay Contest for 8th Graders
- Letter – Lori MacCausland, Re: Managing Land under the Ocean

There was no additional comment about correspondence.

9. Town Administrator's Report

- 1) Resiliency Work:** As mentioned last week, MAPC and the Barr Foundation declined to consider a different study area but MAPC is willing to consider using another funding source to help us advance our resiliency planning. Mr. Federspiel will explore how the Town might advance a community discussion and feasibility analysis of a storm barrier at the mouth of the harbor. (He is open to other ideas as well, but this project would solve a number of issues the Town is facing.)
- 2) Valve and Hydrant Work:** The Town's contractor, Grenese, will return to the intersection of Central and School Streets on Tuesday to replace water valves in the area. The work will run through the rest of the week.
- 3) Long Beach/Sand Dollar Cove:** The meeting last Wednesday was well attended, primarily by folks who do not want to see any changes – residents argue that there are only a handful of days with large crowds, no accidents have happened and, at most, beef up patrol on high volume days. Ms. MacCausland and her position on protecting eelgrass became a major focus of the evening to the point of drowning out safety concerns. People expressed opposition to Senator Bruce Tarr's proposed new legislation (Senator Tarr came in at the end of the meeting.) At Ms. MacCausland's request, Senator Tarr had filed

legislation calling for DEP to develop model bylaws localities could use (at their option) to protect eelgrass beds. There was a strong negative response to Senator Tarr from those in attendance. Mr. Federspiel expects Senator Tarr to modify the legislation to focus on instructing DEP to disseminate eelgrass information to localities rather than develop model bylaws. The HAC will be meeting in March to develop any recommendations for the Board to consider. Mr. Federspiel recommends the Town pursue fixed moorings as an option to dropping private anchors as an initial step in better managing the crowds and to mark out the eel grass beds to discourage anchoring there

- 4) **Regional IT grant:** Middleton, working closely with Danvers, is pursuing a regional efficiency grant to review the possibility of Danvers becoming a regional service center for various IT needs. Mr. Federspiel has signed on as one of the seven North Shore towns interested in participating in the study.
- 5) **Parking Study:** Another grant being developed is a request from MAPC for assistance in conducting a parking study of the Village core. Parking complaints repeatedly came up during Master Plan public forums and workshops. If the funding comes through, the Town will receive an analysis of existing conditions and a series of suggested improvements to review.
- 6) **Shared Services Study:** The consultant working on this joint project with Essex spent the past two weeks interviewing department leaders in both communities. He was pleased with the detailed information he was able to collect and staff engagement.

10. Other matters, as may not have been reasonably anticipated by the Chair (discussion only.)

11. Chebacco Woods Trail Suit (Possible Executive Session)

Ms. Jaques moved the meeting into Executive Session, Mr. Boling seconded the motion. The motion passed with Ms. Beckmann, Mr. Steinert, Ms. Driscoll, Ms. Jaques and Mr. Boling all voting yes.

Meeting Documents:

- Minutes, February 4, 2019
- Town Administrator's Briefing Memo
- Central Pond Restoration Activities and Evaluation
- Central Pond Restoration Summary of Community Outreach
- VHB – Construction Cost Estimate Comparison – Complete Streets
- Fire Department After Event Recommendations
- Annual Town Meeting Petition Articles Documentation – Food Ware and Polystyrene Reduction By-law and Addition of Industrial Sodium Fluoride to the Public Water Supply
- Community Preservation Committee Recommendations for FY 2020
- MBTS – Special Events Permit Applications for Half Marathon By-the-Sea (9.22.19), Cape Ann Kids Ride (9.28.19) and Halloween Fright Raiser (10.25.19)
- Letter – France Caudill, Re: Central Pond Restoration

- Correspondence from MMA Re: Statewide Essay Contest for 8th Graders
- Letter – Lori MacCausland, Re: Managing Land under the Ocean
- Board and Committee Training Follow Up Plan (Draft)

Upcoming BOS Meeting:

- Tuesday, February 26, 2019
- Monday, March 4, 2019
- Monday, March 18, 2019

Tighe&Bond

APPENDIX F

APPENDIX F1

NOI Central Pond Restoration OOC



MANCHESTER-BY-THE-SEA

CONSERVATION COMMISSION • TOWN HALL
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 526-4397 FAX (978) 526-2001

4 June 2020

Greg Federspiel, Town Administrator
Town Hall
10 Central Street
Manchester, MA 01944

HAND DELIVERY

Re: Order of Conditions Central Pond Restoration Project DEP File #039-0824

Dear Greg:

Enclosed is the Order of Conditions for restoration of tidal flows to Central Pond to stabilize the shore with retaining wall repair/replacement, and to construct a living shoreline to improve ecological conditions and coastal resiliency within Riverfront, Land Under Ocean, Coastal Beach, Coastal Bank, Land Subject to Coastal Storm Flowage, and the 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers at 0 Elm Street (map 53, lot 28) which was approved by the Manchester Conservation Commission on 5/5/2020.

Before any work may begin, you must wait 10 business days (the appeal period) after which the Order must be recorded at the Registry of Deeds in its entirety. Once the Order is recorded, please submit proof of recording to me prior to the commencement of work.

Please review the Order carefully as it will govern how the work must be performed in order to be in compliance with the Massachusetts Wetlands Protection Act and the Manchester Wetlands By-Law. Please note that this order includes several pre-construction conditions, **including a pre-construction meeting between your contractors and me prior to the commencement of work** (see Standard and Special Conditions, Section B).

The Order is valid for three years from the original issuance date, except where otherwise specified. Requests for extensions must be received at least 30 days prior to the expiration date. Also note that ANY deviation from the plans contained or required in the Order of Conditions will require a *de minimis* change request, an amendment to the order(s) or submittal of a new application. As always, any other applicable permits required from any other Board or Department (state or local) will have to be obtained prior to commencement of work..

Please be advised that once work has been completed and the plantings have been monitored for two growing seasons, you should promptly seek a Certificate of Compliance from this office. Recording the Certificate of Compliance will clear the title for this property from the Order.

Please let me know if you have any questions or if I may be of further assistance.

Sincerely,



Chris Bertoni
Manchester Conservation Administrator

cc: Richard Canavan, Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
DEP Northeast Regional Office (electronic copy only - filed eDEP)
/file

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 - Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
and Manchester Gen. Wetlands Bylaw

Provided by MassDEP:
MassDEP File #:039-0824
eDEP Transaction #:1200120
City/Town:MANCHESTER

A. General Information

1. Conservation Commission MANCHESTER
2. Issuance a. OOC b. Amended OOC

3. Applicant Details

a. First Name GREGORY b. Last Name FEDERSPIEL
c. Organization TOWN OF MANCHESTER
d. Mailing Address 10 CENTRAL STREET
e. City/Town MANCHESTER f. State MA g. Zip Code 01944

4. Property Owner

a. First Name b. Last Name
c. Organization
d. Mailing Address
e. City/Town f. State g. Zip Code

5. Project Location

a. Street Address CENTRAL STREET, EAST OF ELM STREET
b. City/Town MANCHESTER c. Zip Code 01944
d. Assessors 53 e. Parcel/Lot# 28
Map/Plat#
f. Latitude 42.57532N g. Longitude 70.73622W

6. Property recorded at the Registry of Deed for:

a. County b. Certificate c. Book d. Page
SOUTHERN ESSEX 881 173

7. Dates

a. Date NOI Filed : 4/13/2020 b. Date Public Hearing Closed: 5/5/2020 c. Date Of Issuance: 6/4/2020

8. Final Approved Plans and Other Documents

a. Plan Title: b. Plan Prepared by: c. Plan Signed/Stamped by: d. Revised Final Date: e. Scale:

SEE ATTACHED
DOCUMENT CENTRAL
POND
RESTORATION_STANDARD
AND SPECIAL
CONDS_039-0824

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

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a. <input type="checkbox"/> Public Water Supply	b. <input checked="" type="checkbox"/> Land Containing Shellfish	c. <input checked="" type="checkbox"/> Prevention of Pollution
d. <input type="checkbox"/> Private Water Supply	e. <input checked="" type="checkbox"/> Fisheries	f. <input checked="" type="checkbox"/> Protection of Wildlife Habitat
g. <input checked="" type="checkbox"/> Ground Water Supply	h. <input checked="" type="checkbox"/> Storm Damage Prevention	i. <input checked="" type="checkbox"/> Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b. The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a).

_____ a. linear feet

Inland Resource Area Impacts:(For Approvals Only):

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	_____ a. linear feet	_____ b. linear feet	_____ c. linear feet	_____ d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
6. <input type="checkbox"/> Land under Waterbodies and Waterways	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
	_____ e. c/y dredged	_____ f. c/y dredged		
7. <input type="checkbox"/> Bordering Land Subject to Flooding	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
Cubic Feet Flood Storage	_____ e. cubic feet	_____ f. cubic feet	_____ g. cubic feet	_____ h. cubic feet

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<input type="checkbox"/> Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	25062	25062		
	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	23594	23594		
	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	1468	1468		
	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts:

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
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10. Designated Port Areas Indicate size under Land Under the Ocean, below

11. <input checked="" type="checkbox"/> Land Under the Ocean	2030	2030		
	a. square feet	b. square feet		
	3046	3046		
	c. c/y dredged	d. c/y dredged		

12. Barrier Beaches Indicate size under Coastal Beaches and/or Coastal Dunes below

13. <input checked="" type="checkbox"/> Coastal Beaches	24492	24492	0	
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment

14. <input type="checkbox"/> Coastal Dunes				
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment

15. <input checked="" type="checkbox"/> Coastal Banks	1525	1525		
	a. linear feet	b. linear feet		

16. <input type="checkbox"/> Rocky Intertidal Shores				
	a. square feet	b. square feet		

17. <input type="checkbox"/> Salt Marshes				
	a. square feet	b. square feet	c. square feet	d. square feet

18. <input type="checkbox"/> Land Under Salt Ponds				
	a. square feet	b. square feet		

	c. c/y dredged	d. c/y dredged		

19. <input type="checkbox"/> Land Containing Shellfish				
	a. square feet	b. square feet	c. square feet	d. square feet

20. Fish Runs Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above

	c. c/y dredged	d. c/y dredged		

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which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..

10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"
[or "MassDEP"]
File Number : "039-0824"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

19. The work associated with this Order(the "Project") is (1) is not (2) subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;
- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period

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- BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv.* all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v.* any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: *i.*) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and *ii.*) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.
- g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with

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all applicable federal, state, and local laws and regulations.

- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions:

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No

2. The Conservation Commission hereby (check one that applies):

a. DENIES the proposed work which cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order or Conditions is issued. Which are necessary to comply with a municipal ordinance or bylaw:

b. APPROVES the proposed work, subject to the following additional conditions.

I. Municipal Ordinance or Bylaw	MANCHESTER GENERAL WETLANDS BY- LAW	2. Citation XVII
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3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:
SEE ATTACHED DOCUMENT CENTRAL POND RESTORATION_STANDARD AND SPECIAL CONDS_039-0824

Manchester Conservation Commission

**Central Pond Restoration Project Standard and Special Conditions
Ecological Restoration Limited Project
Order of Conditions (DEP File #039-0824)**

Massachusetts Wetlands Protection Act M.G.L. C. 131 §40 and the Manchester General Wetlands By-Law

DEP File:	#39-0824
Applicant/Owner:	Gregory Federspiel
Project Location:	Central & Elm Streets Map: 53 Lot: 28
Project Description:	This is an Ecological Restoration Limited Project – 310 CMR 10 24(8)(e)(1) – within Riverfront, Coastal Bank, Coastal Beach, Land Under Ocean, and Land Subject to Coastal Storm Flowage. Restoration includes construction of a living shoreline at the western side of the pond (Sawmill Brook), planting native tidal wetland and salt marsh plants, and replacing existing retaining walls along the eastern shore.
Summary of Permitted Activities:	<ul style="list-style-type: none">• Bank Restoration - Western shoreline – bioengineering (install living shoreline) as shown on the Approved Plan and described in the NOI narrative (Section 3)• Bank Restoration - Eastern shoreline – replace the existing retaining wall as shown on the Approved Plan (including existing wall on 19 Central Street parcel, by permission) and described in the NOI narrative. Includes dredging to allow for new footers only (Section 3)• Tidal marsh planting as shown on the Approved Plan and described in the NOI narrative (Section 3)
Approved Plans and Documents	<ul style="list-style-type: none">• “Permit Set Central Pond Restoration [2018/01]”; prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; signed, dated 3/28/2020, and stamped by David. L. Loring, PE, EVN SP, LEED AP; scale 1” = 20’; 16 Sheets• “Central Pond / Sawmill Brook Restoration Project Notice of Intent”; prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; dated March 30, 2020.• Document: “Technical Memorandum Task 2: Living Shoreline Design Sawmill Brook Central Pond Restoration Project”; prepared by Troy Barry & David L. Loring, PE, EVN SP, LEED AP; dated March 25, 2020; 7 pages, including 4 site plans (C-01, C-02, C-101, C-102), NOI Appendix D.• Document: “Letter re: EEA# 16127 Environmental Notification Form”, comments prepared by Daniel J. Mc Kiernan, Acting Director, Division of Marine Fisheries; dated 12/30/19, NOI Appendix F.• Document: “Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form”, prepared by Kathleen A. Theoharides; dated January 10, 2020, 8 pages.• Document: “Memorandum”; prepared by Lisa Berry Engler, Director, CZM; prepared for Kathleen A. Theoharides, Secretary, EEA; dated December 30, 2019; re: EEA-1628, Central Street Bridge Reconstruction and Central Pond / Sawmill Brook Restoration Project, Manchester-by-the-Sea.

Findings

1. The Manchester Conservation Commission (MCC) finds that the site on which the work is proposed contains resource areas subject to the Massachusetts Wetlands Protection Act, M.G.L. c. 131, sec. 40 (the Act) and its Regulations, 310 CMR 10.00 and the Manchester General Wetlands By-Law which are significant to the protection of interests identified in the Act and the By-Law, specifically:
 - a. Riverfront Area (total of 314,437 sf; proposed alteration of 25,062 sf)
 - b. Land Under Ocean (1,280 sf permanent, 750 sf temporary, 3,046 cubic yards dredged)
 - c. Coastal Beach (14,245 sf permanent, 10,247 temporary)
 - d. Coastal Bank (1,525 linear feet)
 - e. Land Subject to Coastal Storm Flowage (39,000 sf temporary)
 - f. 30 foot No Disturbance Zone as protected under the By-Law (8,317 sf, including temporary impacts for safe construction access for seawall replacement and as a result of the proposed bioengineering)
 - g. 50 foot No Build Zone as protected under the By-Law (temporary impact of 2,086 sf for the gravel access construction road)

The project is not known to be within or adjacent to Estimated Habitat of rare or endangered species.

2. The wetland depictions appearing on the Approved Plan(s) is confirmed for this project only and shall be reconfirmed and/or re-delineated for subsequent filings.
3. The project as permitted is an Ecological Restoration Limited Project. The project is for the purposes of restoring or enhancing a wetland resource area in addition to the square footage listed above. The project proposes salt marsh plantings; however, the total area in square feet of Salt Marsh is pending trial plantings.
4. The project as permitted allows an alteration in Riverfront Area of 25,062 square feet (23,594 sf within 100 feet; 1,468 sf between 100 feet and 200 feet).
5. The project as permitted allows an alteration of up to 1,280 square feet of permanent alteration and 750 square feet of temporary alteration in Land Under Ocean; and 3,046 cubic yards of dredging to install footers for the wall replacement in Land Under Ocean.
6. The project as permitted allows an alteration of up to 14,245 square feet of permanent alteration and 10,247 square feet of temporary alteration in Coastal Beach.
7. The project as permitted allows an alteration of up to 1,525 linear feet of Coastal Bank.
8. The project as permitted allows a temporary alteration of 39,000 in Land Subject to Coastal Storm Flowage.
9. The MCC finds that the resources listed above are significant to the protection of the following interests as defined in the Act and its Regulations and the Manchester General Wetlands By-Law :
 - a. Groundwater supply
 - b. Flood control
 - c. Storm Damage Prevention
 - d. Prevention of Pollution
 - e. Fisheries
 - f. Land Containing Shellfish
 - g. Protection of Wildlife Habitat

Specific Findings under the Manchester General Wetlands By-Law and its regulations

1. In addition to those interests protected under the Act and its Regulations, the MCC finds that the resource areas and their buffer zones are significant to the protection of the following interests:
 - a. Water quality

- b. Erosion and sedimentation control
2. The MCC grants a waiver as requested in the “Notice of Intent” prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; dated March 20, 2020, sections 5.3.2.1 and 5.3.3.1, and as shown on the Approved Plans for the following:
- a. Installation of a temporary safe construction access for the wall replacement in the 30-foot No Disturb Zone;
 - b. Bioengineering associated with the installation of the living shoreline in the 30-foot No Disturb Zone; and
 - c. Construction of the temporary gravel access road in the 50-foot No Build Zone as needed on each side of the pond. No other structures are proposed for the 50-foot No Build Zone.

The MCC grants the waiver under the by-law for the following reasons:

- a. The applicant has satisfied the requirement of demonstrating, by clear and convincing evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Disturb Zone. The applicant has also satisfied the requirement of demonstrating, by a preponderance of credible evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Build Zone.
- b. The project on the whole (Preferred Alternative, Section 4.1.6 of the NOI) will provide free-flowing water in a continuous stream, will replace a failing seawall along the east bank, will provide for spot treatment of areas susceptible to erosion along the west bank with toe protection and living shoreline components.
- c. The project overall will increase habitat diversity and restored naturalized landscape with the establishment of the living shoreline and salt marsh plantings.
- d. The project overall will provide improved bank stabilization for the Town of Manchester and abutters to the project area.
- e. The proposed impacts to the 30-foot No Disturb Zone and 50-foot No Build Zone are temporary disturbance for construction access. After construction, the 50-foot No Build Zone will be restored to the existing conditions; the 30- No Disturb Zone will be planted with native vegetation through the top of the living shoreline.

General and Special Conditions

A. General Conditions

- 1. The term “Applicant” as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The MCC shall be notified in writing within 30 days of all transfers of title of any portion of property that take place prior to the issuance of the Certificate of Compliance.
- 2. With respect to all conditions the MCC designates the Conservation Administrator as its agent with full powers to act on its behalf in administering and enforcing this Order.
- 3. This document shall be included by reference in all contracts, plans and specifications dealing with the activity that is the subject of this Order, and that are created or modified after the issuance date of this Order, along with a statement that this Order shall supersede any conflicting contractual arrangements, plans or specifications.

4. It is the responsibility of the applicant to complete any review required by all agencies with jurisdiction over the activity that is the subject of this Order, and to procure all required permits or approvals. These reviews, permits and approvals may include but are not limited to the following:
 - a. Review by the U.S. Army Corps of Engineers for any Category 2 or Individual Permit Activity, and procurement of any permits or approvals identified by the Corps including but not limited to a Section 404/10 Pre-Construction Notification.
 - b. Review by the DEP and procurement of any permits or approvals identified by the DEP, including but not limited to 401 Water Quality Certification for dredging more than 100 cubic yards of Land Under Water, Chapter 91 License.
 - c. Review by the Massachusetts Natural Heritage and Endangered Species Program for any projects within estimated and/or priority habitat and any permits or approvals identified by the Program.
 - d. Review by Massachusetts Office of Coastal Zone Management for a Federal Consistency Review.
 - e. Review by local Planning Boards, Boards of Health, Zoning Boards, and Building Inspectors, and procurement of any permits or approvals required by these boards or agencies.
5. The MCC shall be informed of all changes that may be made to the Plan(s) of Record by any other Board, Commission or Authority or as a result of changes by the Applicant. All changes shall require additional approvals from the MCC.
6. The MCC reserves the right to impose additional conditions on this project, including but not limited to, additional or modified erosion/siltation controls during the project, if it deems that site conditions warrant such measures to mitigate potential impacts.
7. Members and agents of the MCC shall have the right to enter and inspect the property to evaluate compliance with this Order, the Wetlands Protection Act, Wetlands Protection Bylaw, and to require submittal of any data deemed necessary by the MCC for that evaluation.
8. The site engineer or contractor shall have a copy of this Order of Conditions and the final approved plans at the site and available for inspection during all phases of construction. It is the applicants' responsibility to provide the contractors with a set of the approved documents, plans, and this Order, and to ensure that the contractors are aware of the Order's provisions, and that they follow them. If the conditions of the Order are not clear, the MCC or its Administrator shall be asked to clarify them.
9. **Any change in the plans approved under this Order, including those due to review by other boards or resulting from the aforementioned conditions, must be submitted to the MCC in writing for approval prior to implementation.** The MCC will then decide whether the change is substantial enough to require a new Notice of Intent filing or a request for an amendment to this Order of Conditions. Any errors found in the plans or information submitted by the applicant shall be considered as changes.
10. If any changes are made in the above-described plan(s) which may or will alter an area subject to protection under the Wetlands Protection Act, 310 CMR 10.00 or the Manchester Wetlands By-Law, the applicant shall inquire from the MCC or its Administrator, prior to implementing the change in the field, whether the change is significant enough to require the filing of a new Notice of Intent. Any errors in the plans or information submitted by the applicant shall be considered changes and the above procedures shall be followed.

B. Pre-Construction Requirements

11. This Order shall be recorded at the Registry of Deeds in its entirety. The form provided at the end of WPA Form 5 shall be completed and stamped at the Registry of Deeds after the expiration of the 10-day appeal period and within 30 days of the issuance if no request for appeal has been filed with the Department of Environmental Protection. This form shall be returned to the MCC within 21 days of recording **and prior to commencement of any activities subject to the Order of Conditions.**

12. Prior to the commencement of work on each specific Approved Activity of this project (western shoreline, eastern shoreline, tidal marsh plantings):
 - a) Erosion controls (filter sock) shall be installed per the Approved Plan. The filter sock shall consist of biodegradable materials only.
 - b) The applicant or owner shall provide the name, address, and phone number of a contact person responsible for compliance with this Order.
 - c) Apex Jam Structures. Construction details for the Apex Jam Structures similar to those provided for 'Bank Treatment A – Rootwad detail' and 'Bank Treatment C – Encapsulated Soil Lift' shall be provided by the applicant and shall include anchoring details if the structures are to be anchored. In addition, a Monitoring Plan specific to the Apex Jam Structures shall be provided detailing bank /access protection during construction, who is responsible for monitoring effectiveness of the Structures, and who is responsible for removing woody debris that collects on the apex jams.
 - d) Cofferdams. Construction details, choice of material shall not be left up to the discretion of the contractor. Construction details and choice of material shall be provided by the applicant prior to construction and approved by MCC.
 - e) Monitoring. The applicant shall establish fixed photographic monitoring locations and submit photodocumentation of existing conditions. The fixed locations shall be used to photo-document construction, final project conditions and restoration of disturbed areas.
 - f) The Applicant or his designee shall install a sign no less than 2 square feet or more than 3 square feet, visible from the street reading “**MA DEP File #39-0824**”, and not placed on a living tree.
13. Once all of the above pre-construction requirements stated in Conditions #11 and #12 have been fulfilled, the Conservation Administrator shall be contacted at least 48 hours prior to the start of work on each specific Approved Activity of this project in order to schedule a pre-construction meeting at the site. The Administrator may be contacted by email at: bertonic@manchester.ma.us or by phone at [978-526-4397](tel:978-526-4397).

C. Special Conditions

14. Western bank living shoreline plantings and those mitigation plantings installed in the 30-foot No Disturb Zone shall be monitored for two growing seasons to guarantee at least an 85% survivorship. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plant monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.
15. Western bank streambank stabilization components including root wads and apex jams shall be monitored for erosion and scour for two years. A monitoring plan shall be submitted to the Conservation Administrator for approval. Monitoring reports shall be submitted after the first year and again after the second year. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.
16. A monitoring plan for invasive species shall be submitted to the Conservation Administrator for approval and include monitoring of invasive species for at least two years. The monitoring plan shall include details for removing invasive species if found in the planting area. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
17. Prior to any construction that is not on property owned by the Town of Manchester, permission for access shall be obtained, this Order made part of the permission, and kept on file with the Manchester Department of Public Works.

18. **Time-of-Year Restriction.** Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordox*), and habitat for American eel (*Anguila rostrata*). The proposed work may impact passage. In-water work and silt-producing work shall be avoided from March 1 to June 30 of any year.
19. The MCC shall receive monitoring reports and sediment test results as shall be required by the 401 Water Quality permitting process.
20. The contractor selected for this restoration project shall be familiar with the principles and installation of large woody debris for use in restoration and stabilization projects.
21. Bioengineering structures / living shoreline implementation / tide marsh plantings installation shall be overseen by a qualified Environmental Monitor or equivalent with design knowledge and experience with bank restoration and stabilization projects.
22. In case of a major storm event, the site shall be secured beforehand in such a way to protect Sawmill Brook, including covering of any stockpiles of soil; installation of erosion control mats over areas of exposed soil; and removal of any debris, equipment, materials, etc. that could potentially enter the brook.
23. These special conditions shall survive in perpetuity beyond the issuance of a Certificate of Compliance: 16.

D. Project Period

24. The erosion control devices shall function throughout the project to prevent erosion and sedimentation. They shall be inspected and maintained routinely by the applicant or his contractor throughout the duration of the project and after every storm event of 1/2 inch of precipitation or more. Breaks in the line shall be immediately repaired to prevent siltation into the wetlands. Additional erosion controls shall be available on site for such repairs.
25. If soils are to be disturbed for longer than two months, a temporary cover of rye or other grass (conservation mix) shall be established to prevent erosion. Once final grading is completed, loaming and seeding of each area shall be completed promptly. Vegetative cover, either temporary or permanent, shall be established prior to winter. If the season is not appropriate for plant growth, exposed soils shall be stabilized with jute netting, staked mulches, or other U. S. Natural Resource Conservation Service methods.
26. The limit of work shall be the erosion control devices beyond which no work may occur. The MCC reserves the right to require additional erosion controls and storm damage prevention measures at any time if it deems necessary.
27. The contractor or responsible party shall have an appropriately sized spill containment kit on site whenever vehicles or mechanized equipment is operating or present. The kit shall be sized to accommodate the total volume of fluids in the largest piece of equipment present. Appropriately trained personnel shall also be present and have access to this material. The contractor or responsible party shall be required to have additional absorbent materials (pads) and additional length of boom on site.
28. Equipment fuel storage and refueling and lubrication operations shall be situated least 100 feet from any wetland resource area.
29. Heavy equipment shall be stored in an upland area at least 100 feet from any wetland resource area when not in use or overnight.
30. Absolutely no washing of trucks or other equipment shall take place within 100 feet of the resource areas.
31. Only clean fill may be used in connection with this project. Any fill used in connection with this project shall not contain trash, refuse, rubbish, or debris, including but not limited to lumber, brick, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
32. Any excavated materials resulting from the work shall be moved outside the 100-foot buffer zone at the end of each day.

33. Stockpiled earth and other materials or debris shall be located outside of the 100-foot buffer zone of the resource areas(s).
34. All stumps, brush, and debris shall be removed from the site, including existing and construction debris. This material shall be disposed of promptly and properly at an off-site facility licensed to receive the material. Records as to the destination of all materials including stumps, brush, and excess fill shall be kept and supplied to the Commission if requested.
35. Any refuse material generated through the project construction will be removed to an approved landfill, and in no case will these materials be allowed to be buried or disposed of on site or on abutting property.
**REMOVAL MUST BE DONE WEEKLY DURING THE CONSTRUCTION PHASE OF THE PROJECT.
REFUSE MUST NOT BE ALLOWED TO ENTER ANY WETLAND AREAS.**
36. No blasting shall be permitted under this Order of Conditions. If it is discovered during the course of work that blasting will be necessary, the applicant shall file for an Amended Order of Conditions with plans and evidence describing the blasting activities.
37. If weather conditions cause the terrain to be excessively soft, the MCC may halt work until dry conditions permit work to continue without excessive churning of the soil.
38. The construction-period coffer dam shall be removed properly upon completion of construction.

E. Post Project

39. After the completion of construction, the applicant shall submit the following to the MCC:
 - a. A completed Request for a Certificate of Compliance – WPA form 8A.
 - b. A letter from a Registered Professional Engineer certifying compliance of the project with this Order of Conditions, and detailing any deviations that exist and their potential effect on the project. **A statement that the work is in “substantial compliance” with no detailing of the deviations shall not be accepted.**
 - c. An “As-Built” plans stamped and signed by a Registered Professional Engineer or Land Surveyor showing post-construction conditions. This plan shall note any deviations from the Approved Plans and include at a minimum:
 1. All wetland resource area boundaries with associated buffer zones and regulatory setback areas taken from the plan(s) approved in this Order of Conditions;
 2. Locations and elevations of all stormwater management conveyances, structures and best management designs, including foundation drains, constructed under this Order within any wetland resource area or buffer zone;
 3. Distances from any structures constructed under this Order to wetland resource areas - “structures” include, but are not limited to, all buildings, septic system components, wells, utility lines, fences, retaining walls, and roads/driveways;
 4. Wetland resource replication areas constructed under this order.
 - d. Pre-construction, during construction and post-construction photographs demonstrating compliance with this Order, including established vegetation where required, shall be submitted to the MCC.

F. Perpetual Conditions The following conditions shall run with the land and be binding in perpetuity on all successors in title and assigns of the applicant; they are ongoing and do not end upon completion of this project or the issuance of a Certificate of Compliance; they shall be the responsibility of the owner of record of this property.

40. **Additional Alteration Prohibited:** There shall be no additional alterations of the jurisdictional buffers and resource areas without the express permission from the MCC through a Request of

Determination of Applicability or a Notice of Intent application. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.

41. The applicant is required to maintain the Bank Restoration on the western and eastern banks. Should maintenance in the future require a design change to accommodate unforeseen changes in the stream regime and/or bank stability, the applicant shall file with MCC for this change. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
42. There shall be no alteration within the restoration and mitigation areas, except as may be required to maintain the area in its restored or mitigated condition.
43. Use of toxic substances for lawn and garden maintenance presents a hazard to groundwater and resource areas. Use of pesticides and herbicides is therefore permanently prohibited at this site within 100 feet of the resource area.
44. The use of de-icing chemicals (such as sodium chloride, potassium chloride or any other chemicals) is to be limited to the amount necessary to maintain public safety. The Applicant shall assume the responsibility of informing any snow removal contractors working on the property of this requirement.
45. Any hazardous materials (e.g., gasoline, lubricants, etc.) shall be stored securely above the 100-year flood elevation.
46. In areas of restoration planting, the 30-foot No Disturb Zone shall be allowed to grow naturally and shall not be mowed or altered in any way without express permission from the MCC through a Request for Determination of Applicability or a Notice of Intent application.
47. Only organic, slow-release, water-insoluble fertilizers shall be used within 50 feet of the resource areas.
48. In addition to these perpetual conditions, these special conditions shall survive in perpetuity beyond the issuance of a Certificate of Compliance: 16.

[Remainder of page left intentionally blank.]



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0824
 MassDEP File #
 1200120
 eDEP Transaction #
 MANCHESTER
 City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

6/4/2020
1. Date of Issuance

Please indicate the number of members who will sign this form.

6

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

By Vote on 5/5/20, the individuals listed below have authorized the Conservation Administrator to sign on their behalf pursuant to the signature authorization recorded with the Southern Essex Registry of Deeds in Book 38501 Page 530. They also intend for their typed names below to serve as their electronic signatures for any entity (MassDEP) that accepts electronic signatures.

Signatures:

/Sarah Oseasohn/

/Stephen Gang/

/Joseph Puopolo/

/Olga Hayes/

/Henry Oettinger/

/David Lumsden/

Christine Bertoni, Conservation Administrator,
duly authorized (Book 38501, Page 530)

X by hand delivery on

by certified mail, return receipt requested, on

6/4/2020

Date

Date



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:

039-0824

MassDEP File #

1200120

eDEP Transaction #

MANCHESTER

City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0824
 MassDEP File #
 1200120
 eDEP Transaction #
 MANCHESTER
 City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

 Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

 Conservation Commission

Please be advised that the Order of Conditions for the Project at:

 Project Location

 MassDEP File Number

Has been recorded at the Registry of Deeds of:

 County

 Book

 Page

for: _____
 Property Owner

and has been noted in the chain of title of the affected property in:

 Book

 Page

In accordance with the Order of Conditions issued on:

 Date

If recorded land, the instrument number identifying this transaction is:

 Instrument Number

If registered land, the document number identifying this transaction is:

 Document Number

 Signature of Applicant



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number:

Request for Departmental Action Fee Transmittal Form

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address	b. City/Town, Zip
c. Check number	d. Fee amount

2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

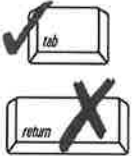
Name

Mailing Address

City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

4. DEP File Number:

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
**Request for Departmental Action Fee
Transmittal Form**

DEP File Number:

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

APPENDIX F2
NOI Central & Elm OOC



MANCHESTER-BY-THE-SEA

CONSERVATION COMMISSION • TOWN HALL
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 526-4397 FAX (978) 526-2001

18 November 2020

Gregory Federspiel, Town Administrator
Town Hall / 10 Central Street
Manchester, MA 01944

HAND DELIVERY

Re: Order of Conditions Central & Elm St DEP File #039-0832

Dear Greg:

Enclosed is the Order of Conditions for the Central Street Bridge Replacement Project including removal of tide gate and replacing the existing Central Street Culvert within Coastal Bank, Coastal Beach, Riverfront Area, Land Under Ocean, Land Subject to Coastal Storm Flowage 100-foot, 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers, which was approved by the Manchester Conservation Commission on 11/3/20.

Before any work may begin, you must wait 10 business days (the appeal period) after which the Order must be recorded at the Registry of Deeds in its entirety. Once the Order is recorded, please submit proof of recording to me prior to the commencement of work.

Please review the Order carefully as it will govern how the work must be performed in order to be in compliance with the Massachusetts Wetlands Protection Act and the Manchester Wetlands By-Law. Please note that this order includes several pre-construction conditions, **including a pre-construction meeting between your contractors and me prior to the commencement of work** (see Standard and Special Conditions, Section B).

The Order is valid for three years from the original issuance date, except where otherwise specified. Requests for extensions must be received at least 30 days prior to the expiration date. Also note that ANY deviation from the plans contained or required in the Order of Conditions will require a *de minimis* change request, an amendment to the order(s) or submittal of a new application. As always, any other applicable permits required from any other Board or Department (state or local) will have to be obtained prior to commencement of work..

Please be advised that once work has been completed and the plantings have been monitored for two growing seasons, you should promptly seek a Certificate of Compliance from this office. Recording the Certificate of Compliance will clear the title for this property from the Order.

Please let me know if you have any questions or if I may be of further assistance.

Sincerely,

Chris Bertoni
Manchester Conservation Administrator

cc: Richard Canavan, Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
Filed eDEP on 11/18/20; Transaction #1239502
/file

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 5 - Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:039-0832
eDEP Transaction #:1239502
City/Town:MANCHESTER

and Manchester Gen. Wetlands Bylaw

A. General Information

1. Conservation Commission MANCHESTER
2. Issuance a. OOC b. Amended OOC

3. Applicant Details

- a. First Name GREGORY b. Last Name FEDERSPIEL
c. Organization TOWN OF MANCHESTER
d. Mailing Address 10 CENTRAL STREET
e. City/Town MANCHESTER BY THE SEA f. State MA g. Zip Code 01944

4. Property Owner

- a. First Name b. Last Name
c. Organization
d. Mailing Address
e. City/Town f. State g. Zip Code

5. Project Location

- a. Street Address CENTRAL STREET AND ELM STREET
b. City/Town MANCHESTER c. Zip Code 01944
d. Assessors Map/Plat# 45 e. Parcel/Lot# 23
f. Latitude 42.57526N g. Longitude 70.77501W

6. Property recorded at the Registry of Deed for:

- | a. County | b. Certificate | c. Book | d. Page |
|----------------|----------------|---------|---------|
| SOUTHERN ESSEX | | 881 | 173 |

7. Dates

- a. Date NOI Filed : 9/15/2020 b. Date Public Hearing Closed: 11/3/2020 c. Date Of Issuance: 11/18/2020

8. Final Approved Plans and Other Documents

- a. Plan Title: b. Plan Prepared by: c. Plan Signed/Stamped by: d. Revised Final Date: e. Scale:
SEE ATTACHED
DOCUMENT
CENTRAL &
ELM_STANDARD
AND SPECIAL
CONDS_039-0832

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

- | | | |
|---|--|---|
| a. <input type="checkbox"/> Public Water Supply | b. <input checked="" type="checkbox"/> Land Containing Shellfish | c. <input type="checkbox"/> Prevention of Pollution |
|---|--|---|

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d. <input type="checkbox"/> Private Water Supply	e. <input checked="" type="checkbox"/> Fisheries	f. <input checked="" type="checkbox"/> Protection of Wildlife Habitat
g. <input type="checkbox"/> Ground Water Supply	h. <input checked="" type="checkbox"/> Storm Damage Prevention	i. <input checked="" type="checkbox"/> Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b. The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a).
a. linear feet

Inland Resource Area Impacts:(For Approvals Only):				
Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	<u> </u> a. linear feet	<u> </u> b. linear feet	<u> </u> c. linear feet	<u> </u> d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
6. <input type="checkbox"/> Land under Waterbodies and Waterways	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
	<u> </u> e. c/y dredged	<u> </u> f. c/y dredged		
7. <input type="checkbox"/> Bordering Land Subject to Flooding	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
Cubic Feet Flood Storage	<u> </u> e. cubic feet	<u> </u> f. cubic feet	<u> </u> g. cubic feet	<u> </u> h. cubic feet
8. <input type="checkbox"/> Isolated Land Subject to Flooding	<u> </u>	<u> </u>	<u> </u>	<u> </u>

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	a. square feet	b. square feet		
Cubic Feet Flood Storage				
	<u>c. cubic feet</u>	<u>d. cubic feet</u>	<u>e. cubic feet</u>	<u>f. cubic feet</u>
9. <input checked="" type="checkbox"/> Riverfront Area	<u>4414</u>	<u>4414</u>		
	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	<u>4414</u>	<u>4414</u>	<u>0</u>	<u>0</u>
	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts:

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input checked="" type="checkbox"/> Land Under the Ocean	<u>0</u>	<u>353</u>		
	a. square feet	b. square feet		
	<u>0</u>	<u></u>		
	c. c/y dredged	d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches	<u></u>	<u></u>	<u></u>	<u></u>
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
14. <input type="checkbox"/> Coastal Dunes	<u></u>	<u></u>	<u></u>	<u></u>
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
15. <input checked="" type="checkbox"/> Coastal Banks	<u>90</u>	<u>90</u>		
	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores	<u></u>	<u></u>		
	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes	<u></u>	<u></u>	<u></u>	<u></u>
	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds	<u></u>	<u></u>		
	a. square feet	b. square feet		
	<u></u>	<u></u>		
	c. c/y dredged	d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish	<u></u>	<u></u>	<u></u>	<u></u>
	a. square feet	b. square feet	c. square feet	d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	<u></u>	<u></u>		
	c. c/y dredged	d. c/y dredged		

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21. Land Subject to Coastal Storm Flowage 6058 6058
a. square feet b. square feet

22. Restoration/Enhancement (For Approvals Only)

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c & d or B.17.c & d above, please entered the additional amount here.

a. square feet of BVW b. square feet of Salt Marsh

23. Streams Crossing(s)

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

a. number of new stream crossings b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects

- 1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
a. the work is a maintenance dredging project as provided for in the Act; or
b. the time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order.
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not exceed the issuance date of the original Final Order of Conditions.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property.

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land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..

10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"
[or 'MassDEP']
File Number : "039-0832"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

19. The work associated with this Order (the "Project") is (1) is not (2) subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;
- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i.* all construction period BMPs have been

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- removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv.* all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v.* any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: *i.*) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and *ii.*) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.
- g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

**Massachusetts Department of Environmental
Protection**

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- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
 - i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
 - j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
 - k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
 - l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions:

SEE ATTACHED DOCUMENT CENTRAL & ELM_STANDARD AND SPECIAL CONDS_039-0832

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No

2. The Conservation Commission hereby (check one that applies):

a. DENIES the proposed work which cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order or Conditions is issued. Which are necessary to comply with a municipal ordinance or bylaw:

b. APPROVES the proposed work, subject to the following additional conditions.

1. Municipal Ordinance or Bylaw _____
MANCHESTER
GENERAL
WETLANDS BY-
LAW _____

2. Citation XVII _____

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:
SEE ATTACHED DOCUMENT CENTRAL & ELM_STANDARD AND SPECIAL CONDS_039-0832

Manchester Conservation Commission

**Central Street (MA-127) & Elm Street Standard and Special Conditions
Order of Conditions (DEP File #039-0832)**

Massachusetts Wetlands Protection Act M.G.L. C. 131 §40 and the Manchester General Wetlands By-Law

DEP File:	#39-0832
Applicant/Owner:	Gregory Federspiel / Town of Manchester-by-the-Sea
Project Location:	Central Street (MA-127) and Elm Street Map: 45 Lot: 23
Project Description:	Central Street Bridge Replacement Project including removal of tide gate and replacing the existing Central Street Culvert within Coastal Bank, Coastal Beach, Riverfront Area, Land Under Ocean, Land Subject to Coastal Storm Flowage 100-foot, 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers
Summary of Permitted Activities:	<ul style="list-style-type: none"> • Removal of tide gate (demolition of concrete structure, slide gate, catwalk, and associated infrastructure) as described in the NOI narrative and shown on the Approved Plans • Replacement of Central Street Bridge (demolish an existing concrete beam span section downstream and upstream stone arch culvert, and replace with a concrete arch culvert with a span of about 20 feet) • Central Street roadway improvements (Roadway portion of this project is an isolated bridge construction and not part of the larger corridor improvement. Overall footprint has been minimized to limit impact and reduce cost.) • Proposed roadway section matches the objectives of the Town objectives and includes elements of “complete streets” approach to downtown. • Utilization of existing access on Church Street and final location of staging & material handling to be further defined during later stages of design development. • Installation / removal of a coffer dam as described in the NOI narrative • Project includes replacing one existing stream crossing
Approved Plans and Documents	<ul style="list-style-type: none"> • “Central Street Bridge Reconstruction [Plans]”; prepared for Town of Manchester-by-the-Sea DPW & BOS by Tighe & Bond; 9/9/20; digitally signed and stamped by David L. Loring, PE; scale 1” = 10’ and others; Permit Set 23 Sheets. • “Checklist for Stormwater Report and Regulatory Compliance including Illicit Discharge Compliance Statement and Long-Term Pollution Prevention Plan”; included in the NOI prepared for Town of Manchester-by-the-Sea DPW & BOS by Tighe & Bond, September 2020. • “Notice of Intent Application”, prepared for Town of Manchester-by-the-Sea DPW & BOS by Tighe & Bond, September 2020. • Document: “Email from Tay Evans, Marine Scientist and Environmental Reviewer to Chris Bertoni, Conservation Administrator”, dated 10/13/20 with comments from MA Division of Marine Fisheries

Findings

1. The Manchester Conservation Commission (MCC) finds that the site on which the work is proposed contains resource areas subject to the Massachusetts Wetlands Protection Act, M.G.L. c. 131, sec. 40 (the Act) and its Regulations, 310 CMR 10.00 and the Manchester General Wetlands By-Law which are significant to the protection of interests identified in the Act and the By-Law, specifically:
 - a. Riverfront Area (total of 4,414 square feet temporary alteration)
 - b. Land Under Ocean (353 square feet proposed replacement/restoration)
 - c. Coastal Bank (90 linear feet)
 - d. Coastal Beach (900 square feet temporary alteration)
 - e. Land Subject to Coastal Storm Flowage (6,058 square feet)
 - f. 100-foot Buffer to Coastal Bank and Coastal Beach
 - g. 30 foot No Disturbance Zone (NDZ) as protected under the By-Law
 - h. 50 foot No Build Zone (NBZ) as protected under the By-Law

The project is not known to be within or adjacent to Estimated Habitat of rare or endangered species.

2. The wetland depiction appearing on the Approved Plan(s) is confirmed for this project only and shall be reconfirmed and/or re-delineated for subsequent filings.
3. The project as permitted allows for a temporary alteration of 4,414 sf within Riverfront Area.
4. The project as permitted allows an alteration of up to 353 sf of restoration in Land Under Ocean.
5. The project as permitted allows 6,056 sf alteration in Land Subject to Coastal Storm Flowage.
6. The project as permitted allows for a temporary alteration of 900 sf to Coastal Beach.
7. The project as permitted allows for an alteration of up to 90 lf to Coastal Bank.
8. The MCC finds that the BVW and its Buffer Zone are significant to the protection of the following interests as defined in the Act and its Regulations and the Manchester General Wetlands By-Law:
 - a. Flood control
 - b. Storm Damage Prevention
 - c. Fisheries
 - d. Land Containing Shellfish
 - e. Protection of Wildlife Habitat

Specific Findings under the Manchester General Wetlands By-Law and its regulations

1. In addition to those interests protected under the Act and its Regulations, the MCC finds that the resource areas and their buffer zones are significant to the protection of the following interests:
 - a. Water quality
 - b. Erosion and sedimentation control
2. The MCC grants a waiver as requested in the "Section 4 Regulatory Compliance of the NOI Application" prepared by Merlin Associates, Inc., dated February 20, 2014 and as shown on the Approved Plans for the Permitted Activities listed above.

The MCC grants the waiver under the by-law for the following reasons:

- a. The applicant has satisfied the requirement of demonstrating, by clear and convincing evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity

which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Disturb Zone. The applicant has also satisfied the requirement of demonstrating, by a preponderance of credible evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Build Zone.

- b. The project involves the replacement of an existing (and failing) downtown Manchester municipal bridge. The replacement bridge will be located within the footprint of the old bridge – no new additional structure is proposed.
- c. The replacement bridge will have an increase in hydraulic capacity so will improve the in-stream resource conditions (tidal flow flushing). The anticipated design life of the replacement bridge is approximately 75 years.
- d. Due to proximity of existing buildings and existing stream ecology, no other methods of bank stabilization are feasible – replacement of the Coastal Bank in-kind is not anticipated to have any adverse impact on Coastal Beach or other resource areas.
- e. The only practical alternative to address the current condition of the infrastructure is to replace the current bridge. In addition, the removal of the tide gate will improve conditions within the Sawmill Brook, a perennial stream.
- f. 30-ft NDZ, 50-ft NBZ – Due to location of the existing infrastructure, it is not possible to move the project outside either zone to avoid impacts to these local buffers. Temporary disturbances will be minimized and restored to pre-construction conditions. In addition, temporary erosion control, dewatering sediment control necessary to protect the on-site resources will be temporarily installed in these zones.

General and Special Conditions

A. General Conditions

1. The term “Applicant” as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The MCC shall be notified in writing within 30 days of all transfers of title of any portion of property that take place prior to the issuance of the Certificate of Compliance.
2. With respect to all conditions the MCC designates the Conservation Administrator as its agent with full powers to act on its behalf in administering and enforcing this Order.
3. This document shall be included by reference in all contracts, plans and specifications dealing with the activity that is the subject of this Order, and that are created or modified after the issuance date of this Order, along with a statement that this Order shall supersede any conflicting contractual arrangements, plans or specifications.
4. It is the responsibility of the applicant to complete any review required by all agencies with jurisdiction over the activity that is the subject of this Order, and to procure all required permits or approvals. These reviews, permits and approvals may include but are not limited to the following:
 - a. Review by the U.S. Army Corps of Engineers for any Category 2 or Individual Permit Activity, and procurement of any permits or approvals identified by the Corps.
 - b. Review by the DEP and procurement of any permits or approvals identified by the DEP.
 - c. Review by the Massachusetts Natural Heritage and Endangered Species Program for any projects within estimated and/or priority habitat and any permits or approvals identified by the Program.
 - d. Review by local Planning Boards, Boards of Health, Zoning Boards, and Building Inspectors,

and procurement of any permits or approvals required by these boards or agencies.

5. The MCC shall be informed of all changes that may be made to the Plan(s) of Record by any other Board, Commission or Authority or as a result of changes by the Applicant. All changes shall require additional approvals from the MCC.
6. The MCC reserves the right to impose additional conditions on this project, including but not limited to, additional or modified erosion/siltation controls during the project, if it deems that site conditions warrant such measures to mitigate potential impacts.
7. Members and agents of the MCC shall have the right to enter and inspect the property to evaluate compliance with this Order, the Wetlands Protection Act, Wetlands Protection Bylaw, and to require submittal of any data deemed necessary by the MCC for that evaluation.
8. The site engineer or contractor shall have a copy of this Order of Conditions and the final approved plans at the site and available for inspection during all phases of construction. It is the applicants' responsibility to provide the contractors with a set of the approved documents, plans, and this Order, and to ensure that the contractors are aware of the Order's provisions, and that they follow them. If the conditions of the Order are not clear, the MCC or its Administrator shall be asked to clarify them.
9. **Any change in the plans approved under this Order, including those due to review by other boards or resulting from the aforementioned conditions, must be submitted to the MCC in writing for approval prior to implementation.** The MCC will then decide whether the change is substantial enough to require a new Notice of Intent filing or a request for an amendment to this Order of Conditions. Any errors found in the plans or information submitted by the applicant shall be considered as changes.
10. If any changes are made in the above-described plan(s) which may or will alter an area subject to protection under the Wetlands Protection Act, 310 CMR 10.00 or the Manchester Wetlands By-Law, the applicant shall inquire from the MCC or its Administrator, prior to implementing the change in the field, whether the change is significant enough to require the filing of a new Notice of Intent. Any errors in the plans or information submitted by the applicant shall be considered changes and the above procedures shall be followed.

B. Pre-Construction Requirements

11. This Order shall be recorded at the Registry of Deeds in its entirety. The form provided at the end of WPA Form 5 shall be completed and stamped at the Registry of Deeds after the expiration of the 10-day appeal period and within 30 days of the issuance if no request for appeal has been filed with the Department of Environmental Protection. This form shall be returned to the MCC within 21 days of recording **and prior to commencement of any activities subject to the Order of Conditions.**
12. Prior to the commencement of work:
 - a) Erosion controls (filter sock) shall be installed per the Approved Plan. The filter sock shall consist of biodegradable materials only.
 - b) The applicant or owner shall provide the name, address, and phone number of a contact person responsible for compliance with this Order.
 - c) A Storm Preparedness Plan shall be prepared and submitted to the Conservation Administrator for review (See condition #21)
 - d) Should a chemical expansion method be chosen, a plan, materials and details preventing chemicals from entering the resource shall be submitted to the Conservation Administrator for review. (See Condition #22)
 - c) Applicant shall provide engineering plans for diverting water from work area and these plans shall come before the Conservation Commission for review. (See condition #23)
 - d) The Applicant or his designee shall install a sign no less than 2 square feet or more than 3 square feet, visible from the street reading "MA DEP File #39-0832", and not placed on a living tree.

13. Once all the above pre-construction requirements stated in Conditions #11 and #12 have been fulfilled, the Conservation Administrator shall be contacted at least 48 hours prior to the start of work in order to schedule a pre-construction meeting at the site. The Administrator may be contacted by email at: bertonic@manchester.ma.us or by phone at [978-526-4397](tel:978-526-4397).

C. Special Conditions

14. Site access shall be as shown on the Approved Plan Set and as described in section 3.3 of the Notice of Intent Application (NOI).
15. The Commission Administrator shall be notified if there are any significant changes to the anticipated Construction Sequence (NOI 3.4).
16. Construction Best Management Practices as described in the NOI (3.5, 3.5.1-7) and shown on the Approved Plan set shall be implemented and followed.
17. The Conservation Administrator shall be notified as to the Responsible Parties.
18. All aspects of the Long-Term Pollution Prevention Plan as described in the NOI shall be implemented and followed.
19. A Time-of-Year restriction of no in-water silt-producing work from March 1 to June 31 shall be implemented and followed. (DMF comments 11/13/20).
20. Post-construction monitoring shall be designed and implemented to assess the effects of tide-gate removal and bridge replacement on Central Pond, particularly on salinity improvements that would support saltmarsh plantings potentially as part of the pond restoration portion of the entire project. (DMF comments 11/13/20).
21. In case of a major storm event, the site shall be secured beforehand in such a way to protect Sawmill Brook and other resources, including covering of any stockpiles of soil; installation of erosion control mats over areas of exposed soil; and removal of any debris, equipment, materials, etc. that could potentially enter the brook and other resources. A Storm Preparedness Plan shall be prepared and submitted to the Conservation Administrator for review.
22. Should a chemical expansion method be chosen, a plan, materials and details preventing chemicals from entering the resource shall be submitted to the Conservation Administrator for review.
23. Applicant shall provide engineering plans for diverting water from work area and these plans shall come before the Conservation Commission for review and discussion at a public meeting.
24. This Order of Conditions shall be included in all bid proposals, contracts, and documents.

D. Project Period

25. The erosion control devices shall function throughout the project to prevent erosion and sedimentation. They shall be inspected and maintained routinely by the applicant or his contractor throughout the duration of the project and after every storm event of 1/2 inch of precipitation or more. Breaks in the line shall be immediately repaired to prevent siltation into the wetlands. Additional erosion controls shall be available on site for such repairs.
26. If soils are to be disturbed for longer than two months, a temporary cover of rye or other grass (conservation mix) shall be established to prevent erosion. Once final grading is completed, loaming and seeding of each area shall be completed promptly. Vegetative cover, either temporary or permanent, shall be established prior to winter. If the season is not appropriate for plant growth, exposed soils shall be stabilized with jute netting, staked mulches, or other U. S. Natural Resource Conservation Service methods.

27. The limit of work shall be the erosion control devices beyond which no work may occur. The MCC reserves the right to require additional erosion controls and storm damage prevention measures at any time if it deems necessary.
28. The contractor or responsible party shall have an appropriately sized spill containment kit on site whenever vehicles or mechanized equipment is operating or present. The kit shall be sized to accommodate the total volume of fluids in the largest piece of equipment present. Appropriately trained personnel shall also be present and have access to this material. The contractor or responsible party shall be required to have additional absorbent materials (pads) and additional length of boom on site.
29. Equipment fuel storage and refueling and lubrication operations shall be situated least 100 feet from any wetland resource area.
30. Heavy equipment shall be stored in an upland area at least 100 feet from any wetland resource area when not in use or overnight.
31. Absolutely no washing of trucks or other equipment shall take place within 100 feet of the resource areas.
32. Only clean fill may be used in connection with this project. Any fill used in connection with this project shall not contain trash, refuse, rubbish, or debris, including but not limited to lumber, brick, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
33. Any excavated materials resulting from the work shall be moved outside the 100-foot buffer zone at the end of each day.
34. Stockpiled earth and other materials or debris shall be located outside of the 100-foot buffer zone of the resource areas(s).
35. All stumps, brush, and debris shall be removed from the site, including existing and construction debris. This material shall be disposed of promptly and properly at an off-site facility licensed to receive the material. Records as to the destination of all materials including stumps, brush, and excess fill shall be kept and supplied to the Commission if requested.
36. Any refuse material generated through the project construction will be removed to an approved landfill, and in no case will these materials be allowed to be buried or disposed of on site or on abutting property. **REMOVAL MUST BE DONE WEEKLY DURING THE CONSTRUCTION PHASE OF THE PROJECT. REFUSE MUST NOT BE ALLOWED TO ENTER ANY WETLAND AREAS.**
37. No blasting shall be permitted under this Order of Conditions. If it is discovered during the course of work that blasting will be necessary, the applicant shall file for an Amended Order of Conditions with plans and evidence describing the blasting activities.
38. If weather conditions cause the terrain to be excessively soft, the MCC may halt work until dry conditions permit work to continue without excessive churning of the soil.

E. Post Project

39. After the completion of construction, the applicant shall submit the following to the MCC:
 - a. A completed Request for a Certificate of Compliance – WPA form 8A.
 - b. A letter from a Registered Professional Engineer certifying compliance of the project with this Order of Conditions and detailing any deviations that exist and their potential effect on the project. **A statement that the work is in “substantial compliance” with no detailing of the deviations shall not be accepted.**
 - c. An “As-Built” plans stamped and signed by a Registered Professional Engineer or Land Surveyor showing post-construction conditions. This plan shall note any deviations from the Approved Plans and include at a minimum:

1. All wetland resource area boundaries with associated buffer zones and regulatory setback areas taken from the plan(s) approved in this Order of Conditions;
 2. Locations and elevations of all stormwater management conveyances, structures and best management designs, including foundation drains, constructed under this Order within any wetland resource area or buffer zone;
 3. Distances from any structures constructed under this Order to wetland resource areas - "structures" include, but are not limited to, all buildings, septic system components, wells, utility lines, fences, retaining walls, and roads/driveways; and
 4. Wetland resource replication areas constructed under this order.
- d. Post construction photographs demonstrating compliance with this Order, including established vegetation where required.
 - e. The required post-construction monitoring shall be implemented and installed that assess the effects of tide-gate removal and bridge replacement on Central Pond.

F. Perpetual Conditions The following conditions shall run with the land and be binding in perpetuity on all successors in title and assigns of the applicant; they are ongoing and do not end upon completion of this project or the issuance of a Certificate of Compliance; they shall be the responsibility of the owner of record of this property.

40. **Additional Alteration Prohibited:** There shall be no additional alterations of the jurisdictional buffers and resource areas without the express permission from the MCC through a Request of Determination of Applicability or a Notice of Intent application. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
41. Use of toxic substances for lawn and garden maintenance presents a hazard to groundwater and resource areas. Use of pesticides and herbicides is therefore permanently prohibited at this site within 100 feet of the resource area. Only organic fertilizers shall be used on the site. Fertilizers shall not contain pesticides or herbicides, shall only contain slow release nitrogen, and shall not contain more than 3% phosphorous. To mitigate runoff, do not fertilize immediately preceding a rainstorm and use fertilizer sparingly.
42. The use of de-icing chemicals (such as sodium chloride, potassium chloride or any other chemicals) is to be limited to the amount necessary to maintain public safety. The Applicant shall assume the responsibility of informing any snow removal contractors working on the property of this requirement.
43. Long term maintenance and pollution prevention shall adhere to the "Long-Term Prevention Pollution Plan" listed under the Approved Plans and Documents above.



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
039-0832
MassDEP File #
1239502
eDEP Transaction #
MANCHESTER
City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

11/18/2020

1. Date of Issuance

Please indicate the number of members who will sign this form.


6

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

By Vote on 5/5/20, the individuals listed below have authorized the Conservation Administrator to sign on their behalf pursuant to the signature authorization recorded with the Southern Essex Registry of Deeds in Book 38501 Page 530. They also intend for their typed names below to serve as their electronic signatures for any entity (MassDEP) that accepts electronic signatures.

Signatures:	<u>/Sarah Oseason/</u>
<u>/Stephen Gang/</u>	<u>/Henry Oettinger/</u>
<u>/Olga Hayes/</u>	<u>/David Lumsden/</u>
 <u>Christine Bertoni, Conservation Administrator, duly authorized (Book 38501, Page 530)</u>	<u>/John Judge/</u>

by hand delivery on
11/18/20
Date

by certified mail, return receipt requested, on
Date



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0832
 MassDEP File #
 1239502
 eDEP Transaction #
 MANCHESTER
 City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0832
 MassDEP File #
 1239502
 eDEP Transaction #
 MANCHESTER
 City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location

MassDEP File Number

Has been recorded at the Registry of Deeds of:

County

Book

Page

for: Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
Request for Departmental Action Fee
Transmittal Form

DEP File Number: _____

Provided by DEP _____

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address _____

b. City/Town, Zip _____

c. Check number _____

d. Fee amount _____

2. Person or party making request (if appropriate, name the citizen group's representative):

Name _____

Mailing Address _____

City/Town _____

State _____

Zip Code _____

Phone Number _____

Fax Number (if applicable) _____

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name _____

Mailing Address _____

City/Town _____

State _____

Zip Code _____

Phone Number _____

Fax Number (if applicable) _____

4. DEP File Number:

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number:

Request for Departmental Action Fee
Transmittal Form

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

APPENDIX F3

401 WQC Central Pond X285965



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

Gregory Federspiel
Town Administrator
Town of Manchester-by-the-Sea
10 Central Street
Manchester-by-the-Sea, MA 01944

March 26, 2021

Re: **401 WATER QUALITY CERTIFICATION**
Application for BRP WW 08, Minor project dredging

At: Central Pond, at 0 Elm Street, Manchester-by-the-Sea, MA

401 WQC Transmittal №: X285965
Wetlands File №: NE 039-0824
EOEEA File №: 16127
ACOE Application №: NAE-2019-02827

Dear Mr. Federspiel:

The Department has reviewed your application for a Water Quality Certificate (WQC) as referenced above. In accordance with the provisions of Section 401 of the Federal Clean Water Act as amended (33 U.S.C. §1251 *et seq.*), MGL c.21, §§ 26-53, and 314 CMR 9.00, the Department has determined there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law.

The waters of Manchester Harbor are designated in the Massachusetts Surface Water Quality Standards as Class SB. Such waters are designated "as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation." Anti-degradation provisions of these Standards require that "existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." In addition, Manchester Harbor has been designated for Shellfishing pursuant to 314 CMR 4.00.

Project Background

The project is located at Central Pond where Sawmill Brook discharges to Manchester Harbor at 0 Elm Street, Manchester-by-the-Sea, MA (Figure 1). The Town proposes improvements to the retaining walls along eastern bank of Central Pond and restoration of a channel through pond sediments using natural in-stream processes and bioengineering techniques. The project is intended to address property and infrastructure damage due to flooding, degradation of water quality and habitat of inland and coastal waterways, and improve fish passage in the watershed.

Project Description

The project proposes improvement dredging of 3,047 cubic yards of sediment as part of a tidal restoration of Central Pond in Manchester-by-the-Sea, MA. The improvement dredging will facilitate replacement of the retaining walls along the eastern shoreline, construction of a shoreline with placement of stabilization elements along the western shoreline, and reconfiguration of the pond bottom. Dredge sediments will be re-used on the project site for restoration with native plantings in the Sawmill Brook intertidal area and low flow channels along the shores.

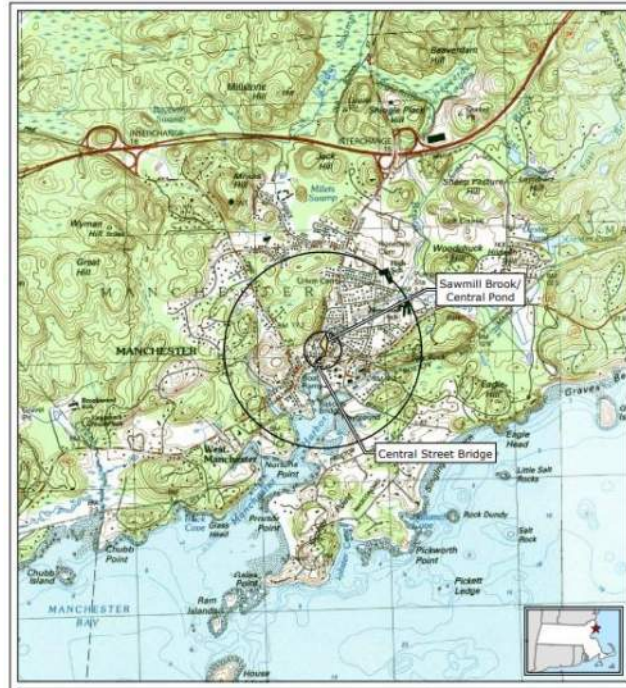


Figure 1. Locus for Central Pond/Sawmill Brook, Manchester-by-the-Sea.^{1 2}

Sediment Dewatering

The Town has authorized temporary stockpile and dewatering of dredged sediment at the Manchester Compost Site at 198 School Street prior to being transported off-site for reuse. Stockpiles will be surrounded by appropriate erosion controls. Town Hall parking lot at 10 Central Street is also authorized for staging materials as needed during construction.³ The dewatering and disposal of sediment is anticipated to be for the duration of construction. The method of dewatering sediments, collecting dewatered effluent, and the method of disposal will be described in the dredged material dewatering plan and sediment stockpile management plan to be submitted by the applicant and approved by MassDEP.

Sediment Sampling Data

Five sediment samples were collected for grain size analysis. (i.e. POND, STREAM UP, STREAM DOWN, WALL SED-1, WALL SED-2). Two samples (WALL SED-1, WALL SED-2) were dated 3/31/2020 and the remaining samples were dated 1/23/2018. Results of the gradation analysis showed between 20.1% and

¹BRP WW 08 Minor Water quality Certification Application: Improvement Dredging of Central Pond /Sawmill Brook Restoration, Central Street, Manchester-by-the-Sea, Massachusetts. Prepared by Tighe and Bond for the Town of Manchester-by-the-Sea, Board of Selectmen. Dated May, 2020.

² Based on USGS Topographic Map for Marblehead North, MA Revised 1985. Contour Interval Equals 3-Meters. Circles indicate 500-foot and half-mile radii.

³ Letter from Gregory Federspiel, Town Administrator, Manchester-by-the-Sea to Alice Smith. Re: Central Pond Restoration Project, Manchester-by-the-Sea, Massachusetts. 401 WQC (Transmittal #X285965) Potential Sediment Stockpile and Dewatering Locations, November 23, 2020.

54.7% of particles in the sediment samples do not pass the No. 200 U.S. Standard Series Testing Sieve. In accordance with 314 CMR 9.07(2), chemical testing was conducted.⁴

Laboratory analysis detected low concentrations of metals, PCBs, and PAH's. Concentrations above the MCP Reportable Concentrations for Soils (RCS-1) were reported for the following sediment samples:

- STREAM DOWN: benzo(a)pyrene (2.10 mg/kg), lead (167 mg/kg)
- WALL SED-1: benzo(a)pyrene (3.64 mg/kg), acenaphthylene (2.20 mg/kg), and dibenzo(a,h)anthracene (0.983 mg/kg).⁵

Dredged Material Disposal or Reuse

The project proposes to reuse dredge sediment onsite to the extent practicable for restoration purposes. Dredge sediments unsuitable for re-use onsite will be transported to either the Aggregate Industries Saugus Quarry or at an approved Massachusetts Landfill for disposal. The volume and on-site location of sediments with contaminant levels exceeding RSC-1 standards for re-use will be shown on the dredged material plan. The plan shall also show a) the volume and on-site location of sediments intended for re-use/restoration and b) the intended on-site destination of re-use sediments. The dredge sediment plan will be submitted by the applicant, approved by MassDEP, and provided to the contractors for construction period guidance.

Time of Year Restriction (TOY) for In-Water Work

The Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordax*), and habitat for American eel (*Anguilla rostrata*). MassDEP incorporates recommendations from Massachusetts Division of Marine Fisheries (DMF) into this permit that no in-water and silt producing work be conducted from March 1 through June 30 of any year to protect fish habitat.⁶ Work will occur behind coffer dams to minimize unconfined silt in water.

Rare Species and Rare Wildlife Habitat

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) Atlas, 14th Edition, effective August 1, 2017, indicates that the Central Pond Restoration project is not located within designated Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife and will not require review pursuant to the Massachusetts Endangered Species Act.

Public Notice

The public notice was published in The Manchester Cricket, a newspaper of general circulation within Manchester-by-the-Sea, on May 22, 2020. The Department did not receive any comments during the 21-day public comment period, which ended on June 15, 2020.

Section 61 Findings:

Pursuant to M.G.L. Chapter 30, Sections 61 to 62I inclusive [the Massachusetts Environmental Policy Act ("MEPA")], the Central Pond Restoration project was required to file an Environmental Notification Form ("ENF") (301 CMR 11.01 (2)(b)(3)). The ENF was submitted for review on December 2, 2019 and published in the Environmental Monitor on December 11, 2019 (EEA #16127). The Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form was issued on

⁴ Tighe Bond, May 2020, 401 WQC Application Central Pond/Sawmill Brook Restoration Project Central Street, Manchester-by-the-Sea, Appendix D – Environmental Information, TABLE 1 Sediment Analytical Results Sawmill Brook Central Pond Restoration Project Manchester-by-the-Sea, Massachusetts.

⁵ IBID, see Footnote #4.

⁶ See Letter from Daniel McKiernan, MA Division of Marine Fisheries, dated December 30, 2019, RE: EEA #16127 Environmental Notification Form.

January 10, 2020. It was determined that the project does not require an Environmental Impact Report (EIR) and that no additional MEPA review was warranted.⁷

Therefore, based on information currently in the record, the Department grants a 401 Water Quality Certification for this project subject to the following conditions to maintain water quality, to minimize impact on waters and wetlands, and to ensure compliance with appropriate state law. The Department further certifies in accordance with 314 CMR 9.00 that there is reasonable assurance the project or activity will be conducted in a manner which will not violate applicable water quality standards (314 CMR 4.00) and other applicable requirements of state law. Finally, the Department has determined that upon satisfying the conditions and mitigation requirements of this approval, the project provides a level of water quality necessary to protect existing uses and accordingly finds that the project to be implemented satisfies the Surface Water Quality Standards at 314 CMR 4.00.

Conditions

1. The Contractor shall take all steps necessary to assure that the proposed activities will be conducted in a manner that will avoid violations of the anti-degradation provisions of the Massachusetts Surface Water Quality Standards that protect all waters, including wetlands.
2. Prior to the start of work or any portion of the work thereafter, the Department shall be notified of any change(s) in the proposed project or plans that may affect waters or wetlands. The Department will determine whether the change(s) require a revision to this Certification.
3. Dredging in accordance with this Certification may begin following the 21-day appeal period, once all other permits have been received, and once outside the all Time of Year restrictions.
4. All work shall be performed in accordance with the following documents and plans:
 - Application for the 401 WQC, Transmittal Form # X285965, dated May 2020.
 - Plan entitled “Town of Manchester-by-the-Sea, Massachusetts CENTRAL POND RESTORATION” consisting of sixteen (16) sheets, various scales, dated March 28, 2020, Sheet G-001, General Notes, Legend & Abbreviations is Revised to 10/15/2020, prepared by Tighe and Bond, and signed and stamped by David L. Loring Civil, registered PE No. 39818. MassDEP shall be notified if there are modifications and or deletions of work as specified in the plans. Depending on the nature and the scope of any change, approval by the Department may be required.
 - Order of Conditions issued pursuant to the Massachusetts Wetlands Protection Act (M.G.L. Chapter 131, § 40) by Town of Manchester-by-the-Sea, MA Conservation Commission for MassDEP File Number NE 039-0824, dated 06/04/2020.
5. The Department shall be notified, attention Alice Smith 617-292-5854, one week prior to the start of in-water work so that Department staff may inspect the work for compliance with the terms and conditions of this Certification.

⁷ Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, (EEA #16127), Central Street Bridge Reconstruction and Central Pond/Sawmill Brook Restoration Project, January 10, 2020.

6. The applicant and its contractor shall allow agents of the Department to enter the project sites to verify compliance with the conditions of this Certification.
7. The Certification remains in effect for the same duration as the federal permit that requires it or five years from the date of issuance of this Certification whichever comes first.
8. The applicant may request an extension of the 401 dredging permit in accordance with 314 CMR 9.09(3) providing that the annual dredging activities summary report is submitted to the Department.
9. Best Management Practices (BMPs) such as coffer dams or a silt curtain shall be deployed surrounding the dredge area to minimize turbidity. At a minimum, the silt curtain shall be bottom-weighted to minimize the degree of lifting/flailing or billowing and shall be of suitable material/grade appropriate based on the velocity of the current at the site. Intermediate vertical floats or other means shall be placed on the silt curtain to lift the bottom of the silt curtain at low tide so that the bottom edges of the curtain remain close to the mudline at low tide but do not rake the sediment in areas subject to tidal influence. Dredging shall be carried out using a closed, environmental bucket if the sediment does not consist solely of gravel/stone/sand or densely compacted silt/clay.
10. No later than 21 days prior to commencement of dredging activity, a dredged material dewatering plan and sediment stockpile management plan shall be submitted to the Department for review and approval. At a minimum, the dewatering plan shall include but not be limited to the location of the dewatering and stockpile activities, the type of containment, method of dewatering (i.e. mechanical or by gravity), method of collecting the dewatered effluent, the method of disposal, and a confirmation that no dewatering or stockpile activities will occur near drainage systems (e.g. catch basins, conveyances) that discharge to wetlands or waters.
11. No later than 21 days prior to commencement of dredging activity, the name and contact information for the project site manager designated by the applicant and contractor responsible for installation, monitoring, inspection, and correction of erosion control measures shall be provided to MassDEP.
12. Dredged material with chemical concentration exceeding MCP RC S1 criteria shall be backfilled at the SAME LOCATION onsite and relatively clean sediment may be reused at other areas. If the dredge material is disposed at an upland facility, the Department shall be notified in writing of the name and location of the upland licensed facility accepting the dredged material for disposal or reuse as daily cover material. If the licensed facility is located out of state, documentation shall be provided to the Department that the dredged material disposal/reuse has been approved and will be accepted by the receiving State in accordance with 314 CMR 9.07(13)(b). The dredged material shall not be transported to the facility without concurrence of the Department.
13. A Dredged Material Tracking Form (DMTF) or Material Shipping Record (MSR) shall be used to track the dredged material to the licensed upland facility. A fully executed copy of the DMTF or MSR shall be provided to the Department within 30 days of final shipment to the reused location or facility.
14. Best Management Practices (BMPs) shall be implemented during transportation of the dredged material to the licensed receiving facility. At a minimum, when transported upon public roadways, all dredged material shall have no free liquid as determined by the Paint Filter Test or other suitably analogous methodology acceptable to the Department, and a tarpaulin or other means shall be used to cover the dredged material during transport.

15. Within 21 days of the effective date of this Certification, the applicant shall submit to the Department for review and approval the following information regarding location of final placement and use of dredged material:
 - a. a United States Geological Survey Topographic Map showing the location of the property;
 - b. a site plan showing the reuse locations for dredged material;
16. Within 30 days of the completion of the initial dredging and any future maintenance dredging to be conducted, a bathymetric survey of the site, depicting post-dredge conditions shall be conducted. At a minimum, the survey shall include an overlay of the dredge footprint (i.e. top of slope) with sufficient coordinates in the Massachusetts State Plane (e.g. longitude and latitude) to clearly delineate the dredge footprint. The survey shall be sent within five working days after its completion to the Department and a copy shall be sent to the Massachusetts Coastal Zone Management office, attention: Robert Boeri.
17. Within 30 days of completion of the construction of the project, the applicant shall provide a set of construction photographs depicting completed project to the Wetlands and Waterways Program in the Boston Office, attn: David Wong and Alice Smith. The photographs shall be marked or labeled with the WQC transmittal number and wetlands file number of the project and include low tide images of the island plantings, retaining wall on eastern shore, low flow channels, bio-engineered western shoreline.
18. In order to protect the migratory habitat for rainbow smelt (*Osmerus mordax*), and habitat for American eel (*Anguilla rostrata*) in Sawmill Brook and Central Pond, no in-water or silt producing work shall be conducted from March 1 through June 30 of any year as recommended by the Massachusetts Division of Marine Fisheries (DMF)⁸. Work shall occur behind coffer dams and/or silt curtains to minimize unconfined silt in water.
19. The Applicant shall utilize stabilized construction entrances, vehicle wash down pads, perimeter erosion controls, and re-vegetation of disturbed areas with native plantings and seed mixes to minimize potential water quality impact resulting from construction activities.
20. Storing, servicing, or cleaning equipment, or washing/rinsing of trucks or equipment, shall be performed outside wetland resource areas and away from Center Pond and Sawmill Brook. Adequate pollutant controls shall be used to prevent fuels, lubricants, hydraulic fluids, or other pollutants associated with these activities from discharging into the pond and brook.
21. During the project period, there shall be no discharge or spillage of fuel, oil or other pollutants into any part of Center Pond or Sawmill Brook. The applicant shall take all reasonable precautions to prevent the release of pollutants by ignorance, accident or vandalism.
22. In case of a storm event, the site shall be secured beforehand to protect Sawmill Brook and Center Pond. This includes site specific erosion and sediment control measures including but not limited to covering stockpiles of dredge sediments, and using erosion control measures to prevent discharge of suspended sediments into the pond and brook; installation of erosion control mats over-areas of exposed soils that provide access to the pond and brook for equipment; and removal of debris, equipment, materials, that are in or could potentially enter the brook.

⁸ According to a letter from Daniel J. McKiernan Acting Director, Massachusetts Division of Marine Fisheries, to Kathleen Theoharides, Secretary EOEEA, dated December 30, 2019.

23. The applicant, or its contractor, shall make every effort to complete the project within the permitted timeframe. Should the applicant, or their contractor, fail to complete the project and wish to request an amendment to the Certification for incursion into the no-dredge period, the written request shall be received by the Department by January 15. The following information shall be included in the request:
- a. project location and transmittal number,
 - b. the date on which dredging started,
 - c. the number of days and hours per day the dredge operated,
 - d. expected daily average production rate and the actual daily average production rate,
 - e. an explanation of why the project failed to remain on schedule,
 - f. an account of efforts made to get the project back on schedule,
 - g. a plan depicting the areas that remain to be dredged,
 - h. the number of cubic yards that remain to be dredged,
 - i. an accurate estimate of the number of days required to complete the project,
 - j. an evaluation of the impact of continued dredging on the species of concern,
 - k. a description of any efforts that will be made to minimize the impacts of the project on the species of concern.

The Department will share the information with other resource agencies and a decision to grant or deny the amendment shall be made by February 1. Requests for amendment received after January 15 will be considered at the Department’s discretion.

24. No later than four weeks after issuance of this water quality certification, the applicant shall submit a notification procedure outlining the reporting process to MassDEP for incidents relating to dredging activities that impact surrounding resource areas and habitats including, but not limited to, observed dead or distressed fish or other aquatic organisms, observed oily sheen on the surface of the water, a sediment spill, a turbidity plume beyond the deployed BMPs, and a barge or equipment accident/spill. If at any time during implementation of the project such an incident occurs, the applicant shall immediately notify MassDEP and all site related activities impacting the water shall cease until the source of the problem is identified and adequate mitigating measures are deployed to the satisfaction of MassDEP.

This certification does not relieve the applicant of the obligation to comply with other applicable state or federal statutes or regulations. Any changes made to the project as described in the previously submitted Notice of Intent, 401 Water Quality Certification application, or supplemental documents will require further notification to the Department.

NOTICE OF APPEAL RIGHTS

401 WQC Appeal Process (314 CMR 9.10):

Certain persons shall have a right to request an adjudicatory hearing concerning certifications by the Department when an application is required:

- a. the applicant or property owner;
- b. any person aggrieved by the decision who has submitted written comments during the public comment period;
- c. any ten (10) persons of the Commonwealth pursuant to M.G.L. c.30A where a group member has submitted written comments during the public comment period; or

- d. any governmental body or private organization with a mandate to protect the environment, which has submitted written comments during the public comment period.

Any person aggrieved, any ten (10) persons of the Commonwealth, or a governmental body or private organization with a mandate to protect the environment may appeal without having submitted written comments during the public comment period only when the claim is based on new substantive issues arising from material changes to the scope or impact of the activity and not apparent at the time of public notice. To request an adjudicatory hearing pursuant to M.G.L. c.30A, § 10, a Notice of Claim must be made in writing, provided that the request is made by certified mail or hand delivery to the Department, with the appropriate filing fee specified within 310 CMR 4.10 along with a DEP Fee Transmittal Form within twenty-one (21) days from the date of issuance of this Certificate, and addressed to:

Case Administrator
Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108.

A copy of the request shall at the same time be sent by certified mail or hand delivery to the issuing office of the Wetlands and Waterways Program at:

Department of Environmental Protection
One Winter Street, 5th Floor
Boston, MA 02108.

A Notice of Claim for Adjudicatory Hearing shall comply with the Department's Rules for Adjudicatory Proceedings, 310 CMR 1.01(6), and shall contain the following information pursuant to 314 CMR 9.10(3):

- a. the 401 Certification Transmittal Number and DEP Wetlands Protection Act File Number;
- b. the complete name of the applicant and address of the project;
- c. the complete name, address, and fax and telephone numbers of the party filing the request, and, if represented by counsel or other representative, the name, fax and telephone numbers, and address of the attorney;
- d. if claiming to be a party aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found at 314 CMR 9.02;
- e. a clear and concise statement that an adjudicatory hearing is being requested;
- f. a clear and concise statement of (1) the facts which are grounds for the proceedings, (2) the objections to this Certificate, including specifically the manner in which it is alleged to be inconsistent with the Department's Water Quality Regulations, 314 CMR 9.00, and (3) the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written Certification; and
- g. a statement that a copy of the request has been sent by certified mail or hand delivery to the applicant, the owner (if different from the applicant), the conservation commission of the city or town where the activity will occur, the Department of Environmental Management (when the certificate concerns projects in Areas of Critical Environmental Concern), the public or private water supplier where the project is located (when the certificate concerns projects in Outstanding Resource Waters), and any other entity with responsibility for the resource where the project is located.

The hearing request along with a DEP Fee Transmittal Form and a valid check or money order payable to the Commonwealth of Massachusetts in the amount of one hundred dollars (\$100) must be mailed to:

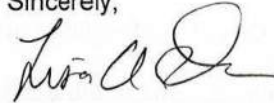
Commonwealth of Massachusetts
Department of Environmental Protection
Commonwealth Master Lockbox
P.O. Box 4062
Boston, MA 02211

The request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. The Department may waive the adjudicatory-hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Failure to comply with this certification is grounds for enforcement, including civil and criminal penalties, under MGL c.21 §42, 314 CMR 9.00, MGL c. 21A §16, 310 CMR 5.00, or other possible actions/penalties as authorized by the General Laws of the Commonwealth.

If you have questions about this decision, please contact Alice Smith 617-292-5854.

Sincerely,



Lisa Rhodes
Wetlands Program Chief

enclosure: Communication for Non-English Speaking Parties - 310 CMR 1.03(5)(a)
Material Shipment Record (MSR)

cc:

Chris Bertoni, Conservation Administrator, Conservation Commission, 10 Central Street Manchester-by-the-Sea, MA 01944-1399
Jill Provencal and Phil DiPietro, MassDEP NERO, 205B Lowell Street, Wilmington, MA 01887
Richard Canavan Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
Gabrielle Belfit Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
Paul Maniccia and Christine Jacek, Regulatory/Enforcement Division, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751
Edward Reiner and Phil Colarusso, US EPA, 5 Post Office Square, Suite 100, Boston, MA 02109
Tay Evans, Division of Marine Fisheries, 30 Emerson Avenue, Gloucester, MA 01930
Kaitlyn Shawn and Mike Johnson, National Marine Fisheries Services, 55 Great Republic Drive, Gloucester, MA 01930
Robert Boeri, MA CZM, 251 Causeway Street, Suite 800, Boston, MA 02114
Amy Hoenig and Melany Cheeseman, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581



Massachusetts Department of Environmental Protection
One Winter Street, Boston MA 02108 • Phone: 617-292-5751
Communication For Non-English Speaking Parties - 310 CMR
1.03(5)(a)



1 English:

This document is important and should be translated immediately. If you need this document translated, please contact MassDEP’s Diversity Director at the telephone numbers listed below.



2 Español (Spanish):

Este documento es importante y debe ser traducido inmediatamente. Si necesita este documento traducido, por favor póngase en contacto con el Director de Diversidad MassDEP a los números de teléfono que aparecen más abajo.



3 Português (Portuguese):

Este documento é importante e deve ser traduzida imediatamente. Se você precisa deste documento traduzido, por favor, entre em contato com Diretor de Diversidade da MassDEP para os números de telefone listados abaixo.



4(a) 中國（傳統） (Chinese (Traditional)): 本文件非常重要，應立即翻譯。

如果您需要翻譯這份文件，請用下面列出的電話號碼與MassDEP的多樣性總監聯繫。



4(b) 中国（简体中文） (Chinese (Simplified)):

本文件非常重要，应立即翻译。如果您需要翻译这份文件，请用下面列出的电话号码与MassDEP的多样性总监联系。



5 Ayisyen (franse kreyòl) (Haitian) (French Creole):

Dokiman sa-a se yon bagay enpòtan epi yo ta dwe tradui imedyatman. Si ou bezwen dokiman sa a tradui, tanpri kontakte Divèsite Direktè MassDEP a nan nimewo telefòn ki nan lis pi ba a.



6 Việt (Vietnamese):

Tài liệu này là rất quan trọng và cần được dịch ngay lập tức. Nếu bạn cần dịch tài liệu này, xin vui lòng liên hệ với Giám đốc MassDEP đa dạng tại các số điện thoại được liệt kê dưới đây.



7 ប្រទេសកម្ពុជា (Kmer (Cambodian)):

ឯកសារនេះគឺមានសារៈសំខាន់និងគួរត្រូវបានបកប្រែភ្លាម។ ប្រសិនបើអ្នកត្រូវបានបកប្រែឯកសារនេះសូមទំនាក់ទំនងឆ្នោតជាសាយភាយ MassDEP នៅលេខទូរស័ព្ទដែលបានរាយខាងក្រោម។



8 Kriolu Kabuverdianu (Cape Verdean):

Es documento é importante e deve ser traduzido imidiatamente. Se bo precisa des documento traduzido, por favor contacta Director de Diversidade na MassDEP's pa es numero indicode li d'boche.



9 Русский язык (Russian):

Этот документ является важным и должно быть переведено сразу. Если вам нужен этот документ переведенный, пожалуйста, свяжитесь с директором разнообразия MassDEP по адресу телефонных номеров, указанных ниже.



10 العربية (Arabic):

هذه الوثيقة الهامة وينبغي أن تترجم على الفور. اذا كنت بحاجة الى هذه الوثيقة المترجمة، يرجى الاتصال مدير التنوع في PMassDE على أرقام الهواتف المدرجة أدناه.



11 한국어 (Korean):

이 문서는 중요하고 즉시 번역해야 합니다. 당신이 번역이 문서가 필요하면 아래의 전화 번호로 MassDEP의 다양성 감독에 문의하시기 바랍니다



12 հայերեն (Armenian):

Այս փաստաթուղթը շատ կարևոր է եւ պետք է թարգմանել անմիջապես. Եթե Ձեզ անհրաժեշտ է այս փաստաթուղթը թարգմանվել դիմել MassDEP բազմազանությունը տնօրեն է հեռախոսահամարների թվարկված են ստորև.



13 فارسی (Farsi (Persian):

این سند مهم است و باید فوراً ترجمه شده است. اگر شما نیاز به این سند ترجمه شده، لطفاً با ما تماس تنوع مدير PMassDE در شماره تلفن های ذکر شده در زیر.



14 Français (French):

Ce document est important et devrait être traduit immédiatement. Si vous avez besoin de ce document traduit, s'il vous plaît communiquer avec le directeur de la diversité MassDEP aux numéros de téléphone indiqués ci-dessous.



15 Deutsch (German):

Dieses Dokument ist wichtig und sollte sofort übersetzt werden. Wenn Sie dieses Dokument übersetzt benötigen, wenden Sie sich bitte Diversity Director MassDEP die in den unten aufgeführten Telefonnummern.



16 Ελληνική (Greek):

Το έγγραφο αυτό είναι σημαντικό και θα πρέπει να μεταφραστούν αμέσως. Αν χρειάζεστε αυτό το έγγραφο μεταφράζεται, παρακαλούμε επικοινωνήστε Diversity Director MassDEP κατά τους αριθμούς τηλεφώνου που αναγράφεται πιο κάτω.



17 Italiano (Italian):

Questo documento è importante e dovrebbe essere tradotto immediatamente. Se avete bisogno di questo documento tradotto, si prega di contattare la diversità Direttore di MassDEP ai numeri di telefono elencati di seguito.



18 Język Polski (Polish):

Dokument ten jest ważny i powinien być natychmiast przetłumaczony. Jeśli potrzebujesz tego dokumentu tłumaczonego, prosimy o kontakt z Dyrektorem MassDEP w różnorodności na numery telefonów wymienionych poniżej.



19 हिन्दी (Hindi):

यह दस्तावेज़ महत्वपूर्ण है और तुरंत अनुवाद किया जाना चाहिए. आप अनुवाद इस दस्तावेज़ की जरूरत है, नीचे सूचीबद्ध फोन नंबरों पर MassDEP की विविधता निदेशक से संपर्क करें.



Massachusetts Department of Environmental Protection
 Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

A. Location Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. Provide the following information on the location where the waste was generated:

Release name (optional) _____

Street _____

Location aid _____

City/Town _____

State _____

Zip code _____

2. Date/Period of generation: _____

From _____

To _____

3. U.S. EPA ID number: _____

4. 21E release: _____

Yes

No

5. List additional tracking documents associated with this document:

Important: This form is not to be used for the shipment of remediation wastes subject to management under section 310 CMR 40.0035 of the Massachusetts Contingency Plan nor is it to be used in lieu of a hazardous waste manifest for hazardous waste or recyclable materials subject to the Massachusetts Hazardous Waste Regulations 310 CMR 30.000.

B. Generator Information

1. Provide the following generator information:

Name of organization _____

Contact name _____

Title _____

Street address _____

City/Town _____

State _____

Zip code _____

Telephone number(including extension) _____

C. Owner and/or Operator Information

1. If the owner and/or operator is different from the generator as indicated in Section B, provide the following information:

Check applicable: owner operator

Name of organization _____

Contact name _____

Title _____

Street address _____

City/Town _____

State _____

Zip code _____

Telephone number _____

Ext. _____



Massachusetts Department of Environmental Protection
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Material Shipping Record & Log

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Tracking Number _____

D. Transporter/Common Carrier Information

1. Provide the following information:

Transporter/Common carrier name _____

Hazardous waste license number (if applicable) _____

Licensing state (if applicable) _____

Contact person _____

Title _____

Street _____

City/Town _____

State _____

Zip code _____

Telephone number _____

Ext. _____

E. Receiving Facility Information

1. Provide the following information on the receiving facility:

Operator/Facility name _____

Contact person _____

Title _____

Street _____

City/Town _____

State _____

Zip code _____

Telephone number _____

Ext. _____

2. Type of facility:

asphalt batch/cold mix

asphalt batch/hot mix

landfill/disposal

landfill/ daily cover

thermal processing

landfill/structural fill

other(specify): _____

3. Permit number: _____



Massachusetts Department of Environmental Protection
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Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

F. Description of Material

Check all that apply:

1. a. soil dredge material fill

b. Description: _____

c. Classification: MIT USDA USAEC ASEE

2. Other(describe): _____

3. Type of contamination:

a. gasoline diesel fuel #2 oil #4 oil
 #6 oil waste oil kerosene jet fuel

b. Debris:
 demolition vegetative inorganic

c. Other(describe): _____

4. Constituents of concern (check all that apply):

As HVOCs
 Cd PATH
 Cr VOCs
 Pb PAHs
 Hg BNAs
 Na TPH
 PCBs Other(describe): _____

5. Analyses performed (check all that apply):

As PATH
 Cd VOCs
 Cr PAHs
 Pb BNAs
 Hg TPH
 Na TCLP (inorganic)
 PCBs TCLP (organic)
 HVOCs Other(describe): _____

6. Screening performed:

_____ Type

_____ Instrument used

_____ Constituents



Massachusetts Department of Environmental Protection
Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

F. Description of Material (cont.)

7. Estimated volume of materials:

Cubic yards _____ Tons _____ Other(specify units) _____

8. Contaminant source (check one):

- transportation accident
- dust
- other(describe): _____

9. Indicate which waste characterization support documentation is attached:

- site history information
- sampling and analytical methods/procedure
- laboratory data
- field screening data

If supporting documentation is not appended, provide an attachment stating the date and in connection with what document such information was previously submitted to the facility.

G. Qualified Environmental Professional Opinion

"I have personally examined and am familiar with the information contained on and submitted with this form. Based on this information, it is my opinion that the testing and assessment actions undertaken were adequate to characterize the waste, and that the facility or location can accept wastes with the characteristics described in this submittal. I am aware that significant penalties including, but not limited to, possible fines and imprisonment may result if I willfully submit information which I know to be false, inaccurate, or materially incomplete."

Name of Organization _____

Name of Professional _____

Title _____

Telephone number _____ Ext. _____

Signature _____

Date (MM/DD/YYYY) _____

License Number¹ _____

Seal²: _____

¹A license number is required for all Qualified Environmental Professional completing this form. A Qualified Environmental Professional is licensed or certified in a discipline related to environmental assessment (i.e., engineering, geology, soil science, or environmental science) by a state or recognized professional organization.

²A seal is **not** required for a **Licensed Site Professional** as defined in M.G.L. 21A, s. 19, holding a valid license issued by the Board of Registration of Hazardous Waste Site Cleanup Professionals pursuant to M.G.L. c. 21A, § 19 through 19J. A seal is required for all other Qualified Environmental Professionals as defined in 1 above.



Massachusetts Department of Environmental Protection
Bureau of Air & Waste

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

H. Certification of Generator

"I certify under penalties of law that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification, and that, based on my inquiry of those individuals immediately responsible for obtaining the information contained herein is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information."

Signature

Date (MM/DD/YYYY)

Name (Print)

I. Acknowledgment of Receipt by Receiving Facility

Receiving Facility

Representative (Print)

Title

Signature

Date (MM/DD/YYYY)



**Massachusetts Department of Environmental Protection
Bureau of Air & Waste**

Material Shipping Record & Log

For the shipment of contaminated soil, urban fill, and dredge materials not subject to management under section 310 CMR 40.0035 nor manifesting under 310 CMR 30.000

Tracking Number _____

J. Load Information

Note:
Make additional copies of this page as necessary.

Load#: _____

Signature of transporter _____

Receiving facility _____

Date received _____

Time received _____

Date of shipment _____

Time of shipment _____

Truck/Tractor registration _____

Trailer registration _____

Load size (cubic yards/tons) _____

Load#: _____

Signature of transporter _____

Receiving facility _____

Date received _____

Time received _____

Date of shipment _____

Time of shipment _____

Truck/Tractor registration _____

Trailer registration _____

Load size (cubic yards/tons) _____

Load#: _____

Signature of transporter _____

Receiving facility _____

Date received _____

Time received _____

Date of shipment _____

Time of shipment _____

Truck/Tractor registration _____

Trailer registration _____

Load size (cubic yards/tons) _____

K. Log Sheet Volume Information

Total volume this page (cubic yards/tons) _____

Total carried forward (cubic yards/tons) _____

Total carried forward and this page (cubic yards/tons) _____

Page _____ of _____

APPENDIX F4
USCG NON NAV.NV-1093

U.S. Department of
Homeland Security

United States
Coast Guard



Commander
First Coast Guard District

One South Street
Battery Park Building
New York, NY 10004-1466
Staff Symbol: dpb
Phone: (212) 514-4330
Email: Dale.K.Lewis2@uscg.mil

May 20, 2021

Tighe & Bond
Attn: Mr. Rick Canavan
Principal Environmental Scientist
120 Front St
Worcester, MA 01608
Via email: RCanavan@Tighebond.com

Re: NV-1093: Center Street Bridge over Sawmill Brook

Dear Mr. Canavan,

This is in response to your letter dated April 13, 2021 and corresponding information requesting whether the Coast Guard will require a permit for the referenced bridge project. We have examined the proposed project area with regard to its status as a navigable waterway of the United States for purposes of Coast Guard bridge jurisdiction.

Our examination indicates that there is no sufficient factual support for concluding that Sawmill Brook, Manchester-by-the-sea, MA, at the project location, has current or historic navigation occurring on this waterway of the United States. Since this is the case, a Coast Guard bridge permit or exemption will not be required for the referenced bridge project.

If you have any questions feel free to contact this office at the number above.

Sincerely,

D. A. Fisher
Bridge Program Manager
U.S. Coast Guard
By direction

E-Copy: 1) USCG Sector Southeastern New England, Waterways
2) USACE, New England Division, Navigation Section

APPENDIX F5

Central St Culvert - HDC Letter of Support



MANCHESTER-BY-THE-SEA
HISTORIC DISTRICT COMMISSION
Town Hall, 10 Central Street
Manchester-by-the-Sea, Massachusetts 01944-1399

April 4, 2019

Board of Selectmen
10 Central Street
Manchester, MA 01944

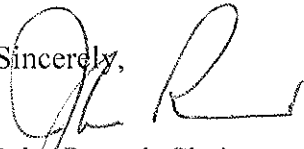
Re: Central Street Bridge Replacement Project

Dear Board of Selectmen:

On behalf of the Historic District Commission ("HDC") of the Town of Manchester-by-the-Sea, I am writing to show support for the Central Street Bridge Replacement Project. Mr. Nate Desrosiers of the Town Department of Public Works staff, preliminarily reviewed certain aesthetic details, such as railing and wall treatments with the Commission at its meeting on March 28, 2019. We understand that the overall project includes removal of the tide gate, replacement of the Central Street Bridge, new abutment walls and other related structural improvements. We also understand that these improvements are partially funded by a grant from the MassDOT Small Bridge program, and that the design is subject to applicable MassDOT bridge design standards. We look forward to working with the DPW to ensure that the furnishings will be consistent with the setting of the historic district.

The Central Street Bridge is listed as non-contributing to the Manchester Village Historic District on the National Register of Historic Places inventory; and, as such, the proposed project as presented is not anticipated to affect known historical properties. In addition, the furnishings as presented to the Commission appear to be generally consistent with the setting of the historic district.

Sincerely,


John Round, Chairman
On Behalf of the Historic District Commission

JR:aa

cc: Mr. Gregory Federspiel, Town Administrator
Mr. Charles Dam, Director, Department of Public Works
✓ Mr. Nate Desrosiers, Project and Facilities Manager, Department of Public Works

6. Tribal distribution and agency contacts list

3. Historic Resources:

- a. Massachusetts Historical Commission (MHC)

The Massachusetts Archives Bldg.
220 Morrissey Boulevard
Boston, MA 02125

yes

(617) 727-8470 (phone); (617) 727-5128 (fax)

Area of concern: The entire Commonwealth of Massachusetts

- b. Massachusetts Board of Underwater Archaeological Resources (BUAR)

251 Causeway Street, Suite 800
Boston, MA 02114

yes

(617) 626-1141 (phone); (617) 626-1240 (fax); victor.mastone@state.ma.us

Area of concern: All Massachusetts lakes, ponds, rivers and navigable waters.

- c. Tribal Historic Preservation Officers (THPOs)

Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

yes

(508) 645-9265, x175 (phone); (508) 645-3790 (fax); bettina@wampanoagtribe.net

Area of concern: The entire Commonwealth of Massachusetts

Tribal Historic Preservation Officer
Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

yes

(508) 477-0208, x101 (phone); (508) 477-1218 (fax); rpeters@mwtribe.com

Area of concern: The entire Commonwealth of Massachusetts

Tribal Historic Preservation Officer
Stockbridge-Munsee Mohican Tribal Historic Preservation, New York Office
65 1st Street
Troy, NY 12180

no

(518) 244-3164 (phone); bonney.hartley@mohican-nsn.gov

Area of concern: West of the Connecticut River and Northfield, Montague, Miller's Falls, Turner's Falls, Sunderland, Amherst, Hadley, South Hadley, Chicopee, Springfield and Longmeadow.

Tribal Historic Preservation Officer
Narragansett Indian Longhouse
4425 South County Trail
Charlestown, RI 02813

No

(401) 585-0142 (phone); (413) 325-7691 (cell); tashtesook@aol.com, dhnthpo@gmail.com

Area of concern: Boston and its surrounding cities and towns; Lynn; Newton; these cities and towns in Plymouth County (Carver, Duxbury, Hingham, Kingston, Marshfield, Middleborough, Plymouth, Plympton, Scituate); these cities and towns in Norfolk County (Milton, Quincy, Braintree, Randolph, Canton, Sharon and Foxborough); the Blackstone River valley; and the cities and towns west of Worcester (which are those including and west of Ashburnham, Westminster, Princeton, Holden, Paxton, Leicester, Oxford and Webster).

VIII: Contacts and Tribal Areas of Concern

1. Federal

U.S. Army Corps of Engineers
Regulatory Division
696 Virginia Road
Concord, Massachusetts 01742-2751
(978) 318-8338 (phone); (978) 318-8303 (fax)
www.nae.usace.army.mil/missions/regulatory

U.S. Environmental Protection Agency
5 Post Office Square
Suite 100 (OEP05-2)
Boston, Massachusetts 02109-3912
(617) 918-1692 (phone)

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9300 (phone)
(Federal endangered species & EFH)

U.S. Fish & Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301
(603) 223-2541 (phone)
(Federal endangered species)

National Park Service
15 State Street
Boston, MA 02109
(617) 223-5191 (phone)
(Wild and Scenic Rivers)

Commander (dpb)
First Coast Guard District
Battery Building
One South Street
New York, NY 10004-1466
(212) 514-4331 (phone); (212) 514-4337 (fax)
(bridge permits)

Chief, Risk Analysis Branch
FEMA Region 1
U.S. Department of Homeland Security
99 High Street, 6th Floor
Boston, MA 02110
(617) 956-7576

2. State of Massachusetts

Department of Environmental Protection (MassDEP)

DEP Division of Wetlands and Waterways
One Winter Street
Boston, MA 02108
(617) 292-5695

DEP Northeast Region
Wetlands Protection Program
205B Lowell Street
Wilmington, MA 01887
(978) 694-3200

DEP Western Region
Wetlands Protection Program
436 Dwight Street
Springfield, MA 01103
(413) 784-1100

DEP Central Region
Wetlands Protection Program
8 New Bond Street
Worcester, MA 01606
(508) 792-7650

DEP Southeast Region
Wetlands Protection Program
20 Riverside Drive, Route 105
Lakeville, MA 02347
(508) 946-2800

Massachusetts Office of Coastal Zone Management (CZM)

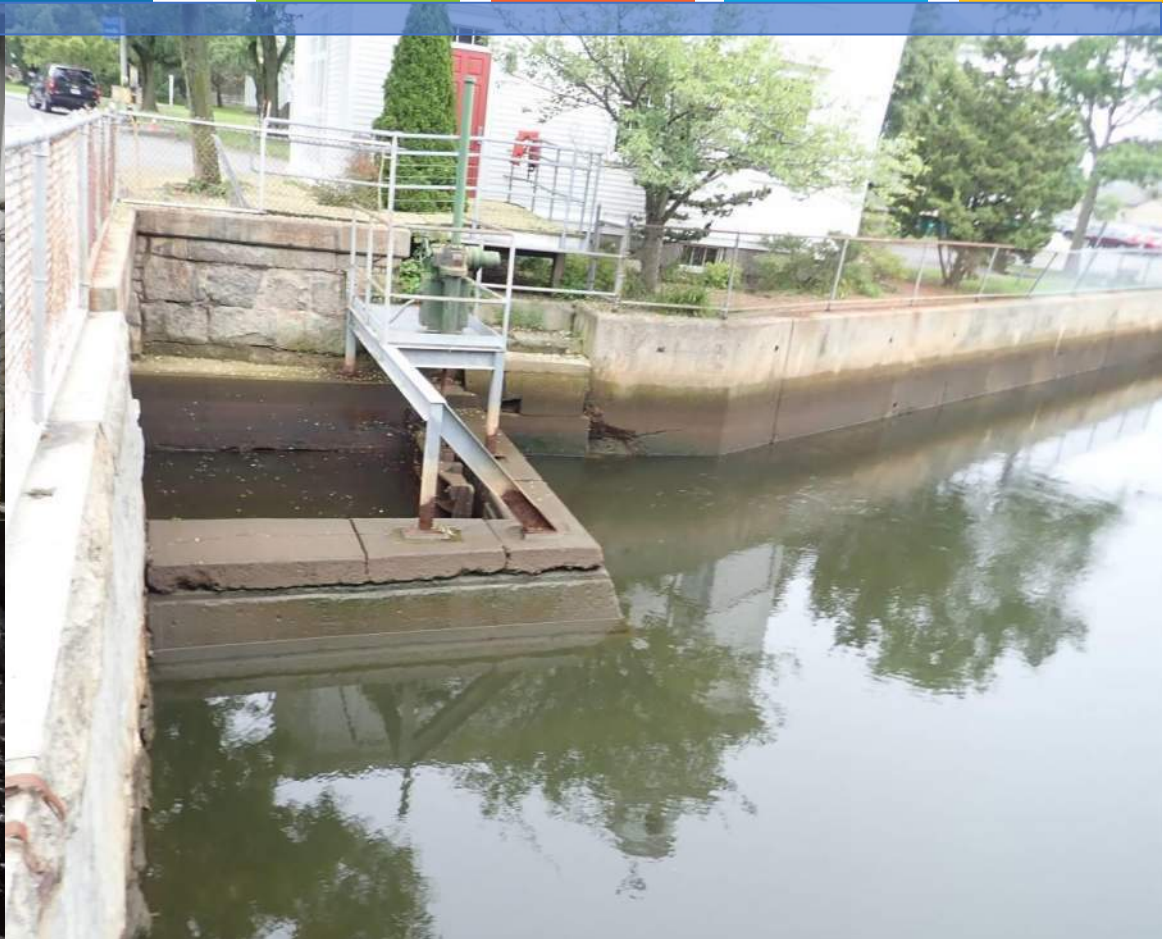
MA Office of Coastal Zone Management
251 Causeway Street, Suite 800
Boston, MA 02114
(617) 626-1200 (phone)

Tighe&Bond

APPENDIX G

APPENDIX G1

**Manchester Central Street Bridge PCN NAE-2019-02827
(June 2021)**



Central Street Bridge Restoration Project
Central Street, Manchester-by-the-Sea

Pre-Construction Notification

Town of Manchester-by-the-Sea
10 Central Street
Manchester-by-the-Sea, Massachusetts

June 2021

M-14760-011
June 11, 2021

Ruthann Brien
Regulatory Division
USACE New England District
ruthann.a.brien@usace.army.mil

Re: **Central Street Bridge Replacement Project
Pre-Construction Notification (PCN) Amendment NAE-2019-02827
Central Street, Manchester-by-the-Sea**

Dear Ruthann,

On the behalf of the Town of Manchester-by-the-Sea, Tighe & Bond is respectfully submitting this amendment to an existing Pre-Construction Notification (PCN) (NAE-2019-02827) to incorporate the Central Street Bridge Replacement Project into the Central Pond Restoration Project. The overarching goal of the projects is to restore the tidal influence within Sawmill Brook/Central Pond in Manchester-by-the-Sea. This submittal will be combined with the Central Pond Restoration project for review and will detail the activities necessary to replace the Central Street bridge and remove the tide gate structure in Sawmill Brook. The tide gate removal and increased hydraulic opening of the replacement bridge will significantly improve the tidal flushing at Sawmill Brook and Central Pond upstream of this road crossing and restore fish passage for the rainbow smelt; a "Species of Concern."

The proposed work is seeking authorization under the Massachusetts General Permits in accordance with Section 404 of the Federal Clean Water Act (33 U.S.C. 1251 et seq.). Authorization under the Massachusetts General Permits is required because the project requires the placement and removal of fill in Waters of the United States. Enclosed with this submittal is a detailed project narrative, project figures and plans, and other supporting materials. Section 1 describe the impacts of the combined project. Sections 2 through 6 of the enclosed narrative describe the Central Street bridge replacement project, and the Central Street bridge replacement project area conditions are shown in the figures, photos, and project plans provided in the appendices. The appendices also include endangered species information, historic preservation officer coordination, and authorizations received to date.

We appreciate your review of the proposed project. Should you have any questions or require additional information please contact Gabrielle Belfit at (508) 304-6362 or GCBelfit@tighebond.com, Daniel Murphy, Jr. at (781) 375-2573 or DLMurphy@tighebond.com, or me at (508) 471-9631 or RCanavan@tighebond.com .

Very truly yours,

TIGHE & BOND, INC.



Richard Canavan, PWS, PhD
Principal Environmental Scientist

Copy: Greg Federspiel, Town Administrator, Manchester-by-the-Sea
Charles Dam, Public Works Director, Manchester-by-the-Sea
Mary Reilly, Grants Administrator, Manchester-by-the-Sea

PRECONSTRUCTION NOTIFICATION FORM
CHECKLIST

VI: Content of Preconstruction Notification

Applications should be emailed to cenae-r@usace.army.mil or to the Corps project manager if one has been assigned. In addition to the following required information, the applicant must provide additional information as the Corps deems essential to make a public interest determination including, where applicable, a determination of compliance with the §404(b)(1) guidelines or ocean dumping criteria.

1. Written information required for all projects:

- ✓ Corps application form ([ENG Form 4345](#)). The MassDEP WQC, Chapter 91 application form and Notice of Intent cannot be substituted for the form, but can be used supplementally.
- ✓ All anticipated direct, indirect and secondary impacts, both permanent and temporary, to waters of the U.S. (in wetlands, and waterward of OHW in inland waters and the HTL in coastal waters) in square feet, acres, or linear feet (for stream and bank impacts), and cubic yards or other appropriate units of measure. The New England District Compensatory Mitigation Guidance is a resource for assessing secondary impacts (see www.nae.usace.army.mil/missions/regulatory/mitigation.aspx).
- ✓ For the discharge of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized. For the remaining impacts, include a statement describing how impacts to waters of the U.S. are to be compensated for or explain why compensatory mitigation should not be required for the proposed impacts.
- N/A For any activity that will alter or temporarily or permanently occupy or use a Corps Federally authorized civil works project, the PCN must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps. See GC 5(a).
- ✓ Information on historic properties (see GC 7), including a copy of the [Historic Property Notification Form](#) (Section IX) and the email or certified mail receipt that was used to send the form to the SHPO, BUAR and applicable THPOs.
- ✓ Information on Federal threatened or endangered species (see GC 10).
- ✓ A restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions (see GC 15).
- ✓ Photographs of wetland/waterway to be impacted. Photos at low tide are preferred for work in tidal waters.
- ✓ Invasive Species Control Plan (see GC 25). For sample control plans, see www.nae.usace.army.mil/missions/regulatory/invasive-species.
- ✓ Provide discussion of habitat, including type of sediment/soil effected (sand, mudflat, etc), along with presence or absence of wildlife, plants, fisheries, and shellfish. Explain how the applicant has determined the presence or absence of the required wildlife, fisheries, shellfish, information, e.g., divers, surveys, personal observation, online maps, etc.
- ✓ Provide a description of the federal wetlands and provide a map of their locations within the project area. Provide an assessment of the impacts expected from the project on the wetlands and wildlife functions.
- ✓ Provide historic information of project area, e.g., existing Corps permit numbers, the names under which the permits were obtained if the permit numbers are unknown, construction dates and proof of prior existence (aerials, photos, town hall records, affidavits, state or local permits, etc.) to verify “grandfathering.”
- ✓ If the project is located in the floodway, state whether the project will increase the 100-year frequency flood level? How much floodplain storage will be removed from the 100-year floodplain by fill.

For dredging projects, include:

- N/A Date the area was last dredged.
- Whether it is new, improvement or maintenance dredging and the method of handling/transporting.
- Type of dredging equipment to be used and dredging method (e.g. mechanical or hydraulic).
- Grain-size of material to be dredged (e.g., silty sand). Provide any existing sediment grain size and bulk sediment chemistry data from the proposed or nearby projects.
- Information on any recent spills of oil and/or other hazardous materials and on nearby outfalls. Document the information source, e.g., the harbormaster or fire chief.
- Total footprint of the dredged area when characterizing impact to resources.
- Discuss alternatives to open-water disposal.

2. Plans for all projects shall include:

- Drawings, sketches, or plans that are legible, reproducible (color is encouraged, but features must be distinguishable in black and white), drawn to scale, and no larger than 11"x17". Numeric and graphic/bar scales must agree and plan details must be measurable using a standard engineer's scale on printed plans. Reduced plans are not acceptable. Show the north arrow and wetland and waterway area impacts. Provide a color locus map and, if necessary, a plan overview of the entire property with a key index to the individual impact sheets.
- Datum in plan and elevation views.
- The horizontal datum shall be in the NAD 83 Massachusetts State Plane Coordinate System (zone is either Mass Mainland or Mass Island) in U.S. survey feet.
- The vertical data in coastal projects shall be referenced to either MLLW or the North American Vertical Datum of 1988 (NAVD 88). Both the distance and depth units shall be U.S. survey feet.
- Existing and proposed conditions, and plan views and cross sections for all work.
- Limits and area (SF) of temporary and permanent fill to be placed in any wetlands or waterway, including construction access and work areas, cofferdams, bedding, and backfill. Show delineation of all wetlands including salt marsh; other special aquatic sites (vegetated shallows, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges); other waters, such as lakes, ponds, vernal pools, and perennial, intermittent, and ephemeral streams; on the project site. Use Federal delineation methods and include Corps wetland delineation data sheets (see GC 2) for all wetlands. Vegetated shallow survey guidance is located at www.nae.usace.army.mil/missions/regulatory/jurisdiction-and-wetlands. Maps of vegetated shallows in Massachusetts are located at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit.
- Copies of sections of National Wetland Inventory Maps, marked to show locations and site boundaries. Identify the quad name and year.
- Ebb and flood in tidal waters and direction of flow in non-tidal waters.
- Indicate the relationship of the proposed work site to waters of the U.S., i.e. adjacent wetlands, tidal influence through culverts, etc.
- Total plan of development, including the proposed use of upland and wetland areas.
- Names or numbers of all roads in the site's vicinity.
- Names of adjoining property owners in plan view.
- N/A For typical pipeline cross-sections, the details of the bedding and backfill to be used in wetlands and waterways. Show proposed trench dams and detail for inland projects.
- N/A Adjacent Federal navigation project (FNP) (anchorage or channel) and/or state/local navigation projects, distance to them, the authorized depths of the FNP, and state plane coordinates of seaward end(s) of structures near an FNP.
- The 100, 500-year and regulatory floodway boundaries as shown on the community's current National Flood Insurance Program maps, if applicable.
- A statement regarding how the project proponent has determined the absence or presence of vegetated

shallows, mudflats, or riffles and pools, e.g., personal visual observation, divers, online maps, conversations with local officials, etc.

- ✓ Shellfish information. A survey may be required.

2a. Plans for structures shall also include:

- ✓ The MLLW, MHW and HTL elevations in tidal waters, and OHW in non-tidal navigable waters.
- ✓ Water depths around the project in all views.
- ✓ Dimensions of the existing and proposed structures. Show the location and dimensions of existing bulkheads and/or shoreline stabilization on adjacent properties and, if applicable, how the proposed work will tie into existing structures.
- N/A□ For piers and other structures, the minimal height of structure above the marsh.
- N/A□ For floats, the methods of securing (piles, bottom anchors) and keeping off substrate (skids, stops).
 - ✓ Any existing structures and moorings in waters adjacent to the proposed activity, their dimensions, and the distance to the limits and coordinates of any proposed mooring field, reconfiguration zone or aquaculture activity. Provide the coordinates for all corners based on the Massachusetts State Plane Coordinate System. Specify the maximum number of slips and/or moorings within proposed reconfiguration zones. If no structures exist or are proposed, state this on the project plans.
 - ✓ The dimensions of the structure or work and extent of encroachment waterward of MHW and from a fixed point on the shoreline or upland.
 - ✓ Shoreline of adjacent properties.
- N/A□ In narrow waterbodies, the distance to opposite shoreline, waterway width, and structures across from proposed work.
- N/A□ For reconfiguration zones, the coordinates of the corners and specify the maximum number of slips and/or moorings within the zone.
- N/A□ A description of the type of vessels that would use the facility, and any plans for sewage pump-out facilities, fueling facilities and contingency plans for oil spills.

2b. Plans for projects involving fill shall also include:

- ✓ All locations of discharges of dredged or fill material waterward of the HTL or OHW.
- N/A□ Any historic permanent fill previously authorized by the Corps and the date of authorization.
 - ✓ The MLLW, MHW and HTL elevations in tidal waters, and OHW elevation in lakes and non-tidal streams.
- N/A□ Structures, if any, proposed to be erected on the fill.
 - ✓ Limits of wetlands (label: wetland boundary) and waterways (labels: OHW or HTL) on all views.
 - ✓ Limits of temporary and permanent fill to be used in any wetlands or waterway, including construction access and work areas, cofferdams, bedding, and backfill.
 - ✓ Area (SF) of each fill that is waterward of the OHW in non-tidal waters, waterward of the HTL in tidal waters, and in wetlands. State if the fill is permanent or temporary.
- N/A□ Disposal site of the excess excavated material. If necessary, submit an additional sheet showing the location of the proposed disposal site. Provide quantity of excess excavated material.
 - ✓ Existing and proposed ground or waterway contours or spot elevations on all views.
- N/A□ Mitigation areas clearly identifying each area and showing the boundaries and SF of each area.
 - ✓ Total plan of development, including the proposed use of upland and wetland areas.

2c. Plans for projects involving dredging shall also include:

- ✓ The area (SF) and volume (CY) of material to be dredged waterward of MHW for each dredge location.
 - ✓ Dredge boundaries.
 - ✓ Bathymetry: existing, proposed and historical (include dates and Corps permits) dredge depths
 - ✓ The likely final angle of repose of the side cuts based on the physical characterization of the material to be dredged and based upon the high/ medium/low, wave or current energy of the location.
 - ✓ Whether the dredging is new, maintenance, improvement, or a combination.
 - ✓ A description of the area to be dredged, i.e. open water, existing channel, wetlands, uplands, etc.
 - ✓ Location of the disposal site (include locus sheet).
 - ✓ The methods and areas used to retain or prevent dredged material from running back into the wetland or waterway. Provide the capacity and points of runback, including the overflow route, into the aquatic system.
- N/A□ For beach nourishment, the disposal footprint, existing and proposed nourishment profiles (multiple profiles are appropriate if the site is more than 150 feet long or non-contiguous), total fill area (SF) and volume (CY), fill area and volume waterward of the HTL, and delineation of dunes, banks, existing beach vegetation, and contours.
- N/A□ Show the finished top elevation of the disposal site.
- N/A□ For open-water disposal, explain why inland or beneficial reuse sites are not practicable.
- ✓ Identification and description of any potential impacts to Essential Fish Habitat and threatened or endangered species.
- N/A□ Note: For projects proposing open water, nearshore disposal, or beach nourishment, contact the Corps as early as possible regarding sampling and testing protocols. Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing may be required. Sampling and testing of sediments without such contact should not occur and if done, would be at the applicant's risk.

Tighe&Bond

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B Project Plan Set
C Site Photographs
D Historical and Archaeological Resources
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E Project Abutters
F Federally-Endangered and Threatened Species List
Essential Fish Habitat Assessment Worksheet
G Sediment Analysis
H Permit Approvals
I Wetland Enhancement and Restoration Plan

Tighe&Bond

SECTION 1

Section 1

ENG Form 4345 Additional Information

ENG Form 4345 21. Type of Material Being Discharged and Amount in Cubic Yards

The previous application for the Central Pond Restoration Project had permanent fill within the Waters of the United States (WoUS) associated with the retaining wall replacement and shoreline stabilization bioengineering elements. The permanent fill consists of the placement of the concrete, modified rockfill, and crushed stone for the retaining wall, and the placement of coir logs and living shoreline elements for slope stabilization, scour protection, and stream restoration. The Central Street Bridge Replacement Project will dredge materials in order to remove the tide gate and existing bridge footings within WoUS.

Table 1-1 details the proposed permanent fill impacts for the project. Refer to Section 4 for additional details on proposed work and associated impacts.

Table 1-1 Types of Material Being Discharged

Permanent Discharge for Central Pond			
Location	Resource Area	Material	Amount in Cubic Yards
Sawmill Brook	WoUS	Concrete	42
Sawmill Brook	WoUS	Crushed stone	80
Sawmill Brook	WoUS	Reused retaining wall blocks	542
Sawmill Brook	WoUS	Living Shore Elements	2,383
Total			±3,047
Permanent Discharge for Central Street Bridge			
Location	Resource Area	Material	Amount in Cubic Yards
Sawmill Brook	WoUS	Concrete	35
Total			±35
New Totals for Permanent Discharge			
Location	Resource Area	Material	Amount in Cubic Yards
Sawmill Brook	WoUS	Concrete	77
Sawmill Brook	WoUS	Crushed stone	80
Sawmill Brook	WoUS	Reused retaining wall blocks	542
Sawmill Brook	WoUS	Living Shore Elements	2,383
Overall Total			±3,082

Temporary Discharge

In-water work for the Central Street bridge will involve temporary discharges to WoUS that include temporary placement of materials and excavation (*i.e.*, dredge) in WoUS to replace the existing bridge and remove the tide gate. The previous application for the retaining wall replacement and living shoreline bioengineering also involved temporary discharges for the temporary placement of materials and excavation in WoUS to repair and replace the existing retaining wall and restore Sawmill Brook.

Table 1-2 details the proposed temporary fill impacts for the project. For the Central Street Bridge Replacement, the plans show overly conservative areas of potential impact due to the cofferdams to allow some flexibility in the actual placement of the cofferdams. The noted potential areas of impact are approximately 50 feet by 45 feet or 2,250 sf on the harbor side and approximately 50 feet by 22 feet or 1,100 sf upstream or north of Central Street.

The plans provide the contractor an option for construction of the cofferdams consisting of stacked sand bags or super sacks. This concept indicates footprints of cofferdam of approximately 42 feet by 45 feet or 1,890 sf on the harbor side and 26 feet by 22 feet, or 572 sf upstream, for a combined area of approximately 2,500 sf. It is possible that the contractor may choose to provide a cofferdam that creates a smaller area of impact, either with a combination of sand bags and sheeting or other system.

Table 1-2 Temporary Material Being Discharged

	Central Pond Restoration	Central Street Bridge Replacement	Total
Cofferdams	9,972 sf	2,500 sf	12,472 sf
Timber mats	1,000 sf	0 sf	1,000 sf

ENG Form 4345 22. Surface Area in Acres of Wetlands or Other Waters Filled

The proposed permanent fill for this combined project is associated with the retaining wall replacement and living shoreline elements. The permanent fill consists of the installation of the retaining wall and the placement of coir logs and rootwads for slope stabilization, scour protection, and stream restoration. The Central Street Bridge Project will remove the tide gate and create resource area within Sawmill Brook. Table 1-3 details the permanent fill impacts for the project by area.

Table 1-3 Surface Area in Acres of Wetlands or Other Waters Filled

Location	Activity	Resource	Area (sf)	Area (acres)
Sawmill Brook	Retaining Wall Replacement	WoUS	4,195	0.096
Sawmill Brook	Living Shoreline Elements	WoUS	10,050	0.231
Sawmill Brook	Tide Gate Removal	WoUS	+353	+0.008
Total			13,892	0.319

Temporary Impacts

There will be approximately 13,472 sf of temporary direct impacts associated with the installation of timber mats for construction access, installation of in-stream sedimentation prevention and water control measures, and other construction-period activities for the retaining wall replacement and living shoreline installation. Cofferdams will be installed to temporarily isolate the work areas as noted in the Temporary Discharge section above.

ENG Form 4345 26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies

Table 1-4 Certificates or Approvals/Denials received from other Federal, State, or Local Agencies

Agency	Type of Approval	Identification Number	Date Applied	Date Approved
MA Executive Office of Energy and Environmental Affairs	Certificate of the Secretary of EEA on the Environmental Notification Form	EEA #16127	12/2/2019	1/10/2020
Manchester-by-the-Sea Conservation Commission	Wetlands Protection Act (MAWPA) Order of Conditions	039-0832	9/15/2020	11/18/2020
MassDEP	Chapter 91 Waterways License	X286196	5/29/2020	Pending
MassDEP	Water Quality Certificate (Pond Restoration only)	X285965	5/15/2020	3/26/2021
MassDOT	Chapter 85 (Bridge Replacement Only)	Pending	Pending	Pending

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SECTION 2

Section 2

Introduction

Project Name: Central Street Bridge Replacement

Project Location: Central Street, Manchester-by-the-Sea, Massachusetts

Project Proponent: Town of Manchester-by-the-Sea

This Pre-Construction Notification (PCN) amendment is being submitted on behalf of the Town of Manchester-by-the-Sea for the proposed replacement of the Central Street Bridge through demolition of the existing 16-foot span and replacement with a 20-foot pre-cast concrete arch bridge. During the demolition of the existing bridge an existing tide gate structure at the downstream face of the bridge will also be demolished and removed. The tide gate removal and increased hydraulic opening of the replacement bridge will significantly improve the tidal flushing at Sawmill Brook and Central Pond upstream of this road crossing and restore fish passage.

This work is part of a larger tidal restoration project that also includes the Central Pond Restoration. The tide gate has been fully open since February 27, 2018 which has partially restored tidal flushing to Central Pond; however, the removal of the structure will allow for additional tidal flushing. The work proposed in this application as well as the Central Pond Restoration were the subject of a single Environmental Notification Form under the Massachusetts Environmental Policy Act (EEA #16127, certificate issued January 10, 2020). These projects are associated and will be combined for review purposes. The Central Pond Restoration Project filed a PCN (NAE-2019-02827) in May 2020, so the narrative of this submittal will focus on the Central Street bridge replacement portion of the project. Compliance with the GP conditions is presented in Section 6 of this narrative.

2.1 Project Background and Purpose

The Town of Manchester-by-the-Sea is a vibrant coastal community with an abundance of natural coastal resources, a stable population, and thriving year-round and seasonal businesses. Flooding events have severely impacted these assets in the past, including economic loss from businesses closed due to floods and disrupted utilities, flood related safety concerns due to impassable roadways and restrained access for emergency vehicles, inoperable wastewater and stormwater systems, and environmental concerns due to loss of habitat from tidal restrictions and erosion by flood waters.

Flooding is a particular problem within the Sawmill Brook watershed, particularly in the lower reaches of the Brook. Flood events during extreme storm events are due to the combination of storm surge, hydraulic restrictions from undersized culverts and the tide gate, stormwater runoff from impervious areas, the channelized stream system in the lower portion of the watershed, and poor infiltration conditions.

The Central Street tide gate and related structures need modification to provide better functionality for drainage and fish passage. The tide gate and bridge at Central Street impede stream flows in Sawmill Brook and overtop during extreme storm events. Seepage through the seawall due to hydrostatic pressure from the tide gate is damaging the roadbed. Culvert arch stones are becoming unstable.

The tide gate and weir at the Central Street bridge have been identified by the Division of Marine Fisheries as an impediment to fish passage, notably impacting rainbow smelt (*Osmerus mordax*), a diadromous fish species designated by the National Marine Fisheries Service as a "Species of Concern", a precursor to listing under the Federal Endangered Species Act.

As part of a multi-phase project to address a number of these conditions, the Central Street bridge replacement project includes removal of the tide gate to restore unrestricted flow of Sawmill Brook into Manchester Harbor, and replacement of Central Street bridge with a concrete arch culvert with a span of approximately 20 feet. The concrete arch culvert will have greater capacity than the existing structure and will have a stone appearance in keeping with the aesthetic of the adjacent stone seawall.

Numerous State and Federal agencies are supporting partners in this project, providing grant funding, technical guidance, and public outreach support. These include the Massachusetts Coastal Zone Management (CZM), Division of Ecological Restoration (DER), the Massachusetts Environmental Trust (MET), the Massachusetts Division of Marine Fisheries (DMF), and the National Oceanic and Atmosphere Administration (NOAA) Restoration Center. The project has been further supported by dedicated Town Staff, the Board of Selectmen, the Manchester Coastal Resilience Advisory Group (CRAG), and Manchester Stream Team volunteers.

A Site Locus Map (Figure 1), Massachusetts Department of Environmental Protection (MassDEP) Priority Resource Area Map (Figure 2), and Site Orthophotograph (Figure 3) are provided in Appendix A. Project plans showing existing and proposed conditions are provided in Appendix B. Photographs of the existing site are provided in Appendix C.

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SECTION 3

Section 3

Existing Conditions

3.1 Project Area

Sawmill Brook and associated tributaries have a watershed area of approximately five square miles which drains much of the central portion of Manchester-by-the-Sea. The mouth of Sawmill Brook drains through a narrow small bridge and tide gate under Central Street. Historical documentation suggests that activity in this area by early European settlers included the relocation of the Sawmill Brook channel, filling of salt marsh and other areas for development. The current tide gate structure was added around 1938 to impound Central Pond, creating a fire reservoir and a winter skating pond. The tide gate and bridge are currently not functioning properly, creating a hydraulic restriction during storm events and impeding the passage of fish such as rainbow smelt.

3.1.1 Sawmill Brook

Tighe & Bond evaluated the bridge and tide gate in June 2015. The passage under the bridge discharges flow from Sawmill Brook via a narrow, channelized reach, with 12-foot high granite walls and buildings abutting either side. The bridge has historically suffered due to the tide gate impounding waters upstream of the bridge, causing seepage and loss of backfill material when large precipitation events and high tide elevations are concurrent. Multiple hydrologic and hydraulic models of the watershed and bridge indicate that the bridge opening is undersized to pass current design storm events with storm surge tail water without overtopping.

In June of 2016, the bridge underwent interim repairs intended to temporarily stabilize the structure. An August 13, 2018 site visit confirmed similar conditions to those observed in the 2015 site visit, including water seepage paths, damming conditions caused by the tide gate, separation and settlement of culvert arch stones, and concrete degradation.

Downstream of the Central Street bridge is the tide gate that consists of a concrete gravity weir surrounding the Sawmill Brook outlet. The Sawmill Brook passes through an opening in the weir restricted by a 6.5 by 5.5 foot cast iron slide gate controlled with an electric actuator. The tide gate serves as a major hydraulic restriction for Sawmill Brook. When the tide gate is closed, it reduces tidal fluctuations within Sawmill Brook and Central Pond, although it is overtopped during very high tides. During rainstorms, it causes flooding of low-lying properties abutting Central Pond. To alleviate this flooding the slide gate has been left open, since February of 2018 partially restoring upstream tidal flows.

The existing tide gate structure has a top of wall elevation just above mean higher high water level (MHHW), making this a significant obstruction to rainbow smelt passage during most high tide conditions. Tidal water levels will rise over these walls on spring high tides (full moon or new moon) and during higher than predicted tides associated with atmospheric low pressure or wind setup, and such conditions will periodically allow rainbow smelt to swim over the walls when the tide gate is closed. This tide gate wall overtopping on spring high tides and storm surge tides indicates that the tide gate is not effective in preventing seawater flooding.

Recent preliminary topographic survey indicates Central Street is within about 1 foot of tidal flooding, based on recorded high tides from the storm of 1978 (NOAA Boston tide record at 93% height correction for Manchester). This was confirmed during the January 4, 2018 record high tide event during Winter Storm Grayson. The frequency of tidal flooding of the roadway will be increasing based on the current mean sea level rise relative to land (including land subsidence) of 0.92 feet per 100 years recorded in Boston (NOAA), and also based on forecast predictions of an increasing rate of relative sea level rise (IPCC).

This tide gate is a bottom opening gate that is not suitable to partial opening for smelt passage due to the head pressure and high flow velocities associated with a limited gate opening needed to maintain the impoundment pond. Full opening of the gate during smelt migration is feasible, though velocities during rainfall events would need to be checked relative to smelt swimming speeds. Even with the tide gate open to allow for fish passage, there are two more weirs inside the stone arch culvert. Since the smelt are not able to jump up weirs, the tide will need to rise to at least 2/3 of mean high tide to allow smelt to swim upstream past these weirs. The DER has selected this area as a provisional Massachusetts Priority Project due to the potential restoration benefits that can be realized in this location, and the level of commitment demonstrated by the community to accomplish these goals.

3.2 Summary of Waters of the U.S.

The project site contains areas subject to jurisdiction under Section 404 of the Clean Water Act (Section 404) and Section 10 of the Rivers and Harbors Act (Section 10). Waters of the United States (WoUS) at the site were delineated by Tighe & Bond on April 18 and 19, 2018 in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0, U.S. Army Corps of Engineers, January 2012).

WoUS identified at the site were limited to the Mean High Water (MHW) marks associated with this segment of Sawmill Brook, a navigable waterway subject to tidal action. The project plans in Appendix B illustrate the locations of these jurisdictional boundaries. Note that the Sawmill Brook is in transition from inland wetland resource area to coastal resource area and that as the restoration of tidal influence improves with removal of the tide gate, the area that may have previously been inland is now being characterized as coastal.

3.3 Description of Waters of the U.S.

The following section describes areas subject to Section 404/10 within the project boundaries. Photos of the project area and associated WoUS are included in Appendix C.

3.3.1 Mean High Water to Sawmill Brook

The Sawmill Brook is shown as a perennial stream on the USGS topographic map (Marblehead North, Massachusetts; 1985). The project area is within a tidal portion of Sawmill Brook as the mouth of coastal rivers mapping (Appendix A-Figure 4) indicates that the tide gate and bridge at Central Street is the mouth of the coastal river.

The mean high water (MHW) mark was determined following a review of available tide charts, tidal datum, and hydraulic modeling. The MHW marks on the project plans are approximately elevation 4.33 feet (NAVD88). Mean Higher-High Water (MHHW) is approximately 4.77 feet (NAVD 88). Mean Lower-Low Water (MLLW) in the bay is estimated to be approximately -5.51 feet (NAVD88) based on the NOAA long-term tide water level monitoring station for Boston, MA (ID 8443970).

With the tide gate open the upstream bridge invert would become the control, so MLLW would need to be greater than the elevation of the upstream bridge invert, -0.2 feet for current tide elevations to have affect in the stream further upstream. Tighe & Bond used data loggers upstream of Central Street from November 27, 2017 to May 4, 2018 to monitor water levels. Based on available data when the tide gate was open, MLW would be at approximately 1.5 feet within the pond and upstream areas of Sawmill Brook.

Tighe & Bond observed areas below the MHW during low tide conditions. Observations during these low tide conditions revealed no shellfish or other submergent aquatic vegetation. The land below the MHW associated with Sawmill Brook ranges from bedrock through cobbles and coarse sand. Areas above the MHW consist of armored banks that confine Sawmill Brook. The top of bank generally consists of impervious surfaces associated with roadways, sidewalks, and parking lots, as well as maintained commercial lawns.

3.4 Flood zone

According to the FEMA Flood Insurance Rate Map (FIRM) No. 25009C0434G (revised to reflect Letter of Map Revision (LOMR) effective 1/2/2017), the project area is within Zone A (1% Chance Flood with No Base Flood Elevation (BFE)). A Zone AE flood area is designated downstream of the project area with a BFE of 10 feet (NAVD88). The adjacent Zone AE elevation of 10 feet is used to provide the limit of 100-year flood within the project area. A detailed map of the FIRM at the project area is provided in Appendix A (Figure 5).

3.5 Federal Wetlands

The National Wetlands Inventory (NWI) Map (refer to the NWI figure in Appendix A), wetland classes (using the Cowardin et al. (1979) system for wetlands and deep-water habitats) within the project area include:

- E1UBL, Estuarine Subtidal Unconsolidated Bottom, Tidal Salt
- R5UBH, Riverine Unknown Perennial Unconsolidated Bottom, Permanently Flooded

The majority of the project area within the limits of Sawmill Brook is identified on the NWI map as E1UBL. A portion of Sawmill Brook is identified on the NWI map as R5UBH.

3.6 Endangered Species

3.6.1 Federal Species

An official species list of the project area was generated from IPaC on February 15, 2021. The list, provided in Appendix F, listed the Northern Long-Eared Bat (*Myotis septentrionalis*, "NLEB") and the Small Whorled Pogonia (*Isotria medeoloides*) as federally-listed threatened species potentially within the project area. A discussion of the project's anticipated impacts to these species is provided in Section 6.2.4.

3.6.2 Federal Species of Concern

The project site has been identified as a potential spawning location for native rainbow smelt, a diadromous fish listed as a Federal Species of Concern by the National Oceanic and Atmospheric Administration (NOAA). Flood-related sedimentation is of particular concern to the spawning areas of this species.

3.6.3 State-listed Species

Neither the subject site nor the surrounding area are mapped as *Priority Habitats of Rare Species* or *Estimated Habitats of Rare Wildlife* by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) Atlas (14th edition, August 1, 2017). Therefore, no state-listed species are anticipated to be present at this site.

3.7 Sediment Quality

In accordance with the Section 401 dredge material sampling and analysis requirements outlined at 314 CMR 9.07(2)(b)(4), one core should be collected for every 1,000 cy of proposed dredge material (for projects up to 10,000 cy) and submitted for laboratory analysis. An estimated 35 cubic yards (cy) of sediment is proposed to be dredged as a result of the tidal gate and bridge abutment removal. Three sediment samples (POND, STREAM UP, STREAM DOWN) were initially collected for laboratory analysis on January 23, 2018. Two additional samples (WALL SED-1, WALL SED-2) were collected on March 31, 2020 for laboratory analysis.

The sediment samples (POND, STREAM UP, STREAM DOWN) were collected from zero to three feet below grade within the river channel at low tide. For further evaluation of grain size within the project area, two additional sediment samples (WALL SED-1 and WALL SED-2) were collected by the retaining wall on the eastern side. These samples were taken from zero to two feet below grade within Central Pond. Sediment sample locations are shown on the aerial figures in Appendix G. Laboratory analytical results are discussed below.

3.7.1 Grain Size Analysis

Sediment samples (POND, STREAM UP, STREAM DOWN, WALL SED-1, WALL SED-2) were submitted to Thielsch Engineering of Cranston, Rhode Island for grain size analysis. POND primarily consisted of sandy silt, STREAM UP and STREAM DOWN consisted primarily of silty sand, while WALL SED-1 and SED-2 primarily consisted of fine grained peat with gravel. Table 2-2 (below) presents the results of the sediment grain size analysis as percentage of total by weight passing. Copies of the grain size laboratory reports are included in Appendix G.

Table 3-1
Summary of Project Area Sediment Sample Grain Size Analysis Results

Analyte	POND	STREAM UP	STREAM DOWN	WALL SED-1	WALL SED-2
Sieve Mesh Size (% Finer)					
No. 4 (Fine Gravel to Coarse Sand)	99.2	91.9	96.8	76.1	85.0
No. 10 (Coarse to Medium Sand)	97.8	89.5	90.5	70.9	84.0
Analyte	POND	STREAM UP	STREAM DOWN	WALL SED-1	WALL SED-2
No. 40 (Medium to Fine Sand)	97.8	81.8	61.2	50.7	76.3
No. 60 (Fine Sand)	80.1	75.0	47.7	39.7	72.4
No. 200 (Silt or Clay)	54.7	38.5	24.8	20.1	48.5

3.7.2 Due Diligence Review

A due diligence review was performed to determine the potential for the proposed dredged sediment to have elevated concentrations of oil or hazardous materials (OHM), as defined in 310 CMR 40.000. The due diligence review consisted of an environmental database search, site history, and review of local, state and federal records pertaining to the use, storage, and release of petroleum products and hazardous substances at the site and surrounding area. Historical aerial photographs, topographic maps, Sanborn Maps, and city directories provided by Environmental Data Resources (EDR) were also reviewed.

Tighe & Bond's review of the EDR report and MassDEP's online Waste Site/Reportable Release Lookup database identified 42 listed OHM release sites within a one-mile radius of the site. Based on our review of the EDR Report and information available via MassDEP's website, none of the listed sites reviewed are believed to have contributed to the presence of OHM in sediment within the project area, for one or more of the following reasons: the release site is hydrologically separate with no potential to impact Sawmill Brook; the severity of the release was limited, with no potential to impact Sawmill Brook; or the release was cross-gradient or down gradient from the proposed dredging locations, with no potential to impact Sawmill Brook.

3.7.3 Chemical Analysis

Tighe & Bond collected POND, STREAM UP, STREAM DOWN, WALL SED-1, and WALL SED-2 to determine the potential presence of OHM in sediment at the site. Based on the due diligence review, it was determined that the analyses listed under 314 CMR 9.07(2)(b)(4) were sufficient to evaluate the site conditions along with additional parameters included in the MassDEP Interim Policy COMM 94-01: Dredged Sediment Reuse or Disposal and MassDEP Interim Policy COMM-15-01: Re-Use of Soil for Large Reclamation Projects used for determining potential disposal options.

The samples were submitted to ESS Laboratories of Cranston, Rhode Island for the following analyses: TPH, EPH with target analytes (polycyclic aromatic hydrocarbons), total metals (MCP 14 metals and copper), VOCs, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCB) congeners, conductivity, grain size, total organic carbon (TOC) and hazardous waste characteristics (*i.e.*, pH, flashpoint, reactive cyanide, reactive sulfide).

Laboratory analytical results were compared to the MCP Method 1 S-1 standards and to the MassDEP Freshwater Sediment Screening Criterion. Analytical results were additionally compared to the COMM 97-01 unlined landfill acceptance criteria, the COMM-94-007 lined landfill acceptance criteria and the Aggregate Industry <RCS-1 COMM-15-01 acceptance criteria to determine potential management options for the sediment. A summary table comparing the sediment sampling results to the above listed criteria is included as Table 1 in Appendix G. Laboratory analysis indicated the presence of metals, PCBs, and PAH's at concentrations below the MassDEP Method 1 S-1 standards, except as noted below.

- STREAM DOWN sample - benzo(a)pyrene (2.10 mg/kg), lead (167 mg/kg)
- WALL SED-1 sample - benzo(a)pyrene (3.64 mg/kg), acenaphthylene (2.20 mg/kg), and dibenzo(a,h)anthracene (0.983 mg/kg).

In accordance with 314 CMR 9.07(9) of the 401 Water Quality Certification regulations, sediment may be reused in upland areas provide that the following exists:

- The sediment is not otherwise classified as a solid or hazardous waste
- The sediment does not contain contaminants of concern above applicable MCP Method 1, S-1 soil standards
- The sediment was not generated from the limits of an MCP Disposal Site unless additional applicable MCP response actions are implemented

In accordance with 314 CMR 9.07(9), it is necessary to demonstrate that the receiving locations do not contain contaminant concentrations that are "significantly lower" than the levels present in the dredge sediment. The sediment concentrations for lead and mercury slightly exceeded the concentrations for "natural" soil published in MassDEP's *Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil* dated May 23, 2002 (Background Guidance). In the Case of Central Pond, since there were detections of benzo(a)pyrene above the MCP Method 1 soil standard in sediment locations collected from downstream locations, upland reuse of the sediment from this area would not be permitted in accordance with 314 CMR 9.07 (9). The project anticipates that the reuse of sediment from other areas in the project site for the restoration would be acceptable, since the contaminant levels are below the Method 1 S1 soil standards.

In addition to our evaluation of the potential for upland reuse of sediment, Tighe & Bond reviewed analytical data collected by CLE Engineering, of Marion, Massachusetts, in 2012 in support of a harbor dredging project (NAE-2012-322 – Bulk Chemical Analysis – Town of Manchester, Manchester Harbor – Tier III Sediment Evaluation), the results of which are summarized in Table 1. A complete copy of the Tier II Sediment Evaluation laboratory analytical report is included in Appendix G. Our review indicates that, overall, the nature of sediment quality upstream of the Central Street tide gate is not significantly different with regard to the presence of heavy metals, notably lead and mercury.

Levels of total PCBs were slightly higher in the Central Harbor sediment samples collected by CLE, while levels of PAHs were slightly higher in samples collected by Tighe & Bond upstream of the Central Street tide gate. The data collected to date indicates that the restoration of natural flow conditions and sediment transport from Sawmill Brook into Central Harbor is unlikely to result in a deterioration of conditions with regard to concentrations of contaminants present in the sediment.

Any remaining sediment can be transported off-site for reuse at either the Aggregate Industries <RCS-1 Saugus Quarry or at an approved Massachusetts Landfill as either intermediate cover, alternative daily cover, or shaping and grading material. Dredged material can be stockpiled and dewatered prior to disposal or reuse, based up on the contractor's preference. If necessary, the dredge material will be stockpiled and dewatered on a Town-owned parcel, at pre-approved location in Manchester-by-the-Sea. The stockpiles will be surrounded by appropriate erosion controls.

The reuse of sediment as cover or shaping and grading material at a Massachusetts unlined landfill or disposal of sediment at either a Massachusetts Unlined or Lined Landfill will require approval by MassDEP Bureau of Waste Prevention (BWP). Although several of the PAHs target analytes and lead have elevated detection limits above those specified in 314 CMR 9.07(2)(6), it is the opinion of Tighe & Bond that this does not affect data usability as the parameters included were not detected at laboratory detection limits which are well below the RCS-1 or Sediment Screening Criteria values. Laboratory analytical results are summarized in Table 1 of Appendix G along with complete Laboratory Reports.

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SECTION 4

Section 4

Proposed Activities

4.1 Proposed Activities

The proposed condition improvements include removing the tide gate and replacing the existing Central Street culvert with a 20-foot wide arch culvert. The proposed culvert would maintain the existing upstream and downstream invert elevations (-0.2 feet NAVD88, and -4 feet NAVD88, respectively), and provide a constant low chord elevation of 6 feet NAVD88.

Removal of the tide gate and enlargement of the culvert will improve fish passage and increase the hydraulic capacity of Sawmill Brook reducing upstream flooding. Removing the tide gate will also limit the hydraulic pressure behind the seawall and reduce safety concerns. Restoration of the seawall and guard rail will improve traffic safety. Stream restoration will improve habitat and aesthetics in the downtown area. The public location is also ideal for educational signage about Sawmill Brook's natural history.

The proposed project includes:

- **Removal of the tide gate.** This work will include demolition of the concrete tide gate structure, slide gate, catwalk, and associated infrastructure to restore the unrestricted flow of Sawmill Brook into Manchester Harbor.
- **Replacement of the Central Street Bridge.** The existing bridge, including the concrete beam span section on the downstream side and upstream stone arch culvert, will be demolished and replaced with a concrete arch culvert with a span of approximately 20 feet, which will have greater capacity than the existing structure. The visible elements of the replacement structure and street furnishings will have a stone appearance in keeping with the aesthetic of the adjacent stone seawall.

4.2 Anticipated Construction Sequence

The following is a broad overview of a typical construction sequence for a project of this nature. The sequence may vary depending on the contractor's proposed schedule and means and methods.

- Notify pertinent regulatory agencies of the construction schedule
- Post MassDEP File Number sign at the entrance to the work areas
- Install erosion and sedimentation controls and establish work areas
- Schedule and conduct site walks with pertinent regulatory agencies to inspect construction-phase BMPs
- Install cofferdams with passage pipe(s) to isolate and dewater the work zone and install and oil booms for water control
- Construct temporary Elm Street roadway and establish detours and road closures
- Provide temporary utilities as necessary for demolition
- Remove tide gate and existing bridge structure with demolition shielding

- Reconstruct Central Street bridge with roadway improvements
- Remove cofferdam, temporary stream access points and in-channel BMPs
- Restore disturbed areas in-kind
- Remove erosion and sedimentation controls pending approval from the Manchester-by-the-Sea Conservation Commission

4.3 Time of Year Restrictions and Work Windows

The DMF requested in their comment letter on the ENF (dated December 30, 2019) that no in-water work be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel (*Anguilla rostrata*). Work will be conducted accordingly within this recommended timeframe. Work will occur behind cofferdams as much as possible to limit unconfined in-water work. A copy of the ENF comment letter is provided in Appendix H.

4.4 Best Management Practices

The following BMPs will be implemented during construction to minimize the potential for impacts to jurisdictional resource areas. The Town will reserve the right to require supplemental and/or alternative construction BMPs during work depending on site and weather conditions.

4.4.1 Erosion and Sedimentation Control

Best Management Practices (BMPs) will be implemented for the project to confine the areas project disturbance from surrounding wetland resource areas. BMPs will include:

- Erosion control barriers, such as compost filter tubes, or silt fence and straw bale barriers, between upland limits of work and sensitive resource areas. Note that much of the separation of work area will be provided by cofferdams described below. Turbidity curtain is proposed to further isolate work areas from stream and tidal flows.
- Limiting footprint of work to the minimum necessary to safely construct the proposed structures
- Project contractors will be required to maintain reserve supplies of erosion control barriers on-site to make repairs as necessary

Supplemental and/or alternative construction BMPs may be required during work, depending on site and weather conditions. All erosion and sedimentation control measures will be inspected, cleaned, or replaced during construction and will remain in place until areas they are protecting are stabilized.

4.4.2 Catch Basin Protection

Silt sacks will be installed in existing catch basins during construction.

4.4.3 Cofferdams

Cofferdams that are anticipated to be constructed of supersacks wrapped in impervious plastic liner with native alluvium backfill on the isolated side of the cofferdam are proposed to be placed upstream and downstream of the bridge replacement work area as shown on Sheets C-005 and C-503, and detailed on Sheet C-505 in the Project Plans provided in Appendix B. Dewatering pump discharge from within cofferdam work areas shall be released into sediment traps away from Sawmill Brook and construction activities, all return flows must meet permit requirements for turbidity, and pump intakes will be screened for fish protection.

The backflow (*i.e.*, flow from downstream to upstream) during a typical tidal cycle was evaluated for varying water control pipe sizes and were compared with existing conditions (with the tide gate open and closed). The proposed water controls are anticipated to provide similar tidal flushing to conditions when the existing tide gate is open, and much more tidal flushing than conditions when the existing tide gate is closed. Dual 4.5-foot diameter CMP would result in 7.0 feet NAVD88 upstream water surface with flushing approximately the same as existing conditions with tide gate open; and a single 6-foot diameter CMP would result in a 7.1 feet NAVD88 upstream water surface elevation and flushing within 2% of existing conditions with tide gate open. The water controls required to pass the 2-year frequency storm event therefore are anticipated to provide adequate flushing during typical tidal cycles.

The contractor will be required to submit a staging and dewatering plan for engineering review to ensure that adequate areas for flow in the channel are maintained. Additional cofferdam details are provided on Sheet C-505 in the Project Plans.

4.4.4 Dewatering

Construction dewatering shall be required during portions of construction which require excavation or other activities where groundwater may interfere with the work. Construction dewatering discharges shall be pre-treated for sediment removal by passing through an appropriately sized filter sock, silt bag, fractionation /sedimentation tank, or sediment trap prior to discharge, as necessary. The work will seek to minimize dewatering through the use of the cofferdams and avoiding work at high tides.

4.4.5 Stockpile Sediment or Soil

Stockpiles of materials removed during construction activities will be surrounded with an erosion control barrier around the perimeter of the stockpile. Stockpiles of erodible material are to be covered prior to inclement weather with a minimum of 20 mil polyethylene sheeting. Stockpiles left undisturbed longer than 14 days will be seeded or covered.

4.4.6 Wetland Enhancement and Restoration Plan

Tighe & Bond developed a *Wetland Enhancement and Restoration Plan* on behalf of the Town of Manchester-by-the-Sea (Town) for the proposed tidal restoration project (Appendix I). The plan also includes a monitoring and operational plan to ensure the long-term success of the larger tidal restoration project that includes ecological restoration at Sawmill Brook and Central Pond in Manchester by the Sea and the replacement of the Central Street Bridge and removal of the tide gate structure at that bridge project.

Stabilization of disturbed areas or new soil fills shall be implemented within 14 days after grading or construction activities have permanently ceased. Appropriate vegetative soil stabilization is to be used to minimize erosion. Temporary and permanent vegetative cover is to be established in accordance with the Project plans provided in Appendix B. Restoration of vegetated upland areas will consist of replacement of topsoil or placement of imported loam as needed such that a minimum of four inches of suitable material is present and appropriately limed, fertilized, graded, and scarified. Disturbed upland areas shall then be hydroseeded with an approved dry site restoration seed mix at the rate recommended by the manufacturer.

Final stabilization shall be considered complete when all soil-disturbing activities have been completed and a uniform, perennial vegetative cover with a density of eighty percent has been established or equivalent stabilization measures (such as the use of mulches or erosion control matting) have been employed on all unpaved areas and areas not covered by permanent structures. The wetland restoration plan includes 5-years of monitoring based on the requirements of the Army Corps of Engineers Massachusetts General Permits.

4.5 Proposed Impacts

Impact tables for the proposed project impacts are provided in Section 1 of this narrative as responses to form field numbers 21 and 22 on the ENG Form 4345 application. Temporary impacts to Sawmill Brook (up to 13,472 sf) are required for construction access and the installation of the in-stream water controls and sedimentation prevention measures for both the Central Pond restoration and Central Street bridge replacement. These areas will be restored following construction as described in Section 4.4.6. Approximately 4,195 sf of permanent impacts are required to replace the existing retaining wall that is in critical condition. Approximately 10,050 sf of permanent impacts are required for living shoreline elements that will stabilize the existing western shoreline and facilitate the stream restoration. The Central Bridge Project will remove the tide gate and expose an area within Sawmill Brook, which is anticipated to provide habitat and ecological benefits.

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SECTION 5

Section 5

Alternative Analysis

A number of alternatives were considered for the Central Street bridge and tide gate during the planning phase and engineering design based on input received from the Town. The alternatives presented below represent a higher-level summary of the alternatives explored during this process. In addition to a "No Action" alternative that would not meet the safety standards, other design alternatives that explore the installation methods are described below, in no particular order.

5.1 Alternative Analysis

During a June 2015 in-water walk-through to view existing conditions, evidence of advanced deterioration was observed at the Central Street bridge, including separation of joints, cracked blocks, wall seepage, and foundation undermining. Emergency repairs were made in June 2016 to temporarily stabilize the existing arch barrel and footing, but continued deterioration due to water seepage, scour, settling, and stone separation is inevitable without major repairs or replacement. The existing tide gate and bridge at Central Street impede flow from Sawmill Brook, especially during coastal storm events, resulting in localized flooding.

As the existing Central Street bridge is in deteriorating condition and is physically associated with the tide gate and adjacent Central Pond / Sawmill Brook, off-site alternatives would not meet project goals and were therefore not considered. On-site alternatives considered for the project included a no action alternative, repair, or replacement of the Central Street culvert/bridge. Factors considered in the evaluation of alternatives include environmental impacts, public safety, climate change resiliency, and rainbow smelt spawning condition improvements.

In both the repair and replacement alternatives, the existing tide gate is proposed to be removed as it has been identified by DMF, DER, and NOAA as an impediment to rainbow smelt fish passage. The existing deteriorated bridge is proposed to be rehabilitated or replaced to address public safety concerns. Alternatives for the bridge structure are limited by depth to bedrock, the presence of buildings immediately adjacent to the bridge and roadway, and constraints imposed by numerous utilities on the site.

5.1.1 No Action

The no action scenario would result in no immediate direct impacts or costs, but will result in increasing safety and functionality concerns over time, if deterioration of the bridge and tide gate is allowed to continue at the current pace. Impacts from flooding associated with the tide gate would continue to negatively affect adjacent property owners and rainbow smelt spawning conditions.

As the no action alternative does not meet project goals of addressing failing infrastructure, reducing flooding and increasing resiliency, and improving habitat conditions and possibility for rainbow smelt, it is not preferred.

5.1.2 Rehabilitate Bridge and Culvert Structure, Remove Tide Gate

Rehabilitating the existing bridge and culvert structure and removing the tide gate structure is anticipated to result in improved hydraulic capacity, habitat restoration, improvements to aesthetics and water quality, and a reduction in upstream flooding due to the removal of the tide gate.

However, rehabilitation would only provide a temporary solution to the continued deterioration of the bridge and culvert structure, would not allow for implementation of pedestrian and traffic safety improvements, and would not maximize the bridge opening for the brook.

5.1.3 Replace Culvert with Bridge, Remove Tide Gate (Preferred)

The Town has identified the existing narrow roadway width of the Central Street bridge as a safety issue with respect to pedestrian, bicycle, and automobile traffic. Although options to widen the roadway are limited due to abutting businesses, even a modest increase in roadway width will improve safety. Concerns with the replacement alternative include temporary water quality impacts, a change in hydrology and increased tidal range relative to existing conditions, a shift in species, and temporary water quality impacts.

Replacing the existing culvert with a precast concrete bridge structure and removing the existing tide gate is anticipated to result in improved hydraulic capacity, habitat restoration, improvements to aesthetics and water quality, improvements to roadway safety, and a reduction in upstream flooding.

Tighe&Bond

SECTION 6

Section 6

Regulatory Compliance

6.1 Quantification of Impacts

The project has been designed to avoid and minimize impacts to WoUS. The permanent impacts are necessary to protect and improve existing infrastructure, improve the stability of the shoreline of Central Pond and Sawmill Brook, enhance both ecological conditions and coastal resiliency, and remove the tide gate. The temporary impacts are associated with the installation of temporary erosion and sedimentation control measures and construction access.

6.2 Section 404/10 Compliance

The project is requesting Pre-Construction Notification (PCN) authorization under multiple GP categories. Section 404/10 compliance requirements not addressed in the following sections are addressed elsewhere in this permit application.

6.2.1 Time of Year Work Window

As discussed in Section 4.3, DMF requested in their comment letter on the ENF that no in-water work be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel. Work will be conducted accordingly within the recommended timeframe.

6.2.2 Section 106 of the National Historic Preservation Act

The bridge is referenced in the Manchester Village National Register of Historic Places registration form as appearing to be of modern construction, and marks the entrance to downtown Manchester-by-the-Sea. Water, drainage, sewer, electric, and gas utilities are located within the roadbed over the arch bridge.

A Project Notification Form (PNF) was distributed to the Massachusetts State Historic Preservation Officer (SHPO) and Massachusetts Board of Underwater Archaeological Resources (MA BUAR) during the initial design phase of this project. Copies were also sent to the Wampanoag Tribe (Aquinnah) and the Mashpee Wampanoag Tribal Historic Preservation Officers (THPOs) in anticipation of the preparation and submittal of this PCN to initiate their review early in this process.

The MHC responded on February 7, 2018 requesting project plans and comments from Manchester-by-the-Sea Historic District Commission. The Manchester-by-the-Sea Historic Commission wrote a letter of support on April 4, 2019. Coordination with the Manchester-by-the-Sea Historic Commission is ongoing for the aesthetics of the bridge. The Environmental Notification Form, dated December 2, 2019, was also distributed to the Massachusetts State Historic Preservation Officer (SHPO) and Massachusetts Board of Underwater Archaeological Resources (MA BUAR), Wampanoag Tribe (Aquinnah) and the Mashpee Wampanoag Tribal Historic Preservation Officers (THPOs). Copies of the correspondence and PNF are included in Appendix D.

6.2.3 Navigation

Due to the nature of the project and the location of the existing infrastructure, potential temporary impacts to navigation are possible but unavoidable and have been reduced to the extent practicable. Due to existing location of the tide gate, navigation through this portion of Sawmill Brook is not feasible. During construction, cofferdams will be installed along with a pipe, or combination of pipes to allow for fish passage through the work area without the need for flumes or pumps. The public will be able to pass around the project area, outside of the active work zone.

6.2.4 Federally-Listed Endangered Species

There are two federally-listed endangered or threatened species potentially present in the project area, the Northern Long-Eared Bat (NLEB) and Small Whorled Pogonia. There are no known hibernacula or maternity roost trees for the NLEB located in Manchester-by-the-Sea. The nearest hibernaculum and maternity roost tree are 15.6 and 59.6 miles away, respectively, from the project site. In addition, the proposed project does not involve any tree removal. Therefore, the NLEB should not be impacted by the project in accordance with the Northern Long-eared Bat Consultation and 4(d) Rule Consistency.

The Small Whorled Pogonia generally grows in areas with sparse to moderate ground cover. The project site generally consists of disturbed areas (*i.e.* paved parking areas roadway and maintained residential lawns). Given the existing habitat within the project area, it is unlikely that the pogonia is present within the area. In addition, the Small Whorled Pogonia is listed as a Massachusetts Endangered Species. The project site nor the surrounding area is not mapped as *Priority Habitats of Rare Species* or *Estimated Habitats of Rare Wildlife* by the Massachusetts NHESP Atlas. Therefore, no state-listed species are anticipated to be present at this site.

6.2.5 Federal Species of Concern

The project site has been identified as a potential spawning location for native rainbow smelt, a diadromous fish listed as a Federal Species of Concern by the National Oceanic and Atmospheric Administration (NOAA). The project has been designed to address flood-related sedimentation within the area.

6.2.6 Essential Fish Habitat

According to a data query of the NOAA Habitat Conservation Essential Fish Habitat (EFH) mapper, there is EFH within Sawmill Brook and Central Pond. No Habitat Areas of Particular Concern (HAPC) or EFH Areas Protected from Fishing (EFHA) were identified. The EFH worksheet is included within Appendix F. Coordination with DMF has been ongoing through the permitting process.

6.2.7 Construction Equipment

Access to the proposed work area will be from Central Street. Staging of equipment and materials will likely be handled in the municipal parking lot along Church Street. Should this happen, existing parking on Church Street will be impacted temporarily. Staging areas will be surrounded with compost filter tube erosion barriers on the downhill side. During and after construction, all paved road and driveway surfaces are to be scraped and swept free of excavated materials on a daily basis. Final location of staging and material handling will be further defined during later stages of design development.

6.2.8 Invasive Species Management Plan

In compliance with General Condition 25, invasive species management elements have been incorporated into the project plans to reduce the potential for introduction of invasive plants into the project area. Measures will include the following:

- Construction equipment, including machinery and construction matting, will be cleaned of loose soils and plant matter before mobilization to the site.
- On-site soils, which are likely to carry non-native/invasive species seed, will not be used for grading and restoration activities.
- Work materials which enter the pond, including the containment system and cofferdam materials, will be checked for aquatic invasive plants and cleaned prior to placement in the pond. Any aquatic plants on construction equipment should be removed, bagged, and disposed of in an appropriate off-site location.


This plan will seek to limit the establishment of invasive species following construction. There is the potential for the establishment of common reed (*Phragmites australis*) in the disturbed areas of the project site. The increase of tidal flushing and planting of native plants will help minimize potential establishment of *Phragmites* in the project area

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APPENDIX A

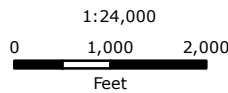


Legend

 Limit of Work

Tighe & Bond
 Engineers | Environmental Specialists

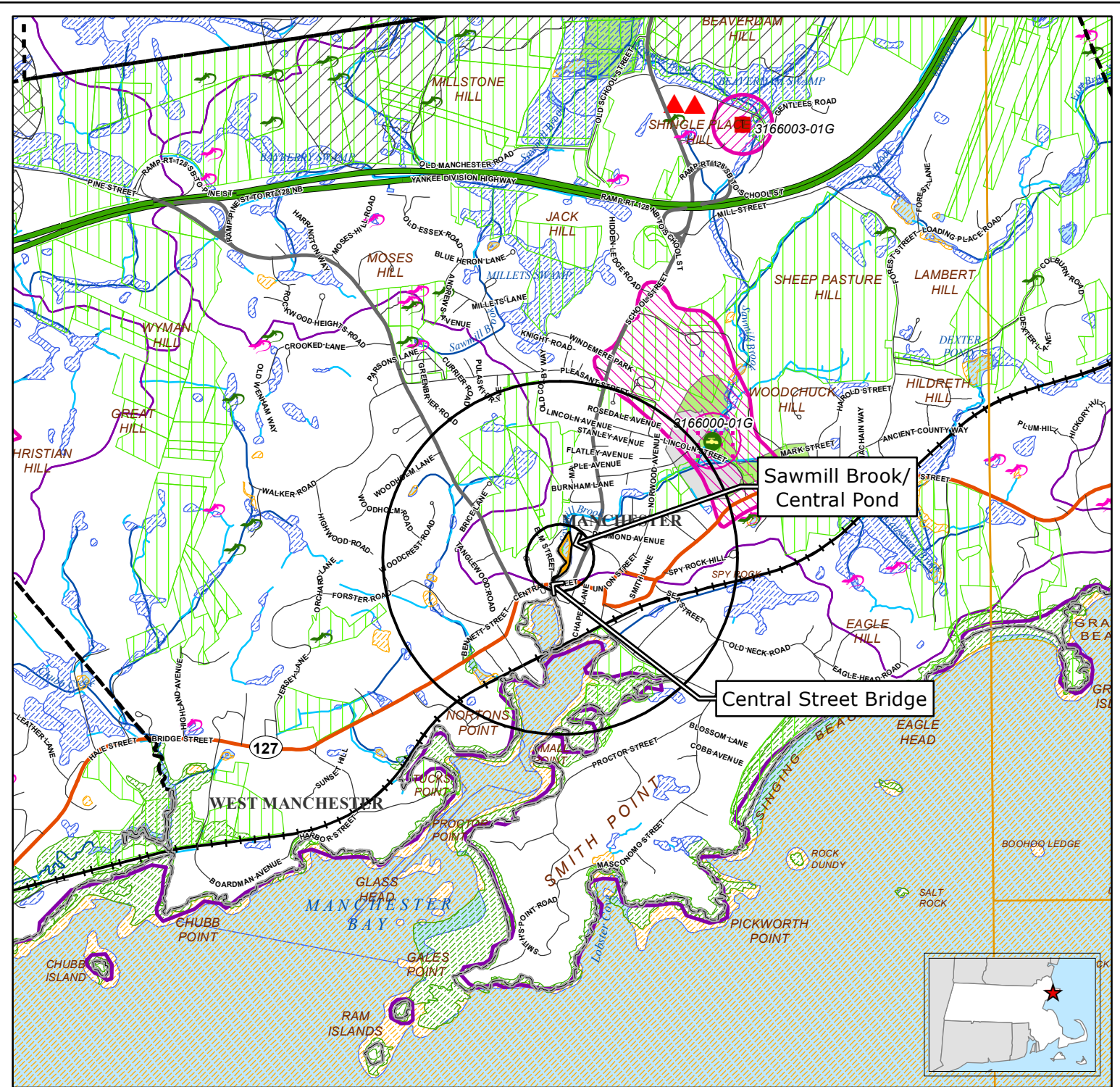
Based on USGS Topographic Map for
 Marblehead North, MA Revised 1985.
 Contour Interval Equals 3-Meters
 Circles indicate 500-foot and half-mile radii



**FIGURE 1
 SITE LOCATION**

Central Street Bridge Replacement/
 Sawmill Brook Restoration Project
 Manchester-by-the-Sea, Massachusetts

September 2019



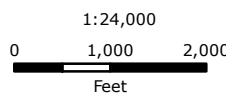
Legend

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> NHESP Certified Vernal Pools NHESP Potential Vernal Pools Non-Landfill Solid Waste Sites Proposed Well Emergency Surface Water Community Public Water Supply - Surface Water Community Public Water Supply - Groundwater Non-Community Non-Transient Public Water Supply Non-Community Transient Public Water Supply Limited Access Highway Multi-Lane Highway, NOT Limited Access Other Numbered Highway Major Road - Collector Minor Street or Road | <ul style="list-style-type: none"> Aquaducts Hydrologic Connections Stream/Intermittent Stream Powerline Pipeline Track or Trail Trains Public Surface Water Supply Protection Area (Zone A) DEP Approved Wellhead Protection Area (Zone I) DEP Approved Wellhead Protection Area (Zone II) DEP Interim Wellhead Protection Area (IWPA) Protected and Recreational Open Space Solid Waste Landfill Area of Critical Environmental Concern (ACEC) NHESP Priority Habitats for Rare Species NHESP Estimated Habitats for Rare Wildlife EPA Designated Sole Source Aquifer Major Drainage Basin Sub Drainage Basin | <ul style="list-style-type: none"> MassDEP Open Water MassDEP Inland Wetlands MassDEP Coastal Wetlands MassDEP Not Interpreted Wetlands Public Surface Water Supply (PSWS) Water Bodies Non-Potential Drinking Water Source Area - High Yield Non-Potential Drinking Water Source Area - Medium Yield Potentially Productive Medium Yield Aquifer Potentially Productive High Yield Aquifer County Boundary Town Boundary USGS Quadrangle Sheet Boundary Limit of Work |
|--|---|--|

FIGURE 2 PRIORITY RESOURCES

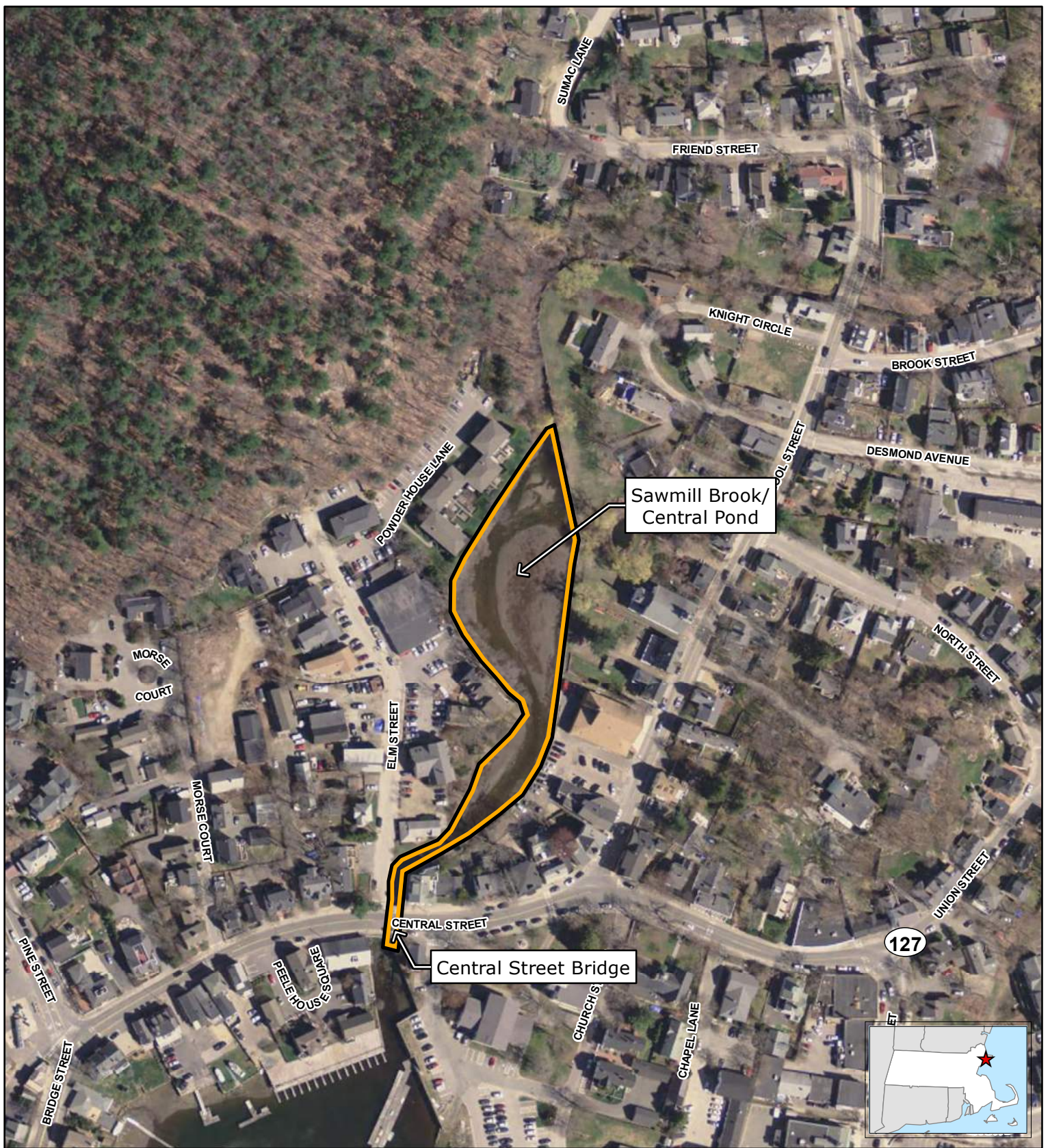
Central Street Bridge Replacement/
Sawmill Brook Restoration Project
Manchester-by-the-Sea, Massachusetts

Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology
Circles indicate 500-foot and half-mile radii.
Data valid as of September 2019.




Tighe & Bond
Engineers | Environmental Specialists

September 2019

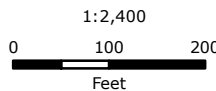


Legend

 Limit of Work

Tighe&Bond
 Engineers | Environmental Specialists

Based on MassGIS Color Orthophotography (2013)



**FIGURE 3
 ORTHOPHOTOGRAPH**

Central Street Bridge Replacement/
 Sawmill Brook Restoration Project
 Manchester-by-the-Sea, Massachusetts

September 2019

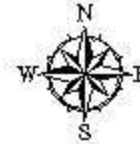
Figure 4

Massachusetts Mouth of Coastal River Maps

M.G.L. c.131, s.40
310 CMR 10.58

Town: MANCHESTER
River: CAUSEWAY BROOK
ID: MANCHESTER MOR-1

March 1, 2005

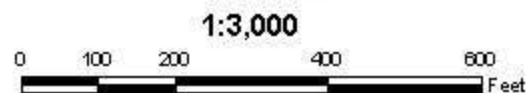


Map Legend

- Mouth of River
- Town Boundary
- State Boundary



Mitt Romney, Governor
Ellen Roy Heitzfelder, Secretary
Executive Office of Environmental Affairs



1 inch equals 250 feet

Mouth of River lines delineated by DEP Wetlands Program.

Color OrthoP photo base map from MassGIS, 2001-2003.

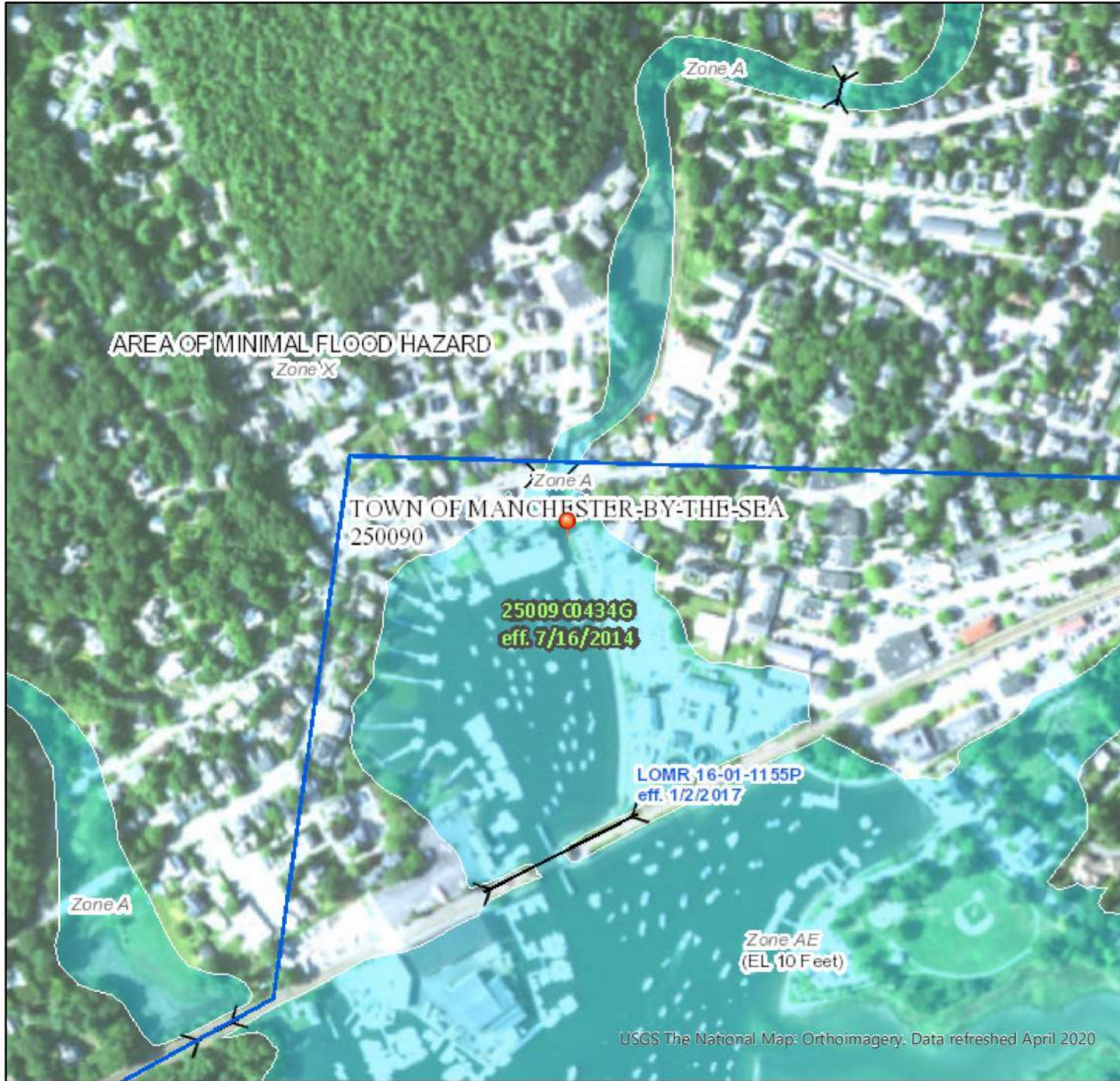
Mass DEP GIS Program

National Flood Hazard Layer FIRMette

Figure 5



70°46'41"W 42°34'42"N



USGS The National Map: Orthoimagery. Data refreshed April 2020



70°46'4"W 42°34'16"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

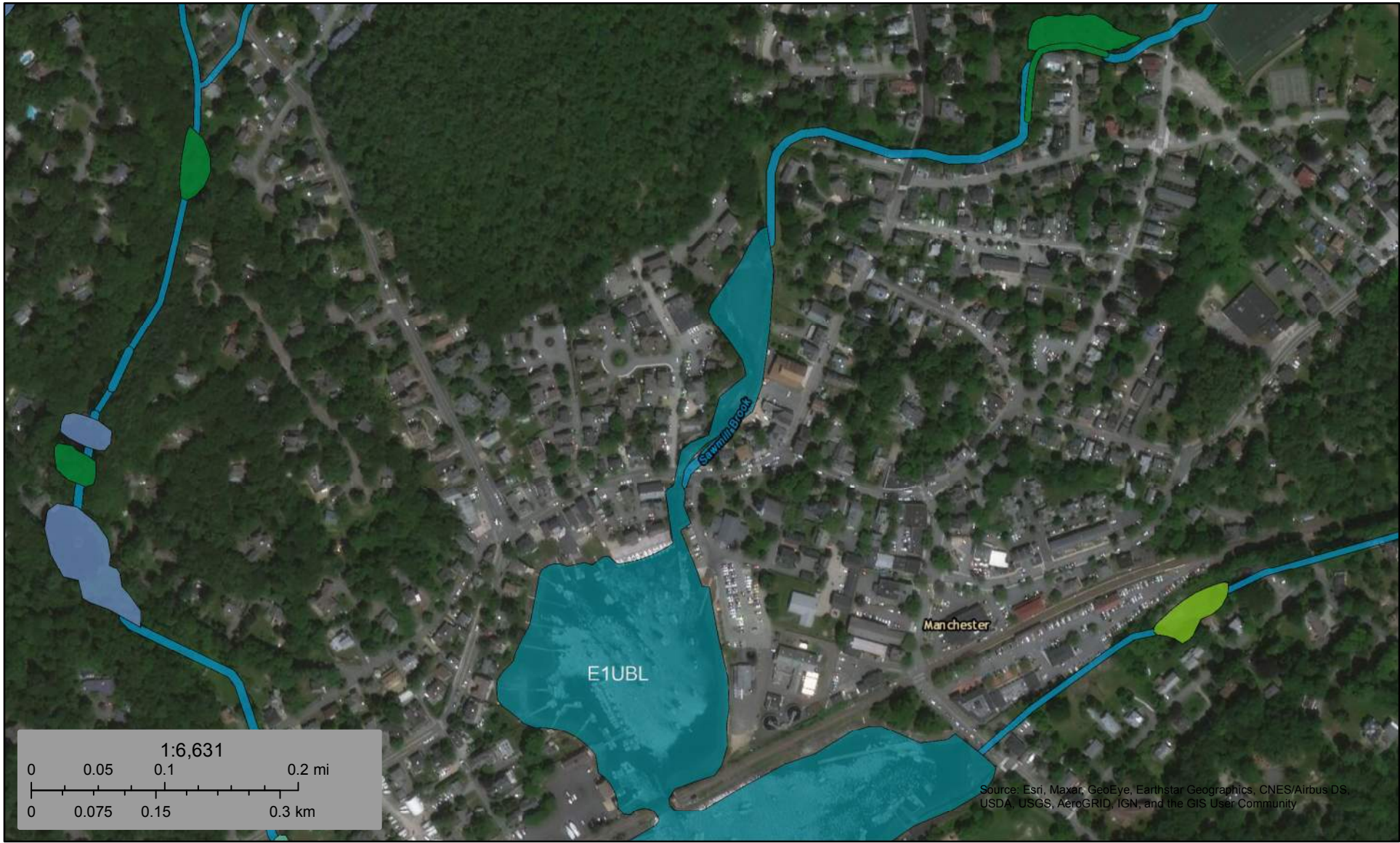


This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/31/2020 at 4:54 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.





This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 6
Central Street Bridge Replacement



February 15, 2021

Wetlands

- | | | |
|--|---|---|
|  Estuarine and Marine Deepwater |  Freshwater Emergent Wetland |  Lake |
|  Estuarine and Marine Wetland |  Freshwater Forested/Shrub Wetland |  Other |
|  Freshwater Pond |  Riverine | |

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Tighe&Bond

APPENDIX B

TOWN OF MANCHESTER-BY-THE-SEA, MASSACHUSETTS

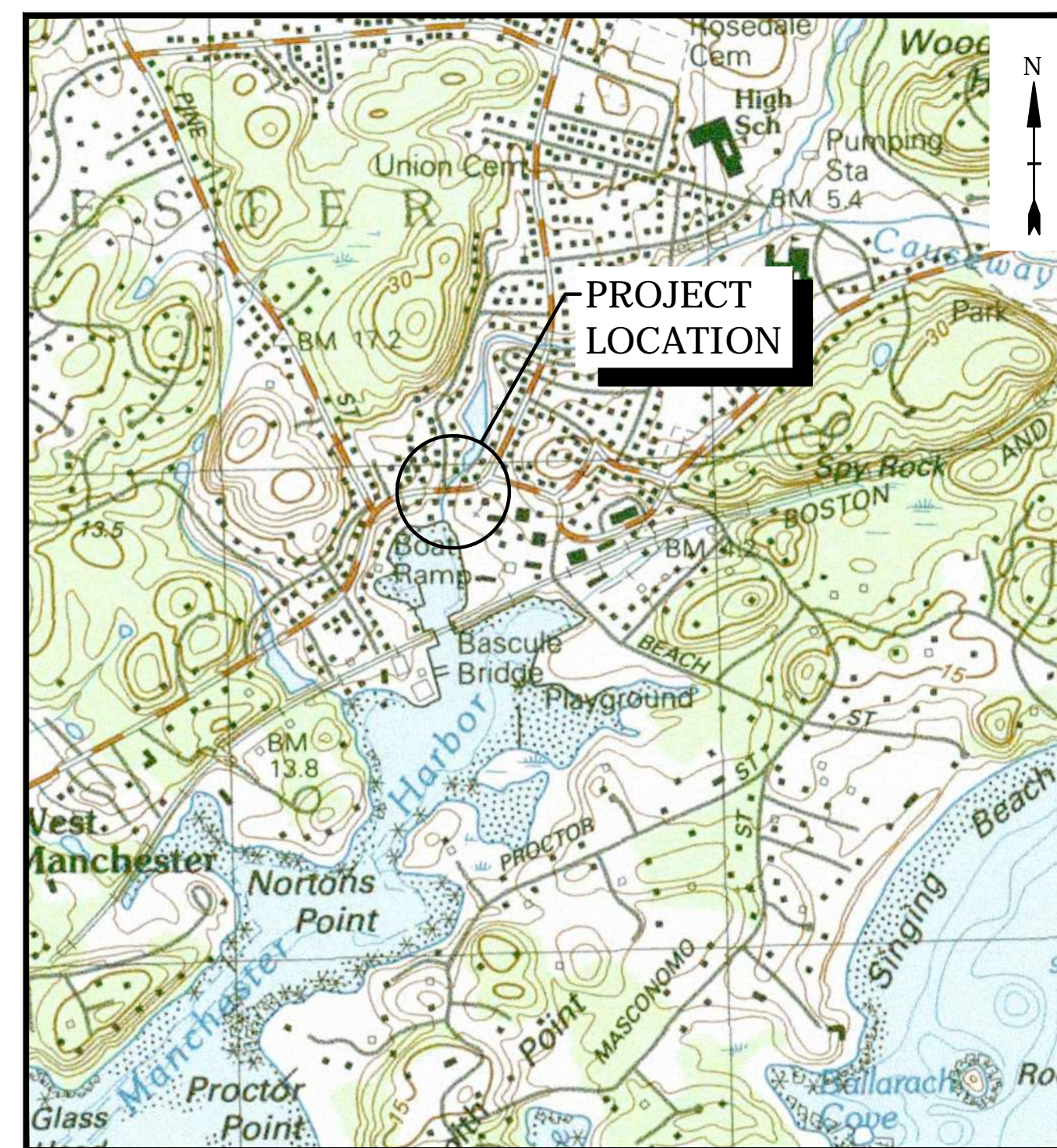
CENTRAL STREET BRIDGE

RECONSTRUCTION

PROJECT NO: M1476-011

MARCH 2021

LIST OF DRAWINGS	
SHEET NO.	SHEET TITLE
	COVER
G-001	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
C-001	CENTRAL STREET SURVEY 1 OF 4
C-002	CENTRAL STREET SURVEY 2 OF 4
C-003	CENTRAL STREET SURVEY 3 OF 4
C-004	CENTRAL STREET SURVEY 4 OF 4
C-005	DEMOLITION PLAN & SITE PREPARATION PLAN
C-101	SITE PLAN AND PROFILE
C-102	UTILITY PLAN
C-103	TEMPORARY ROAD & UTILITY PLAN
C-501 TO C-502	CONSTRUCTION DETAILS
C-503	COASTAL BANK PLAN
C-504 TO C-505	CONTROL OF WATER NOTES AND DETAILS
C-701	TEMPORARY TRAFFIC CONTROL PLAN - GENERAL
C-702	TEMPORARY TRAFFIC CONTROL PLAN - DETOUR
S-001 TO S-103	BRIDGE DRAWINGS
S-104	BRIDGE SECTIONS & DETAILS
R-101	S3-TL4 BARRIER DETAILS
R-102	PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS
R-103	TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR S3-TL4 BARRIER
R-104	GUARDRAIL TRANSITION TO BRIDGE RAIL (BACK OF SIDEWALK)



LOCATION MAP
SCALE: 1" = 2000'

PREPARED FOR:
TOWN OF MANCHESTER-BY-THE-SEA
DEPARTMENT OF PUBLIC WORKS
CHUCK DAM, DIRECTOR

BOARD OF SELECTMEN
ELI BOLING, CHAIR
JEFFERY BODMER-TURNER, VICE CHAIR
ANN HARRISON
BECKY JAQUES
JOHN ROUND

PREPARED BY:
Tighe & Bond
Engineers | Environmental Specialists

**90% DRAWINGS
NOT FOR CONSTRUCTION**

COMPLETE SET 28 SHEETS

GENERAL NOTES

1. BASE PLAN ENTITLED "MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PLAN OF TOPOGRAPHIC SURVEY OF CENTRAL STREET, MANCHESTER BY THE SEA" PREPARED BY DOUCET SURVEY INC. ON NOVEMBER 9, 2018.
2. THE HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. BOLD TEXT AND LINES INDICATES PROPOSED WORK. LIGHT TEXT AND LINES INDICATES APPROXIMATE EXISTING CONDITIONS.
4. WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND ON APRIL 18, 2018.
5. SOIL BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS ON AUGUST 9, 2018.
6. NOTIFY "DIGSAFE" AT 1-888-344-7233 TO ARRANGE FOR MARKING OUT EXISTING UNDERGROUND UTILITIES AT LEAST 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS) PRIOR TO BEGINNING EXCAVATION AT ANY GIVEN LOCATION. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR BE ALLOWED TO START ANY KIND OF EXCAVATION WORK PRIOR TO OBTAINING ALL THE NECESSARY INFORMATION REGARDING THE LOCATION OF UNDERGROUND UTILITIES AT THE SITE. ACCOMPLISH ALL EXCAVATION SO THAT UNDERGROUND UTILITIES OR STRUCTURES ARE NOT DAMAGED. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED DURING EXCAVATION OPERATIONS. REPAIR ANY EXISTING PIPE OR UTILITY DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
7. THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR THE LOCATION OF EXISTING UTILITIES. THE ENGINEER AND OWNER MAKE NO GUARANTEE AS TO THE UNDERGROUND CONDITIONS THAT MAY BE ENCOUNTERED.
8. FIELD MEASURE TO VERIFY EXISTING AND CONTRACT INTERFACE DIMENSIONS, LOCATIONS, AND OTHER CONDITIONS.
9. TEST PITS TO LOCATE EXISTING UTILITIES ARE STRONGLY ENCOURAGED AND MAY BE ORDERED BY THE ENGINEER.
10. IF CHANGES TO THE DESIGN ARE PROPOSED, THE CHANGES SHALL BE SUBMITTED TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
11. MAKE NECESSARY ARRANGEMENTS TO PERFORM ANY WORK NEAR THE OVERHEAD UTILITIES PRIOR TO THE START OF CONSTRUCTION.
12. EXISTING UTILITY POLES IN CLOSE PROXIMITY TO CONSTRUCTION MAY REQUIRE TEMPORARY SUPPORT BY THE UTILITY COMPANY. INCLUDE COST UNDER THE PRICES BID FOR THE VARIOUS ITEMS OF WORK.
13. NO OPEN TRENCHES WILL BE ALLOWED OVERNIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED.
14. STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE FROM THE SITE TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
15. IMMEDIATELY REPORT SPILLS OF OIL AND/OR HAZARDOUS MATERIALS (OHM) TO THE MASSDEP.
16. PROVIDE A SUFFICIENT SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS, SUCH AS BOOMS OR BLANKETS, AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS.
17. FURNISH AND INSTALL TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR TRAFFIC THROUGH THE WORK AREA OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA.

LEGEND

EXISTING	NEW	
		IRON PIPE FOUND
		UTILITY POLE
		BURIED DRAIN PIPE
		OVERHEAD UTILITY WIRES
		FENCE (SIZE AND TYPE NOTED)
		GUARDRAIL
		APPROXIMATE PROPERTY LINE
		SIGN AND POST
		TREE LINE
		INDEX CONTOUR
		INTERMEDIATE CONTOUR
		STONEWALL
		BORING
	351.3	PROFILE ELEVATIONS
		WETLAND FLAGS
		WETLAND SYMBOL
		LAND SUBJECT TO COASTAL STORM FLOWAGE
		100-FOOT BUFFER ZONE
		200-FOOT RIVERFRONT AREA
		30-FOOT NO DISTURBANCE ZONE
		50-FOOT NO BUILD ZONE
		COASTAL BANK
		TEMPORARY COFFER DAM
		EROSION CONTROL BARRIERS
		SURVEYED EDGE OF WATER (APRIL 2018)

ABBREVIATIONS

GENERAL		UTILITIES	
ABAN	ABANDON	AC	ASBESTOS CEMENT PIPE
ADJ	ADJUST	ACCOMP	ASPHALT COATED CORRUGATED METAL PIPE
APPROX	APPROXIMATE	CAP	CORRUGATED ALUMINUM PIPE
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS	CB	CATCH BASIN
BIT	BITUMINOUS	CI	CAST IRON PIPE
BOS	BOTTOM OF SLOPE	CIT	CHANGE IN TYPE
BVW	BORDERING VEGETATIVE WETLANDS	CMP	CORRUGATED METAL PIPE
CC	CONCRETE CURB	CNO	COULD NOT OPEN
CCW	CEMENT CONCRETE WALK	COND	CONDUIT
CEM	CEMENT	CPP	CORRUGATED PLASTIC PIPE
CLF	CHAIN LINK FENCE	CS	CURB STOP
CMP	CORRUGATED METAL PIPE	DIA	DIAMETER
CONC	CONCRETE	DI	DUCTILE IRON PIPE
CS	CUT SPIKE	DMH	DRAIN MANHOLE
CW	CONCRETE WALK	EMH	ELECTRIC MANHOLE
DIM	DIMENSION	F&C	FRAME AND COVER
DPW	DEPARTMENT OF PUBLIC WORKS	F&G	FRAME AND GRATE
EOP	EDGE OF PAVEMENT	GSO	GAS SHUT OFF
EXIST	EXISTING	HH	HANDHOLE
'	FEET/FOOT	HYD	HYDRANT
FDN	FOUNDATION	INV	INVERT ELEVATION
FND	FOUND	MJ	MECHANICAL JOINT
GC	GRANITE CURB	MW	MONITORING WELL
GE	GRANITE EDGING	PVC	POLYVINYLCHLORIDE PIPE
GRAN	GRANITE	RCP	REINFORCED CONCRETE PIPE
HMA	HOT MIX ASPHALT	RP	RECORD PLAN
"	INCH	SC	STORM WATER TREATMENT UNIT
IFO	IN FRONT OF	SD	STORM DRAIN LINE
IP	IRON PIN	SMH	SEWER MANHOLE
LSCSF	LAND SUBJECT TO COASTAL STORM FLOWAGE	TSV&B	TAPPING SLEEVE, VALVE AND BOX
MASSDEP	MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION	UP	UTILITY POLE
MAX	MAXIMUM	WG	WATER GATE
MIN	MINIMUM	WSO	WATER SHUT OFF
MHD	MASSACHUSETTS HIGHWAY DEPARTMENT		
M	MHD MATERIAL REFERENCE	ALIGNMENT/PROFILE	
MISC	MISCELLANEOUS	AD	ALGEBRAIC DIFFERENCE
N/F	NOW/FORMERLY	BL	CONSTRUCTION BASELINE
NTS	NOT TO SCALE	CC	CENTER OF CURVE
PREF	PREFERRED	E	EAST
PROP	PROPOSED	EL/ELEV	ELEVATION
PSF	POUNDS PER SQUARE FOOT	GB	GRANITE BOUND
PSI	POUNDS PER SQUARE INCH	K	RATE OF VERTICAL CURVATURE
PVMT	PAVEMENT	L	LENGTH
QTY	QUANTITY	LT	LEFT
REMOD	REMODEL	N	NORTH
REM	REMOVE	OC	ON CENTER
REQD	REQUIRED	PC	POINT OF CURVE
RET	RETAIN	PCC	POINT OF COMPOUND CURVE
R&D	REMOVE AND DISPOSE	PK/SPIKE	SURVEY NAIL
R&R	REMOVE AND RESET	PL	PROPERTY LINE
R&S	REMOVE AND STACK	PRC	POINT OF REVERSE CURVE
SB	STONE BOUND	PT	POINT OF TANGENT
SF	SQUARE FEET	PVC	POINT OF VERTICAL CURVE
SPKS	SURVEY SPIKE	PVI	POINT OF VERTICAL INTERSECTION
TOS	TOP OF SLOPE	PVCC	POINT OF VERTICAL COMPOUND CURVE
TYP	TYPICAL	PVRC	POINT OF VERTICAL REVERSE CURVE
VGC	VERTICAL GRANITE CURB	PVT	POINT OF VERTICAL TANGENT
WCR	WHEELCHAIR RAMP	R	RADIUS
YD	YARD	ROW	RIGHT OF WAY
		RT	RIGHT
		S	SOUTH
		STA	STATION
		VC	VERTICAL CURVE
		W	WEST

SURFACE RESTORATION NOTES

1. RESTORE ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE LIMITS OF WORK TO ORIGINAL CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
2. ALL PAVEMENT DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. PROTECT SURFACE FEATURES (E.G., WALLS, FENCES, MAIL BOXES, SIGNS, SIDEWALKS, CURBING, STAIRS, WALKWAYS, TREES, ECT.) FROM DAMAGE DURING CONSTRUCTION, INCLUDING PROVIDING TEMPORARY SUPPORTS, WHEN APPROPRIATE.
4. IF REMOVAL OF SURFACE FEATURES IS REQUIRED IN ORDER TO PERFORM THE PROPOSED WORK, REMOVE THOSE SITE FEATURES ONLY UPON APPROVAL OF ENGINEER. REPLACE ALL REMOVED SITE FEATURES; NEW ITEMS SHALL BE EQUAL OR BETTER IN QUALITY AND CONDITION TO THE ITEMS REMOVED.
5. EXISTING SURVEY MONUMENTS DISTURBED BY THE CONTRACTOR SHALL BE REPLACED BY A LAND SURVEYOR LICENSED IN THE STATE IN WHICH THE WORK IS PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
6. REPAIR DISTURBED PAVED SURFACES AT THE END OF EACH WORK WEEK, UNLESS OTHERWISE APPROVED/REQUIRED BY THE OWNER.

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO: M1476-011		
DATE: MARCH 2021		
FILE: M1476-011-G-001.dwg		
DRAWN BY: DWB		CHECKED: ADF
APPROVED: DLL		

LEGEND, ABBREVIATIONS, AND
GENERAL NOTES

SCALE: NO SCALE

G-001

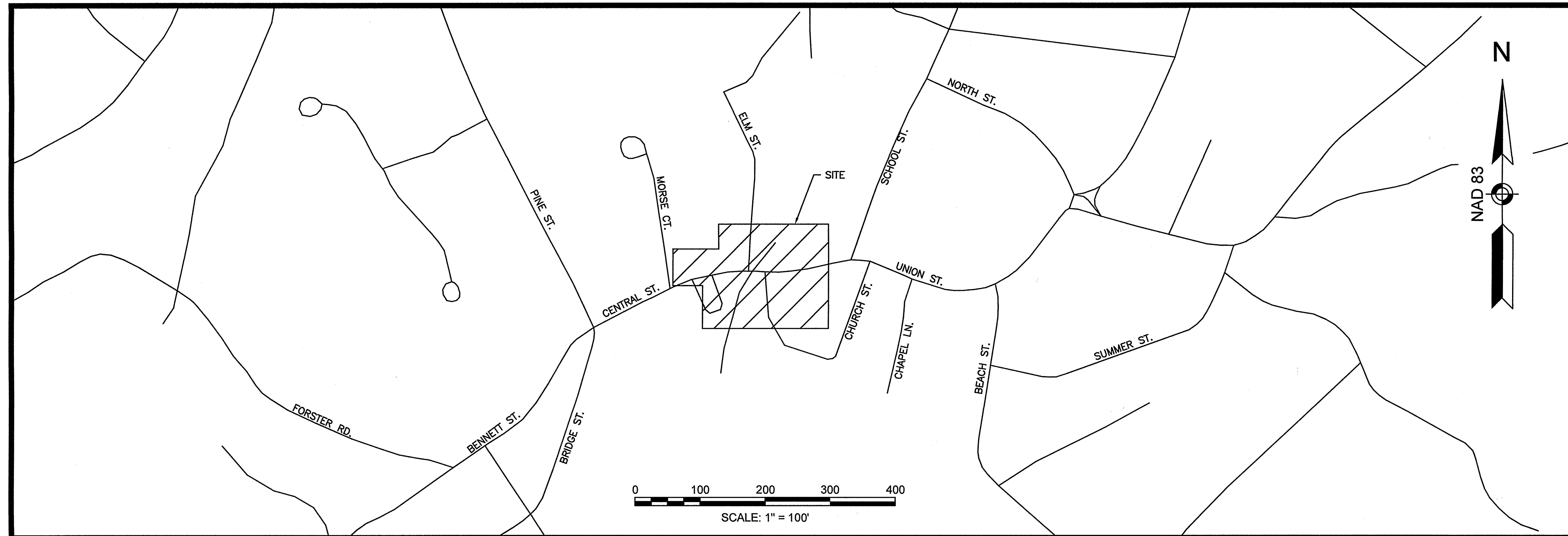
CITY/TOWN
STREET/ROUTE # OR NAME

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	

TITLE SHEET, LEGEND & ABBREVIATIONS

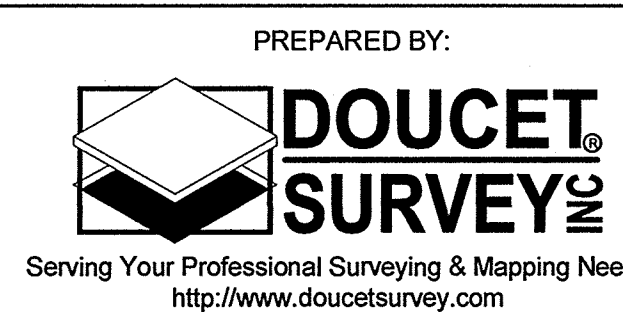
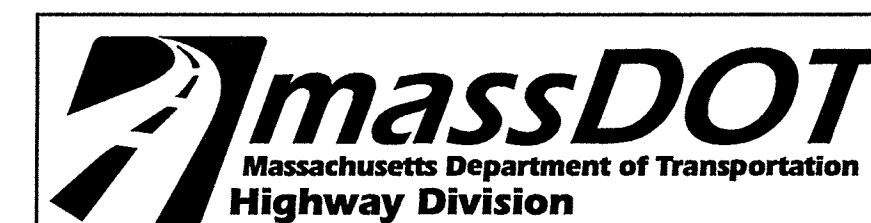
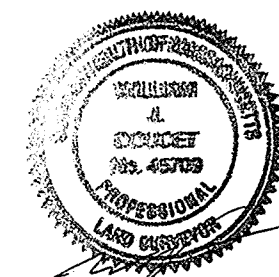
LEGEND

	APPROX. ABUTTERS LOT LINE (SEE NOTE 9)
	GAS LINE
	SEWER LINE
	TELEPHONE LINE
	WATER LINE
	UNDERGROUND ELECTRIC LINE
	SHRUB LINE
	OVERHEAD WIRE
	CHAIN-LINK FENCE
	HAND RAIL
	OTHER FENCE
	MAJOR CONTOUR LINE
	MINOR CONTOUR LINE
	RIVER BED MAJOR CONTOUR LINE (SEE NOTE 10)
	RIVER BED MINOR CONTOUR LINE (SEE NOTE 10)
	BRICK
	CONCRETE
	CRUSHED STONE
	LANDSCAPED AREA
	CATCH BASIN - SQUARE
	CLEANOUT
	DISK (CAV, USC&GS, LAND COURT, ETC.)
	DRAIN MANHOLE
	ELECTRIC HANDHOLE
	ELECTRIC MANHOLE
	ELECTRIC METER
	FLAG POLE
	GAS GATE
	GAS METER
	GAS SHUTOFF VALVE
	FIRE HYDRANT
	LIGHT POLE
	OTHER MANHOLE
	SQUARE POST
	SEWER MANHOLE
	TELEPHONE MANHOLE
	TREE
	SIGN
	UTILITY POLE
	WATER GATE
	WATER SHUTOFF
	BITUMINOUS BERM
	CAST IRON PIPE
	CONCRETE
	COBBLESTONE
	DOUBLE YELLOW LINE
	DRAIN MANHOLE
	DOWN SPOUT
	DISK
	ELEVATION
	EDGE OF PAVEMENT
	EDGE OF TRAVELED WAY
	FINISHED FLOOR
	GRANITE
	HEADWALL
	LEAD PLUG WITH ESCUTCHEON PIN
	RETAINING
	SOLID WHITE LINE
	TYPICAL
	VERTICAL GRANITE CURB



NOTES:

- REFERENCE: TOWN OF MANCHESTER-BY-THE-SEA. CENTRAL STREET BRIDGE OVER SAWMILL BROOK.
- FIELD SURVEY PERFORMED BY B.T. & T.M.M. DURING AUGUST 2018 USING A TRIMBLE S6 TOTAL STATION WITH A TRIMBLE TSC3 DATA COLLECTOR AND A SOKKIA B21 AUTO LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS. ADDITIONAL FIELD SURVEY PERFORMED BY M.J.C. IN AUGUST 2018 USING A LEICA P40 HDS SCANNER. REGISTRATION ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- THIS MAP WAS PREPARED FROM RECORD RESEARCH, OTHER MAPS, LIMITED FIELD MEASUREMENTS AND OTHER SOURCES. IT IS NOT TO BE CONSTRUED AS A PROPERTY / BOUNDARY SURVEY AND IS SUBJECT TO SUCH FACTS AS SAID SURVEYS MAY DISCLOSE.
- HORIZONTAL DATUM BASED ON MASSACHUSETTS MAINLAND ZONE NAD83(2011) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- VERTICAL DATUM IS BASED ON NAVD88 DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK AND CALIBRATED TO THREE MASSDOT GEODETIC CONTROL STATIONS (REF. DSI PROJECT 4536).
- PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT (1') INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY, INC. WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.
- THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING; THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.
- ALL ELECTRIC, GAS, TEL. WATER, SEWER AND DRAIN SERVICES ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN ON THIS SITE USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.
- ABUTTER AND RIGHT OF WAY LINES SHOWN HEREON ARE FROM MASS.GOV OFFICE OF GEOGRAPHIC INFORMATION (MASSGIS) ONLY.THE REFERENCE PLANS LISTED HEREON ARE PROVIDED AS A COURTESY ONLY; THE SCOPE OF THIS TOPOGRAPHIC SURVEY DID NOT INCLUDE BOUNDARY ANALYSIS OR FIELD SURVEY EFFORTS TO UNCOVER RECORD MONUMENTS.
- ELEVATIONS AND LOCATIONS SHOWN DEPICTING SPRING LINE ARE BASED ON DATA FROM LASER SCAN POINT CLOUD OF STONE ARCH CULVERT.
- VISIBLE UTILITY STRUCTURES (MANHOLES, CATCH BASINS, GAS & WATER VALVES, ETC.) WERE LOCATED BY INSTRUMENT SURVEY BY THIS OFFICE. THE CORRESPONDING STORMWATER DRAIN & SANITARY SEWER INVERT SIZE & ELEVATION IS PER SURVEY DONE BY THIS OFFICE. THE LOCATIONS OF THE REMAINING UNDERGROUND UTILITIES ARE BASED ON THE LOCATIONS OF S.U.E. PAINT MARKS (BY OTHERS - UNKNOWN) OBSERVED ON SITE AT THE TIME OF OUR SURVEY.



REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

SCALE: 10 FEET TO THE INCH

FILE NAME: 5521A_SV
FIELD BOOK NO: XXXX
DRAWN BY: W.D.C. CHECKED BY: W.J.D.
FIELD CHIEF: XXX PARS. NO: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET

(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF

MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	

TITLE SHEET, LEGEND & ABBREVIATIONS

REFERENCE PLANS:

- "PLAN OF A PORTION OF THE MAIN ROAD IN MANCHESTER SHOWING THE PROPOSED WIDENINGS" DONE BY CHARLES A. PUTNAM, DATED NOVEMBER 23, 1871. COUNTY OF ESSEX RECORD #1230.
- "PLAN OF A PORTION OF CENTRAL STREET AT THE JUNCTION OF SCHOOL STREET AND UNION STREET IN THE TOWN OF MANCHESTER AS ALTERED" DONE BY CLINTON C. BARKER COUNTY ENGINEER DATED SEPTEMBER 1947. S.E.D.R.D. PLAN #76-35.
- "PLAN OF A PORTION OF CENTRAL STREET FROM ELM STREET TO SCHOOL STREET IN THE TOWN OF MANCHESTER AS ALTERED" BY JOHN O. MARMAALA COUNTY ENGINEER DATED SEPTEMBER 1953. S.E.D.R.D. PLAN #84-8.
- "PLAN OF LAND IN MANCHESTER, MASS FOR JEAN E. GRELET" DATED MARCH 20, 1959 BY DANA F. PERKINS & SONS, INC. S.E.D.R.D. PLAN #92-74.
- "PLAN OF A PORTION OF ELM STREET FROM CENTRAL STREET 700 FEET NORTHERLY IN THE TOWN OF MANCHESTER AS LAID OUT" BY EARL H. PAGE DATED OCTOBER 25, 1966. S.E.D.R.D. PLAN #107-91.
- "PLAN OF LAND IN MANCHESTER, MASSACHUSETTS COUNTY OF ESSEX FOR ANN N. KILEY & DOROTHY B. KILEY" DATED FEBRUARY 14, 1985. DONE BY W. C. CAMMETT ENGINEERING, INC. S.E.D.R.D. PLAN #233-32.
- "SITE PLAN 27 CENTRAL ST. CONDOMINIUMS" DONE BY W. C. CAMMETT ENGINEERING, INC. DATED FEBRUARY 1985. S.E.D.R.D. PLAN #233-33.
- "PLAN OF LAND BELONGING TO SAMUEL KNIGHT SONS CO." DATED SEPTEMBER 27, 1946 BY RICHARD A. WIRLING. S.E.D.R.D. PLAN #1946-824.
- "PLAN OF LAND IN MANCHESTER TO BE CONVEYED FROM F. J. MERRILL TO THE CRICKET PRESS, INC." FEBRUARY 15, 1923. BY RAYMOND C. ALLEN. S.E.D.R.D. PLAN #2549-181.
- "LAND OF JOHN W. MARSHALL HEIRS" DATED OCTOBER 28, 1944 BY WARREN A. CROMBIE. S.E.D.R.D. PLAN #3465-1.
- "PLAN OF LAND BELONGING TO SAMUEL KNIGHT SONS, CO." DATED DECEMBER 10, 1946 BY RICHARD A. WIRLING. S.E.D.R.D. PLAN #3521-600.
- "PROPERTY OF JEAN E. GRELET, CENTRAL ST, MANCHESTER MASS" DATED NOVEMBER 8, 1952 S.E.D.R.D. PLAN #3925-1.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF SEA ROCK ESTATE, INC." DATED DECEMBER 18, 1970. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5765-800.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF SEA ROCK ESTATE, INC." DATED MAY 3, 1971 BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5835-1.
- "PLAN OF LAND IN MANCHESTER PEELE HOUSE SQUARE" FOR SEA ROCK ESTATE, INC. DATED JULY 11, 1972 BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5961-297.
- "PLAN OF LAND IN MANCHESTER PEELE HOUSE SQUARE" FOR SEA ROCK ESTATE, INC. DATED MAY 8, 1973. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #6025-1.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF ARTHUR A. & MARJOIRE SECHER" DATED JUNE 11, 1984. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #7688-133.
- "PLAN TO ACCOMPANY PETITION OF THE TOWN OF MANCHESTER. TO CONSTRUCT A RETAINING WALL AND FILL SOLID MANCHESTER HARBOR" DATED NOVEMBER 3, 1921. BY RAYMOND C. ALLEN. S.E.D.R.D. PLAN #36-31.
- PLAN TITLED "MANCHESTER-BY-THE-SEA DOWNTOWN ATLAS, MANCHESTER-BY-THE-SEA, MASSACHUSETTS, ESSEX COUNTY" PREPARED BY DGT SURVEY GROUP DATED 6-10-2015.

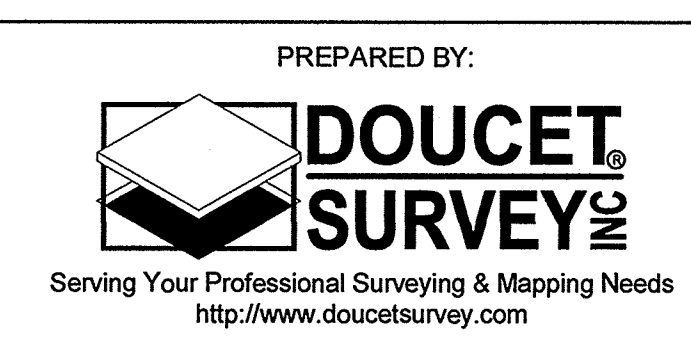
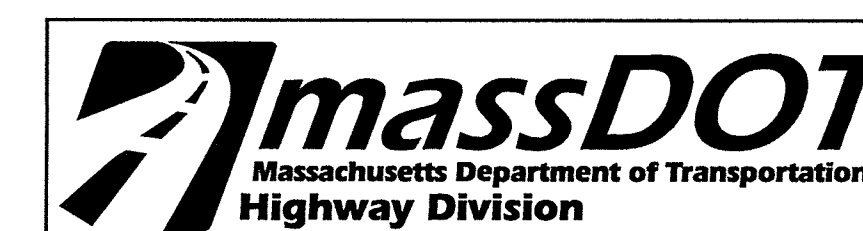
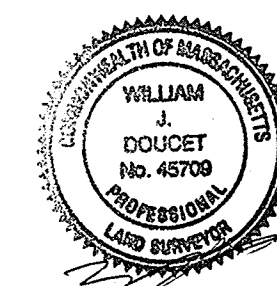
DRAINAGE STRUCTURES	
CB 1104	RIM ELEV.=14.2'
(A) 4" CIP INV.=12.1' (4" METAL**)	
(B) 10" CMP INV.=10.5' (8"**)	
CB 1153	RIM ELEV.=10.1'
SUMP ELEV.=7.8'	
CONC. CHANNEL TO OUTFALL	
CB 1196	RIM ELEV.=9.2'
(OUTFALL) 12" CLAY INV.=5.3' (10" CONC**)	
(A) 12" CLAY INV.=5.2' (12"**)	
CB 1215	RIM ELEV.=9.2'
(1226) 15" CMP INV.=2.6'	
(A) 8" METAL INV.=1.6'	
(B) 8" METAL INV.=1.5'	
DMH 1228	RIM ELEV.=10.1'
(1245) 10" CLAY INV.=6.4' (10" CLAY**)	
(1215) 15" CMP INV.=5.5'	
DMH 1245	RIM ELEV.=11.5'
(1215) 12" PVC INV.=9.3' (12" PVC**)	
(A) VERY RECESSED (12" CLAY FROM CB 1246**)	
WATER ELEV.=9.3'	
SUMP ELEV.=8.3'	
CB 1246	RIM ELEV.=11.2'
(A) 12" UNKN INV.=9.6'	
(10" OR 12" CLAY TO DMH 1245**)	

**INDICATES PIPE SIZE/DIA. INFO.
IS PER REF. PLAN 19

SEWER STRUCTURES	
SMH 1081	RIM ELEV.=12.4'
CC=-1.1'	
(1155) UNKN BC=-1.2' (12" PIPE**)	
(1109) UNKN BC=-1.3' (15" PIPE**)	
SMH 1109	RIM ELEV.=14.6'
(1081) 15" UNKN INV.=-2.1' (15" PIPE**)	
(A) 15" UNKN INV.=-2.6'	
(B) 15" UNKN INV.=-2.7' (18" PIPE**)	
SMH 1155	RIM ELEV.=10.2'
(A) 4" PVC INV.=4.7'	
(B) 4" PVC INV.=0'	
(C) UNKN INV.=-0.3' (6" PIPE**)	
(1248) UNKN INV.=-0.6' (15" PIPE**)	
(1081) UNKN INV.=-0.6' (12" PIPE**)	
CC=-0.6'	
SMH 1248	RIM ELEV.=13.7'
(A) 8" UNKN INV.=6.7'	
(B) 8" UNKN INV.=0.1'	
(1155) 12" UNKN INV.=-0.3' (15" PIPE**)	
(C) 12" UNKN INV.=-0.4' (12" PIPE**)	
(D) 12" UNKN INV.=-0.4'	

**INDICATES PIPE SIZE/DIA. INFO.
IS PER REF. PLAN 19

OTHER STRUCTURES	
MH 1063	RIM ELEV.=11.5'
SUMP ELEV.=6.8'	
DRY NO PIPES W/ WATER SHUT OFF	
MH 1550	RIM ELEV.=13.8'
SUMP ELEV.=9.9'	
DRY NO PIPES W/ ELECTRIC METER AND CHANNEL TO FOUNTAIN	



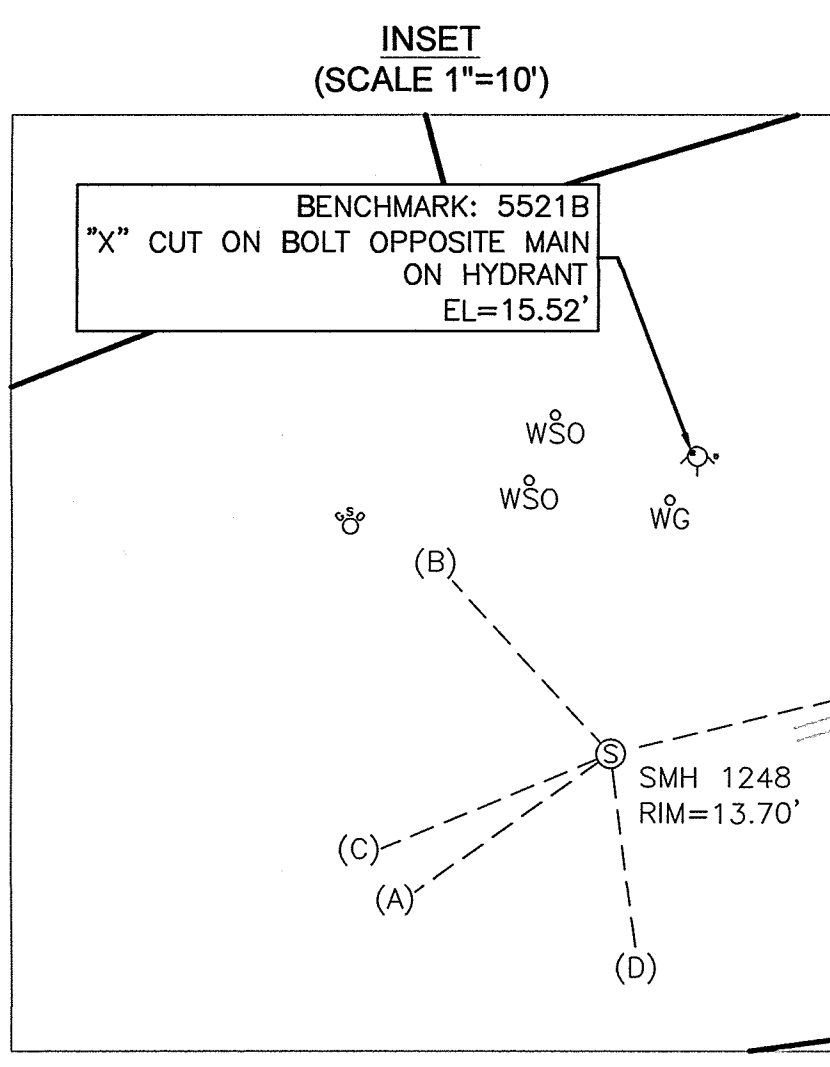
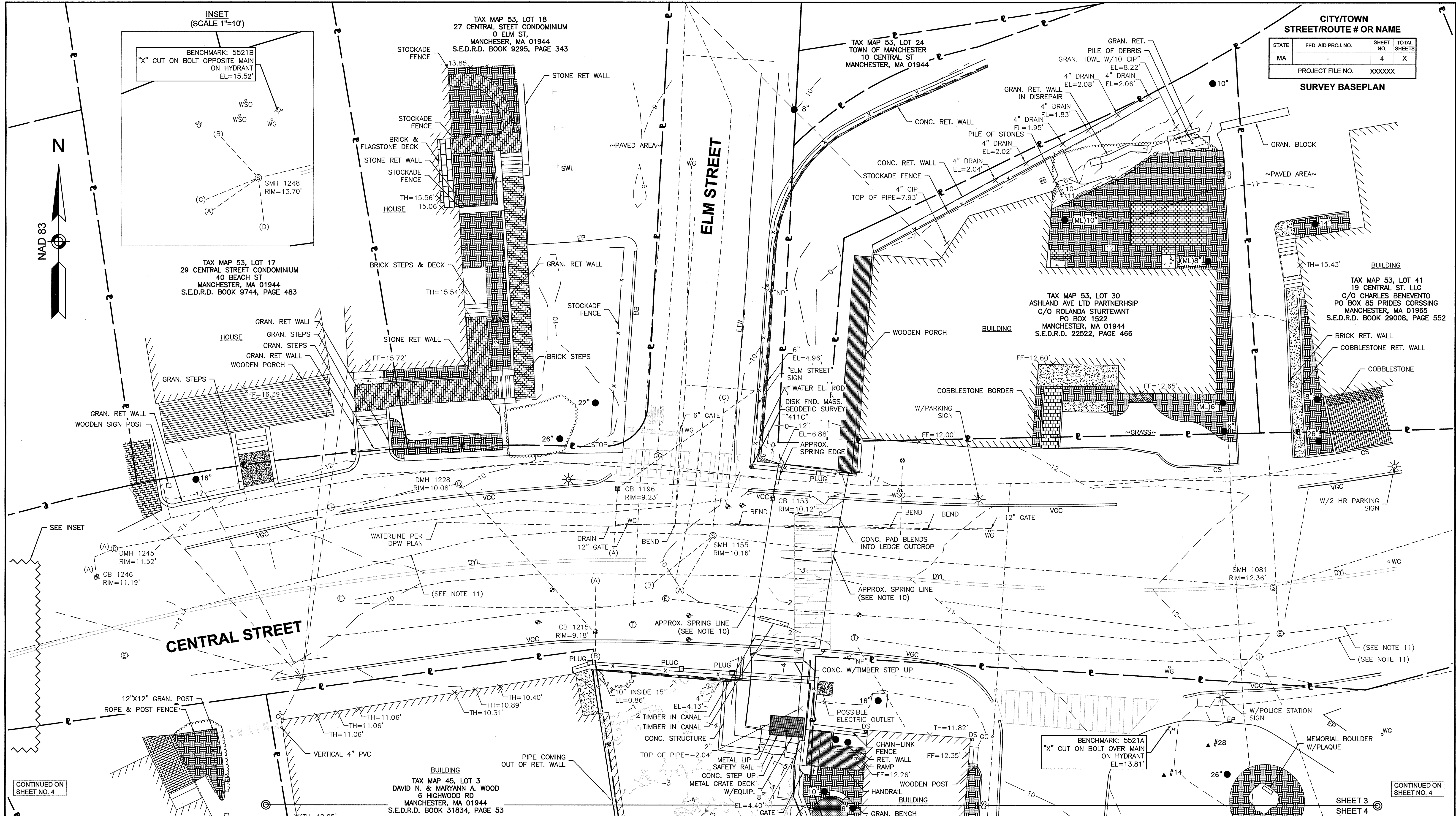
REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

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FILE NAME: 5521A_SV	
FIELD BOOK NO: XXXX	
DRAWN BY: W.D.C.	CHECKED BY: W.J.D.
FIELD CHIEF: XXX	PARS. NO: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF
MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

DATE: _____ SHEET 2 OF 4

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	
SURVEY BASEPLAN			



TAX MAP 53, LOT 17
29 CENTRAL STREET CONDOMINIUM
40 BEACH ST
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 9744, PAGE 483

TAX MAP 53, LOT 18
27 CENTRAL STREET CONDOMINIUM
0 ELM ST,
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 9295, PAGE 343

TAX MAP 53, LOT 24
TOWN OF MANCHESTER
10 CENTRAL ST
MANCHESTER, MA 01944

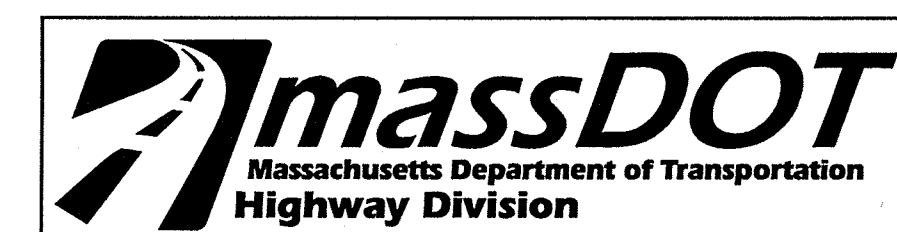
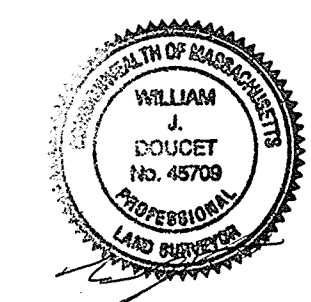
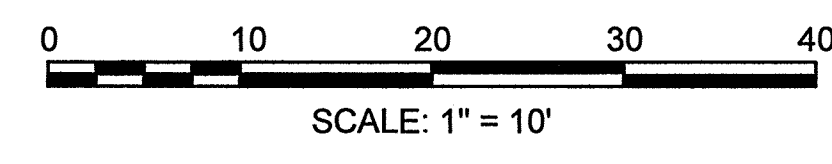
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ASHLAND AVE LTD PARTNERSHIP
C/O ROLANDA STURTEVANT
PO BOX 1522
MANCHESTER, MA 01944
S.E.D.R.D. 22522, PAGE 466

TAX MAP 53, LOT 41
19 CENTRAL ST. LLC
C/O CHARLES BENEVENTO
PO BOX 85 PRIDES CORSSING
MANCHESTER, MA 01965
S.E.D.R.D. BOOK 29008, PAGE 552

TAX MAP 45, LOT 3
DAVID N. & MARYANN A. WOOD
6 HIGHWOOD RD
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 31834, PAGE 53

CONTINUED ON SHEET NO. 4

CONTINUED ON SHEET NO. 4



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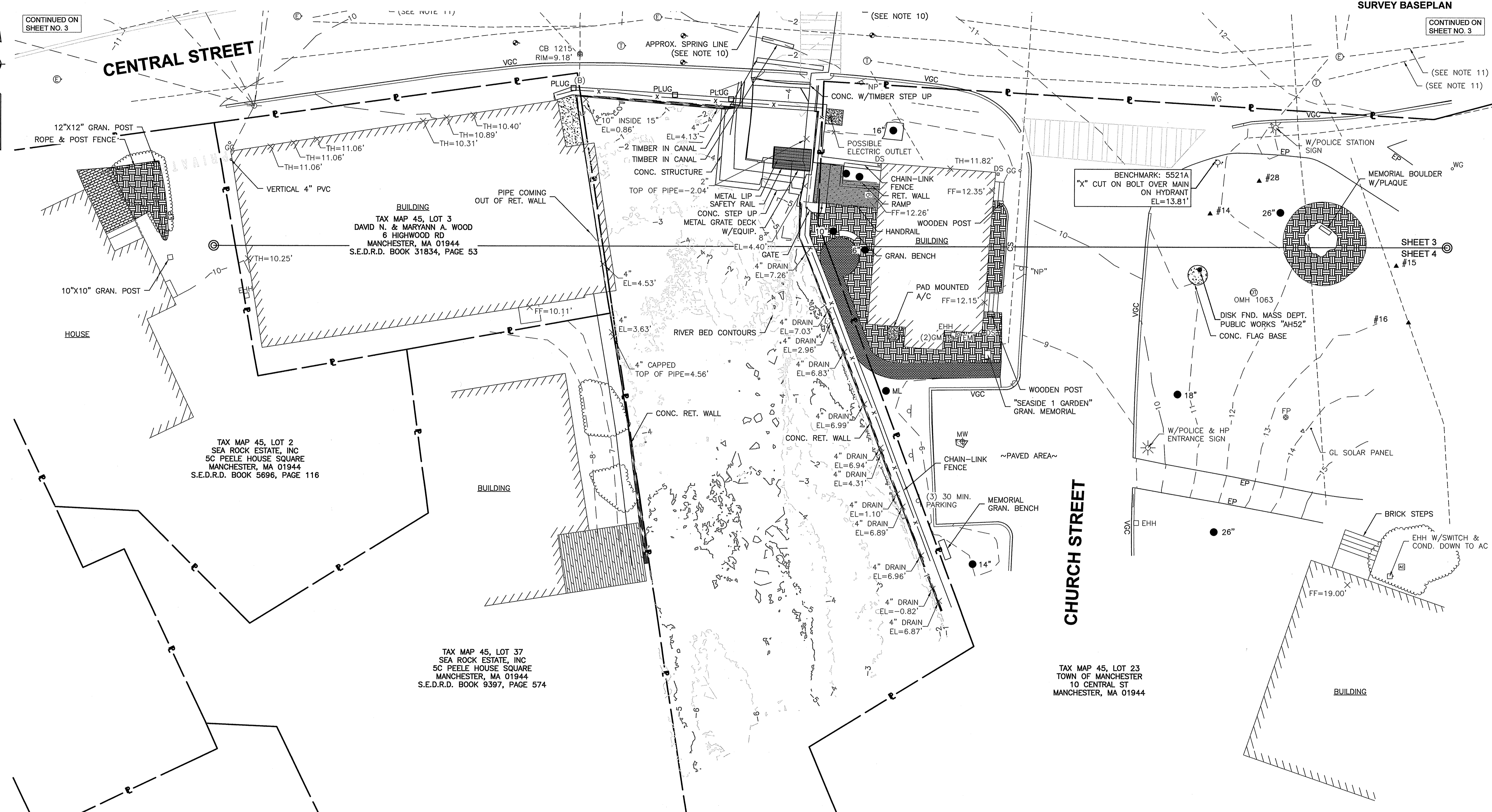
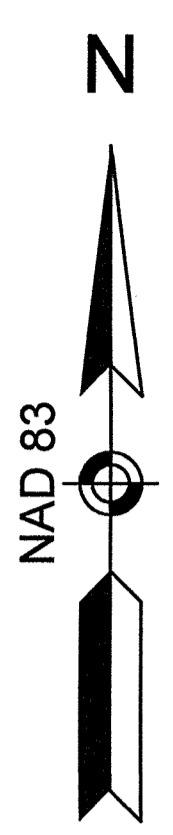
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02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

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DRAWN BY: W.D.C. CHECKED BY: W.J.D.
FIELD CHIEF: XXX PARS. NO.: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF

MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO. XXXXX			
SURVEY BASEPLAN			



CONTINUED ON SHEET NO. 3

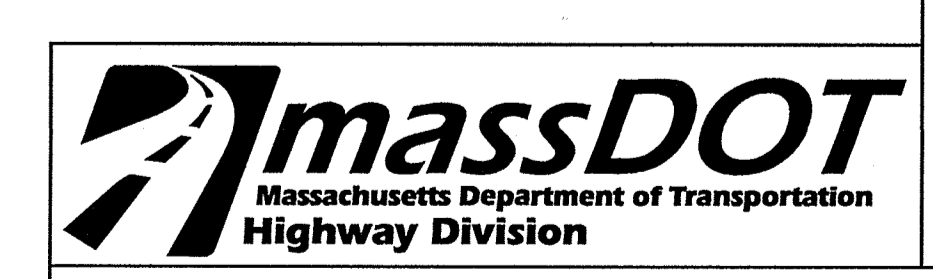
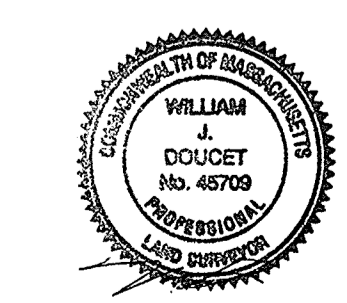
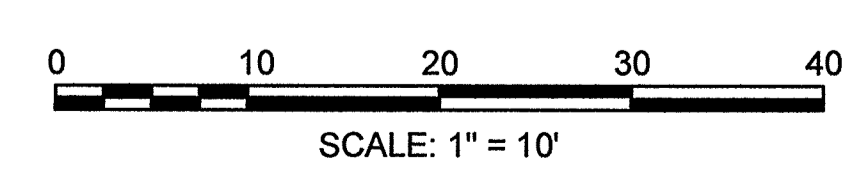
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TAX MAP 45, LOT 2
SEA ROCK ESTATE, INC
5C PEELE HOUSE SQUARE
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 5696, PAGE 116

BUILDING
TAX MAP 45, LOT 3
DAVID N. & MARYANN A. WOOD
6 HIGHWOOD RD
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 31834, PAGE 53

TAX MAP 45, LOT 37
SEA ROCK ESTATE, INC
5C PEELE HOUSE SQUARE
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 9397, PAGE 574

TAX MAP 45, LOT 23
TOWN OF MANCHESTER
10 CENTRAL ST
MANCHESTER, MA 01944



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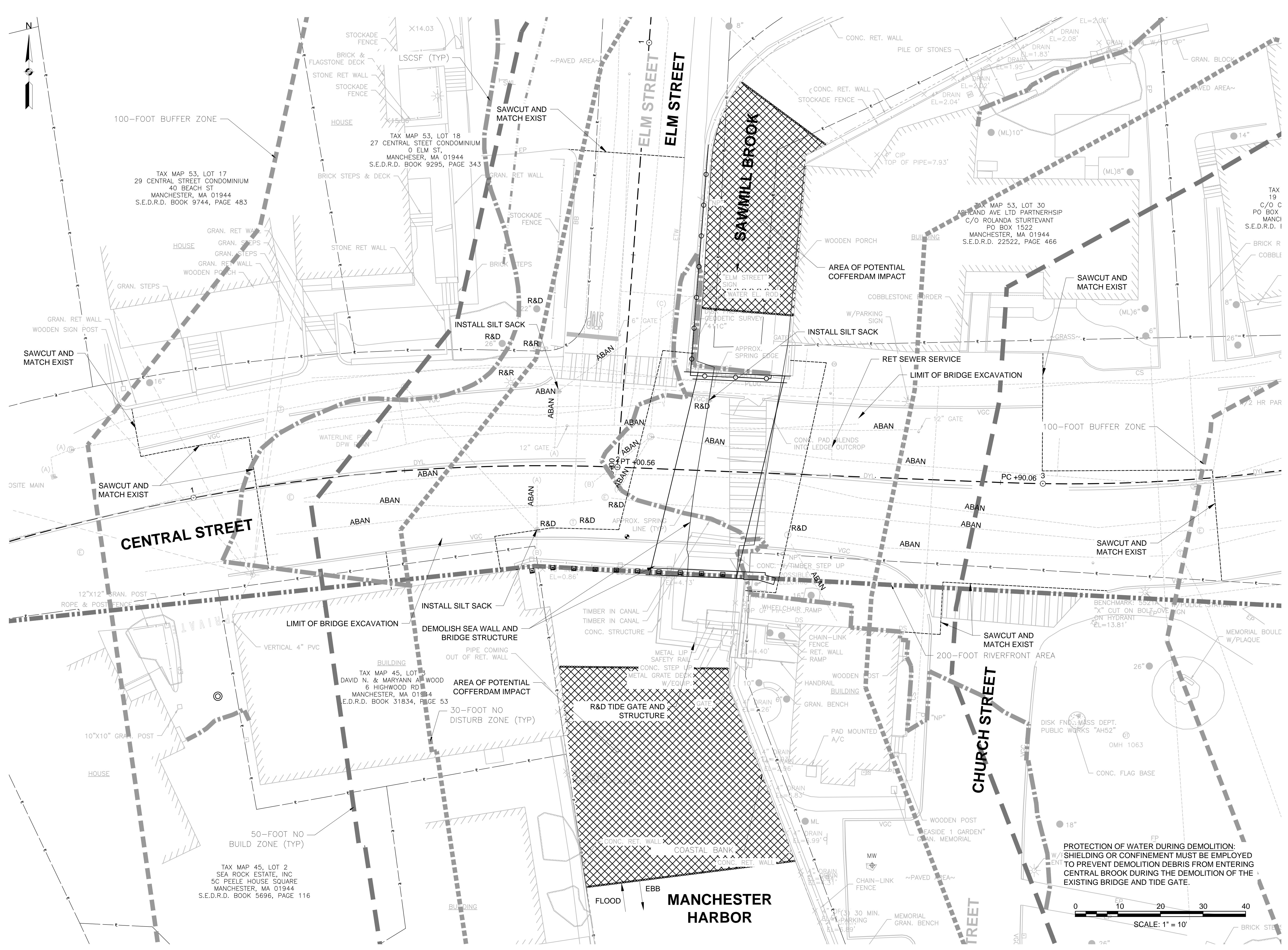
REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

SCALE: 10 FEET TO THE INCH	
FILE NAME: 5521A_SV	CHECKED BY: W.J.D.
FIELD BOOK NO: XXXX	PARS. NO: XXXXXX
DRAWN BY: W.D.C.	DATE:
FIELD CHIEF: XXX	

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF
MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

SHEET 4 OF 4

5521A_SV.DWG Plotted on 14-Dec-2018 8:09 AM



90%
Drawings
Not For
Construction

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
0	3/12/2021	90% Drawings

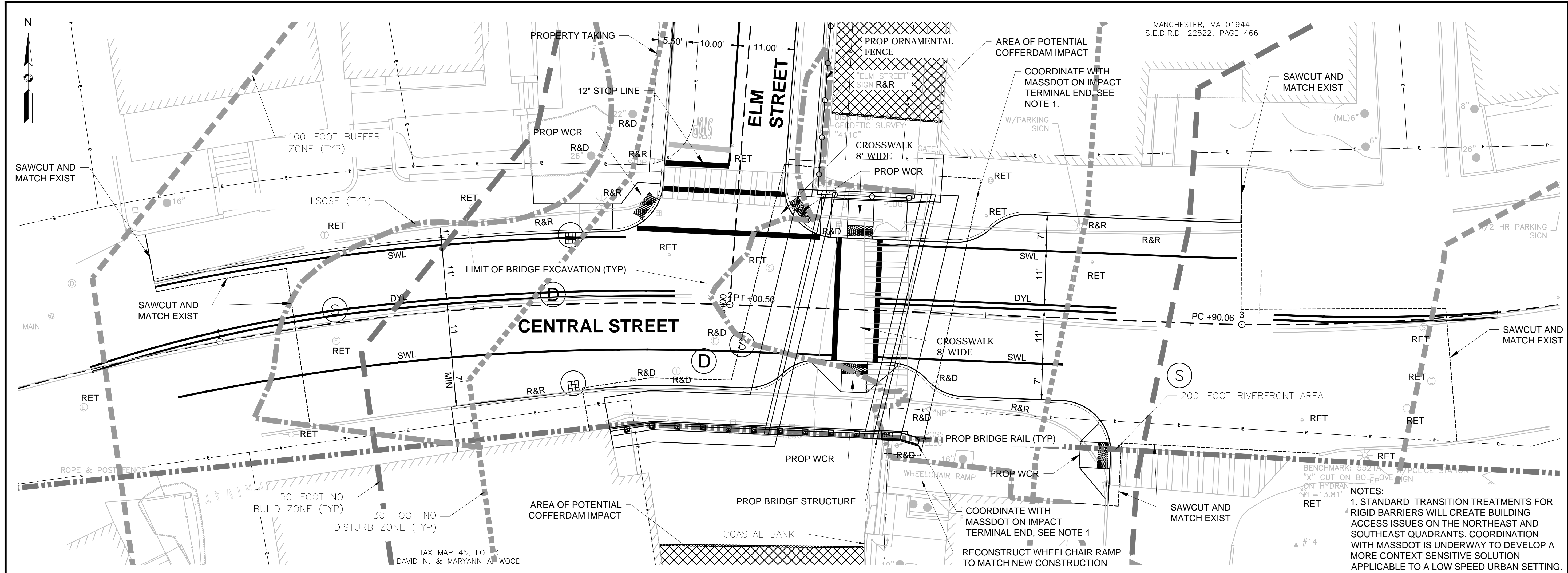
PROJECT NO:	M1476-011
DATE:	MARCH 2021
FILE:	M1476-011-C-005.dwg
DRAWN BY:	DWB
CHECKED:	ADF
APPROVED:	DLL

**DEMOLITION AND SITE
PREPARATION PLAN**

SCALE: 1" = 10'

C-005

Last Saved: 3/2/2021 2:24pm By: AGR
 Tighe & Bond, Inc. 1476 Central Street Bridge Drawings, Figures/Annex/Sheet M1476-011-C-005.dwg



MANCHESTER, MA 01944
S.E.D.R.D. 22522, PAGE 466

NOTES:
1. STANDARD TRANSITION TREATMENTS FOR RIGID BARRIERS WILL CREATE BUILDING ACCESS ISSUES ON THE NORTHEAST AND SOUTHEAST QUADRANTS. COORDINATION WITH MASSDOT IS UNDERWAY TO DEVELOP A MORE CONTEXT SENSITIVE SOLUTION APPLICABLE TO A LOW SPEED URBAN SETTING.

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Drawings
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Construction

**Central Street
Bridge
Replacement**

Department of
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MassDOT Bridge No.
M-02-001, BIN 8AM

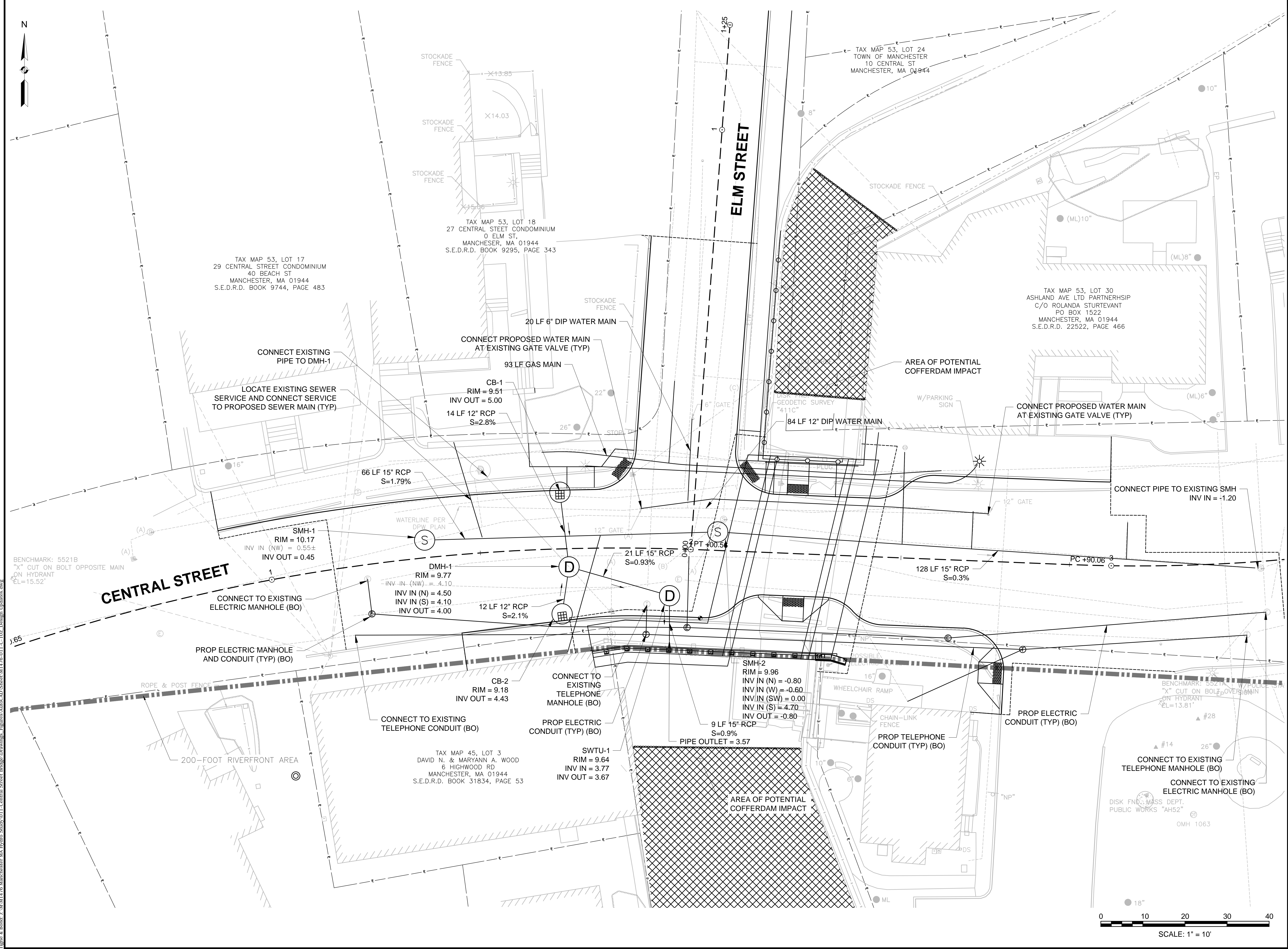
Town of
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MARK	DATE	DESCRIPTION
0	3/12/2021	90% Drawings
PROJECT NO: M1476-011		
DATE: MARCH 2021		
FILE: M1476-011-C-101.dwg		
DRAWN BY: DWB		
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SITE PLAN AND PROFILE

SCALE: 1"=10' HORIZ, 1"=4' VERT

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 Tighe & Bond, 1476 Manchester MA Hydro Study 011-Central Street Bridge Drawings, Figures/Views/CAD/Sheet/M1476-011-C-101.dwg



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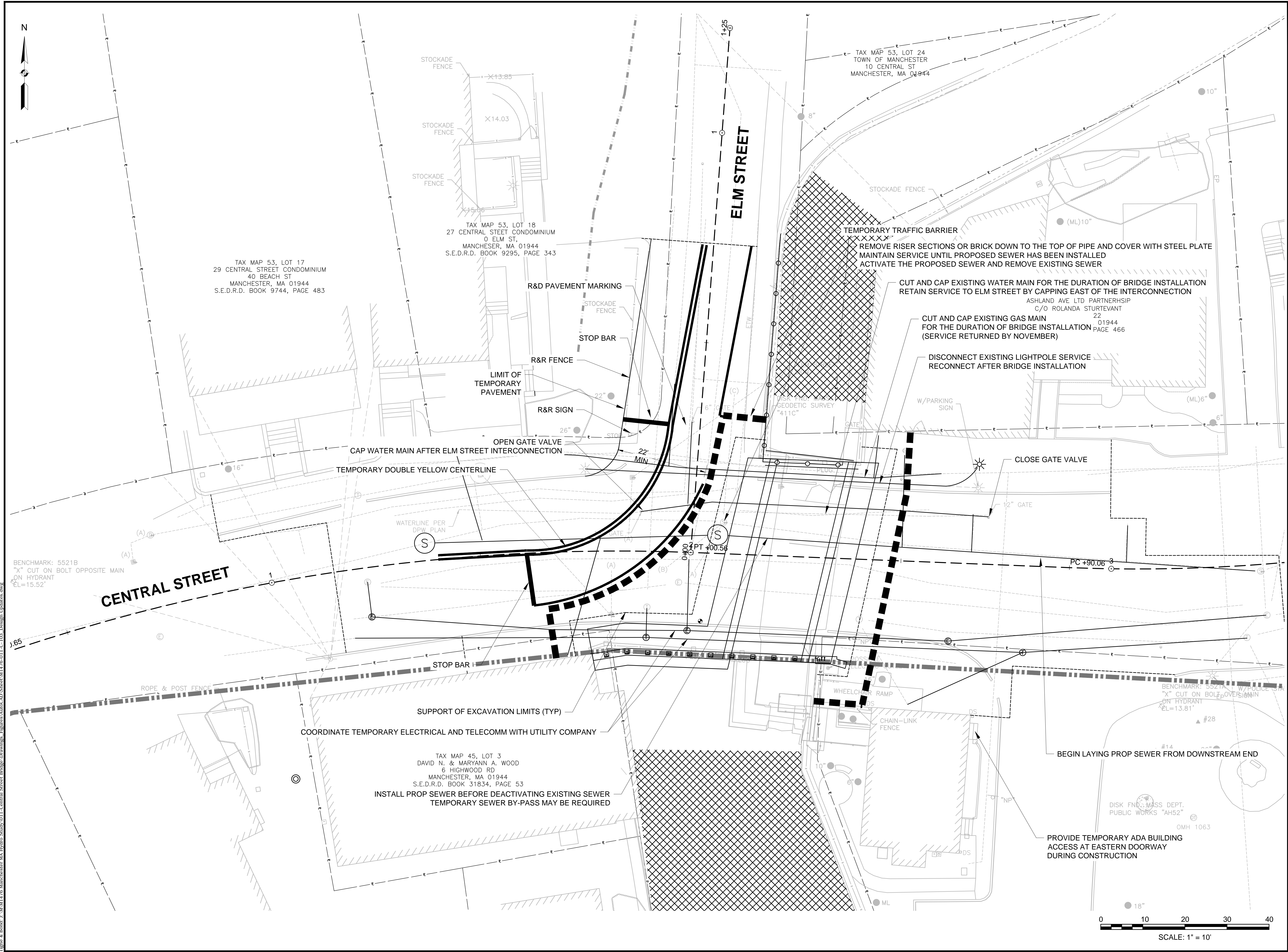
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APPROVED BY: DLL		

UTILITY PLAN
SCALE: 1" = 10'
C-102

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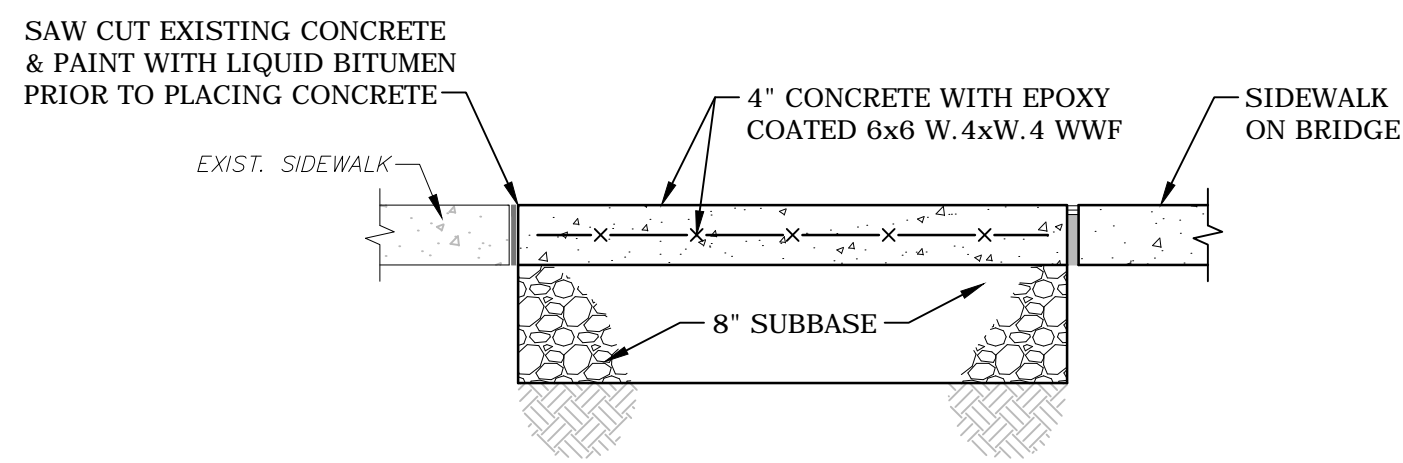
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DATE:	MARCH 2021	
FILE:	M1476-011-C-103_Design Updates.dwg	
DRAWN BY:	DWB	
CHECKED:	ADF	
APPROVED:	DLL	

TEMPORARY ROADWAY AND
UTILITY PLAN

SCALE: 1" = 10'

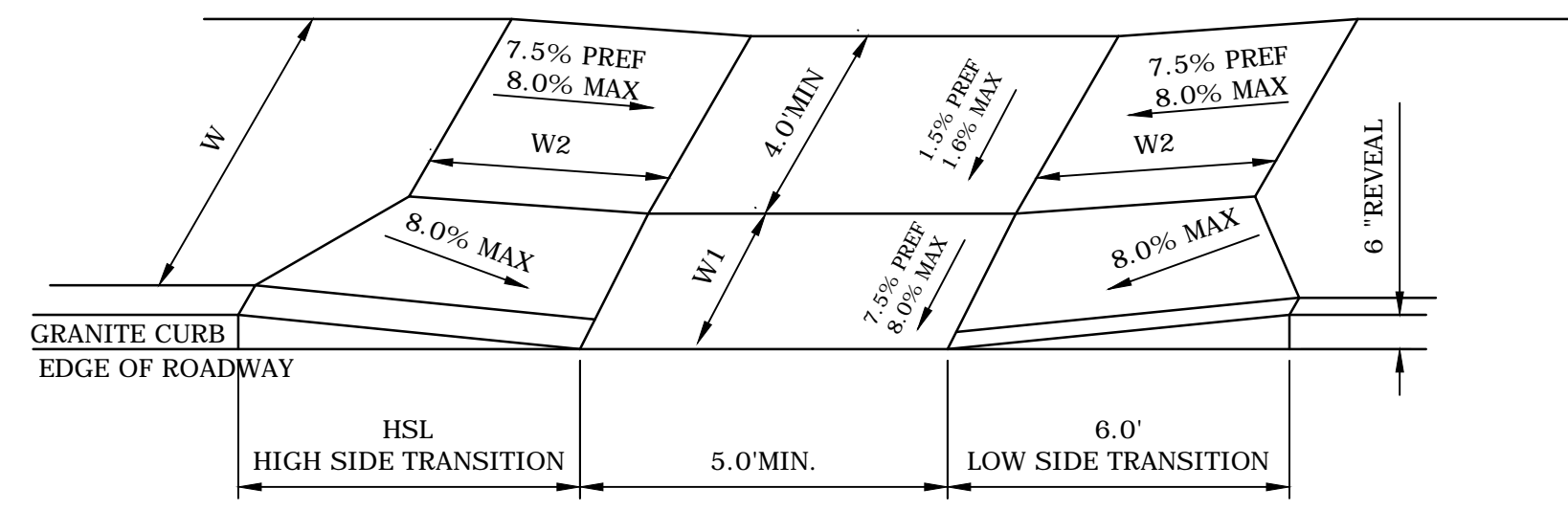
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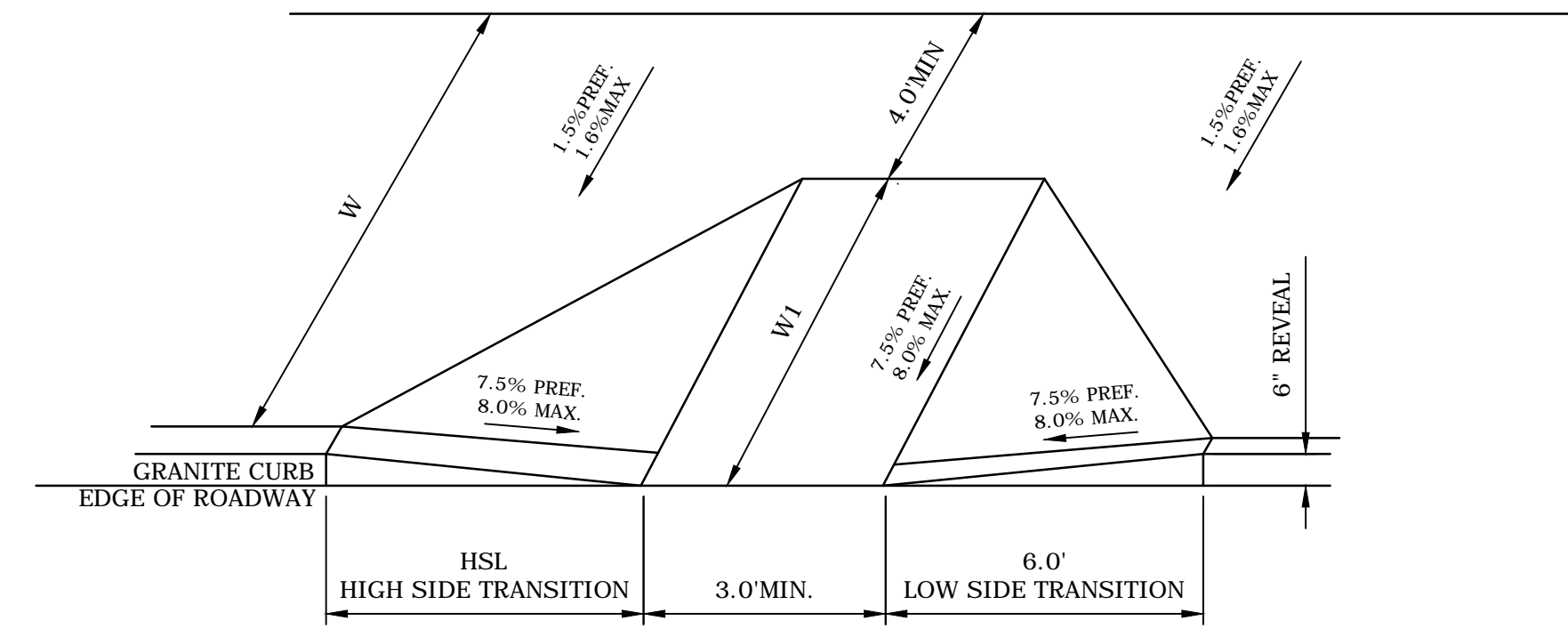
NOTES:

1. ALL CONCRETE, AGGREGATE, STABILIZED COURSE, SUBBASE AND LIQUID BITUMEN SHALL CONFORM TO THE MATERIALS EQUIPMENT AND CONSTRUCTION REQUIREMENTS AS PER STATE SPECIFICATIONS.
2. PROVIDE A 1" CONSTRUCTION JOINT BETWEEN BRIDGE AND APPROACH SIDEWALK. FILL JOINT WITH COMPRESSIBLE FILLER MATERIAL AND SEAL WITH 1" WIDE x 1/2" DEEP SILICONE JOINT SEALANT.
3. MATCH FINISH GRADE AND WIDTH OF EXISTING SIDEWALK.

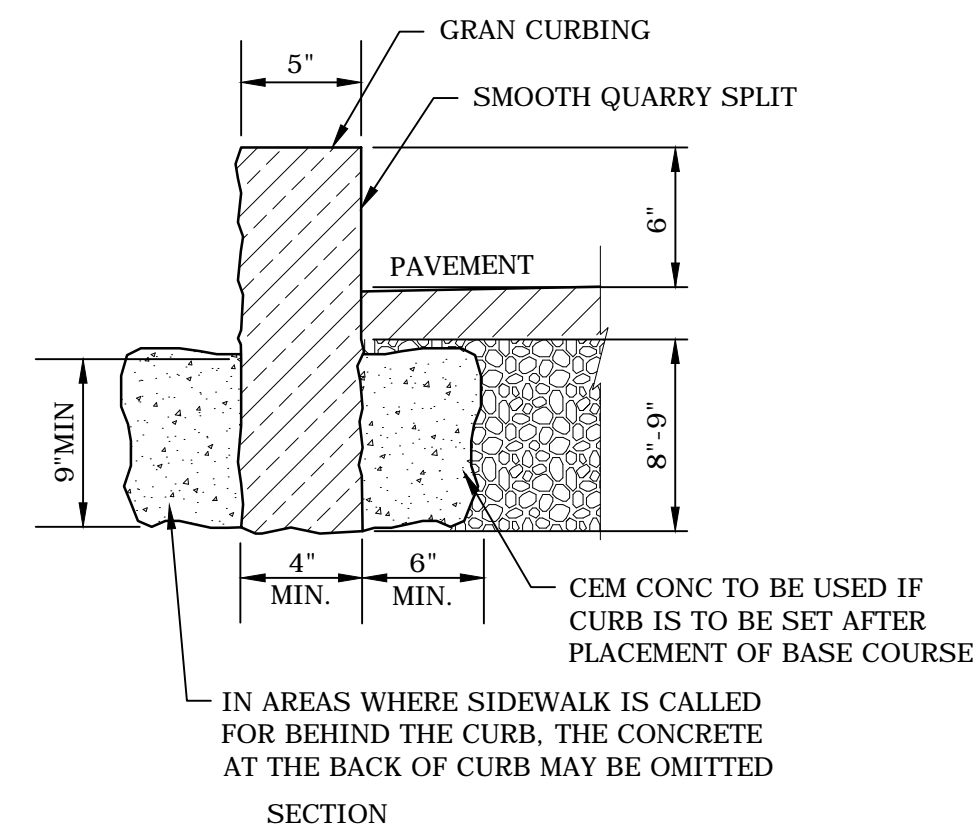
APPROACH SIDEWALK
NO SCALE



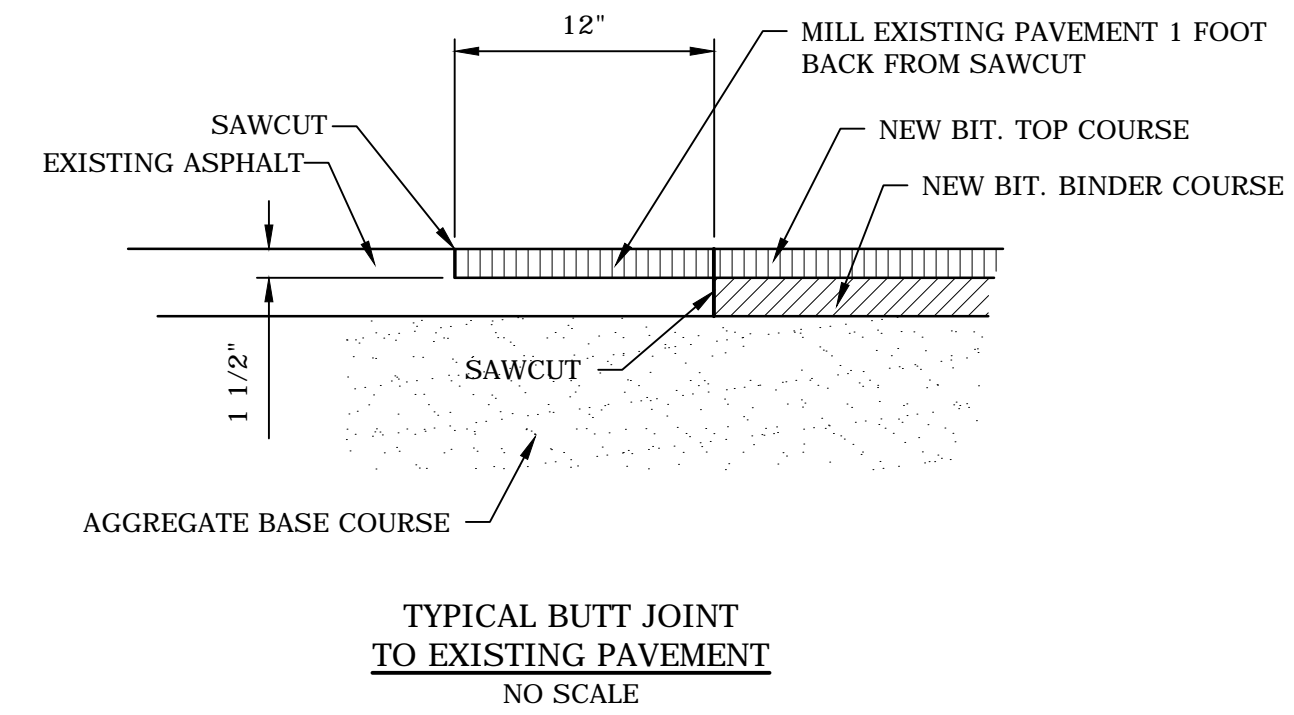
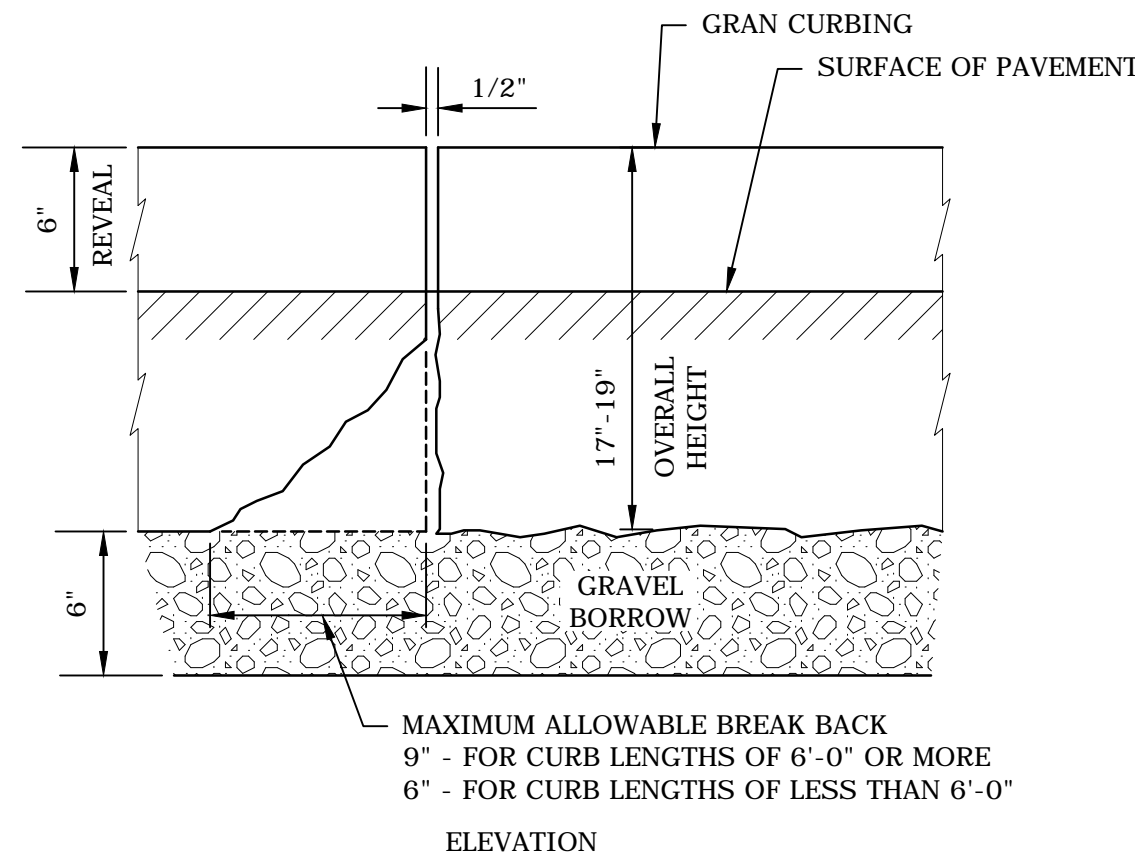
HANDICAP RAMP FOR LESS THAN 11.5' SIDEWALK
NO SCALE



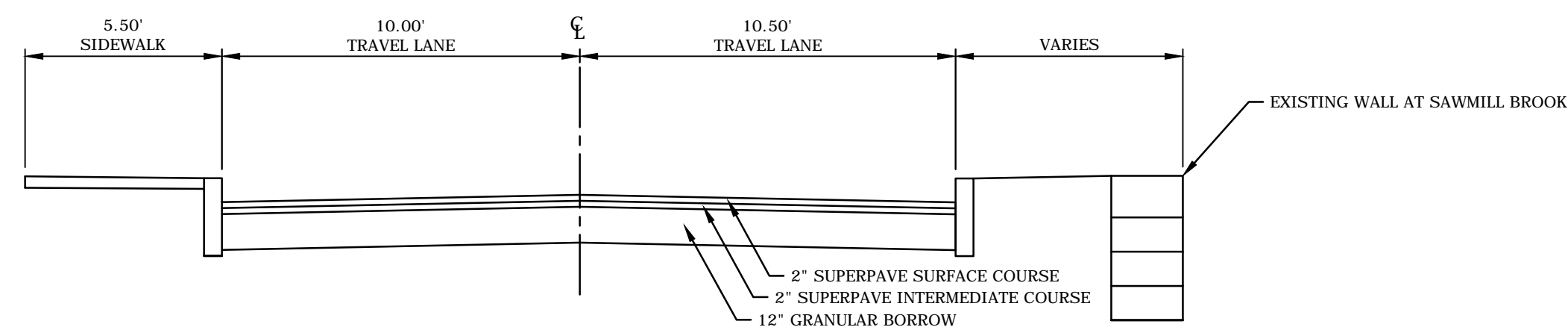
HANDICAP RAMP FOR WIDER THAN 11.5' SIDEWALK
NO SCALE



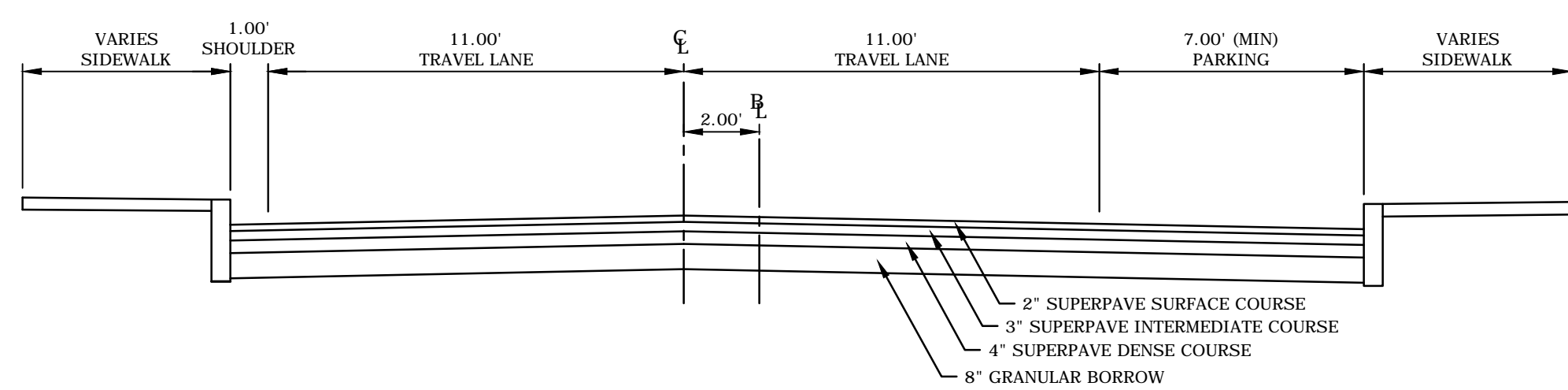
GRANITE CURB
NO SCALE



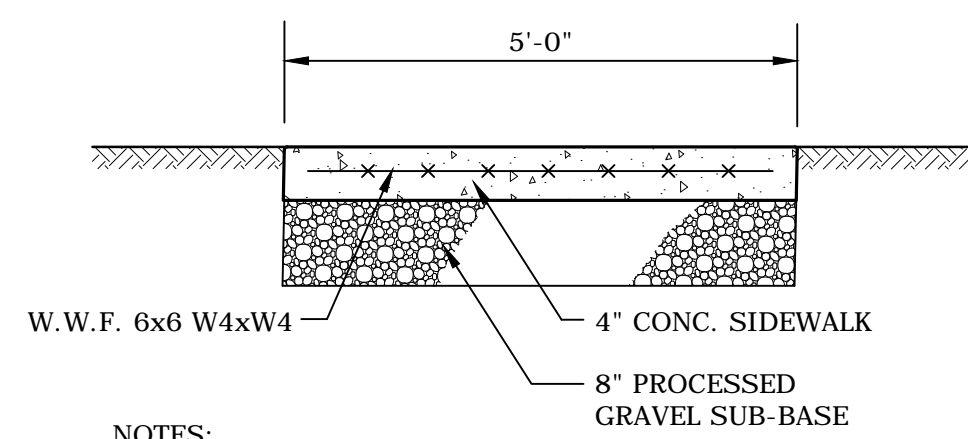
TYPICAL BUTT JOINT TO EXISTING PAVEMENT
NO SCALE



ELM STREET TYPICAL SECTION
NO SCALE



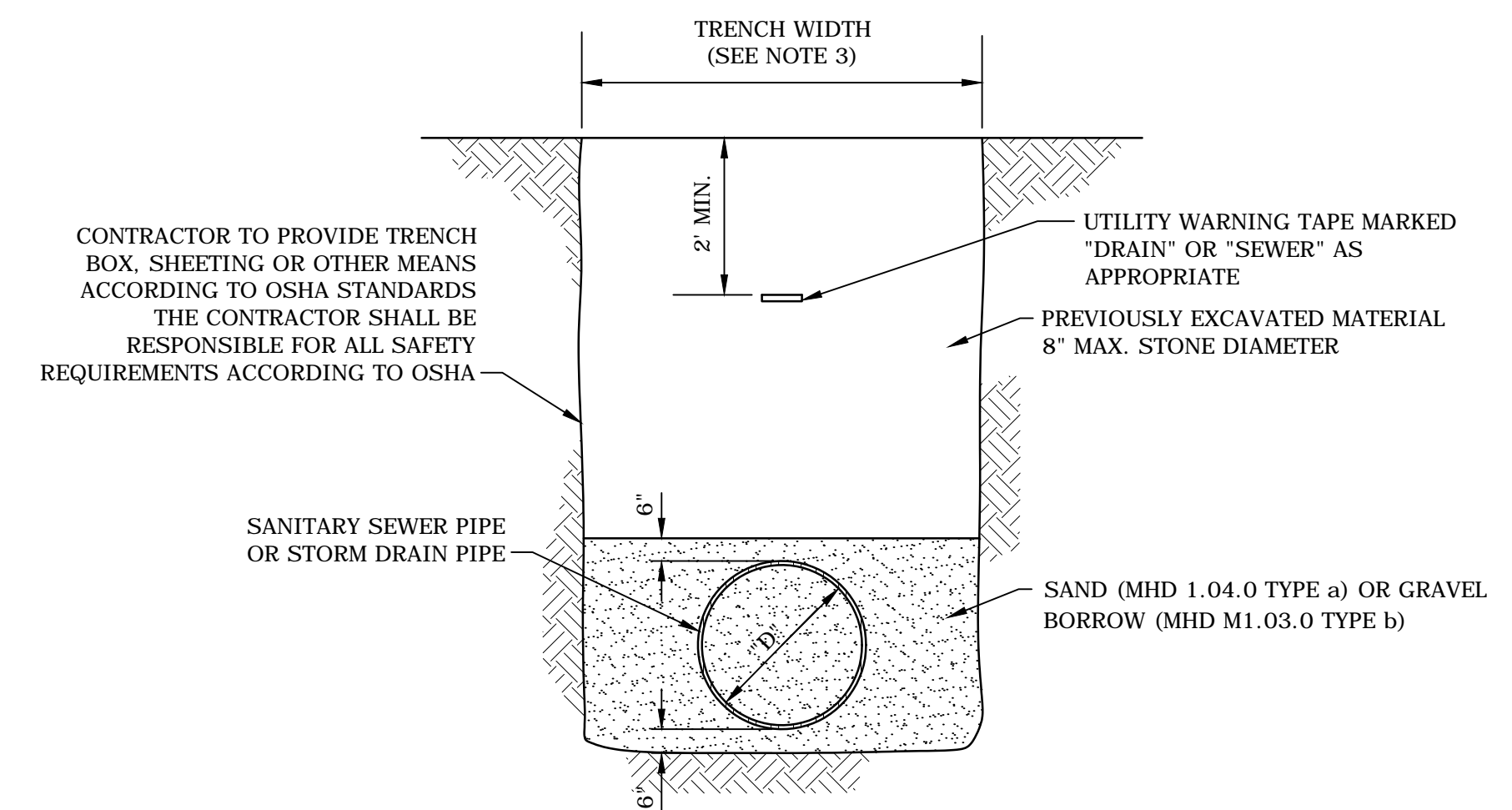
CENTRAL STREET TYPICAL SECTION
NO SCALE



NOTES:

1. WALK TO HAVE 1/4" RADIUS TOOLED DUMMY JOINT 1/4 OF THE THICKNESS OF THE SIDEWALK IN DEPTH EVERY 5 L.F. OF WALK.
2. WALK TO HAVE 1/2" WIDE NON-EXTRUDING PREFORMED EXPANSION JOINT EVERY 20 L.F. OF WALK.

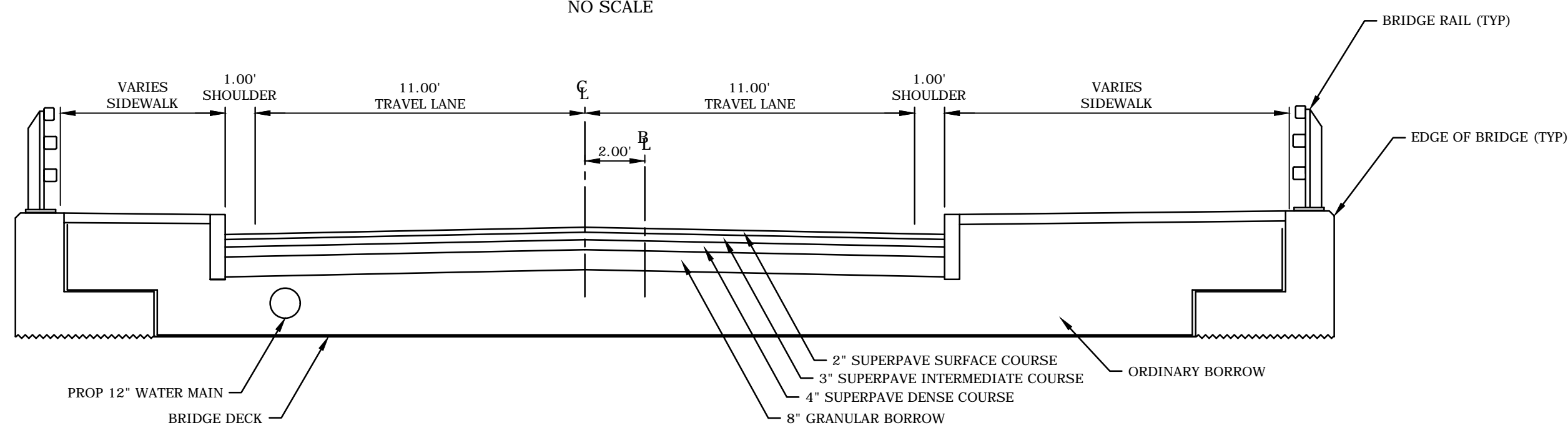
CONCRETE SIDEWALK
NO SCALE



TYPICAL DRAIN LINE AND SEWER TRENCH SECTION
NO SCALE

NOTES:

1. COMPACT ALL BACKFILL MATERIAL WITH VIBRATORY PLATE EQUIPMENT (MINIMUM TWO PASSES) TO A MINIMUM DENSITY OF 95 PERCENT OF THE STANDARD PROCTOR DENSITY AS DETERMINED BY ASTM D698.
2. PLACE BACKFILL MATERIAL IN MAXIMUM ONE FOOT LIFTS.
3. FOR PIPES LESS THAN 24" IN DIAMETER THE TRENCH WIDTH SHALL BE 5.0'. FOR PIPES 24" IN DIAMETER AND GREATER, TRENCH WIDTH SHALL BE THE PIPE DIAMETER PLUS 3.0'.



CENTRAL STREET BRIDGE TYPICAL SECTION
NO SCALE

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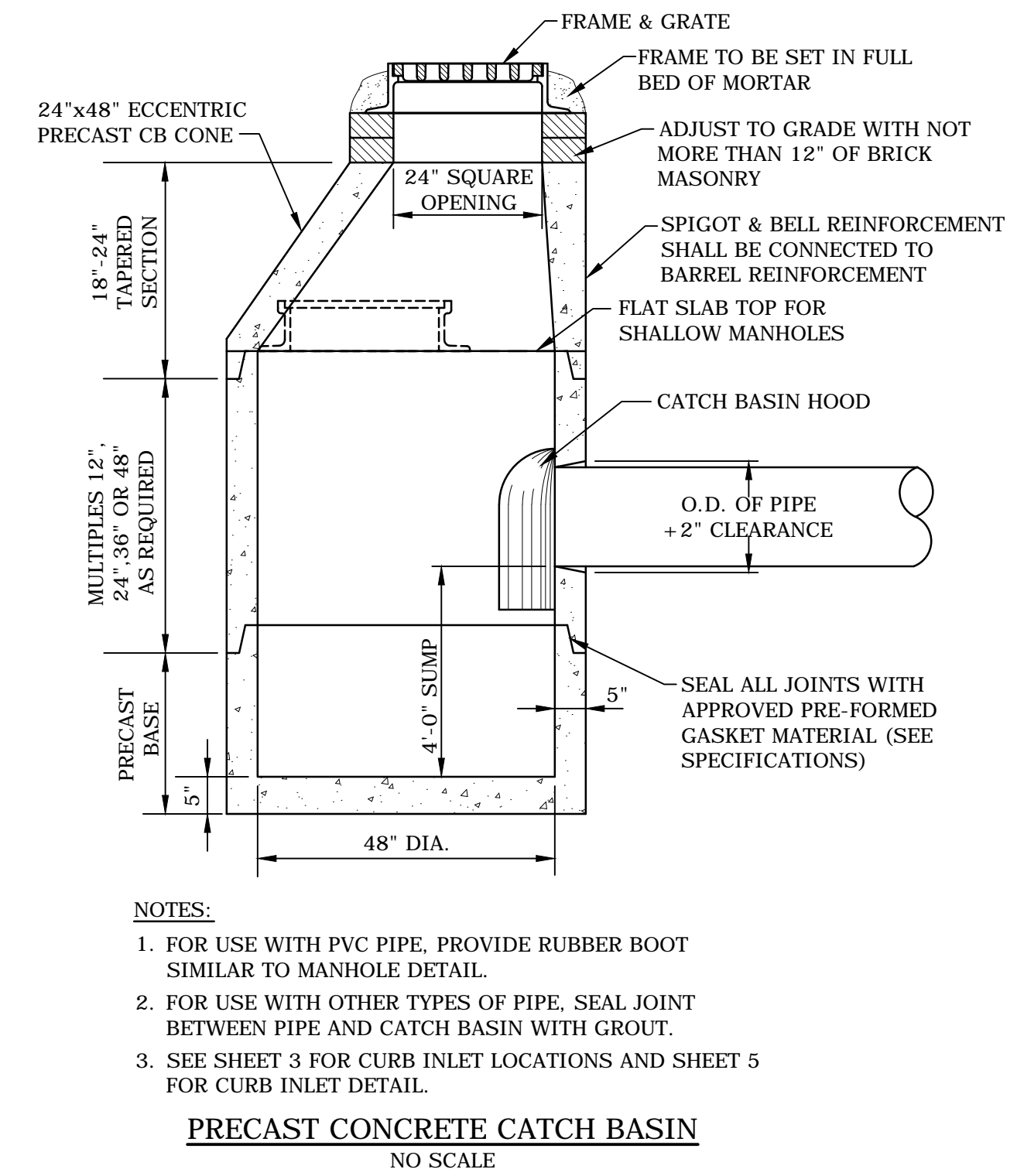
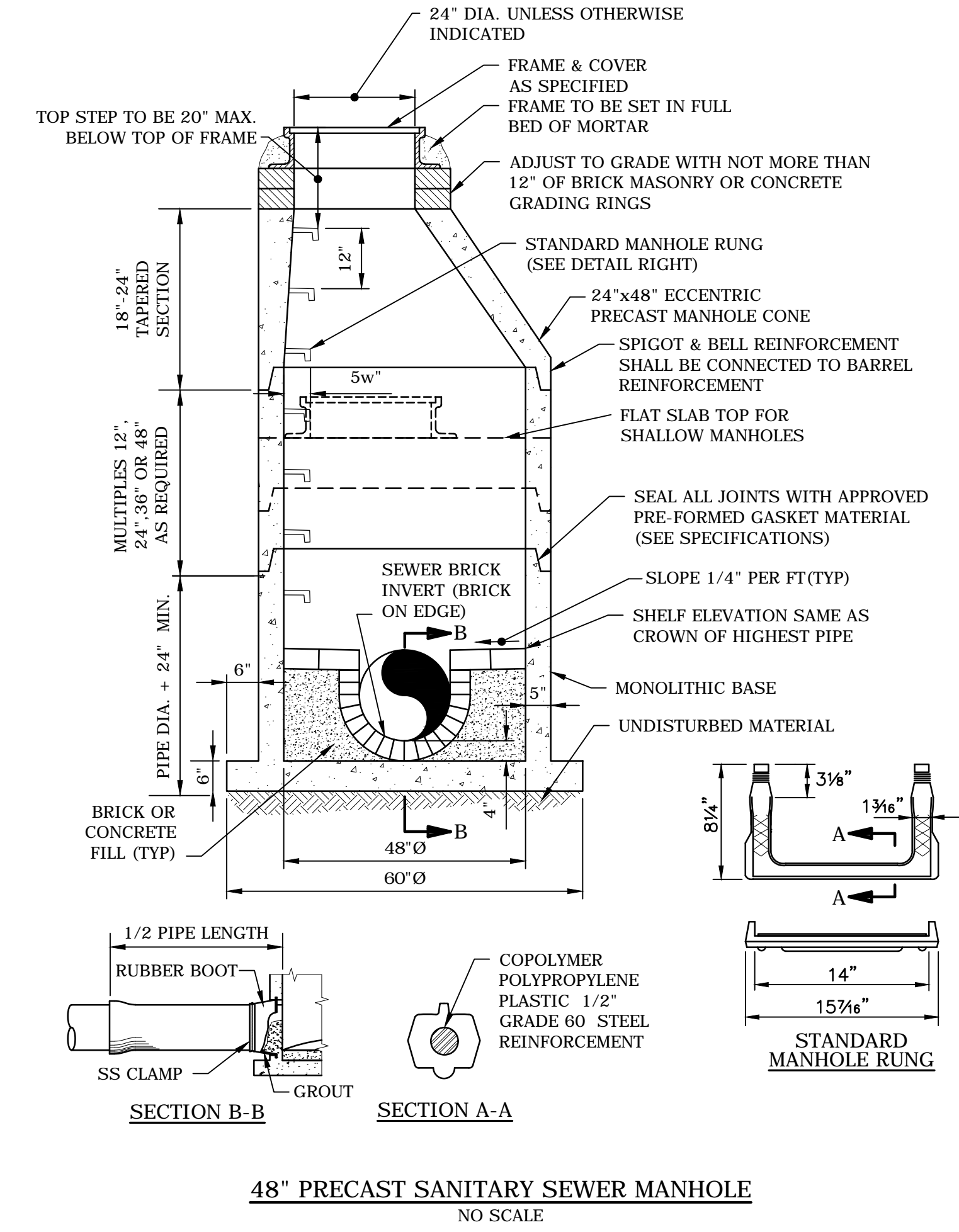
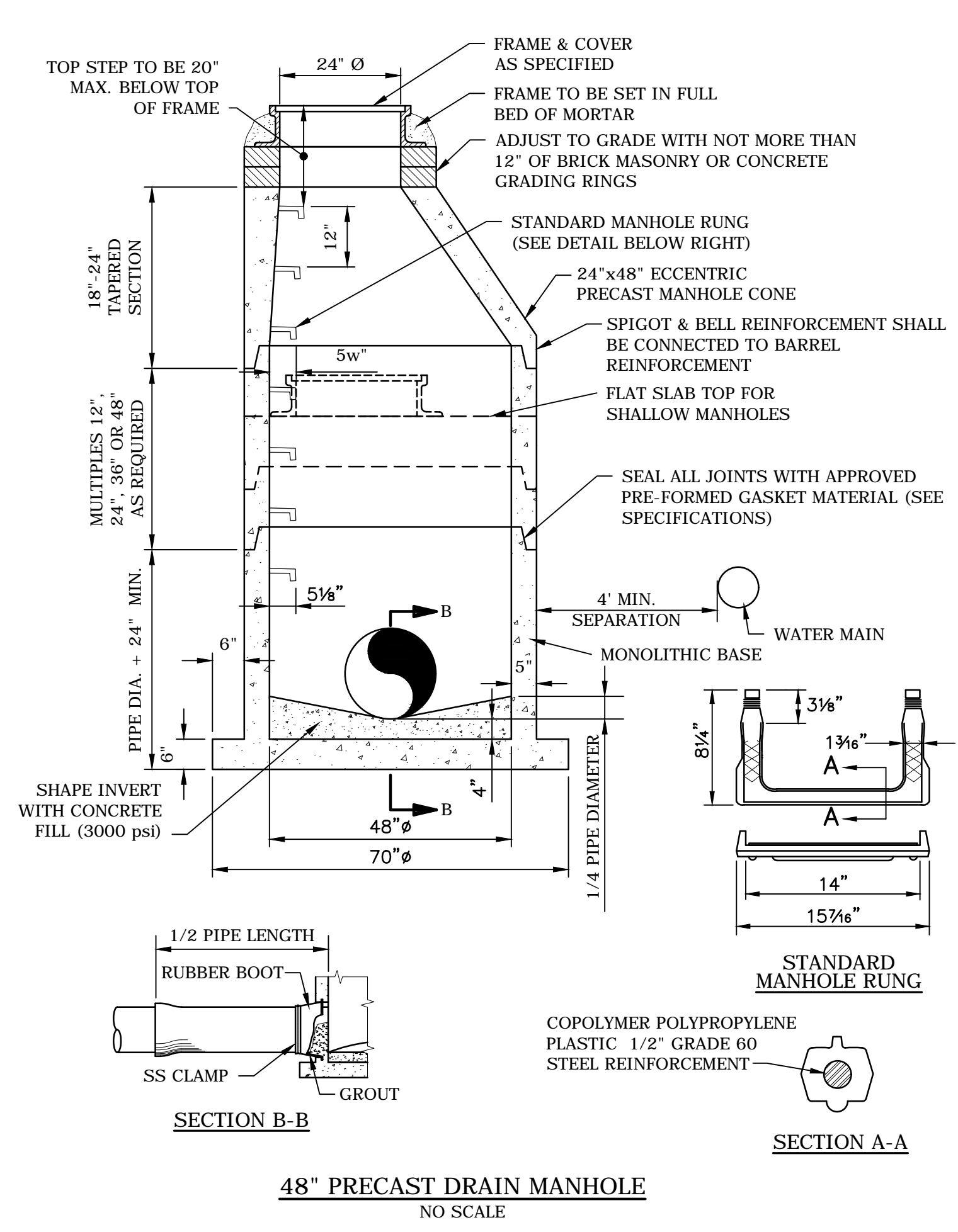
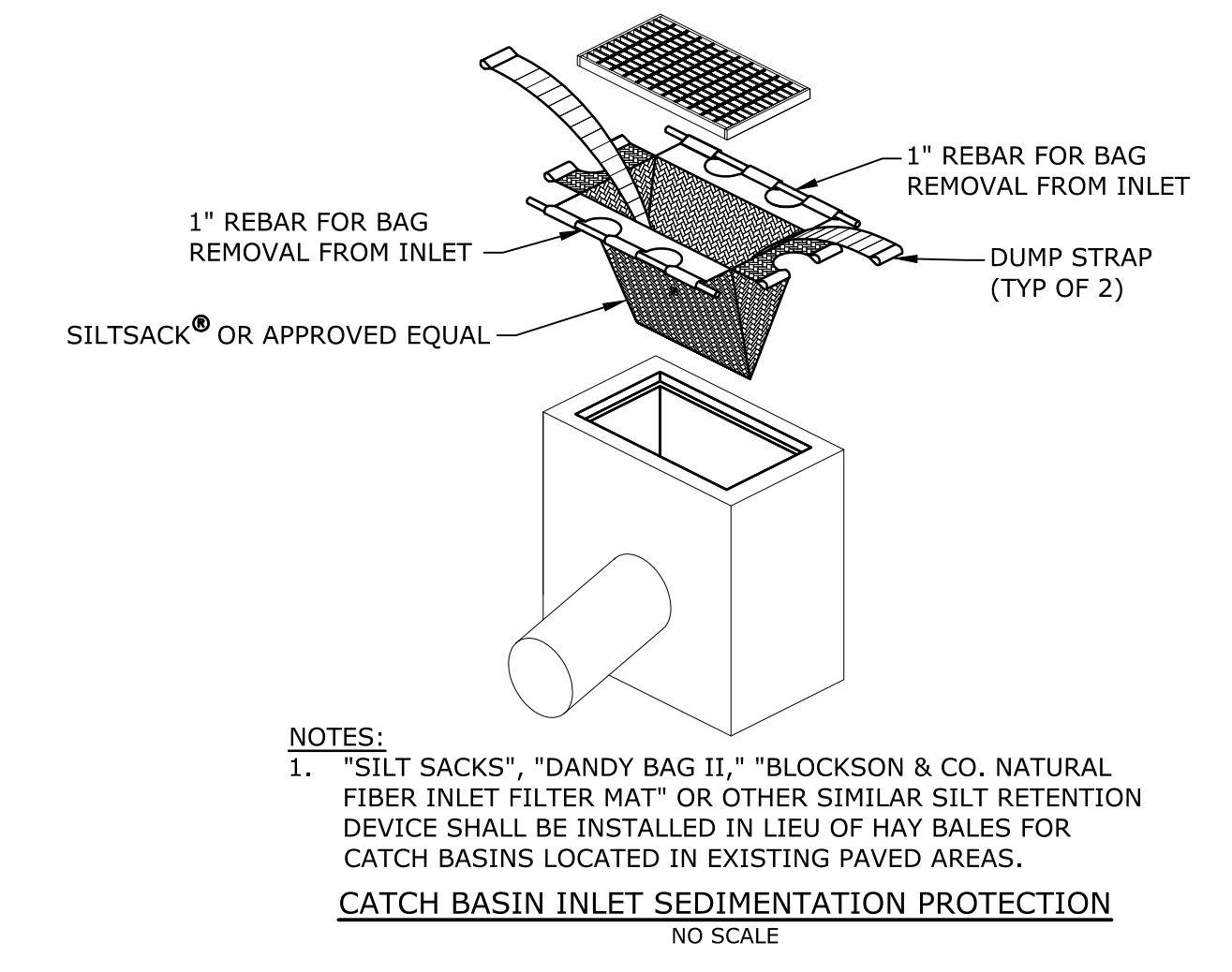
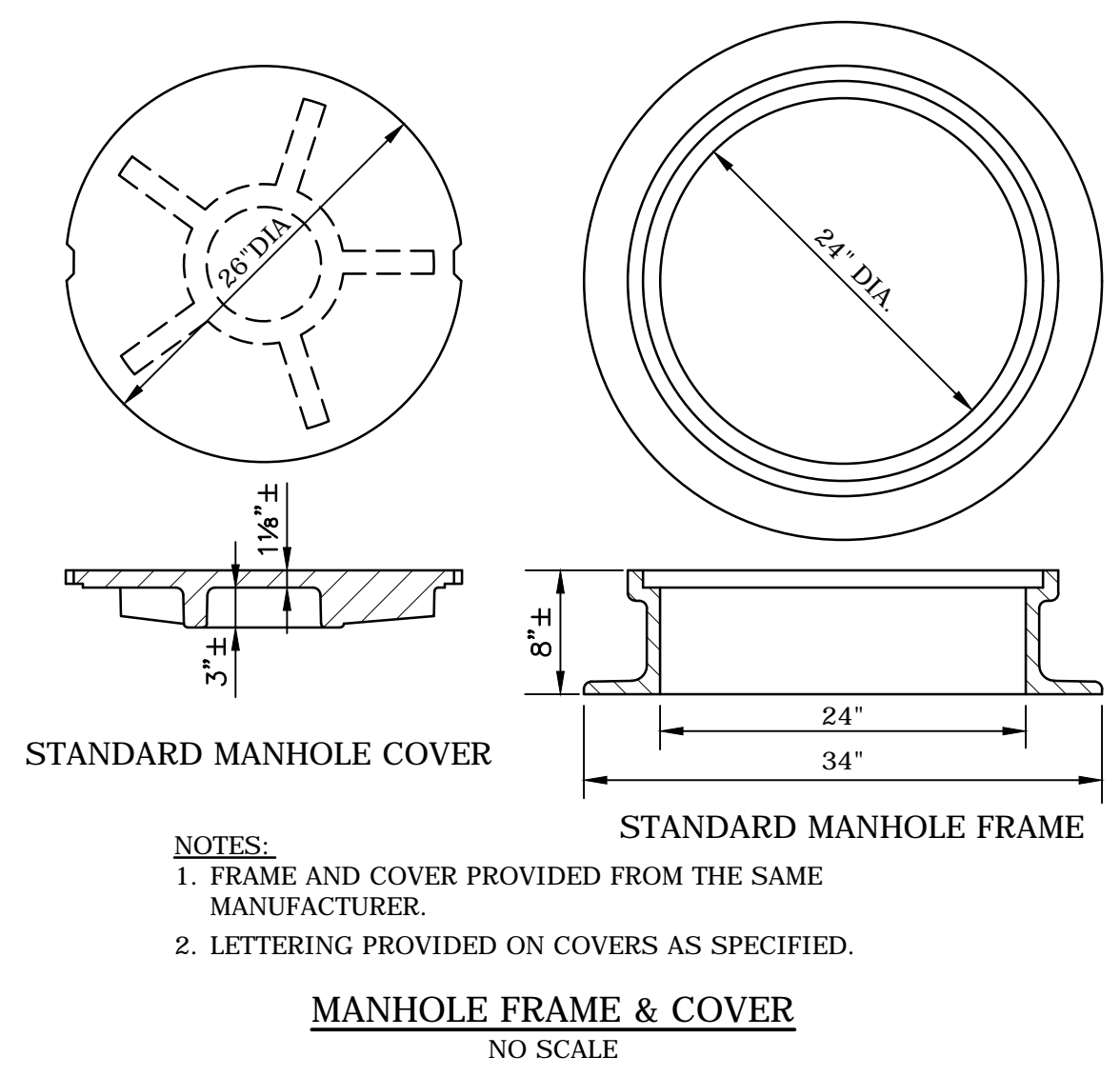
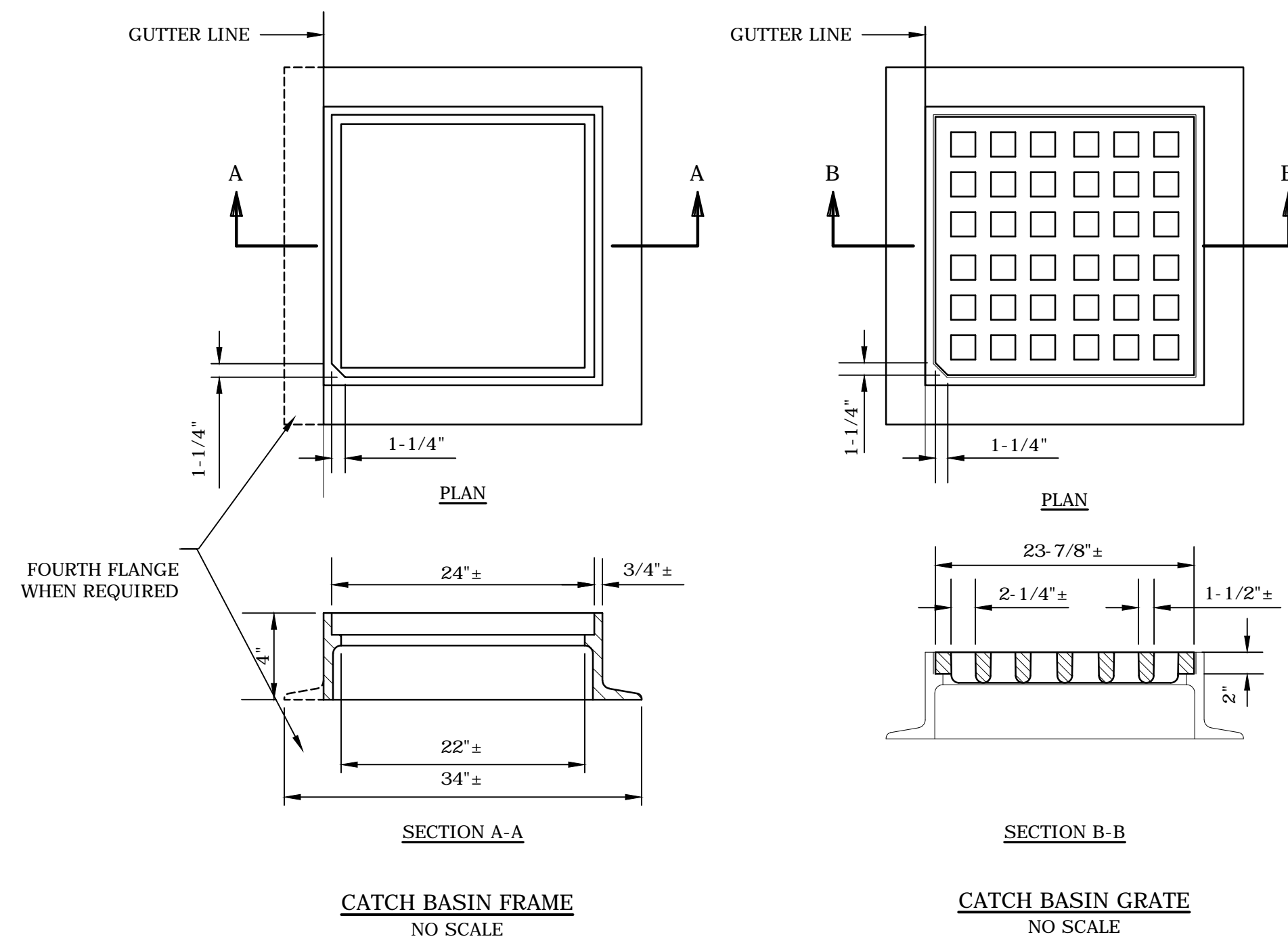
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DATE: MARCH 2021		
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CONSTRUCTION DETAILS

SCALE: AS NOTED

C-501



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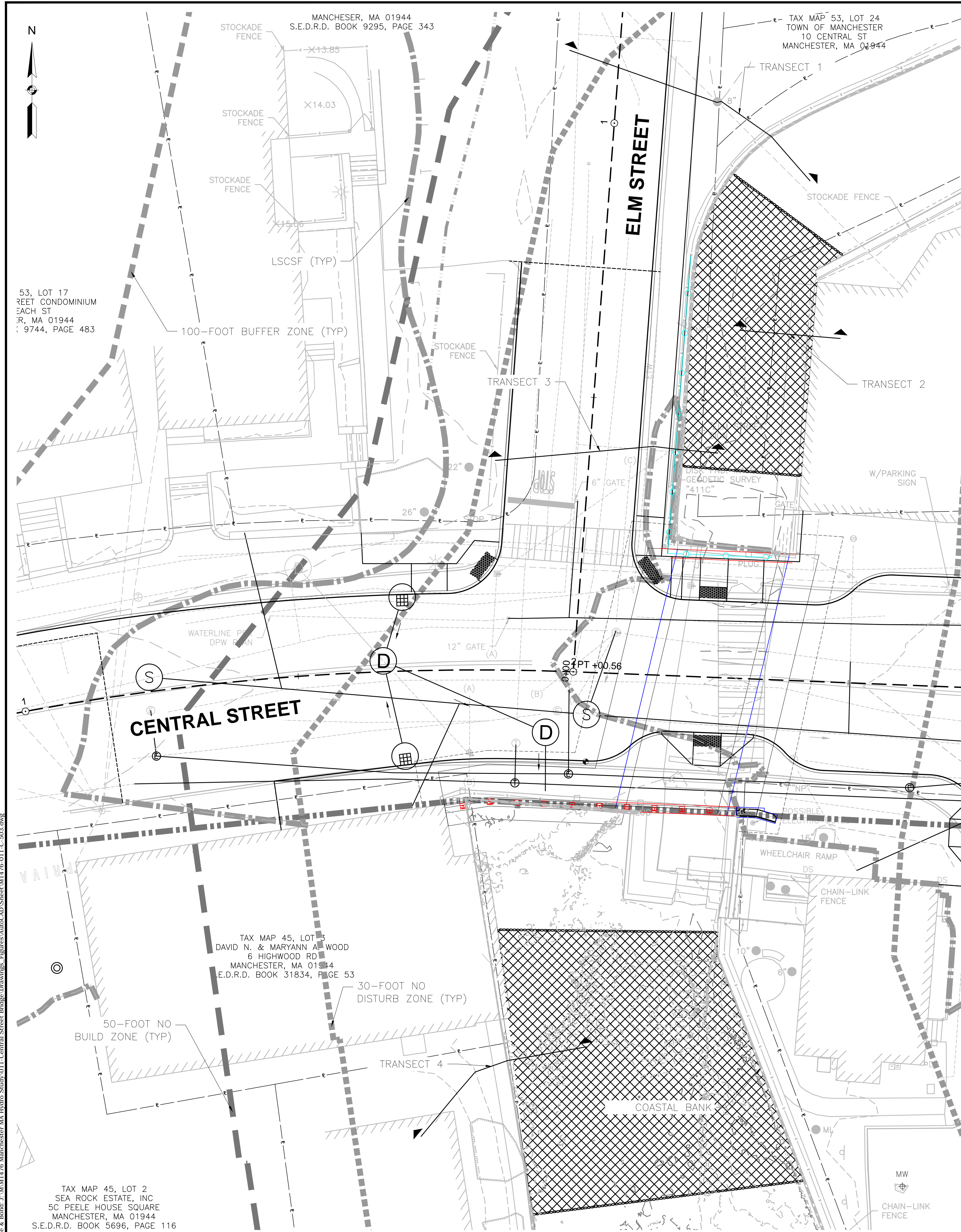
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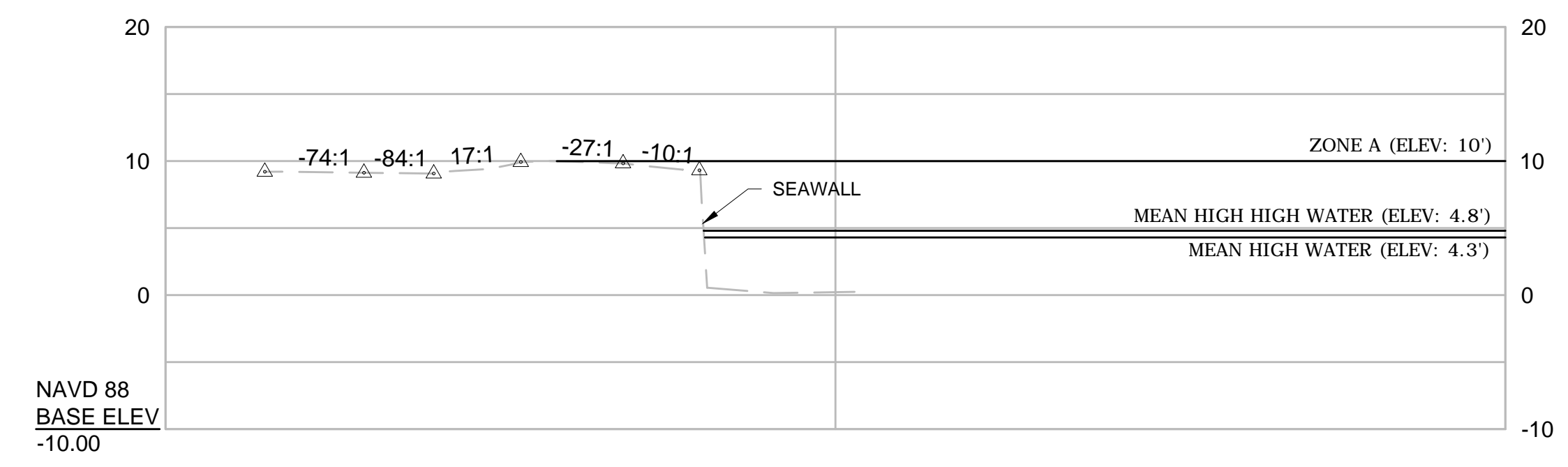
CONSTRUCTION DETAILS

SCALE: AS NOTED

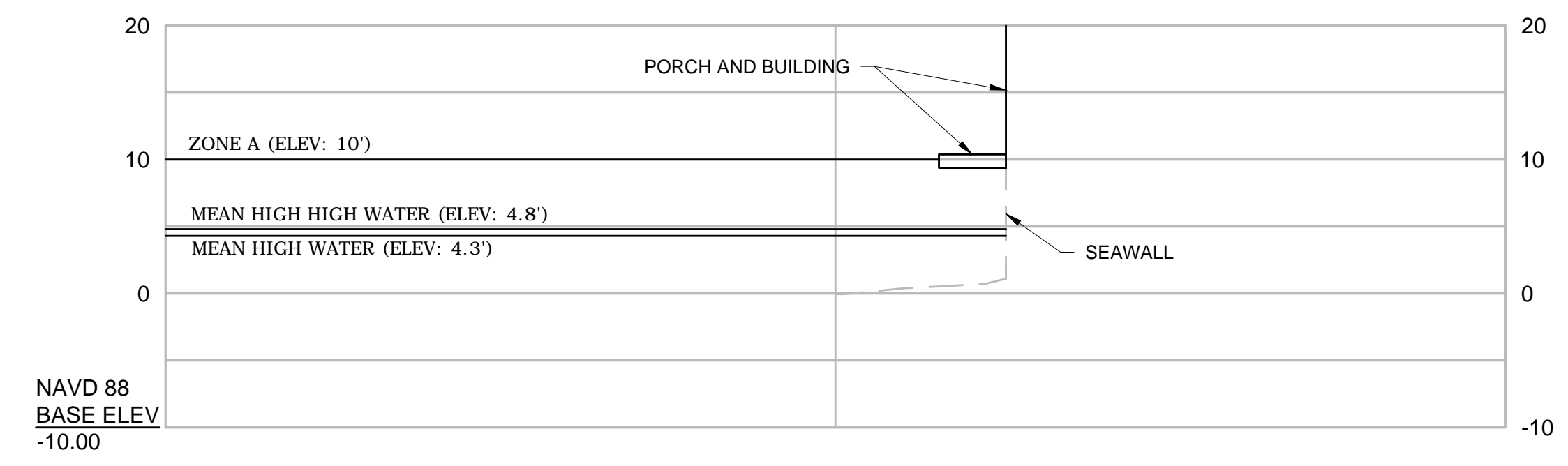
C-502



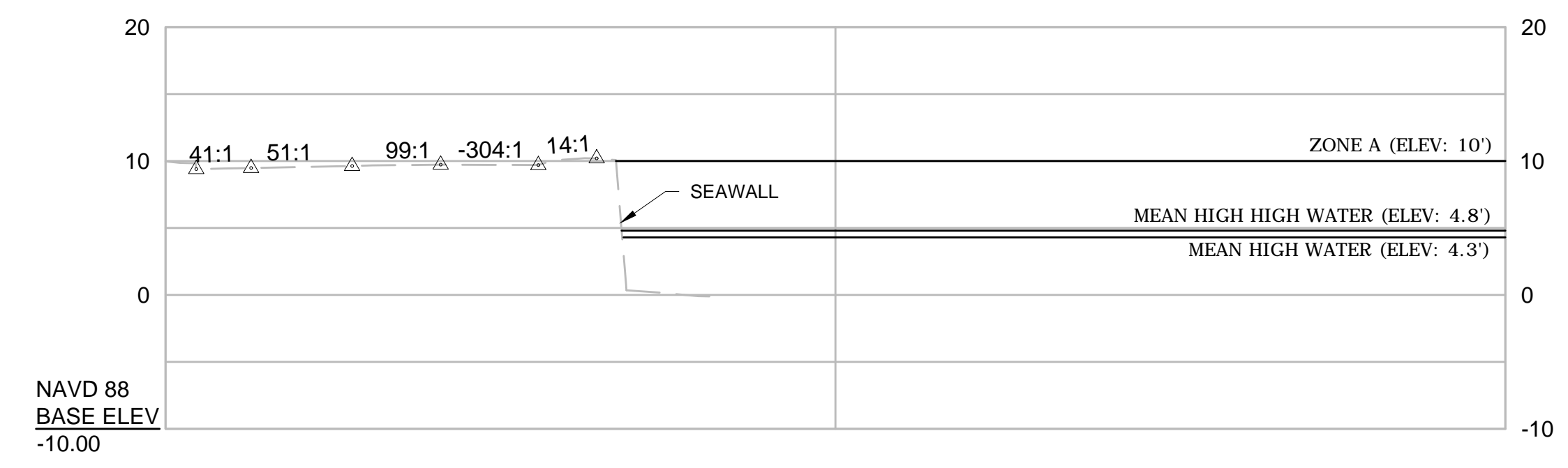
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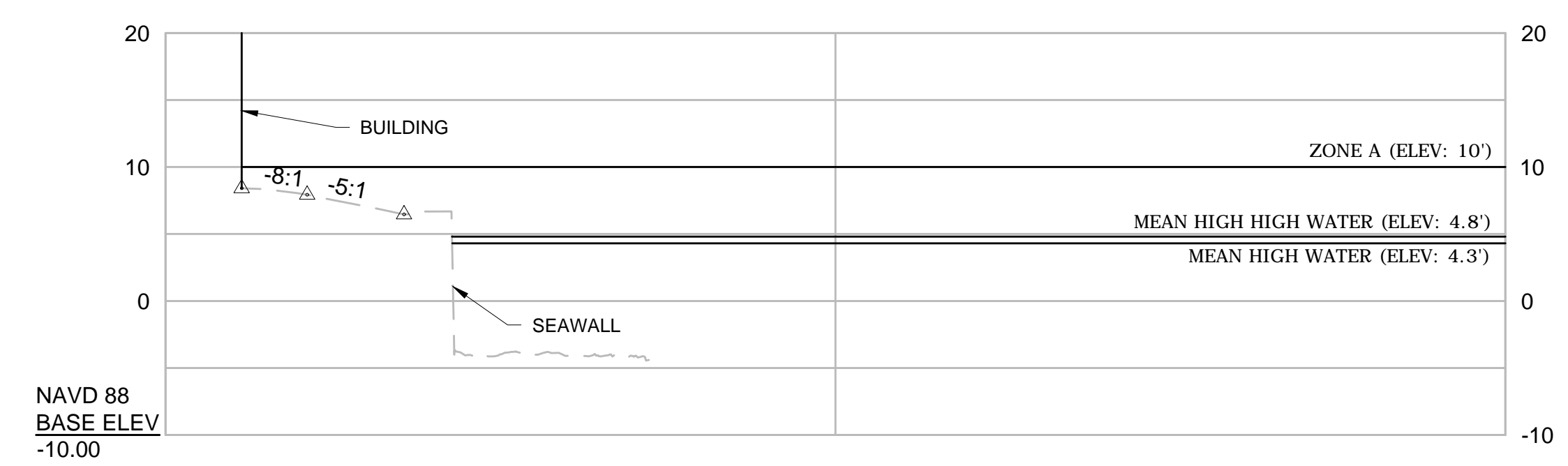
TRANSECT 2



TRANSECT 3



TRANSECT 4



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COASTAL BANK PLAN

SCALE: HORIZ. VERT: 1" = 10'

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BEST MANAGEMENT PRACTICES

INSPECTION AND MAINTENANCE

- SEDIMENT, EROSION CONTROLS, AND BEST MANAGEMENT PRACTICES (BMPS) SHALL BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION AT THE SITE. NO WORK WHICH SHALL DISTURB THE SITE OR CREATE THE POTENTIAL FOR SEDIMENT RELEASE SHALL COMMENCE UNTIL THE SEDIMENT AND EROSION CONTROLS HAVE BEEN INSPECTED AND APPROVED BY THE OWNER, ENGINEER, AND REGULATORY AGENCIES. ALL CONTROLS AND BMPS SHALL BE SUBJECT TO INSPECTION BY THE OWNER, HIS REPRESENTATIVE, AND REGULATORY AGENCIES AT ANYTIME THEREAFTER.
- PERIODIC INSPECTION, MAINTENANCE, AND CLEANING OF TEMPORARY EROSION OF SEDIMENT CONTROL MEASURES AND BMPS SHALL BE REQUIRED. ALL CONTROLS AND BMPS SHALL BE INSPECTED EVERY 7 DAYS AND WITHIN 24 HOURS OF RAINFALL EVENTS OF 0.25 INCHES OR GREATER. ROUTINE INSPECTION AND MAINTENANCE WILL REDUCE THE CHANCE OF POLLUTING STORMWATER BY FINDING AND CORRECTING PROBLEMS BEFORE THE NEXT RAIN EVENT. THE FOCUS OF THE INSPECTION WILL BE TO DETERMINE:
 1. WHETHER OR NOT THE MEASURE WAS INSTALLED / PERFORMED CORRECTLY;
 2. WHETHER OR NOT THERE HAS BEEN ANY DAMAGE TO THE MEASURE SINCE IT WAS INSTALLED OR PERFORMED; AND
 3. WHAT SHOULD BE DONE TO CORRECT ANY PROBLEMS WITH THE MEASURE. EACH MEASURE IS TO BE OBSERVED TO DETERMINE IF IT IS STILL EFFECTIVE.
 IN SOME CASES, SPECIFIC MEASUREMENTS MAY BE TAKEN TO DETERMINE IF MAINTENANCE OF THE MEASURES IS REQUIRED.

SITE MANAGER

- PRIOR TO CONSTRUCTION, A SITE MANAGER WILL BE DESIGNATED BY THE CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION, MONITORING, INSPECTION, AND CORRECTION OF EROSION AND SEDIMENT CONTROL MEASURES.

CONSTRUCTION SITE ENTRANCE

- TO REDUCE THE TRACKING OF SEDIMENT FROM THE CONSTRUCTION SITE ONTO OTHER AREAS OF THE PROPERTY AND/OR PUBLIC ROADS, AS WELL AS THE PRODUCTION OF AIRBORNE DUST, A STABILIZED CONSTRUCTION ENTRANCE IS TO BE ESTABLISHED AT ANY PERMANENT CONSTRUCTION STAGING AREA. THE ENTRANCE IS TO CONSIST OF A 6-INCH THICK PAD OF CRUSHED STONE UNDERLAIN WITH FILTER FABRIC OR A BITUMINOUS CONCRETE APRON. IT IS TO BE REMOVED AND THE AREA RESTORED FOLLOWING CONSTRUCTION.

SITE CLEARING

- DURING SITE CLEARING, EXISTING VEGETATION WITHIN THE OVERALL LIMITS OF CLEARING AND GRUBBING SHALL BE REMOVED, EXCEPT AS OTHERWISE DIRECTED. PRIOR TO ANY SITE CLEARING ACTIVITIES, SEDIMENT CONTROL BARRIERS SHALL BE PLACED ALONG THE OUTER LIMIT OF DISTURBANCE. CLEARING IS TO BE LIMITED TO THOSE AREAS OF PROPOSED WORK. DISTURBED AREAS ARE TO BE KEPT TO A MINIMUM. NO TREE WITH A BREAST HEIGHT DIAMETER OF GREATER THAN 6 INCHES SHALL BE CLEARED FROM AREAS OUTSIDE THE LIMITS OF CLEARING AND GRUBBING WITHOUT PRIOR APPROVAL FROM THE OWNER.

DUST CONTROL

- STANDARD DUST CONTROL MEASURES, INCLUDING SPRAYING AND MISTING SHALL BE USED AS NECESSARY. CALCIUM CHLORIDE SHALL NOT BE ALLOWED ON THIS PROJECT.

STAGING AREAS

- THE CONTRACTOR SHALL COORDINATE LAYDOWN STAGING AREAS FOR STORING EQUIPMENT AND MATERIALS WITH THE OWNER.
- STAGING AREAS SHALL BE SURROUNDED WITH COMPOST FILTER TUBE EROSION BARRIERS ON THE DOWNHILL SIDE.
- DURING AND AFTER CONSTRUCTION, ALL PAVED ROAD AND DRIVEWAY SURFACES ARE TO BE SCRAPED AND BROOMED FREE OF EXCAVATED MATERIALS ON A DAILY BASIS, UNLESS APPROVED BY THE OWNER.

STOCKPILED MATERIALS

- STOCKPILES OF SOIL CREATED DURING CONSTRUCTION ACTIVITIES ARE TO BE SURROUNDED WITH AN EROSION CONTROL BARRIER AROUND THE PERIMETER OF THE STOCKPILE. STOCKPILES OF ERODIBLE MATERIAL ARE TO BE COVERED PRIOR TO INCLEMENT WEATHER WITH A MINIMUM OF 20 MIL POLYETHYLENE SHEETING. STOCKPILES LEFT UNDISTURBED LONGER THAN 14 DAYS SHALL BE SEEDED OR COVERED.

EQUIPMENT FUELING

- EQUIPMENT FUELING AND OTHER ACTIVITIES INVOLVING PETROLEUM, OIL, OR OTHER POTENTIALLY HAZARDOUS SUBSTANCES ARE TO BE PERFORMED AT PRE-APPROVED, DESIGNATED AREAS WITH APPROPRIATE SPILL PREVENTION AND CONTROL MEASURES. PORTABLE SECONDARY CONTAINMENT IS TO BE USED, AND SORBENT MATERIALS ARE TO BE PLACED AROUND THE PERIMETER OF THE FUELING AREA.

CONSTRUCTION DEWATERING

- CONSTRUCTION DEWATERING SHALL BE REQUIRED DURING PORTIONS OF CONSTRUCTION WHICH REQUIRE EXCAVATION OR OTHER ACTIVITIES WHERE GROUNDWATER MAY INTERFERE WITH THE WORK.
- CONSTRUCTION DEWATERING DISCHARGES SHALL BE PRE-TREATED FOR SEDIMENT REMOVAL BY PASSING THROUGH AN APPROPRIATELY SIZED FILTER SOCK, SILT BAG, FRACTIONATION / SEDIMENTATION TANK, OR SEDIMENT TRAP PRIOR TO DISCHARGE, AS NECESSARY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DEWATERING TECHNIQUES AND MAINTAINING DEWATERING PROCEDURES THROUGHOUT THE DURATION OF THE PROJECT.

OUTLET PROTECTION

- APPROPRIATE OUTLET PROTECTION, CONSISTING OF RIPRAP CHANNEL LINING, A LEVEL SPREADER, OR OTHER SUCH MEASURE SHALL BE PROVIDED AT THE OUTLET OF ANY DEWATERING CONDUIT OR STORMWATER CULVERT OR CHANNEL OUTFALL TO REDUCE VELOCITIES AND ENHANCE SEDIMENTATION PRIOR TO DISCHARGE.

LIMITS OF WORK

- THE CONTRACTOR SHALL LINE THE UPGRADIENT BOUNDARY OF WORK AREAS WITH ORANGE SAFETY FENCING BEFORE THE START OF SITE CLEARING ACTIVITIES EXCEPT WHERE CHAIN-LINK FENCING IS NEEDED TO RESTRICT PUBLIC ACCESS.

SURFACE WATER CONTROL

- THE CONTRACTOR MUST MAINTAIN THE SITE FLOWAGE OF SURFACE WATER THROUGH THE WORK AREA IN ACCORDANCE WITH THE SPECIFICATIONS. ALL COFFERDAMS SHALL CONSIST OF NON-ERODIBLE MATERIAL. THE CONTRACTOR SHALL SUBMIT A WATER CONTROL PLAN THAT WILL ADDRESS EMERGENCY MEASURES TO IMPLEMENT IN THE EVENT A STORM OCCURS DURING CONSTRUCTION.

TURBIDITY MONITORING AND CONTROL

- TURBIDITY SHALL BE MONITORED AND CONTROLLED BY THE CONTRACTOR. A TURBIDITY CURTAIN SHALL BE INSTALLED SURROUNDING AREAS OF EXCAVATION AT AND BELOW THE IMPOUNDMENT WATER LINE.
- IF TURBIDITY LEVELS ARE UNACCEPTABLE AS JUDGED BY THE OWNER, ENGINEER, OR REGULATORY AGENCY, ADDITIONAL MEASURES SHALL BE IMPLEMENTED AT NO EXPENSE TO THE OWNER.

TEMPORARY STABILIZATION

- WHEN NECESSARY, TEMPORARY SLOPE PROTECTION SHALL BE PROVIDED BY INSTALLING SEDIMENT TRAP BARRIERS AT THE TOE OF FILLS OR CUT SLOPES. IF ADDITIONAL STABILIZATION IS NEEDED, THEN THE CONTRACTOR SHALL INSTALL MULCH LOGS, MATTING, SUCH AS STRAW, JUTE, WOOD FIBER, OR BIODEGRADABLE MESH. A TACKIFIER SHALL BE USED ON LOOSE MATERIALS USED FOR TEMPORARY EROSION CONTROL.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN TWO WEEKS, THE AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 100 LBS. PER 1,000 S.F. TO HELP CONTROL EROSION. 100% BIODEGRADABLE EROSION CONTROL BLANKETS OR TWO INCHES OF WOOD CHIP MULCH MAY ALSO BE USED AS TEMPORARY COVER.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN ONE MONTH, THE AREAS SHALL BE TOPSOILED AND SEEDED AS PER THE SPECIFICATIONS AND AT NO ADDITIONAL COST TO THE OWNER.
- LEAVE THE SURFACE OF ALL EXCAVATIONS AND FILLS IN A FIRM AND STABLE CONDITION AT THE END OF EACH DAY. ROLL OR OTHERWISE TREAT THE SURFACE AS NEEDED.

SITE RESTORATION

- STABILIZATION OF DISTURBED AREAS OR NEW SOIL FILLS SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY AND PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF PREVIOUSLY VEGETATED UPLAND AREAS DISTURBED BY CONSTRUCTION ACTIVITIES. RESTORATION OF UPLAND AREAS CONSIST OF REPLACEMENT OF TOPSOIL OR PLACEMENT OF IMPORTED LOAM AS NEEDED SUCH THAT A MINIMUM OF 4 INCHES OF SUITABLE MATERIAL IS PRESENT AND APPROPRIATELY LIMED, FERTILIZED, GRADED, AND SCARIFIED. FIELDS DISTURBED OR COMPACTED BY CONSTRUCTION ACTIVITIES SHALL BE PLOWED TO LOOSEN THE SOIL, HARROWED TO PROVIDE AN EVEN SURFACE, AND APPROPRIATELY PREPARED FOR PLANTING.
- DISTURBED UPLAND AREAS SHALL THEN BE HYDROSEEDED WITH AN APPROVED SEED MIX AT THE RATE RECOMMENDED BY THE MANUFACTURER. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING. SEED MIX SHALL BE DRY SITE RESTORATION SEED MIX UNLESS OTHERWISE NOTED OR AS APPROVED BY THE ENGINEER.
- 100% BIODEGRADABLE EROSION CONTROL BLANKETS MUST BE USED FOR STABILIZATION OF SLOPES IN EXCESS OF 3H: 1V AND MAY BE USED IN LIEU OF HYDROSEEDING AT THE CONTRACTOR'S DISCRETION TO PROVIDE ADDITIONAL EROSION PROTECTION.
- FINAL STABILIZATION SHALL BE CONSIDERED COMPLETE WHEN ALL SOIL-DISTURBING ACTIVITIES HAVE BEEN COMPLETED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY PERCENT HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES (SUCH AS THE USE OF MULCHES OR EROSION CONTROL MATTING) HAVE BEEN EMPLOYED ON ALL UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL VEGETATED SURFACES, INCLUDING WATERING, FERTILIZING, REPAIRING EROSION, INVASIVE PLANT REMOVAL, AND RE-SEEDING UNTIL ESTABLISHMENT CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.

EROSION CONTROL NOTES:

1. CONTRACTOR MUST FINALIZE AND IMPLEMENT THE EROSION AND SEDIMENT CONTROL PLAN (ESCP).
2. THE ESCP SHALL BE UPDATED AS CONSTRUCTION PROGRESSES. IT SHOULD REFLECT CURRENT OWNERSHIP, RESPONSIBILITIES, OPERATIONS AND FINDINGS. THE PLAN SHALL BE REVISED NO LATER THAN 7 DAYS AFTER THE INSPECTION. IF HAZARDOUS CONDITIONS OCCUR THE PLAN NEEDS TO BE MODIFIED BEFORE PROCEEDING WITH WORK. STEPS TO PREVENT THE REOCCURRENCE OF SUCH RELEASES WILL BE IDENTIFIED IN A PLAN REVISION AND IMPLEMENTED.
3. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
4. MAINTAIN ALL EROSION CONTROL MEASURES IN GOOD WORKING CONDITION. THIS MAY REQUIRE CLEANING, REPAIRING, REPLACEMENT, AND SEDIMENT DISPOSAL. MAINTENANCE SHALL BE INITIATED WITHIN 24 HOURS OF IDENTIFICATION. SEDIMENT BARRIERS SHOULD HAVE SEDIMENT CLEANED OUT WHEN THE BARRIER IS 50% OF CAPACITY. SOIL AND DEBRIS ON ADJOINING PROPERTIES OR STREETS SHALL BE MINIMIZED. HAZARDOUS MATERIAL SPILLS SHOULD BE REMOVED IMMEDIATELY AND REMEDIAL ACTIONS FOR PREVENTION MUST BE TAKEN. HAZARDOUS MATERIALS SHALL BE CLEANED UP BY REMOVING AND DISPOSING OF CONTAMINATED MATERIALS PROPERLY.
5. SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
6. THE ESCP MEASURES SHOWN ON THIS PLAN ARE THE BASE REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, UPGRADE THESE MEASURES AS NEEDED TO COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL EROSION AND SEDIMENT CONTROL REGULATIONS.
7. EROSION AND SEDIMENT CONTROL MEASURES INCLUDING PERIMETER SEDIMENT CONTROL MUST BE IN PLACE BEFORE VEGETATION IS DISTURBED AND MUST REMAIN IN PLACE AND BE MAINTAINED, CLEANED, REPAIRED OR REPLACED, AND PROMPTLY IMPLEMENTED FOLLOWING PROCEDURES ESTABLISHED FOR THE DURATION OF CONSTRUCTION, INCLUDING PROTECTION FOR ACTIVE STORM DRAIN INLETS AND CATCH BASINS AND APPROPRIATE NON-STORMWATER POLLUTION CONTROLS.
8. PHASE CLEARING AND GRADING TO THE MAXIMUM EXTENT PRACTICAL TO PREVENT EXPOSED INACTIVE AREAS FROM BECOMING A SOURCE OF EROSION. CONSTRUCTION ACTIVITIES MUST AVOID OR MINIMIZE UNSTABILIZED EXCAVATION AND CREATION OF BARE GROUND DURING WET WEATHER.
9. PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO PREVENT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
10. IDENTIFY, MARK, AND PROTECT (BY FENCING OFF OR OTHER MEANS) CRITICAL RIPARIAN AREAS AND VEGETATION INCLUDING ALL TREES AND ASSOCIATED ROOTING ZONES, AND VEGETATION AREAS NOT SPECIFICALLY IDENTIFIED FOR REMOVAL. MARK IN THE FIELD VEGETATIVE BUFFER ZONES BETWEEN THE SITE AND SENSITIVE AREAS (E.G., WETLANDS), AND OTHER AREAS TO BE PRESERVED, ESPECIALLY IN PERIMETER AREAS.
11. THE INTENTIONAL WASHING OF SEDIMENT INTO SAWMILL BROOK MUST NOT OCCUR. VACUUMING OR DRY SWEEPING AND MATERIAL PICKUP MUST BE USED TO CLEANUP SEDIMENTS.
12. STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY.
13. APPLY TEMPORARY AND/OR PERMANENT SOIL STABILIZATION MEASURES ON ALL DISTURBED AREAS AS GRADING PROGRESSES AND FOR ALL ROADWAYS INCLUDING GRAVEL ROADWAYS.
14. ESTABLISH CONCRETE TRUCK AND OTHER CONCRETE EQUIPMENT CONTAINED WASHOUT AREAS BEFORE BEGINNING CONCRETE WORK. CONCRETE WASHOUT MUST BE CONTAINED AWAY FROM DRAINAGE AREAS. IT MUST BE CLEARLY MARKED AND ACCESSIBLE.
15. ESTABLISH MATERIAL AND WASTE STORAGE AREAS, AND OTHER NON-STORMWATER CONTROLS. DISPOSAL OF MATERIALS AND WASTE SHALL COMPLY WITH STATE AND LOCAL WASTE DISPOSAL. SANITARY WASTE AND OTHER HAZARDOUS WASTE SHALL BE DISPOSED OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
16. DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER. DISCHARGE WATER FROM DEWATERING TO THE APPROPRIATE LOCATION AND WITHOUT SEDIMENT.
17. ALL SILT-LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS IN A SEDIMENTATION BASIN OR FILTER BAG LOCATED DOWNSTREAM, PRIOR TO RELEASE TO A WATERWAY OR EXISTING DRAINAGE SYSTEM.
18. PREVENT TRACKING OF SEDIMENT OUTSIDE OF PROJECT LIMITS USING BMPS SUCH AS: GRAVELED (OR PAVED) EXITS AND PARKING AREAS, GRAVEL ALL UNPAVED ROADS LOCATED ONSITE, OR USE AN EXIT TIRE WASH. THESE BMPS MUST BE IN PLACE PRIOR TO LAND-DISTURBING ACTIVITIES. AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHT-OF-WAYS BEYOND THE PROJECT LIMITS SHALL BE SWEEP AWAY.
19. WHEN TRUCKING SATURATED SOILS FROM THE SITE, EITHER USE WATER-TIGHT TRUCKS OR DEWATER LOADS ON SITE.
20. BMP'S SHOULD BE IMPLEMENTED AND MONITORED THROUGHOUT THE PROJECT. USE BMPS TO PREVENT OR MINIMIZE STORMWATER EXPOSURE TO POLLUTANTS FROM SPILLS; VEHICLE AND EQUIPMENT FUELING, MAINTENANCE, AND STORAGE; OTHER CLEANING AND MAINTENANCE ACTIVITIES; AND WASTE HANDLING ACTIVITIES. THESE POLLUTANTS INCLUDE FUEL, HYDRAULIC FLUID, AND OTHER OILS FROM VEHICLES AND MACHINERY, AS WELL AS DEBRIS, LEFTOVER PAINTS, SOLVENTS, AND GLUES FROM CONSTRUCTION OPERATIONS.
21. WRITTEN SPILL PREVENTION AND RESPONSE PROCEDURES, EMPLOYEE TRAINING ON SPILL PREVENTION AND PROPER DISPOSAL PROCEDURES, SPILL KITS IN ALL VEHICLES, REGULAR MAINTENANCE SCHEDULE FOR VEHICLES AND MACHINERY, MATERIAL DELIVERY AND STORAGE CONTROLS, TRAINING AND SIGNAGE, AND COVERED STORAGE AREAS FOR WASTE AND SUPPLIES. HAZARDOUS MATERIALS SHOULD BE STORED AWAY FROM THE STREAM TO ELIMINATE CHANCES FOR ACCIDENTAL SPILL SHALL BE IMPLEMENTED.
22. IF A TREATMENT (FOR EXAMPLE, ELECTRO-COAGULATION, FLOCCULATION, FILTRATION, ETC.) FOR SEDIMENT OR OTHER POLLUTANT REMOVAL IS EMPLOYED, SUBMIT AN OPERATION AND MAINTENANCE PLAN (INCLUDING SYSTEM SCHEMATIC, LOCATION OF SYSTEM, LOCATION OF INLET, LOCATION OF DISCHARGE, DISCHARGE DISPERSION DEVICE DESIGN, AND A SAMPLING PLAN AND FREQUENCY) BEFORE OPERATING THE TREATMENT SYSTEM. OBTAIN ENGINEER'S PLAN REVIEW BEFORE OPERATING THE TREATMENT SYSTEM. OPERATE AND MAINTAIN THE TREATMENT SYSTEM ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
23. TEMPORARILY STABILIZE SOILS AT THE END OF THE SHIFT BEFORE HOLIDAYS AND WEEKENDS. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT SOILS ARE STABLE DURING EVENTS AT ANY TIME.
24. STABILIZING PRACTICES : SEEDING WITH MULCH AND ROLLED EROSION CONTROL MATTING. ANY AREAS NOT SUBJECT TO CONSTRUCTION ACTIVITY FOR 14 DAYS MUST BE STABILIZED IMMEDIATELY. PRESERVE EXISTING VEGETATION IN AREAS NOT DISTURBED DURING CONSTRUCTION. ANY ON SITE STOCK PILES SHALL BE STABILIZED WITHIN 14 DAYS AFTER CONSTRUCTION ACTIVITY HAS CEASED WITH SEDIMENT BARRIERS INSTALLED.
25. FINAL STABILIZATION: MEANS THAT ALL SOIL DISTURBING ACTIVITIES AT THE SITE HAVE BEEN COMPLETED AND THAT A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% FOR THE AREA HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES HAVE BEEN EMPLOYED.

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

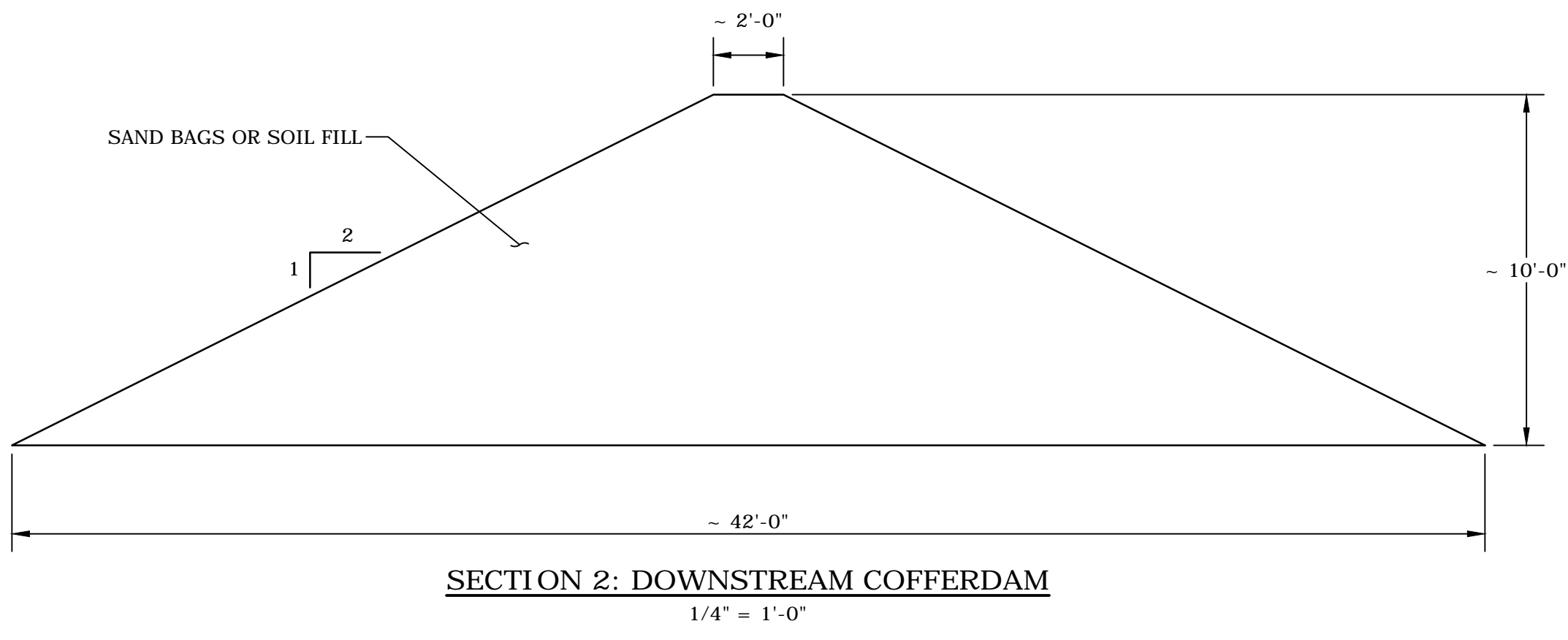
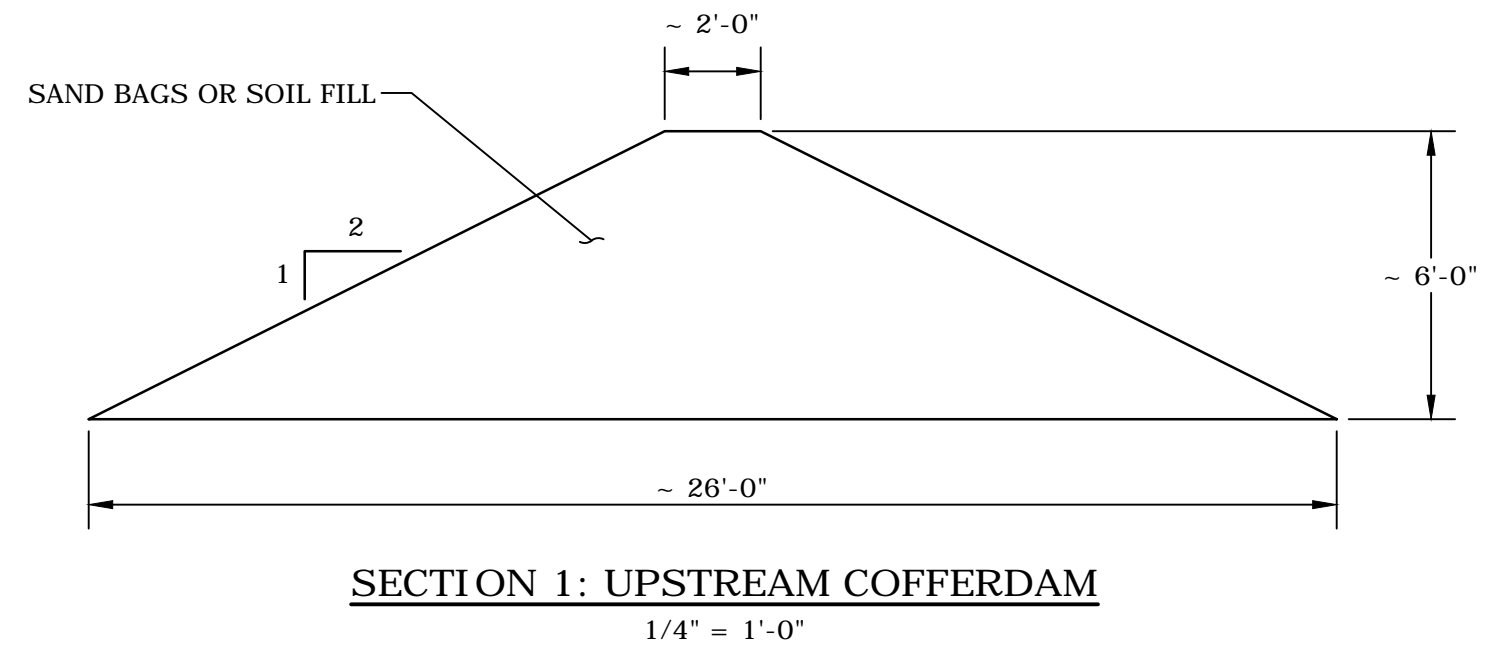
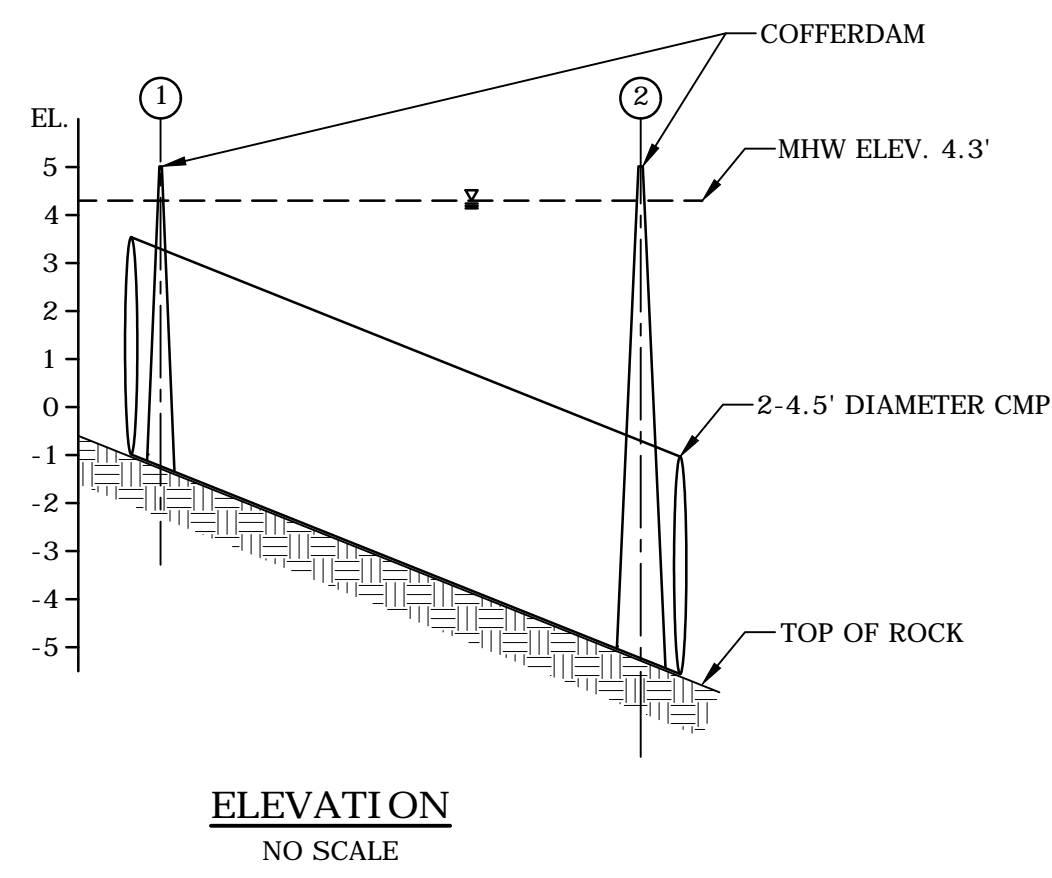
Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	MARCH 2021	
FILE:	M1476-011-C-501.dwg	
DRAWN BY:	DWB	
CHECKED:	ADF	
APPROVED:	DLL	

CONTROL OF WATER NOTES

SCALE: AS NOTED

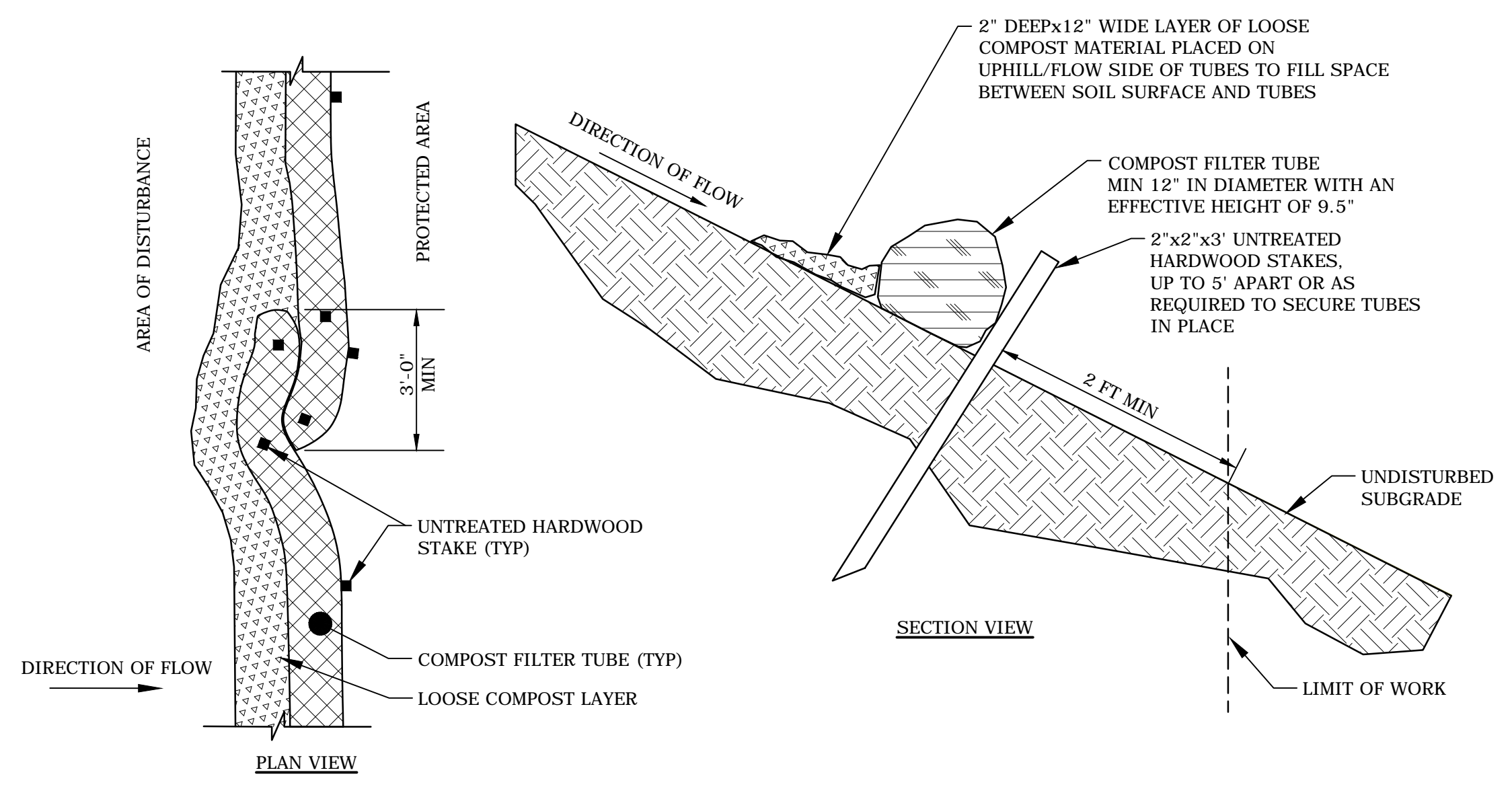
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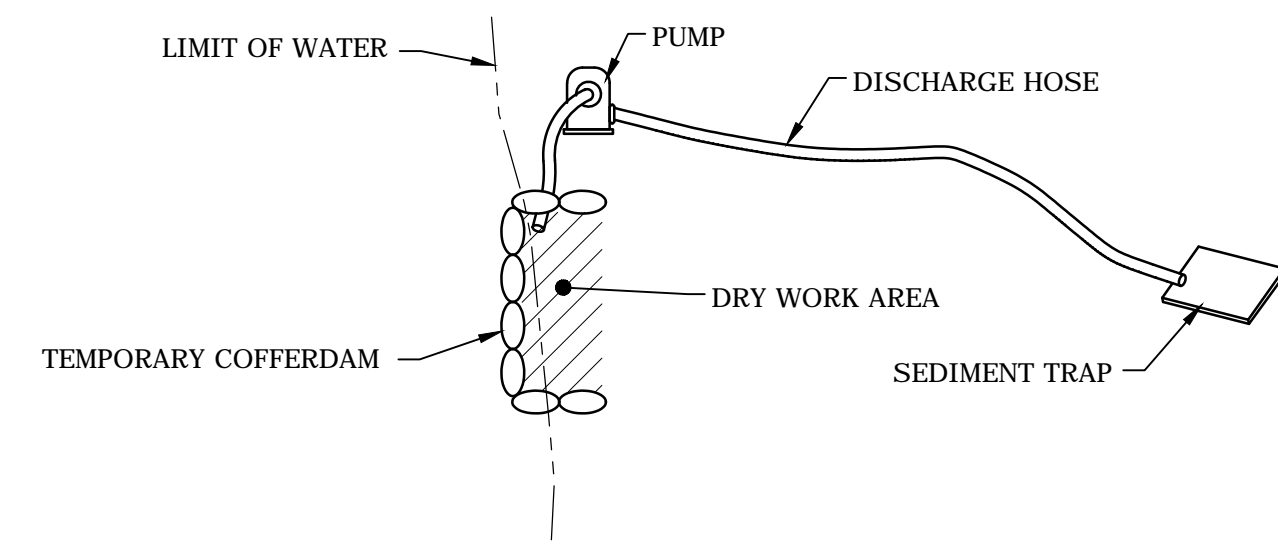
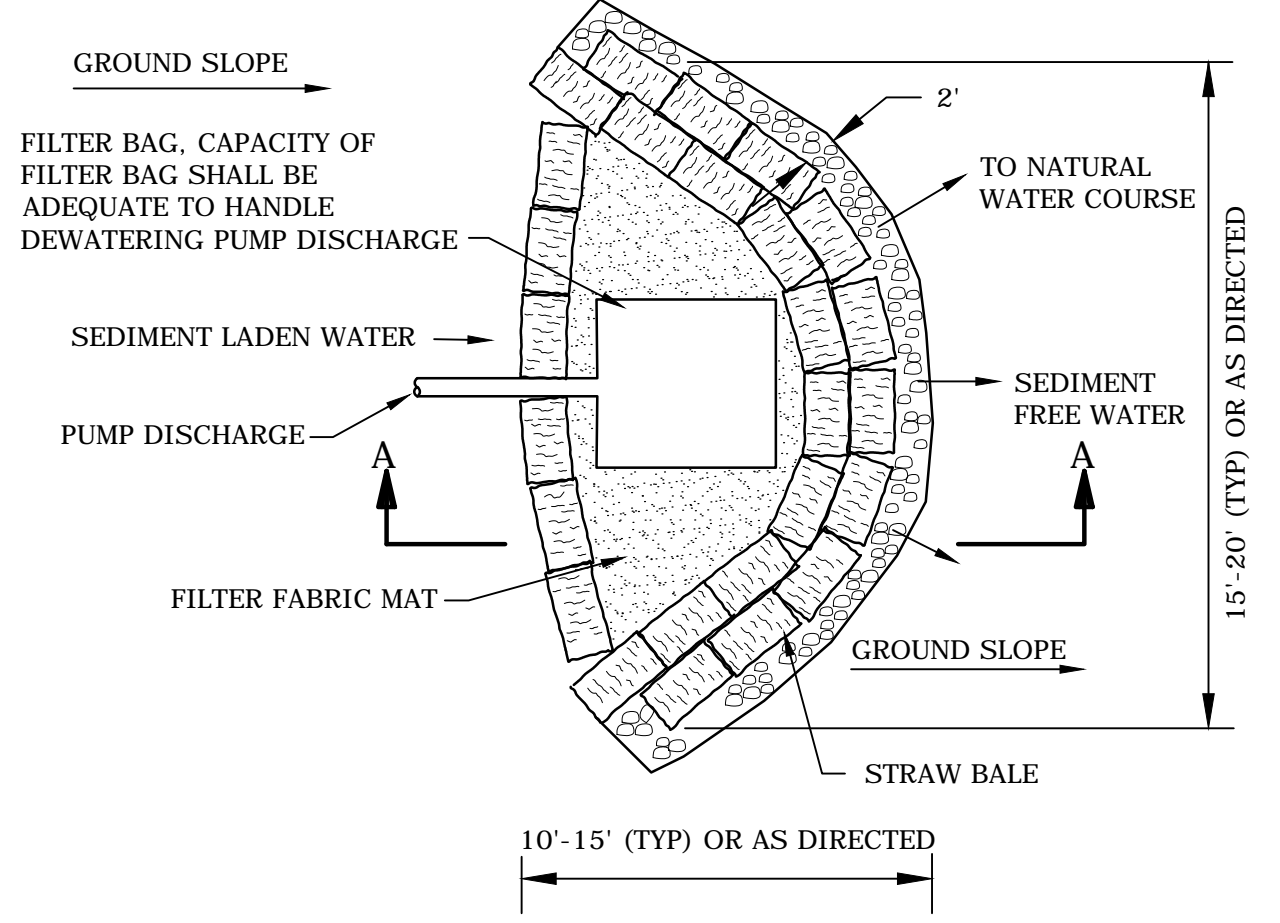
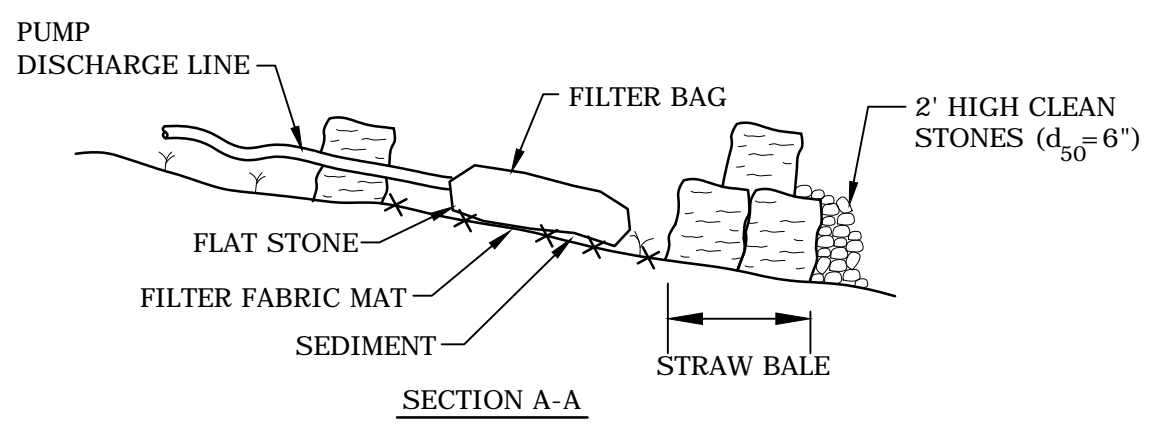
COFFERDAMS, PUMPING, DEWATERING, AND STREAM BYPASS NOTES:

- THE DETAILS SHOWN ON THIS SHEET ARE AN EXAMPLE OF ACCEPTABLE METHODS TO USE DURING CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND SUBMITTING A COFFERDAM PLAN, PUMPING AND DEWATERING PLAN FOR REVIEW AND APPROVAL BY THE CONTRACTING AGENCY OR ENGINEER. THE PLAN SHALL INCLUDE SUFFICIENT DETAIL OF MEANS AND METHODS TO SATISFY THE PROJECT SPECIFICATIONS AND PERMIT REQUIREMENTS. IF APPROVED, OTHER METHODS MAY BE USED SUCH AS UTILIZING INFLATABLE BLADDERS, PLATES, OR BARRIERS OF VARIOUS MATERIALS. COFFERDAMS SHALL INCLUDE PLASTIC LINER OR FINE MESH SILT FENCE TO REDUCE TURBIDITY AND FINES FROM ENTERING THE FREE FLOWING PORTION OF LIVE WATER.
- THE CONTRACTING AGENCY IS RESPONSIBLE FOR MEASURING TURBIDITY HOWEVER THE CONTRACTOR SHALL ADHERE TO THE SPECIAL PROCEDURES REGARDING IN-STREAM WORK, TURBIDITY, AND DEWATERING IN THE DESIGN DRAWINGS.
- CONSERVATION MEASURES ARE SUMMARIZED IN THE PLANS AND SHALL BE STRICTLY ADHERED TO.
- THE CONTRACTOR SHALL NOTIFY THE OWNER AND CONTRACTING OFFICER AT LEAST 5 DAYS BEFORE EACH COFFERDAM INSTALLATION DATE. ANTICIPATED COFFERDAM LOCATIONS ARE SHOWN IN THE PLANS.
- FILL MATERIAL FOR BULK BAGS FOR "SUPER SACKS", IF USED, SHALL BE CLEAN, WASHED, AND ROUNDED MATERIAL MEETING STANDARD SPECIFICATIONS FOR DRAIN ROCK, STREAMBED AGGREGATES, STREAMBED SEDIMENTS, OR STREAMBED COBBLES. MATERIAL USED TO FILL BULK BAGS SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PERMITS. IF PERMITS ALLOW, MATERIAL MAY BE DISPOSED OF IN UPLAND AREAS AS DIRECTED BY THE CONTRACTING OFFICER.
- DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
- EXCAVATIONS ASSOCIATED WITH CHANNEL, FLOODPLAIN, AND STRUCTURES SHALL BE DEWATERED.
- WATER SHALL BE PUMPED AND DISCHARGED AWAY FROM THE WORK AREAS TO SEDIMENT TRAPS.
- DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
- ALL PUMP INTAKES SHALL BE SCREENED FOR FISH PROTECTION AS REQUIRED BY NOAA.
- ALL EARTHWORK ACTIVITIES AND STRUCTURE CONSTRUCTION WITHIN THE ORDINARY HIGH WATER CHANNEL SHALL CONFORM TO THE WATER QUALITY STANDARDS ESTABLISHED BY REGULATORY AGENCY PERMITS FOR THIS PROJECT.

DATUMS FOR 8443970, BOSTON MA (NAVD88)	
MHHW	4.77
MHW	4.33
MSL	-0.30
MLW	-5.16
MLLW	-5.51



COMPOST FILTER TUBE
NO SCALE



- NOTES:**
- DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS AND SHALL DISCHARGE OUTSIDE OF THE WETLAND BOUNDARY AS SHOWN ON SHEET C-001.
 - DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION.

SEDIMENT TRAP AND DEWATERING
NO SCALE

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

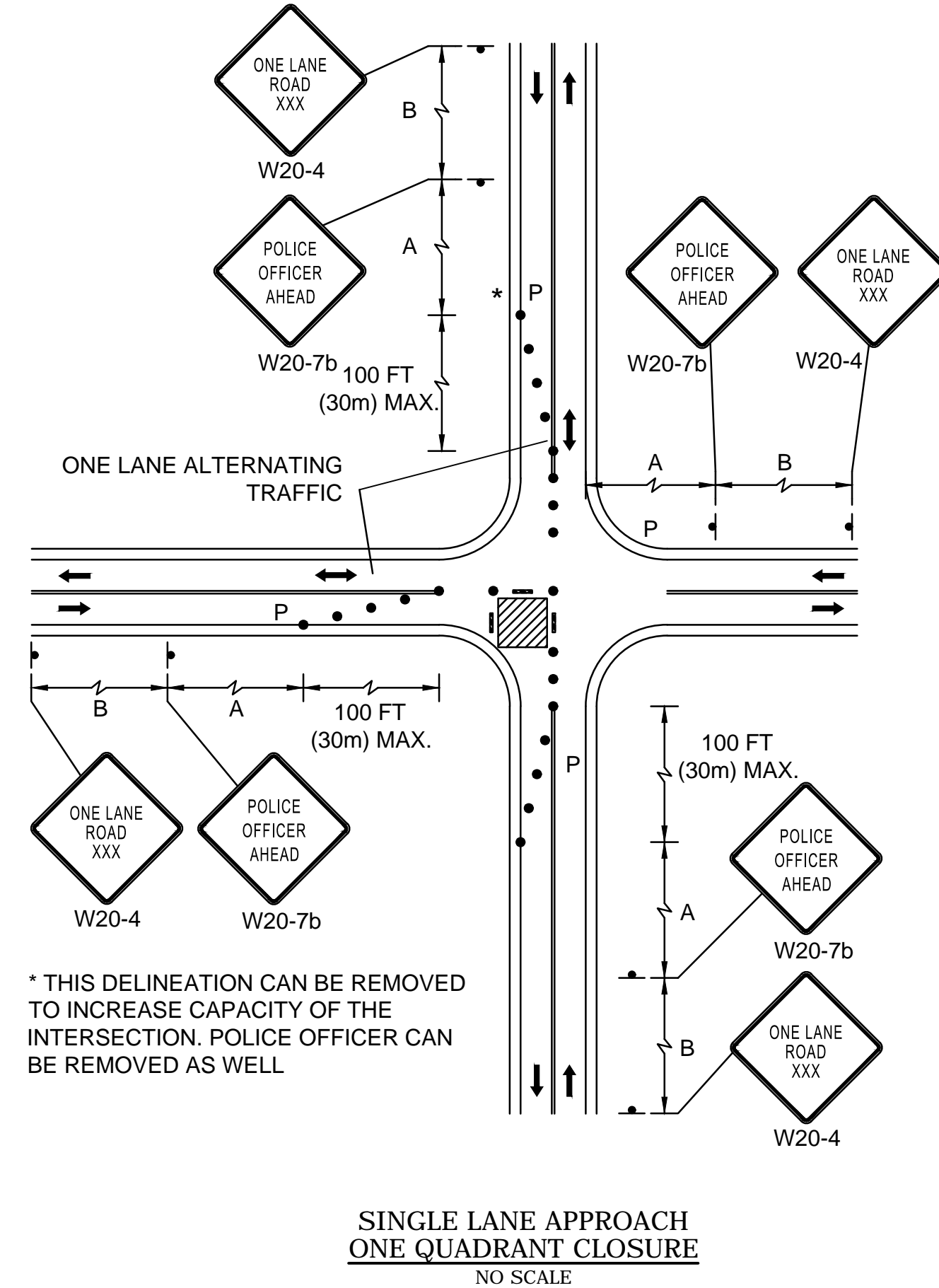
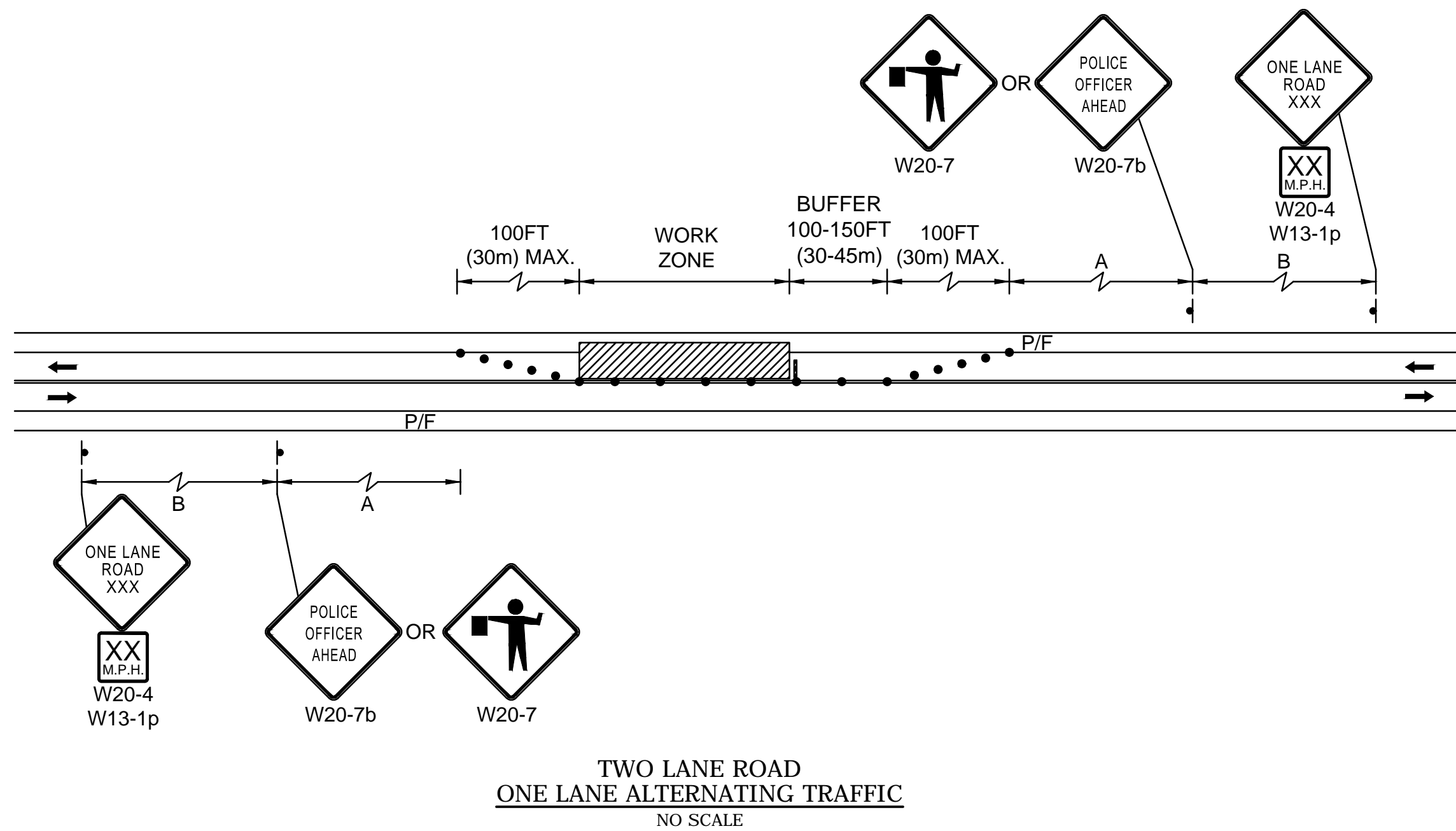
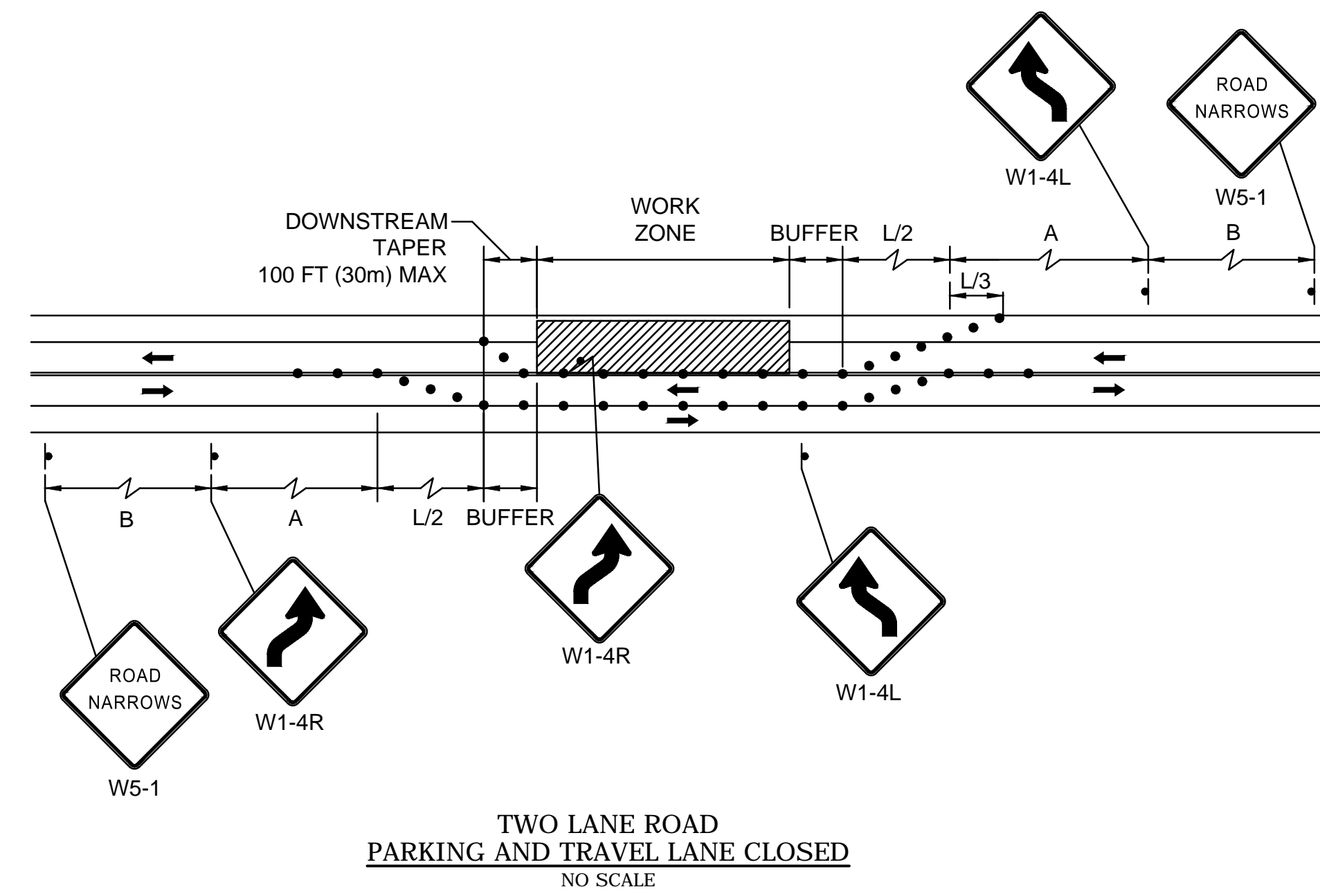
Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
0	3/12/2021	90% Drawings
PROJECT NO: M1476-011		
DATE: MARCH 2021		
FILE: M1476-011-C-501.dwg		
DRAWN BY: DWB		
CHECKED: ADF		
APPROVED: DLL		

CONTROL OF WATER DETAILS

SCALE: AS NOTED

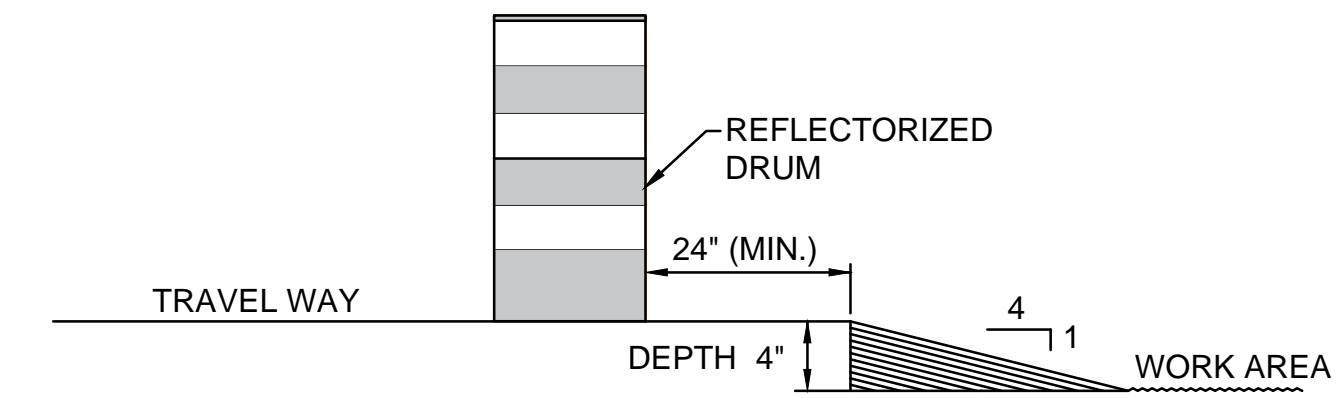
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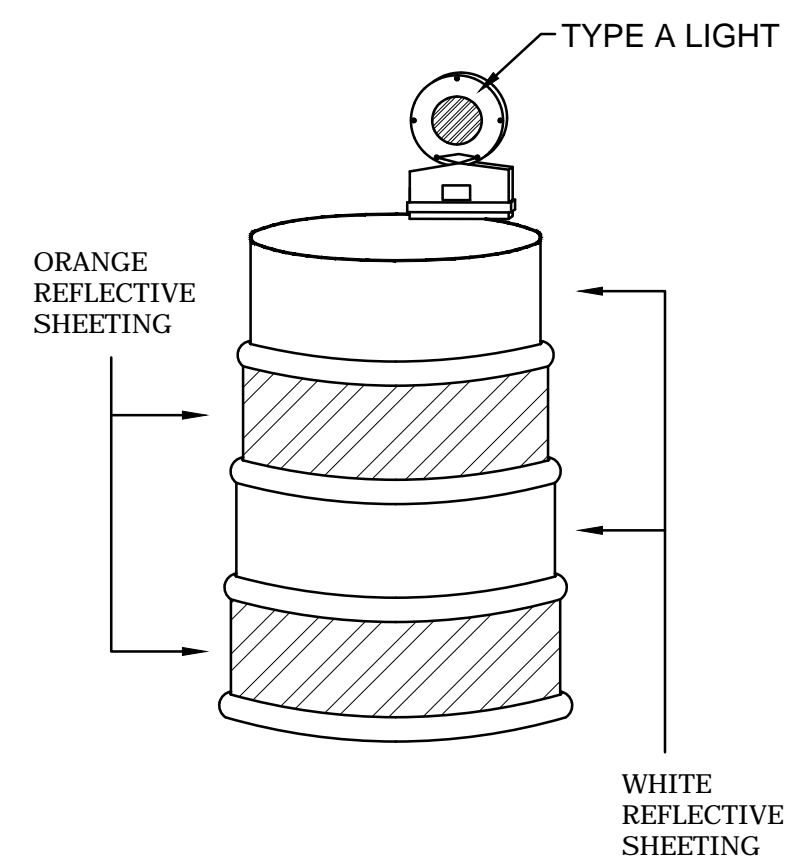
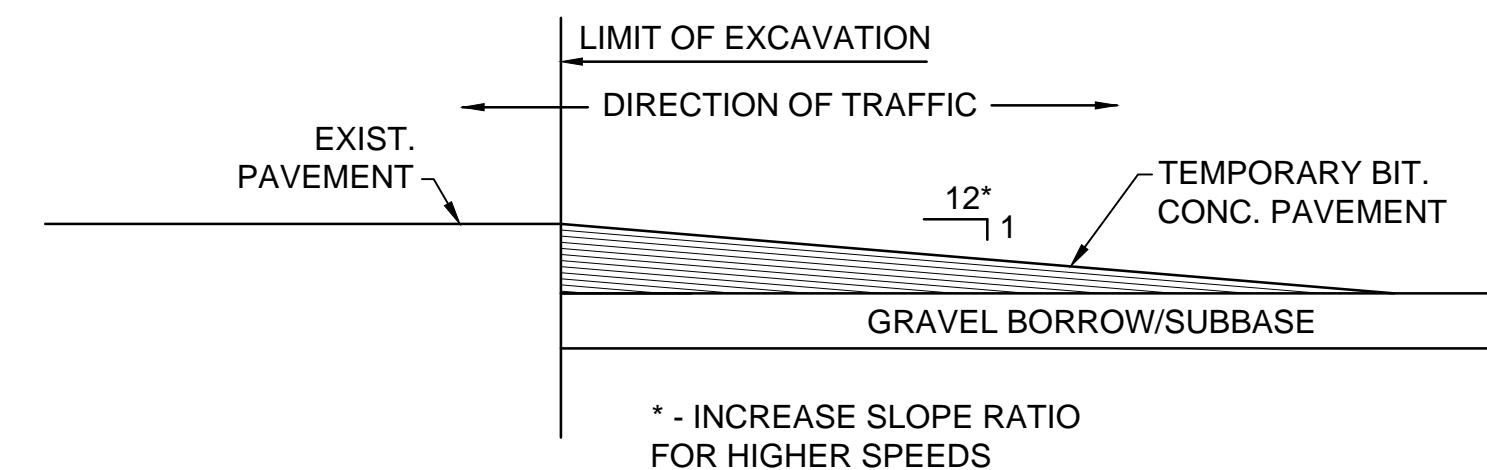
FORMULAS FOR DETERMINING TAPER LENGTHS

SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

WHERE:
L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH



IF "D" IS GREATER THAN 4" THE CONTRACTOR SHALL PLACE FILL MATERIAL AT A 4:1 SLOPE AT THE EDGE OF THE EXCAVATED AREA. SUPPLYING, PLACING AND REMOVING THIS FILL MATERIAL SHALL BE INCIDENTAL TO THE PROJECT AND NOT SEPARATELY MEASURED OR PAID FOR.



NOTES:

- DRUM DESIGN AND APPLICATION SHALL BE AS PER THE CURRENT EDITION OF THE MUTCD.
- DRUMS SHALL BE APPROXIMATELY 36" IN HEIGHT, HAVING A MINIMUM WALL THICKNESS OF 3/32" AND A MINIMUM DIAMETER OF 18" REGARDLESS OF ORIENTATION.
- DRUM MATERIAL MUST BE APPROVED UV RESISTANT, LOW DENSITY, IMPACT RESISTANT, LINEAR POLYETHYLENE (OR APPROVED EQUIVALENT).
- SHEETING SHALL BE APPROVED ORANGE AND WHITE TYPE IV REFLECTORIZED SHEETING CONFORMING TO M9.30.0.
- ALL DRUMS SHALL BE WELL MAINTAINED INCLUDING REMOVAL OF DUST OR ROAD FILM, SO AS NOT TO REDUCE REFLECTIVE EFFICIENCY. WHEN A DRUM LOSTS TARGET VALUE IT SHALL BE REPLACED.
- STORE UNUSED DRUMS IN ONE LOCATION, AWAY FROM ALL TRAFFIC, OR REMOVE FROM SITE ENTIRELY.

NOTES:

- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
- TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
- TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
- NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
- DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
- MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
- ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
- TEMPORARY PEDESTRIAN WALKWAY LOCATION TO BE DETERMINED IN THE FIELD. CONTRACTOR AND ENGINEER TO DETERMINE TREE REMOVAL ALONG DETOUR PATH.
- TEMPORARY PEDESTRIAN WALKWAY TO CONFORM WITH ADA STANDARDS.
- TEMPORARY PEDESTRIAN WALKWAY TO BE RETURNED TO PRECONSTRUCTION CONDITIONS. REPLACE TREES IN KIND.
- CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE AND NON-SLIP SURFACE.
- PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOP STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
- DETECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
- CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
- CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
- THE CURB RAMP WALKWAY EDGE SHALL BE MARKED WITH A CONTRASTING COLOR 2 TO 4 IN. WIDE MARKING. THE MARKING IS OPTIONAL WHERE COLOR CONTRASTING EDGING IS USED.
- WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
- LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
- CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	MARCH 2021	
FILE:	M1476-011-C-701.dwg	
DRAWN BY:	DWB	
CHECKED:	ADF	
APPROVED:	DLL	

TEMPORARY TRAFFIC CONTROL PLAN - GENERAL

SCALE: AS NOTED

C-701

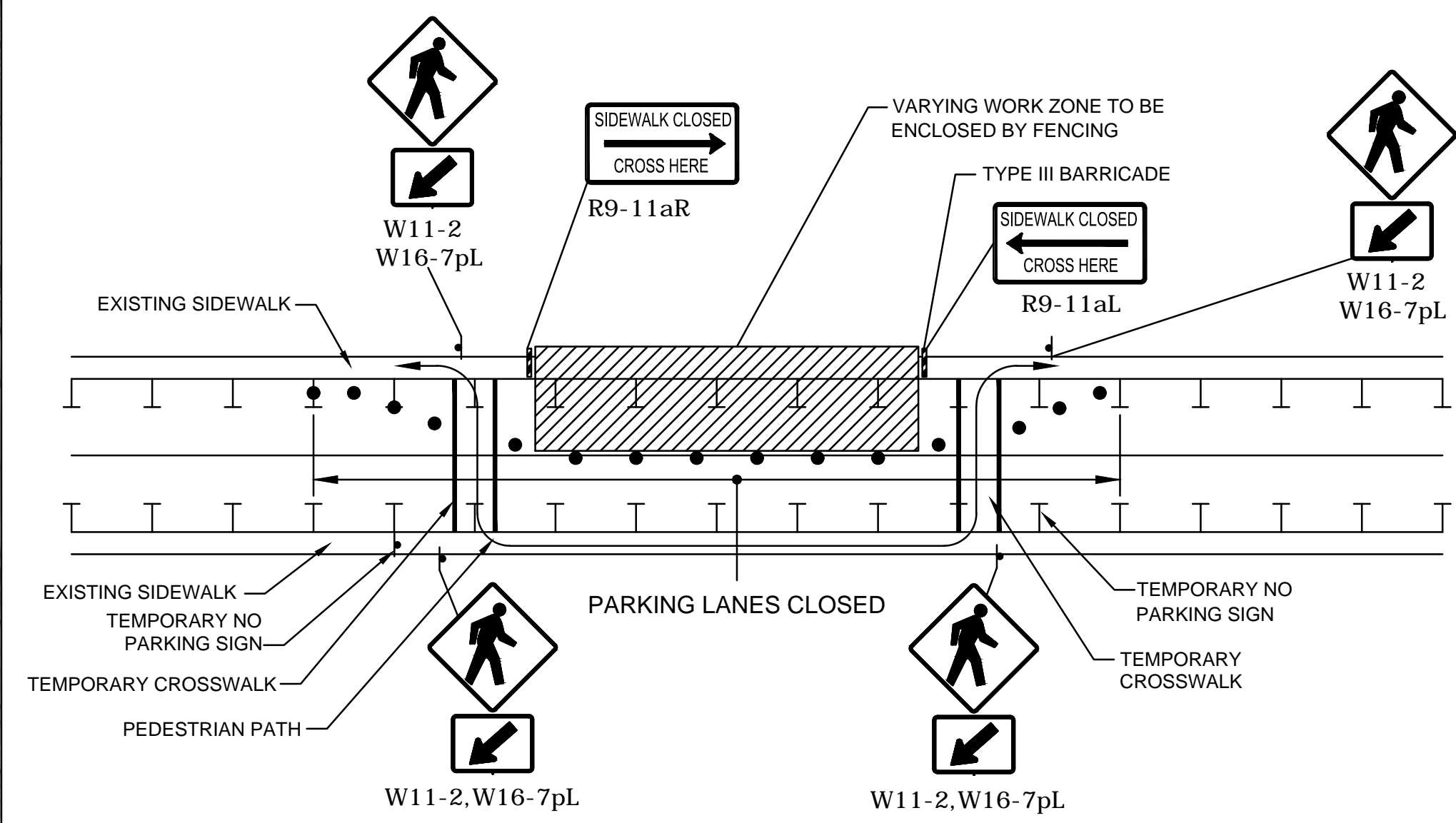
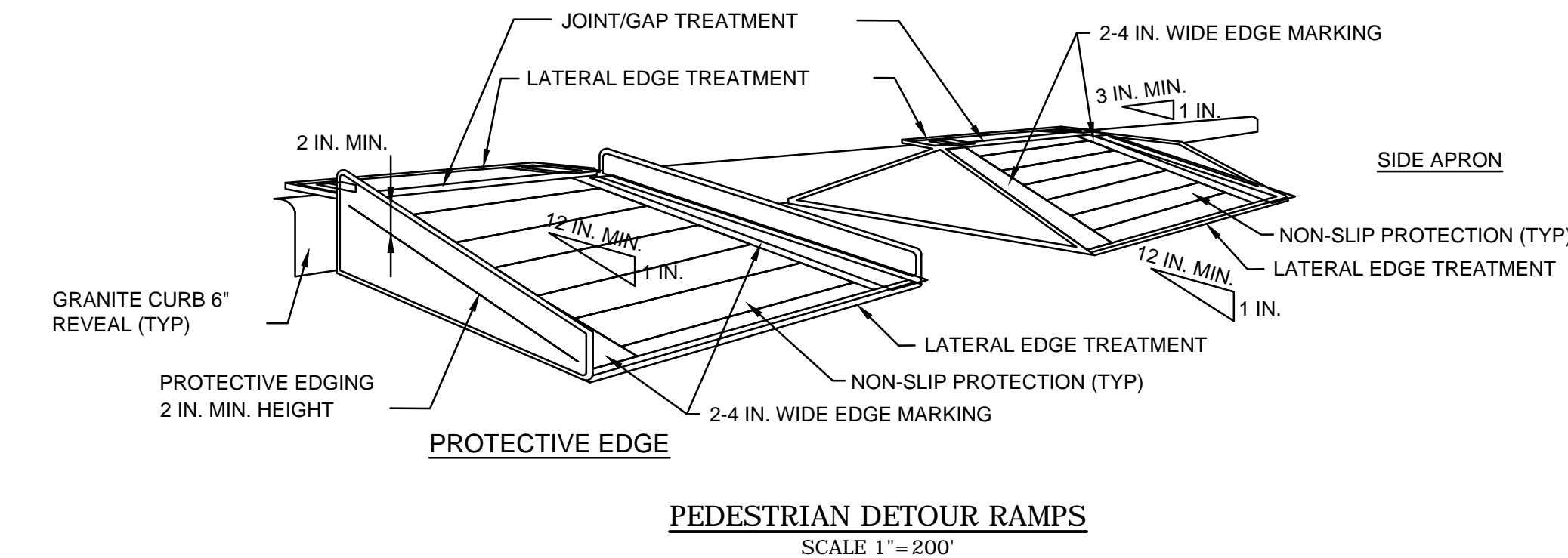


W20-1-a
DETOUR PLAN
SCALE 1"=500'

LEGEND

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- ▨ WORK ZONE
- ▬ DIRECTION OF TRAFFIC
- ▬ TYPE III BARRICADE
- ▬ CHANGEABLE MESSAGE SIGN
- ▲ SIGN

SIGN LEGEND					
CODE	DESCRIPTION	SIZE	AREA	NO.	TOTAL AREA
W20-1-a	ROAD WORK AHEAD	36"x36"	9 SF	2	18 SF
W20-3	ROAD CLOSED AHEAD	36"x36"	9 SF	2	18 SF
R11-2	ROAD CLOSED	48"x30"	10 SF	2	20 SF
R11-4	ROAD CLOSED TO THRU TRAFFIC	60"x30"	12.5 SF	2	25 SF
M4-10L	DETOUR	48"x18"	6 SF	1	6 SF
M4-10R	DETOUR	48"x18"	6 SF	1	6 SF
M4-9L	DETOUR	30"x24"	5 SF	5	25 SF
M4-9R	DETOUR	30"x24"	5 SF	5	25 SF
M4-8a	END DETOUR	30"x24"	5 SF	2	10 SF
TOTAL =					153 SF



- NOTES
- ADDITIONAL ADVANCE WARNING MAY BE NECESSARY.
 - CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN. VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE.
 - STREET LIGHTING SHOULD BE CONSIDERED WHEN LOCATING CONTROL DEVICES.
 - TEMPORARY CROSSWALKS WITH APPROPRIATE SIGNS SHOULD BE INSTALLED TO CROSS PEDESTRIANS TO THE OPPOSITE SIDE OF THE STREET AS SHOWN IN PEDESTRIAN BYPASS, AND AS DIRECTED BY THE ENGINEER. TEMPORARY CURB RAMPS WILL BE REQUIRED AT ALL TEMPORARY CROSSWALK LOCATIONS.
 - BYPASS IS TO BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DIRECTED BY THE ENGINEER.
 - THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THIS WALKWAY EXCEEDS 200 FEET THEN A 5 FOOT X 5 FOOT PASSING ZONE. (FOR SHORT TERM SETUPS < 10 HOURS, THIS CONDITION MAY BE WAIVED. A NOTE WOULD NEED TO BE INCLUDED IN THE TTCP THAT STATES HOW THE CONTRACTOR SHOULD ADDRESS THIS ISSUE.)

PEDESTRIAN DETOUR
NO SCALE

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

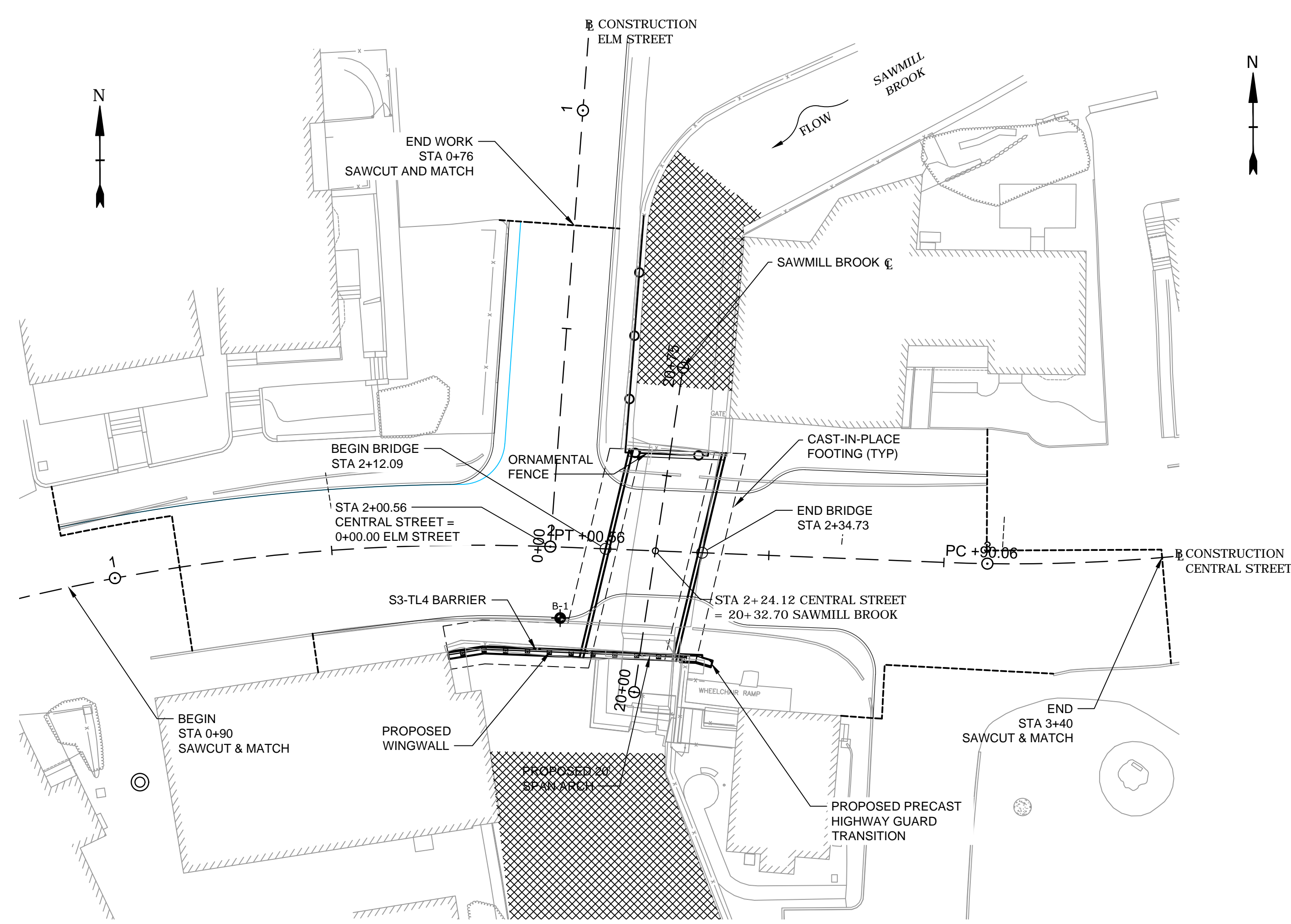
Town of
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The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
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PROJECT NO: M1476-011		
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FILE: M1476-011-C-702.dwg		
DRAWN BY: DWB		
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APPROVED: DLL		

TEMPORARY TRAFFIC CONTROL
PLAN - DETOUR

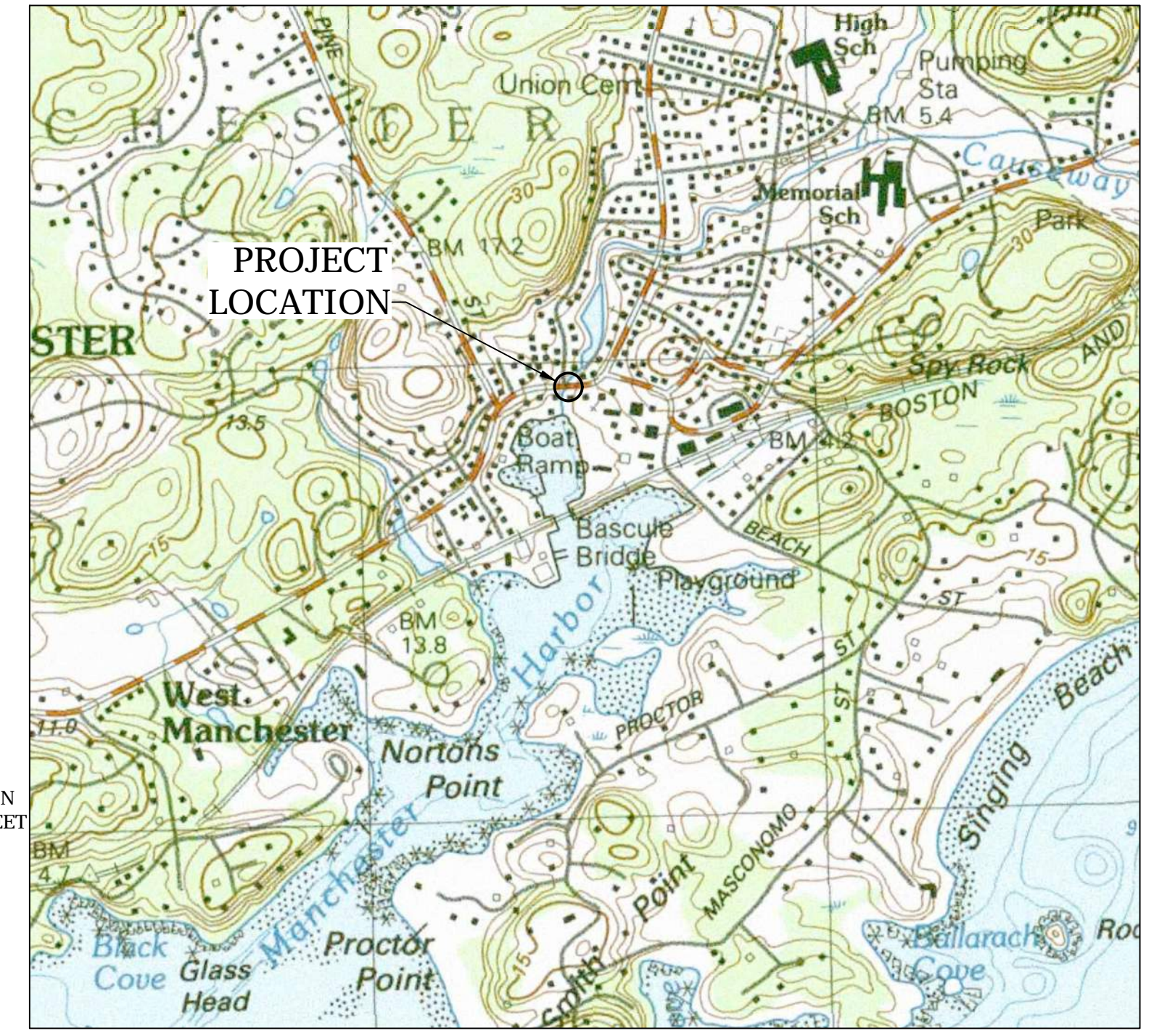
SCALE: AS NOTED

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 Hydro Study\011-Central Street Bridge Drawings_Eginess\AutoCAD\Sheet\M1476-011-C-702.dwg



KEY PLAN
SCALE: 1" = 20'

- NOTES:**
- EXISTING AND PROPOSED UTILITIES NOT SHOWN FOR CLARITY. SEE SHEET C-XXX FOR APPROXIMATE LOCATIONS.



LOCUS PLAN
SCALE: 1" = 1000'

- BRIDGE DRAWING INDEX**
- S-001 BRIDGE KEY PLAN, PROFILES, LOCUS, AND INDEX
 - S-002 BRIDGE NOTES
 - S-003 BORING LOGS & BORING NOTES
 - S-101 GENERAL BRIDGE PLAN AND ELEVATION
 - S-102 ABUTMENT PLAN & DETAILS
 - S-103 BRIDGE FRAMING AND LAYOUT PLAN
 - S-104 BRIDGE SECTION & DETAILS

- REFERENCE DRAWING INDEX**
- R-101 S3-TL4 BARRIER DETAILS
 - R-102 PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS
 - R-103 TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR S3-TL4
 - R-104 GUARDRAIL TRANSITION TO BRIDGE RAIL (BACK OF SIDEWALK)

HYDRAULIC DATA	
DRAINAGE AREA	5.0 SQ. MILES
WATER CONTROL FLOOD DISCHARGE (2 YR)	254 CFS
DESIGN FLOOD DISCHARGE (25 YR)	1,363 CFS
DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	4% (25-YEARS)
DESIGN FLOOD VELOCITY (25 YR)	7.5 FPS
DESIGN FLOOD ELEVATION (25 YR)	5.7 FEET
MEAN HIGHER HIGH WATER ELEVATION (MHHW)	4.8 FEET
MEAN HIGH WATER ELEVATION (MHW)	3.1 FEET
MEAN LOW WATER ELEVATION (MLW)	-1.5 FEET
MEAN LOWER LOW WATER ELEVATION (MLLW)	-5.5 FEET
BASE (100-YR) FLOOD DATA	
BASE FLOOD DISCHARGE (100 YR)	2,267 CFS
BASE FLOOD ELEVATION (100 YR)	* 7.7 FEET
DESIGN AND CHECK SCOUR DATA	
SCOUR DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	2% (50-YEARS)
DESIGN FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
SCOUR CHECK FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	1% (100-YEARS)
CHECK FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
FLOOD OF RECORD	
DISCHARGE	UNKNOWN
FREQUENCY (IF KNOWN)	N/A
MAXIMUM ELEVATION	N/A
DATE	N/A
HISTORY OF ICE FLOES	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	UNKNOWN

* THE 7.7' ELEVATION IS THE MODELED 100-YEAR PRECIPITATION EVENT DISCHARGE ELEVATION AT THE BRIDGE

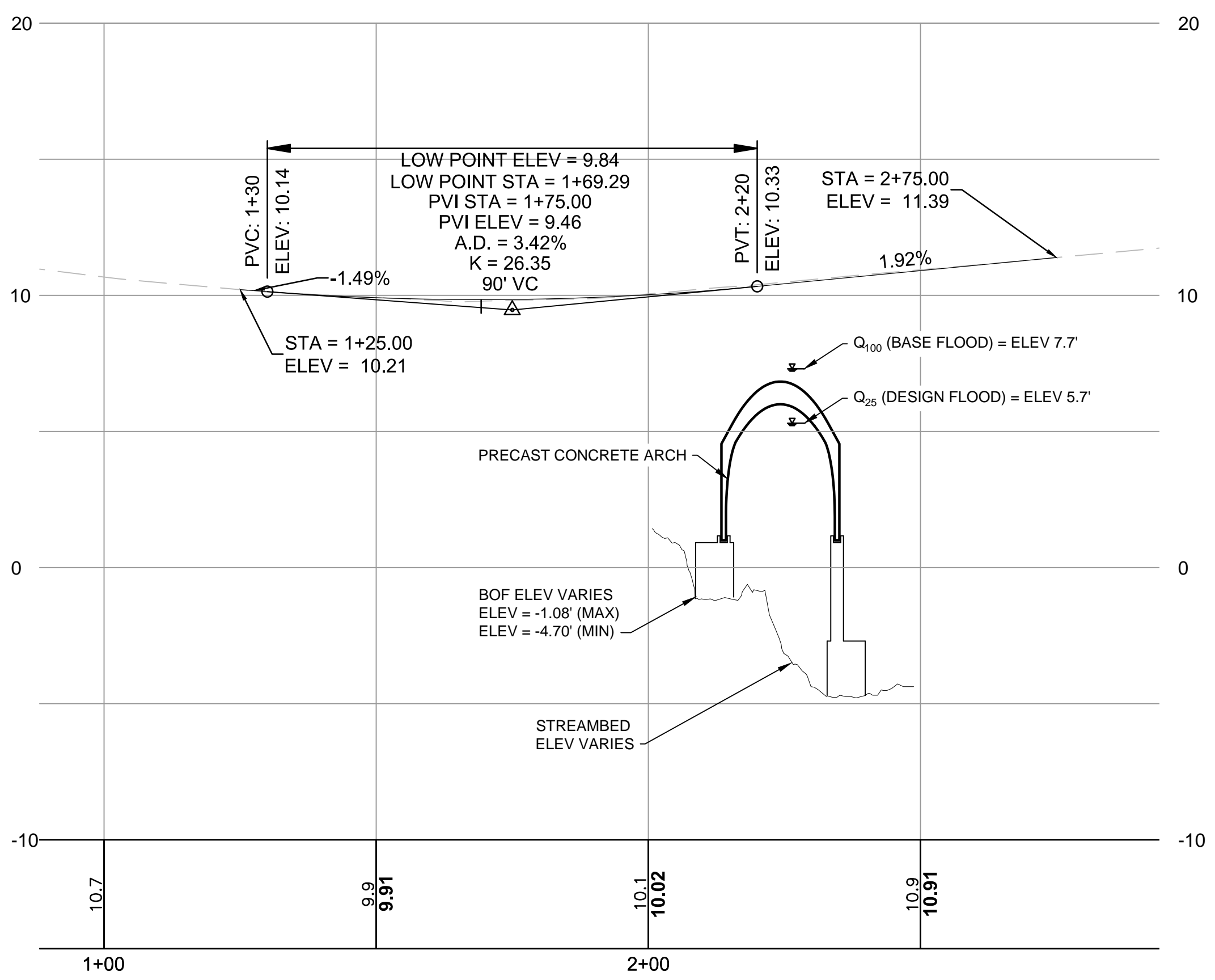
90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

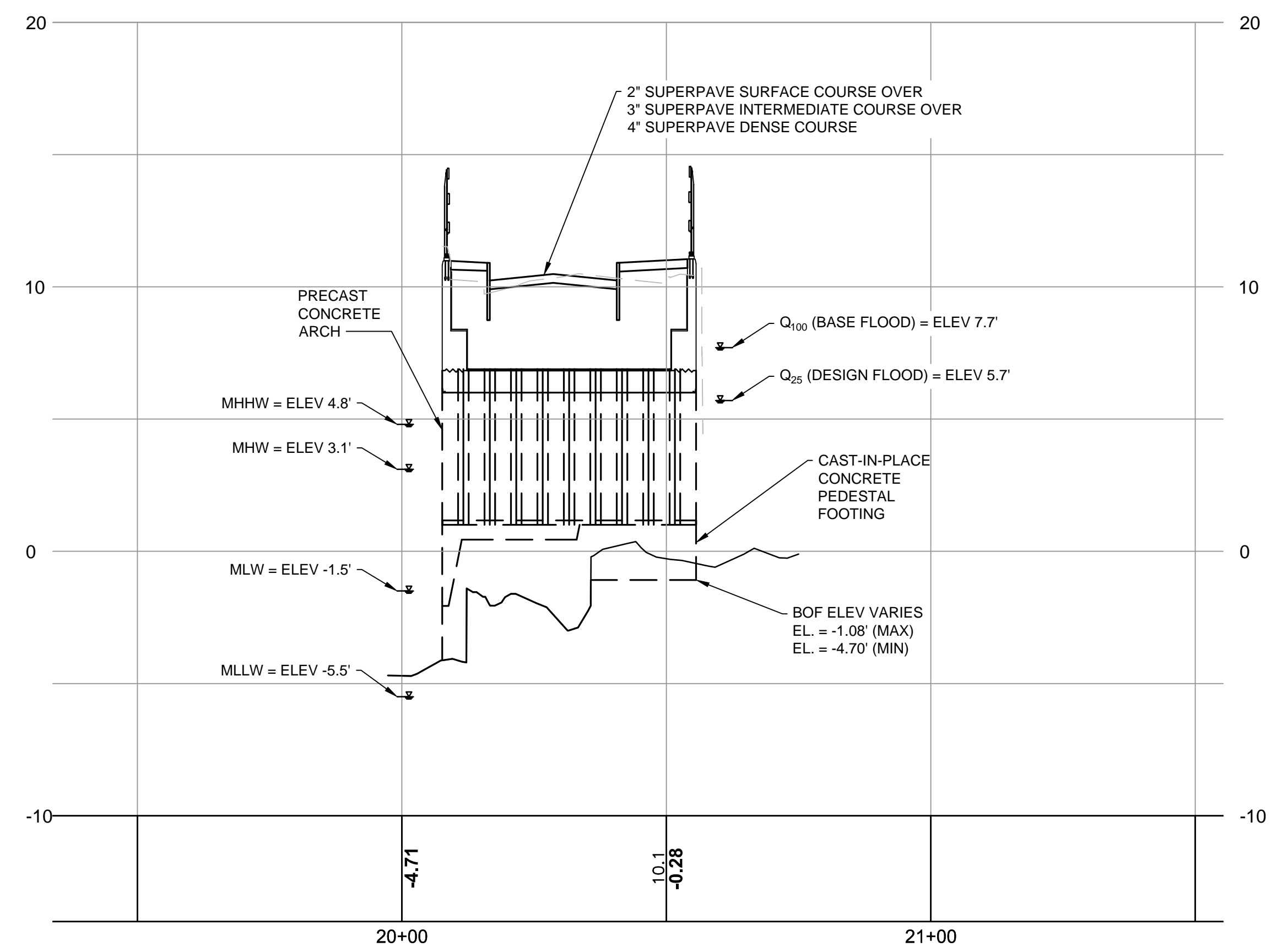
Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts



PROFILE - CENTRAL STREET
SCALE: 1" = 20'H, 1" = 8'V



PROFILE - SAWMILL BROOK
SCALE: 1" = 20'H, 1" = 4'V

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

- IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO: M1476-011		
DATE: MARCH 2021		
FILE: M1476-011-S-001.dwg		
DRAWN BY: D BISHOP		
CHECKED: EAO		
APPROVED: DLL		

BRIDGE KEY PLAN, PROFILES,
LOCUS AND INDEX

SCALE: AS NOTED

S-001

Last Saved: 3/3/2021 12:31:19 PM By: KCR
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90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

Table with 3 columns: MARK, DATE, DESCRIPTION. Includes project details like PROJECT NO: M1476-011, DATE: MARCH 2021, and DRAWN BY: D BISHOP.

BRIDGE NOTES

SCALE: AS NOTED

S-002

DESIGN LOADS AND SPECIFICATIONS:

- 1. DESIGN LOADING: HL-93
2. DESIGN: LOAD AND RESISTANCE FACTOR DESIGN (LRFD) IN ACCORDANCE WITH: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH ED., 2017 AS AMENDED
3. SPECIFICATIONS: MASSDOT 2020 STANDARD SPECIFICATIONS AS AMENDED
4. FOUNDATION DATA: ABUTMENTS AND U-WINGWALL: SPREAD FOOTINGS SUPPORTED ON SOUND BEDROCK WITH A NOMINAL BEARING CAPACITY OF 100.0 TSF IN COMBINATION WITH A RESISTANCE FACTOR OF 0.45.

GENERAL NOTES:

- 1. PLANS OF THE EXISTING BRIDGE ARE NOT AVAILABLE.
2. BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTORS ON 9/8/2018.
3. ALL EXISTING BRONZE DISCS REPRESENTING STATE BENCHMARKS OR SURVEY TRIANGULATION POINTS MUST NOT BE DISTURBED.
4. ALL WORK SHALL COMPLY WITH OSHA'S LATEST STANDARDS. ALL REQUIREMENTS OF OSHA'S EXCAVATION STANDARDS SHALL BE PROVIDED BY THE CONTRACTOR INCLUDING, BUT NOT LIMITED TO, THE PROVISION FOR A COMPETENT PERSON ON SITE AND ANY REQUIRED DOCUMENTATION THAT MAY REQUIRE CERTIFICATION BY A PROFESSIONAL ENGINEER.

- 19. TAKE ALL NECESSARY MEASURES AND PROVIDE ALL NECESSARY CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE AND STRENGTH TO PREVENT ACCESS TO ALL OPEN EXCAVATIONS AT THE COMPLETION OF EACH DAY'S WORK.
20. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4", UNLESS OTHERWISE NOTED.
21. SHEAR KEYS SHALL BE 3" HIGH BY ONE-THIRD THE WIDTH OF THE CONCRETE ELEMENT, CENTERED, WITH 3" MIN. CLEAR EACH SIDE.

BRIDGE REMOVAL NOTES:

- 1. THE CONTRACTOR'S METHOD FOR REMOVAL OF THE EXISTING BRIDGE SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND ACCEPTANCE PRIOR TO THE COMMENCEMENT OF ANY REMOVAL OPERATIONS.
2. REMOVAL OF EXISTING BRIDGE STRUCTURE SHALL INCLUDE THE COMPLETE REMOVAL OF THE ARCH, FOOTINGS, HEADWALLS, AND WINGWALL. REFER TO SHEET C-005 (CIVIL SHEETS) FOR DEMOLITION PLAN.

FOUNDATION NOTES:

- 1. FOUNDATION MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.
2. CONCRETE SHALL NOT BE PLACED IN WATER OR ON FROZEN GROUND.
3. BOTTOM OF FOUNDATION ELEVATIONS PROVIDED ON DRAWINGS SHALL BE CONSIDERED MINIMUM DEPTHS. CONTRACTOR SHALL REMOVE UNSUITABLE MATERIAL AS REQUIRED.

GEOTECHNICAL DESIGN PARAMETERS

- 1. MINIMUM EMBEDMENT FOR FROST PROTECTION = 4 FEET BELOW ADJACENT GROUND SURFACE.
2. FACTORED STRENGTH LIMIT STATE BEARING RESISTANCE = 45.0 TONS PER SQUARE FOOT
a. THE BRIDGE DESIGNER SHALL VERIFY THE BEARING RESISTANCE BASED ON THE FINAL BRIDGE AND WINGWALL FOUNDATION DIMENSIONS AND EMBEDMENT

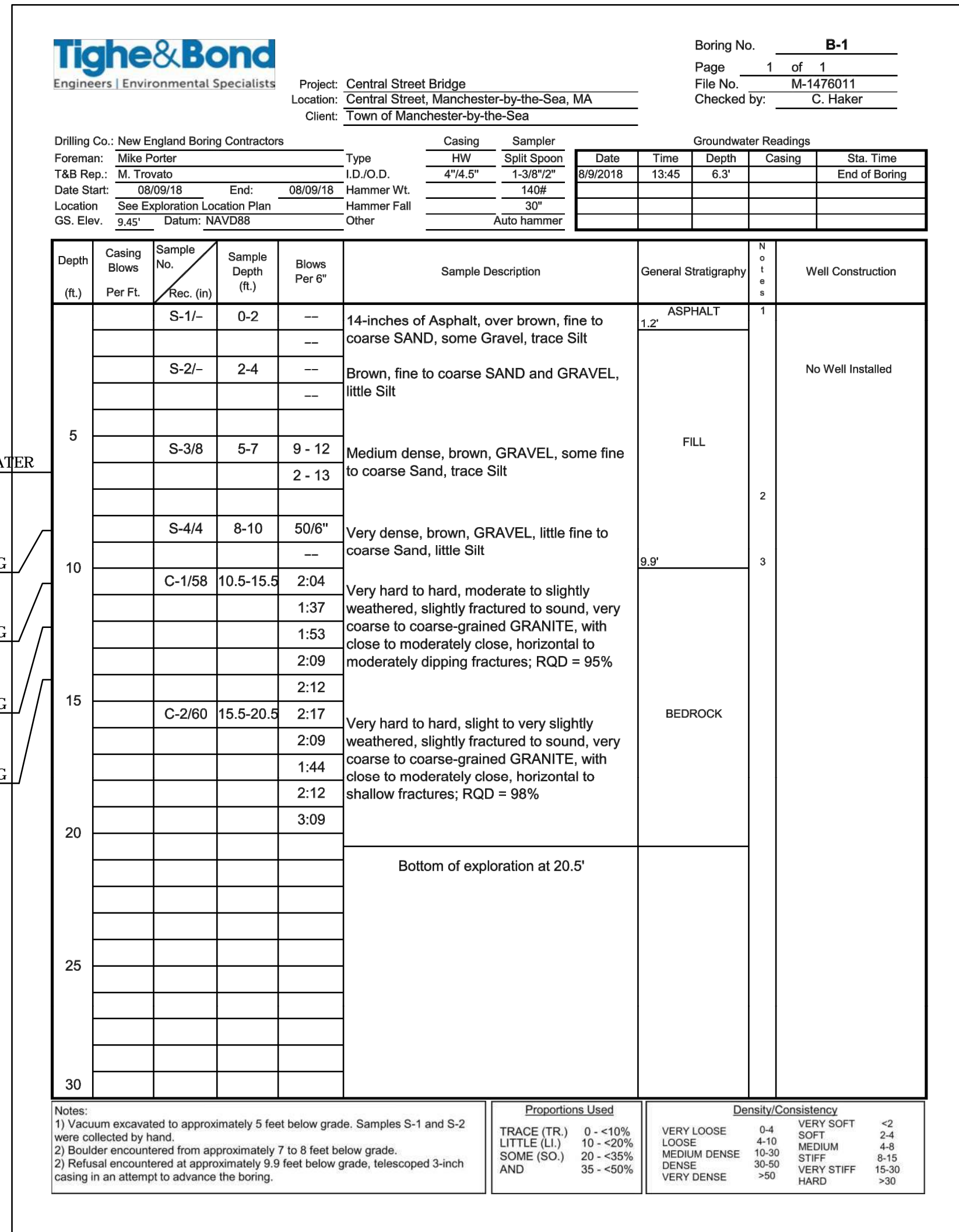
PRECAST CONCRETE BRIDGE STRUCTURE NOTES:

- 1. ITEM 995.01, BRIDGE STRUCTURE - STRUCTURE NO. 1, SHALL INCLUDE THE PRECAST CONCRETE ARCH, CURBS/HEADWALLS, PEDESTAL FOOTINGS USED TO SUPPORT THE RIGID FRAME, U-WINGWALL, AND WINGWALL FOOTING.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS, SEALED AND SIGNED BY A CURRENTLY REGISTERED MASSACHUSETTS PROFESSIONAL ENGINEER TO THE MUNICIPALITY'S DESIGNER OF RECORD FOR REVIEW AND ACCEPTANCE FOR REVIEW TO ENSURE CONFORMANCE WITH THE CONTRACT DOCUMENTS.
3. CHANGES OR MODIFICATIONS DURING THE FABRICATION PROCESS MUST BE SUBMITTED TO THE MUNICIPALITY'S DESIGNER OF RECORD FOR ACCEPTANCE AND INCORPORATED INTO THE FINAL AS-BUILT DRAWINGS.

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

- 1. IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL.

COMMONWEALTH OF MASSACHUSETTS MassDOT, Highway Division CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING DISTRICT 4 BRIDGE ENGINEER DATE



BORING LOG B-1

BORING LOCATIONS		
BORING	STATION	OFFSET
B-1	0+52.3	RT. 16.2'

BORING NOTES:

- LOCATION OF BORINGS SHOWN ON SHEET S-001 THUS:
- BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 1/2" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
- ALL BORINGS WERE MADE IN SEPTEMBER 2018.
- BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE.
- THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
- THE WATER LEVELS RECORDED IN THE TABLE ARE THOSE MEASURED ON THE DATES GIVEN AND DO NOT NECESSARILY REPRESENT GROUND WATER LEVEL AT TIME OF CONSTRUCTION. IT SHOULD BE NOTED THAT GROUNDWATER LEVELS CAN FLUCTUATE WITH TIDE, SEASON, PRECIPITATION, AND NEARBY CONSTRUCTION OR OTHER BELOW GRADE ACTIVITIES, SUCH AS EXCAVATION, DEWATERING, WELLS, INFILTRATION BASINS, ETC.
- SEE SHEET S-002 FOR GEOTECHNICAL DESIGN PARAMETERS.
- ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR DESIGN AND ESTIMATING PURPOSES. PRESENTATION OF THE INFORMATION IN THE CONTRACT IS INTENDED TO PROVIDE THE CONTRACTOR ACCESS TO THE SAME DATA AVAILABLE TO THE OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

90%
Drawings
Not For
Construction

**Central Street
Bridge
Replacement**

**Department of
Public Works**

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION

PROJECT NO:	M1476-011
DATE:	MARCH 2021
FILE:	M1476-011-S-003.dwg
DRAWN BY:	D BISHOP
CHECKED:	EAO
APPROVED:	DLL

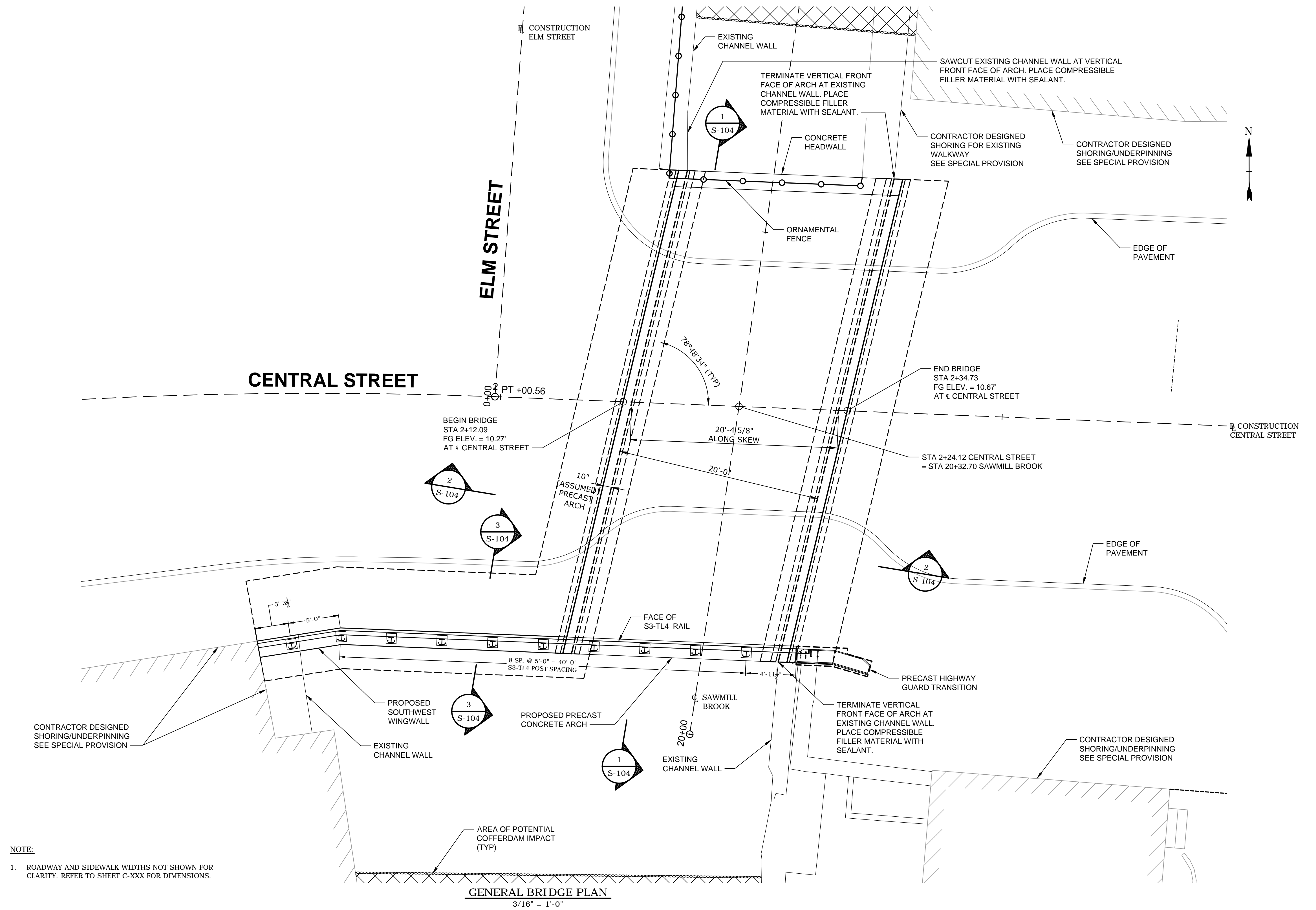
BORING LOGS AND
BORING NOTES

SCALE: AS NOTED

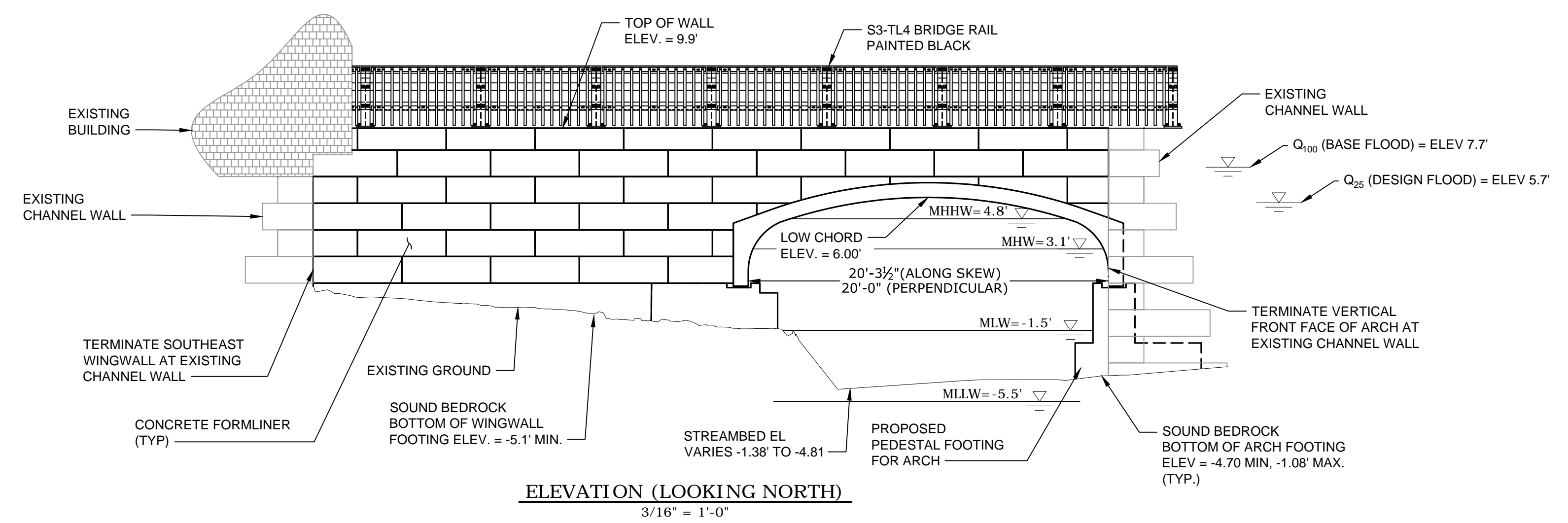
S-003

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____



NOTE:
1. ROADWAY AND SIDEWALK WIDTHS NOT SHOWN FOR CLARITY. REFER TO SHEET C-XXX FOR DIMENSIONS.



COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
DISTRICT 4 BRIDGE ENGINEER DATE

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Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

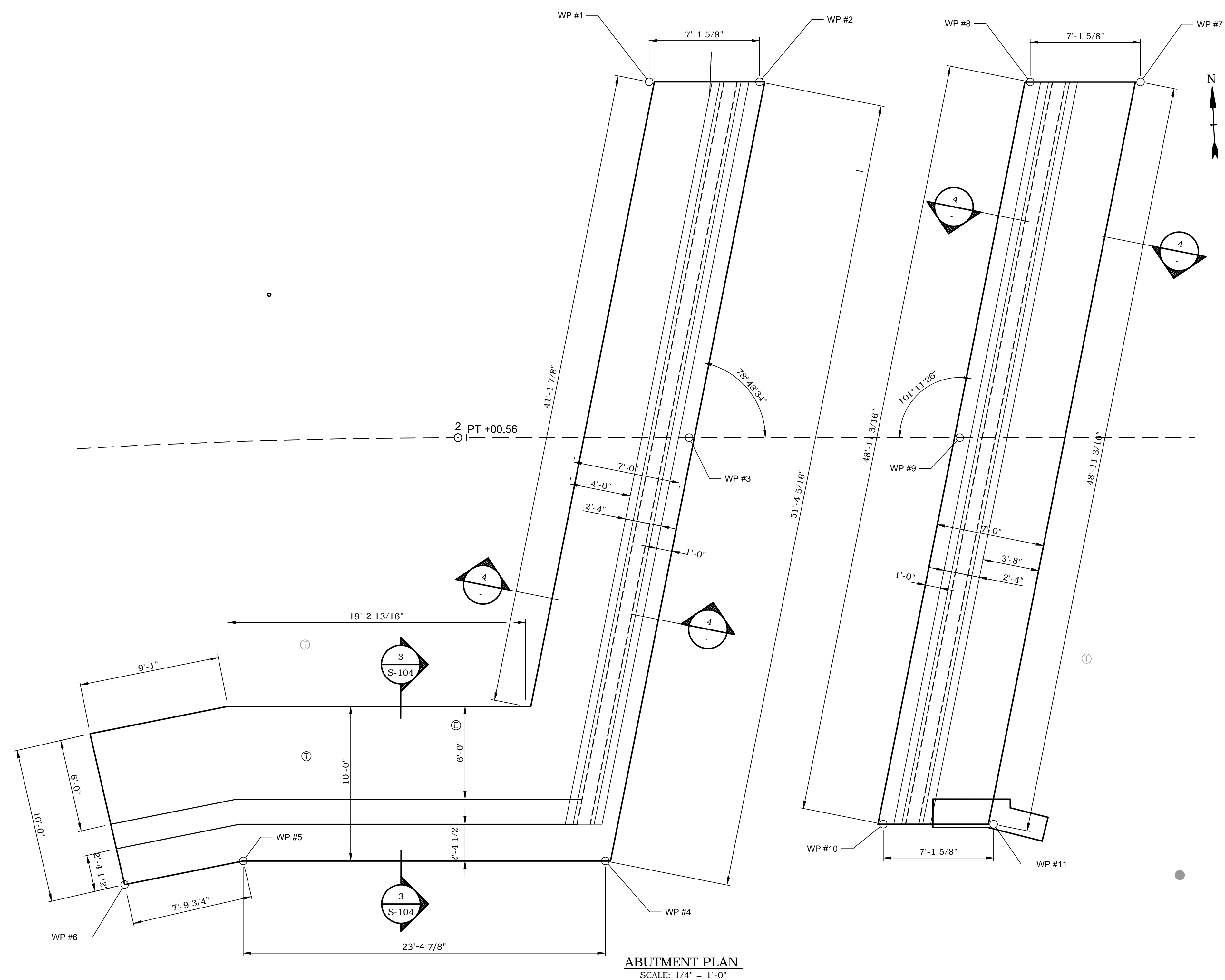
Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
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DATE: MARCH 2021		
FILE: M1476-011-S-101_103.dwg		
DRAWN BY: D BISHOP		
CHECKED BY: EAO		
APPROVED BY: DLL		

GENERAL BRIDGE PLAN
AND ELEVATION

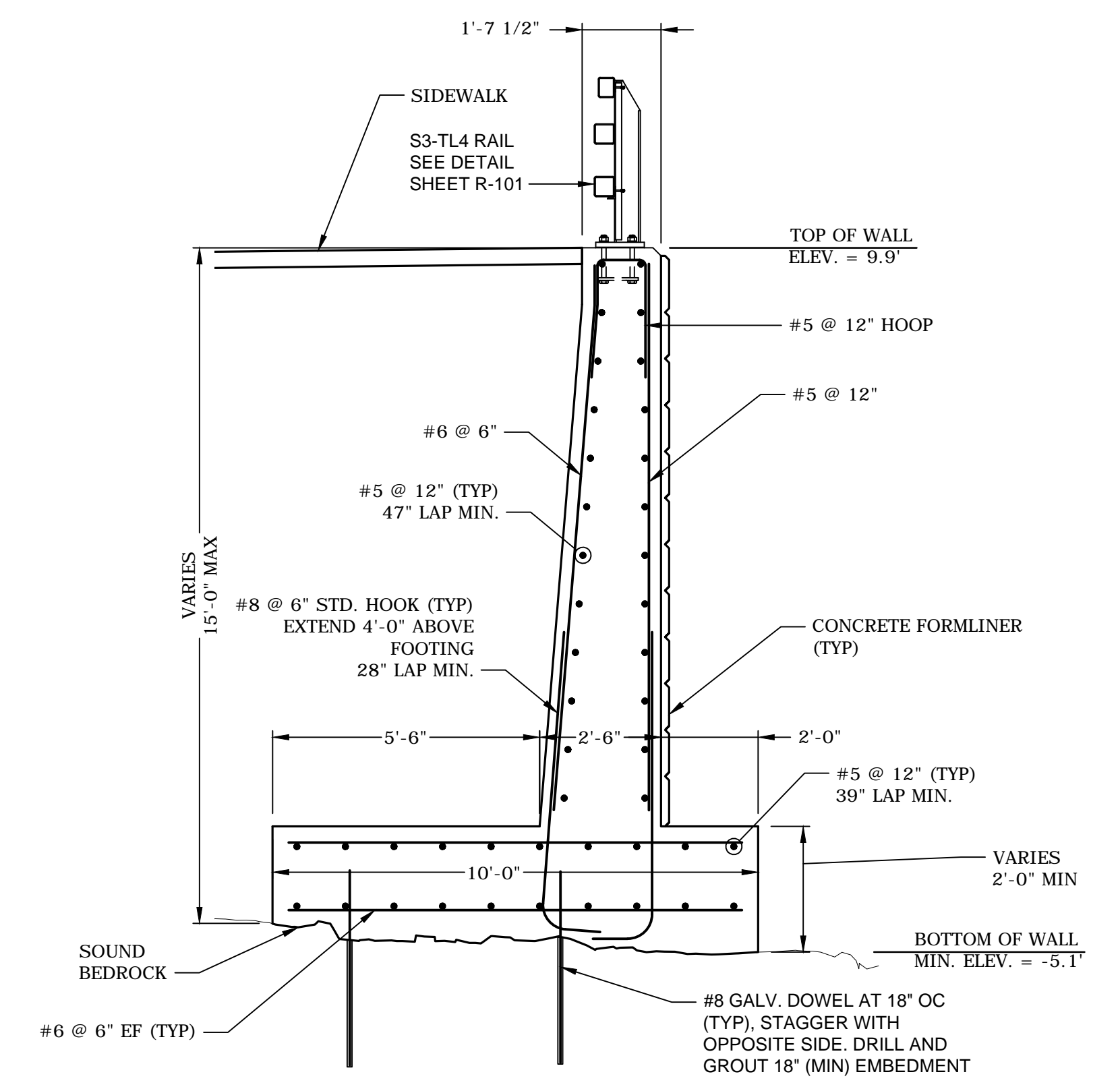
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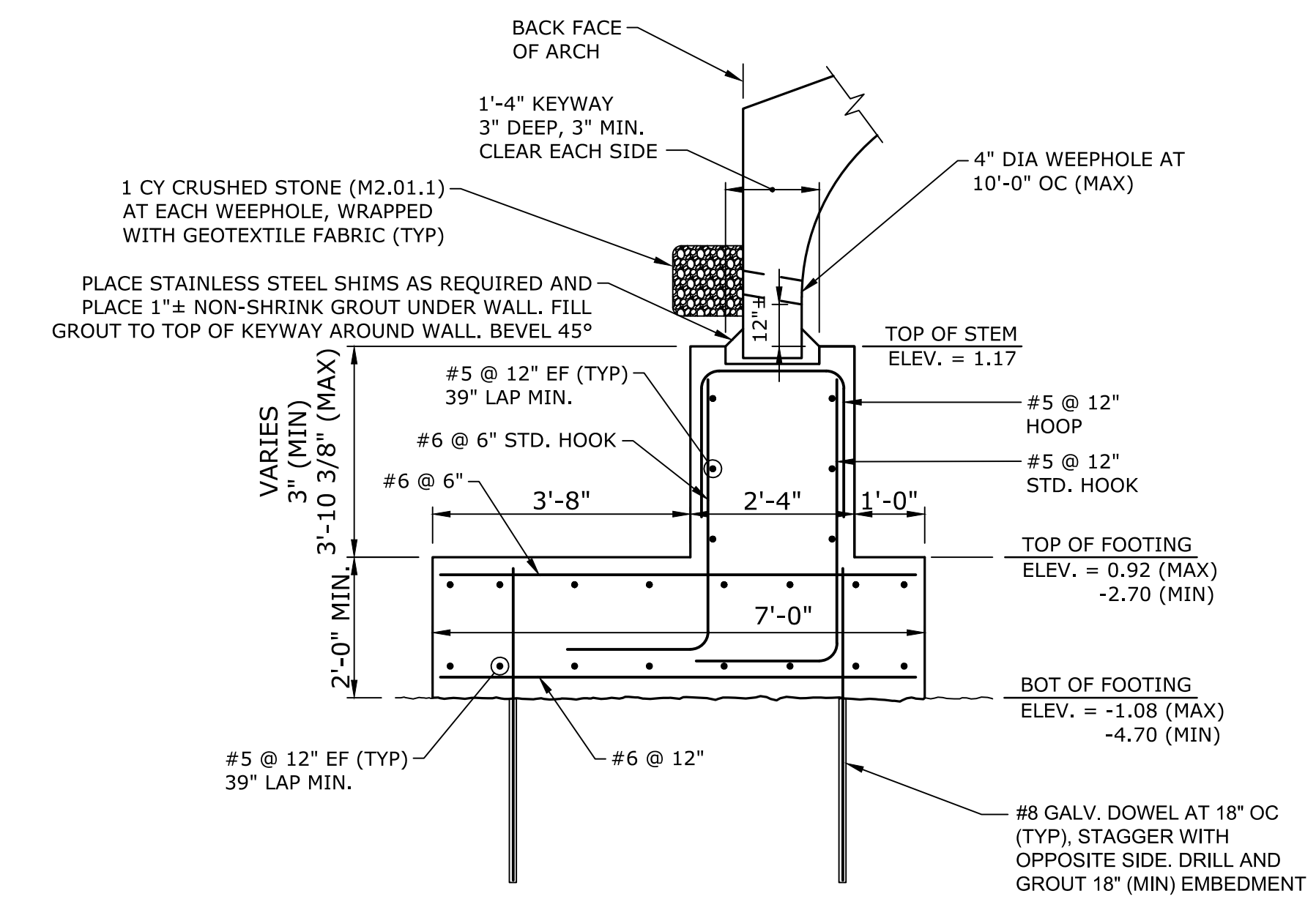
ABUTMENT PLAN
SCALE: 1/4" = 1'-0"

WORKING POINT	STATION	OFFSET	NORTHING	EASTING
WP #1	2+12.36	LT 23.01	3,035,515.59	852,008.30
WP #2	2+19.49	LT 23.01	3,035,515.30	852,015.43
WP #3	2+14.94	-	3,035,492.49	852,009.96
WP #4	2+09.52	RT 27.37	3,035,465.36	852,003.46
WP #5	1+85.19	RT 27.13	3,035,466.29	851,980.07
WP #6	1+76.96	RT 28.32	3,035,465.08	851,972.35
WP #7	2+44.12	LT 23.00	3,035,514.30	852,040.05
WP #8	2+36.99	LT 23.00	3,035,514.59	852,032.92
WP #9	2+32.44	-	3,035,491.79	852,027.45
WP #10	2+27.49	RT 25.00	3,035,467.01	852,021.51
WP #11	2+34.63	RT 25.00	3,035,466.72	852,028.63



SOUTHWEST WINGWALL

SECTION 3
3/8" = 1'-0" S-101/S-102



SECTION 4
1/2" = 1'-0"

TYPICAL CAST-IN-PLACE ABUTMENT SECTION

CAST-IN-PLACE FOOTING NOTES:

- THE PRECAST CONCRETE ARCH UNITS SHALL BE INSTALLED ON CAST-IN-PLACE CONCRETE FOOTINGS. THE FOOTING DESIGN PROVIDED HEREIN IS BASED ON LRFD METHODOLOGIES AND THE FOLLOWING NOMINAL REACTIONS FROM THE ARCH.
 - VERTICAL DEAD LOAD (COMPONENTS) = 1.86 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - VERTICAL DEAD LOAD (WEARING SURFACE) = 1.04 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - VERTICAL LIVE LOAD = 5.30 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
- IF THE CONTRACTOR'S FINAL DESIGN OF THE ARCH DEVIATES FROM THE RANGE PROVIDED ABOVE TO BETTER SUIT THE CONTRACTOR'S MEANS AND METHODS, THE ENGINEER WILL PROVIDE NEW FOOTING DESIGN DRAWINGS DETAILING REVISED FOOTINGS TO ACCOMMODATE THE FINAL ARCH DESIGN PROVIDED BY THE CONTRACTOR. ADDITIONAL ENGINEERING FOR REVISED FOOTING DESIGN TO SUIT THE CONTRACTOR'S MEANS AND METHODS SHALL BE AT THE CONTRACTOR'S SOLE COST.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
DISTRICT 4 BRIDGE ENGINEER DATE

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

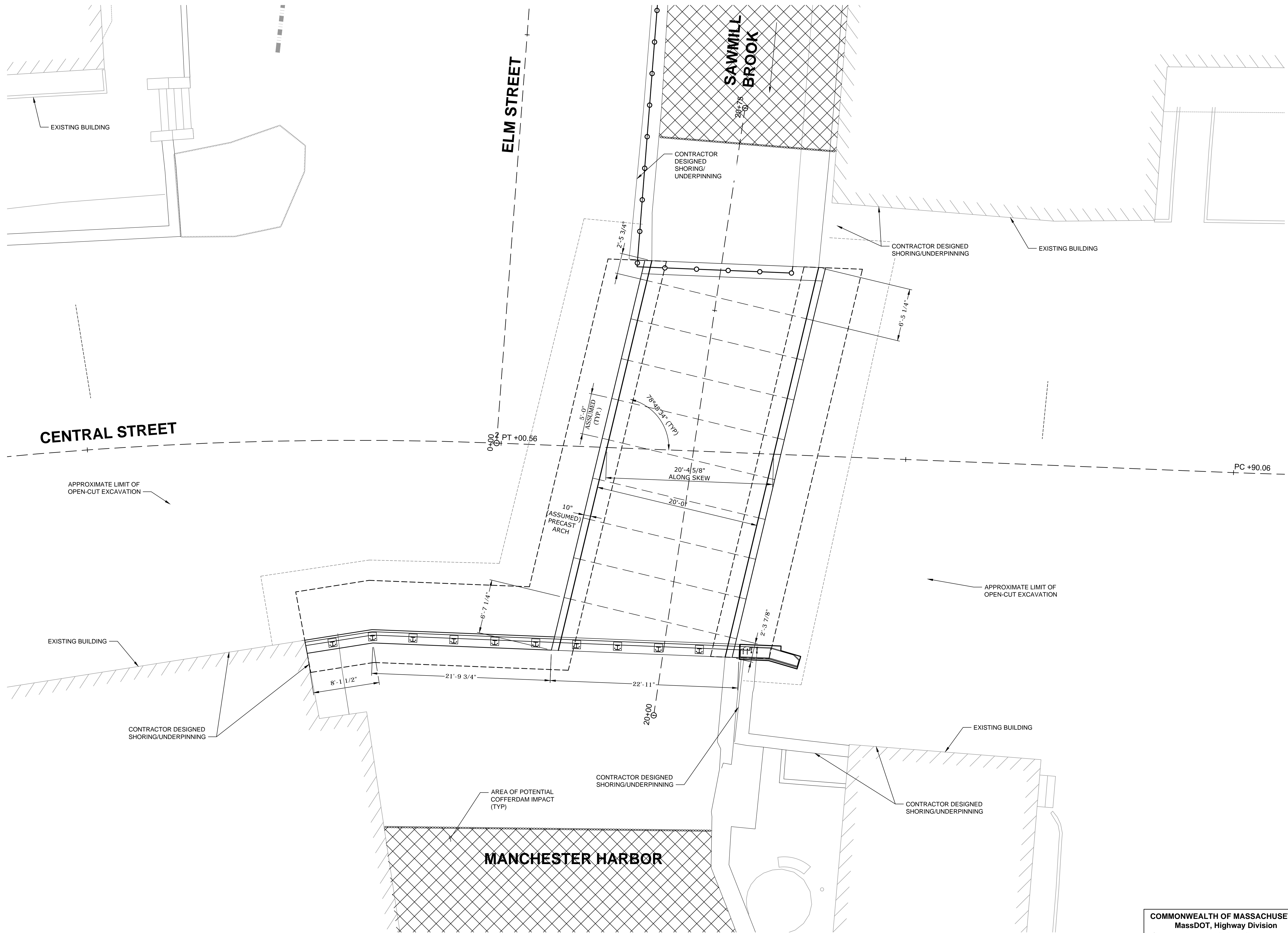
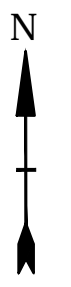
Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO: M1476-011		
DATE: MARCH 2021		
FILE: M1476-011-S-101_103.dwg		
DRAWN BY: DRF		
CHECKED BY: EAO		
APPROVED BY: DLL		

ABUTMENT PLAN & DETAILS

SCALE: AS NOTED

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**Central Street
Bridge
Replacement**

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APPROVED: DLL		

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**

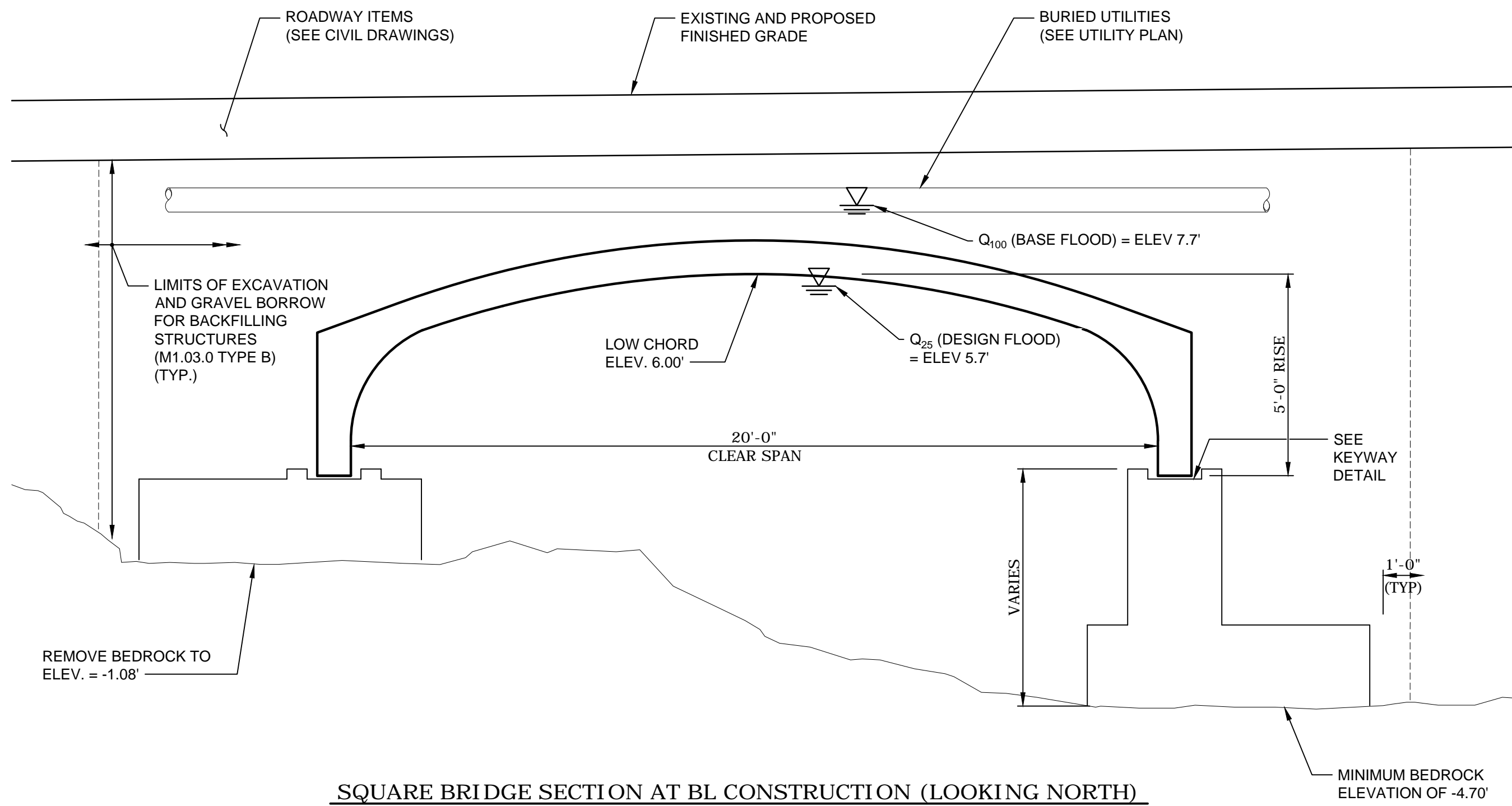
DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

BRIDGE FRAMING AND
LAYOUT PLAN

SCALE: AS NOTED

BRIDGE FRAMING AND LAYOUT PLAN
3/16" = 1'-0"

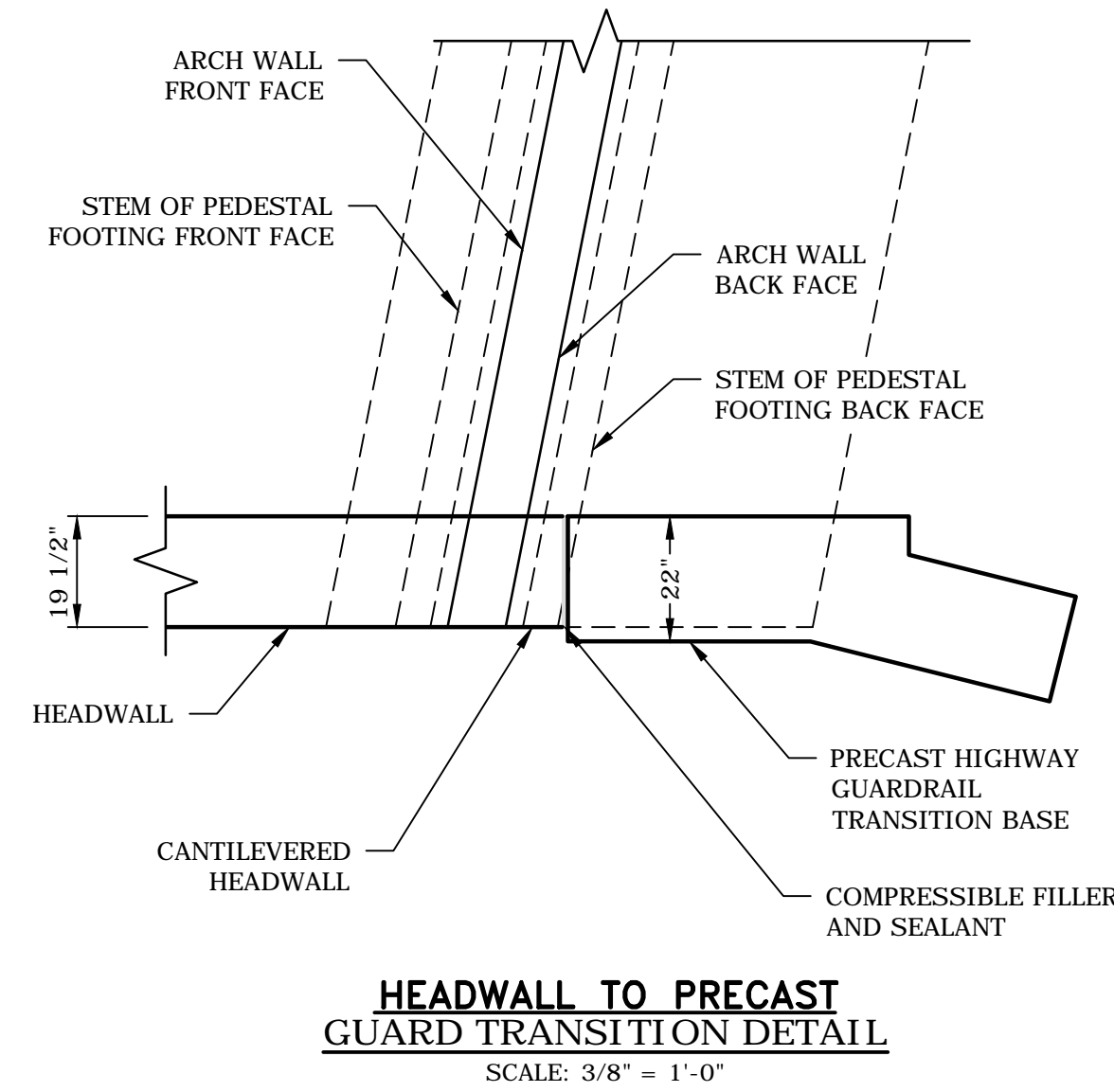
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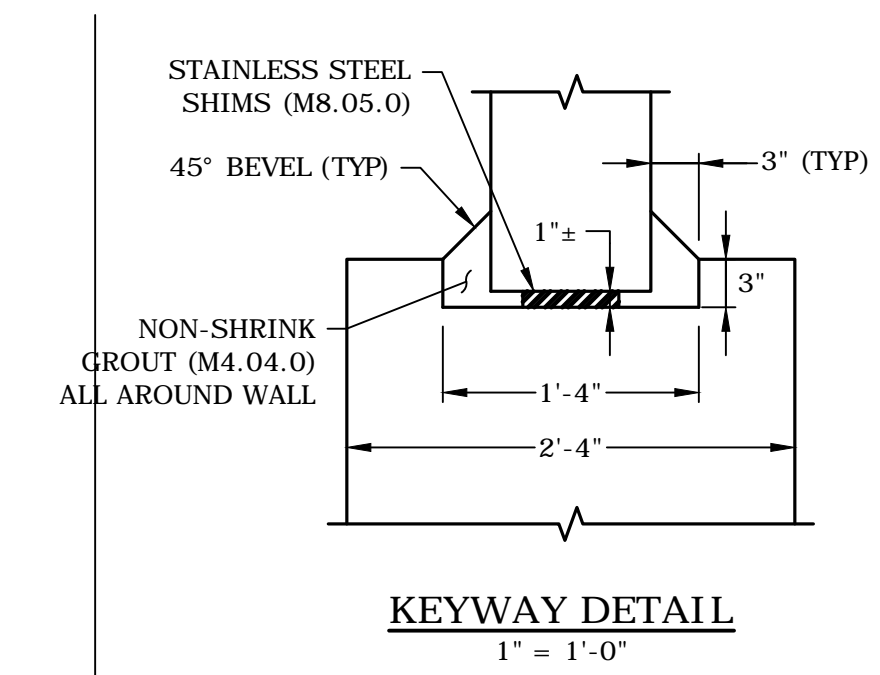
SQUARE BRIDGE SECTION AT BL CONSTRUCTION (LOOKING NORTH)

SECTION 2
3/8" = 1'-0"

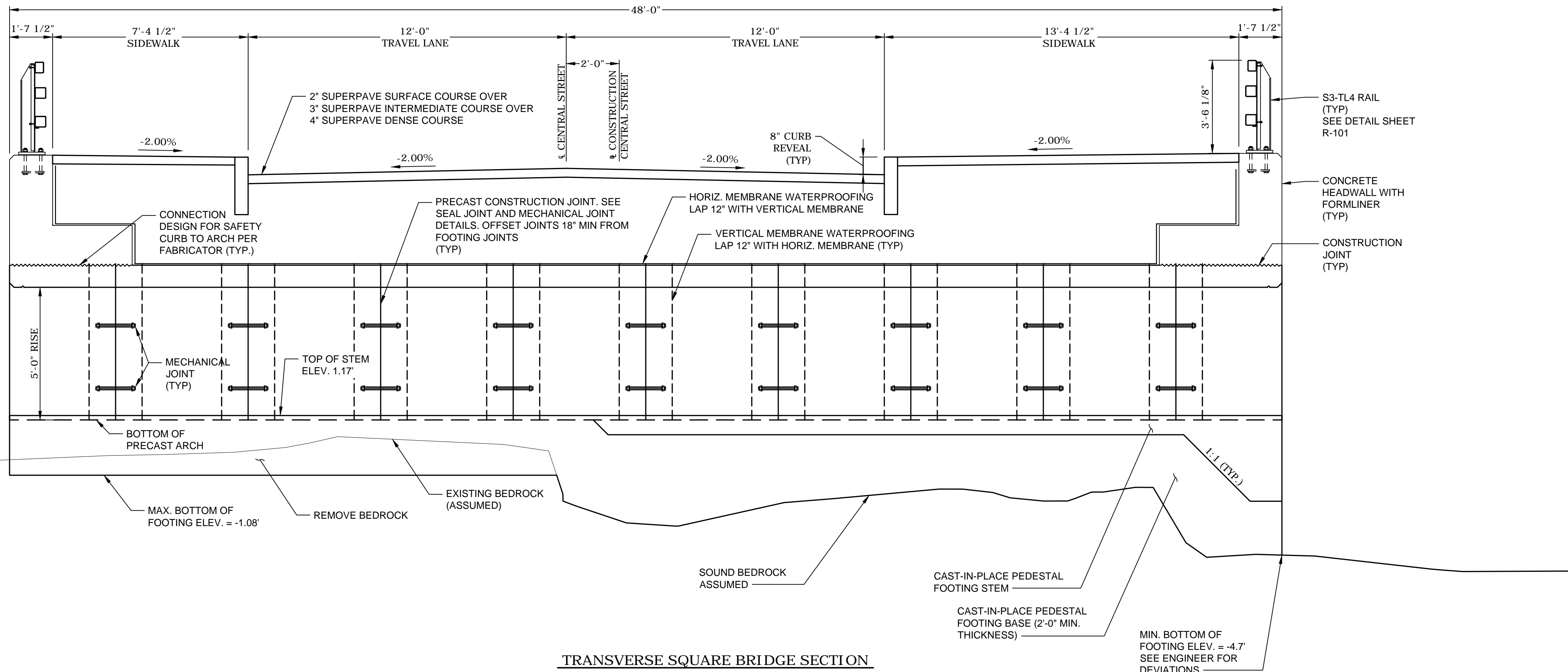
NOTE:
1. SECTION REFLECTS MAXIMUM AND MINIMUM ANTICIPATED BEDROCK ELEVATIONS. CONTRACTOR TO EVALUATE FIELD CONDITIONS AFTER DEMOLITION OF EXISTING BRIDGE AND REPORT TO ENGINEER PRIOR TO CASTING OF ARCH FOOTINGS.



HEADWALL TO PRECAST GUARD TRANSITION DETAIL
SCALE: 3/8" = 1'-0"

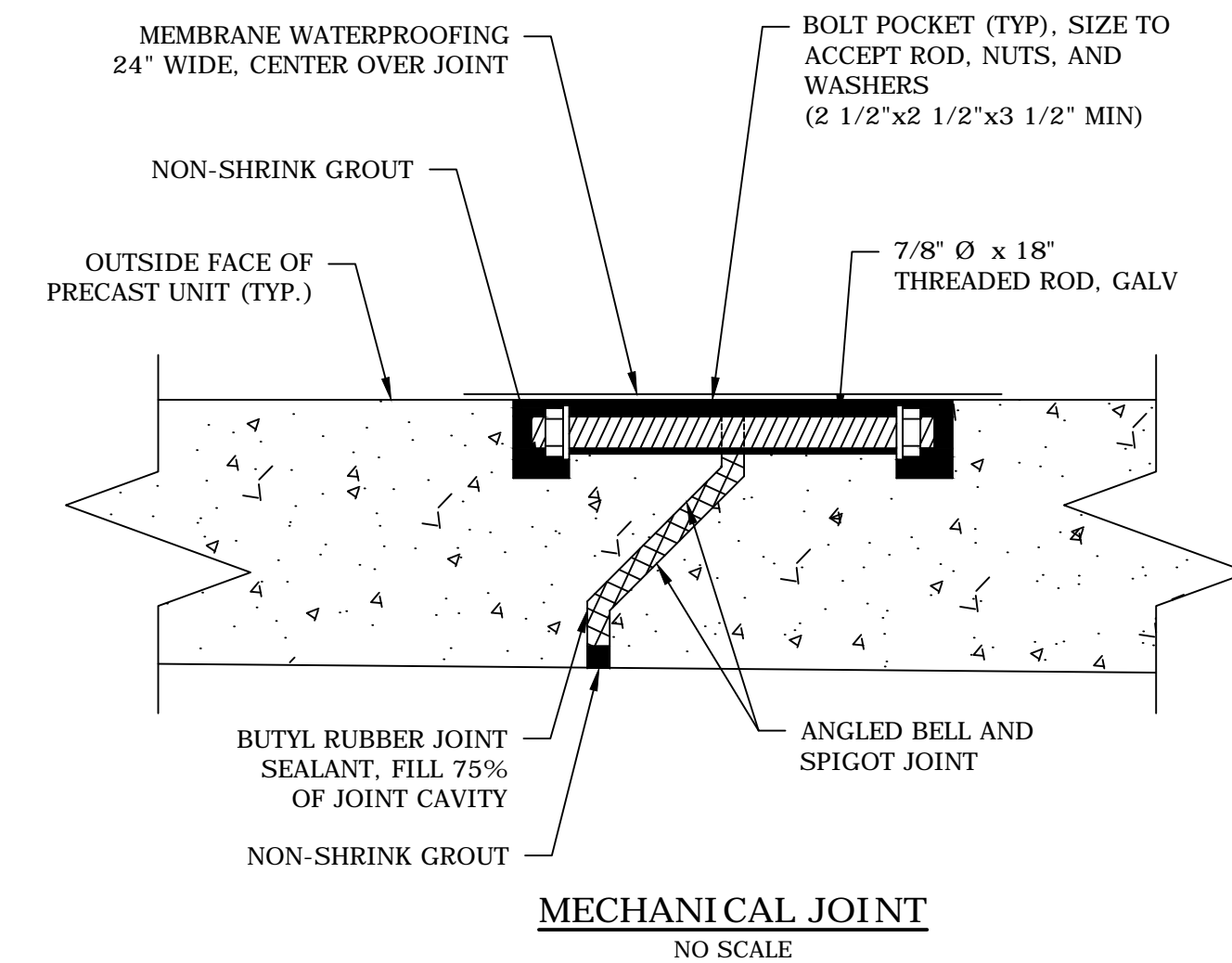


KEYWAY DETAIL
1" = 1'-0"

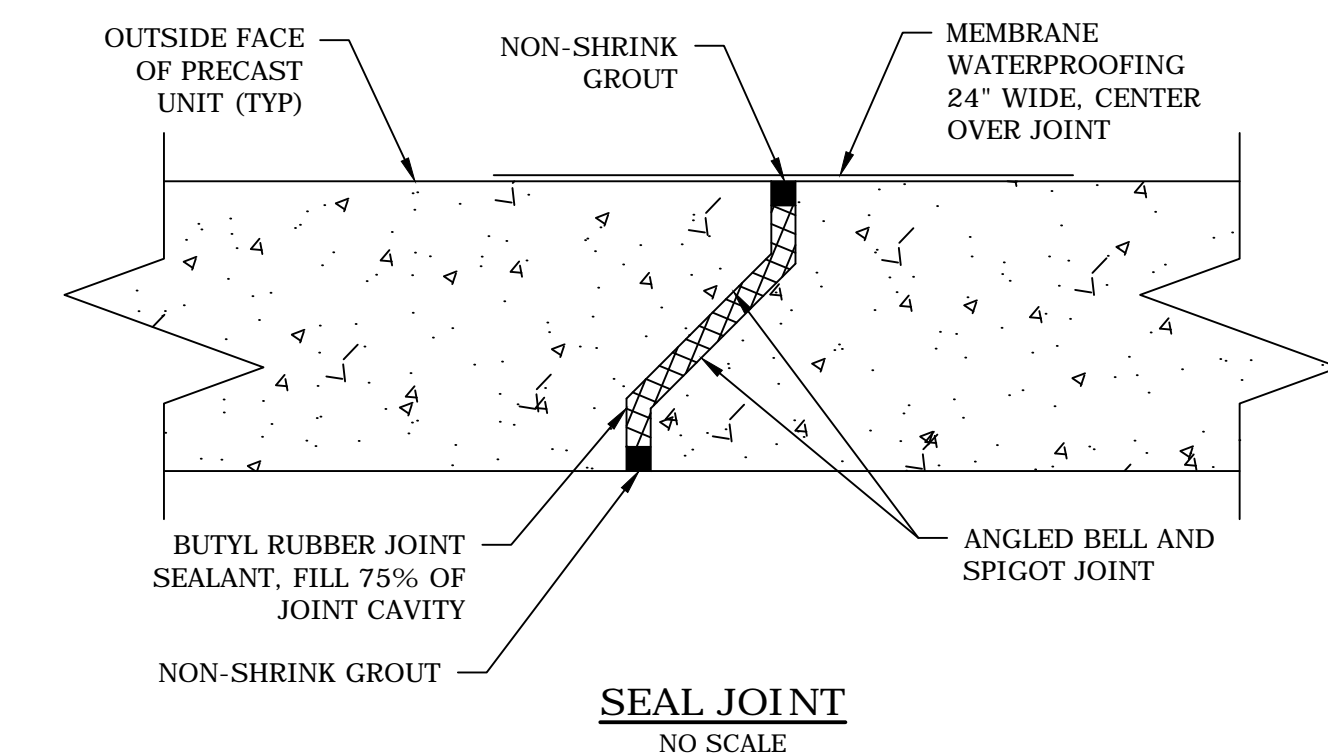


TRANSVERSE SQUARE BRIDGE SECTION

SECTION 1
3/8" = 1'-0"



MECHANICAL JOINT
NO SCALE



SEAL JOINT
NO SCALE

JOINT SEALANT NOTES:

1. PROVIDE BUTYL RUBBER JOINT SEALANT (AASHTO M-198) BETWEEN PRECAST CONCRETE UNITS.
2. PROVIDE A MINIMUM OF 7 MECHANICAL CONNECTORS BETWEEN EACH ARCH UNIT (3 ON TOP AND 2 ON EACH SIDE).
3. ALL BOLT POCKETS SHALL BE FILLED WITH NON-SHRINK GROUT.
4. PEEL AND STICK BARRIER MEMBRANE SHALL BE PLACED IN 2-FOOT WIDE STRIPS, CENTERED OVER THE TOP AND/OR SIDES OF EACH JOINT.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER DATE

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Public Works

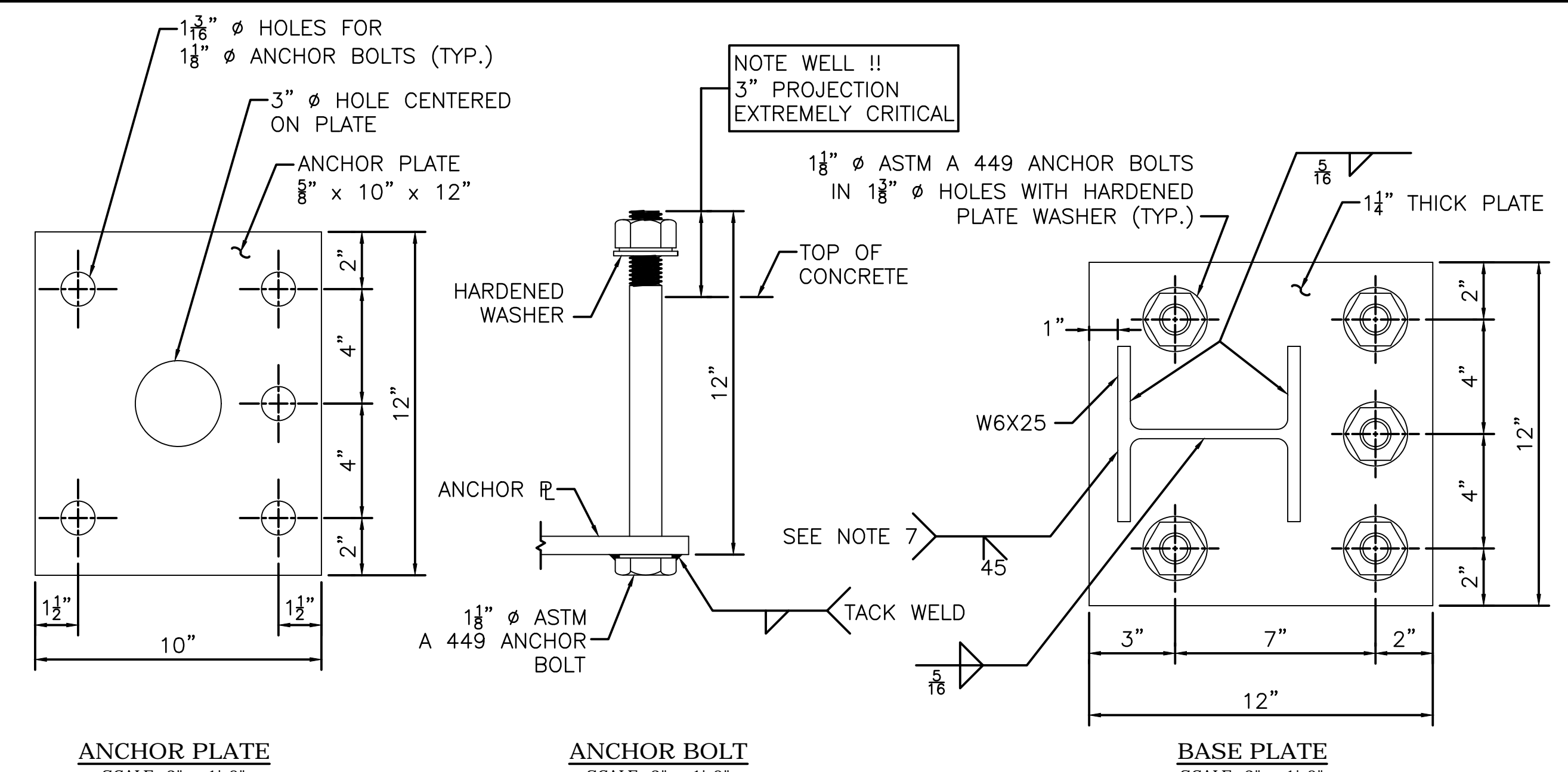
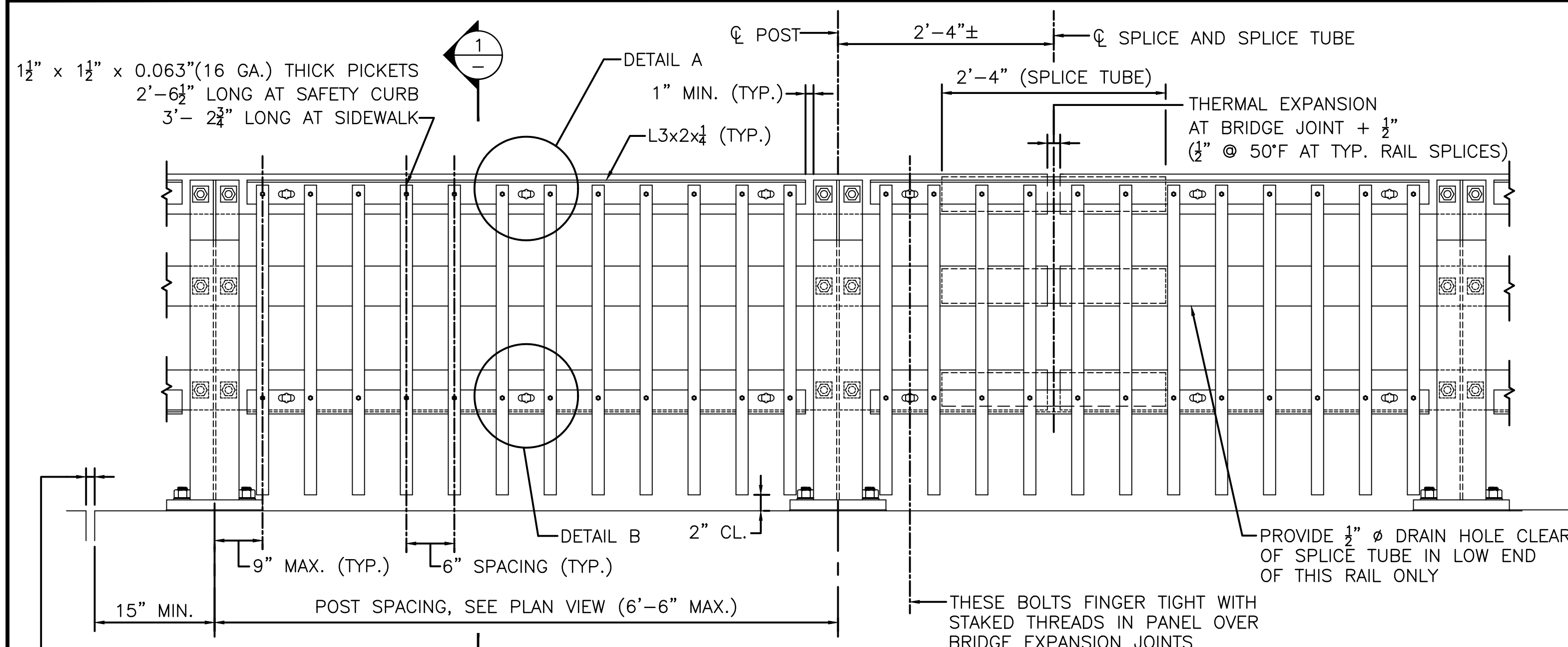
MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

BRIDGE SECTION & DETAILS

SCALE: AS NOTED

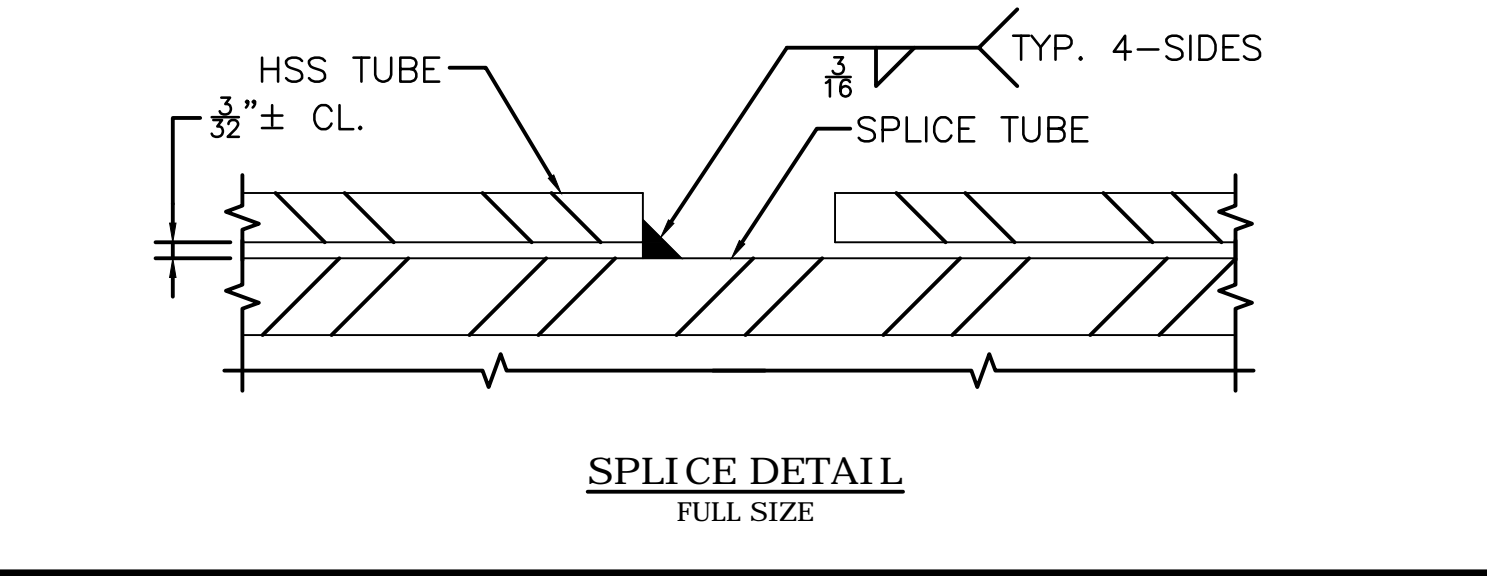
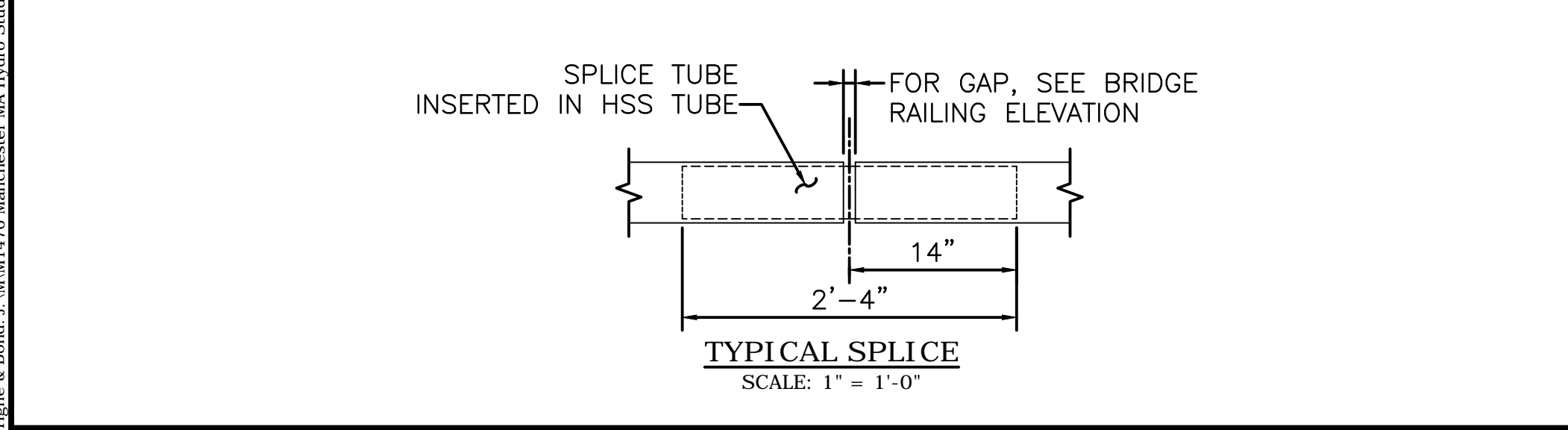
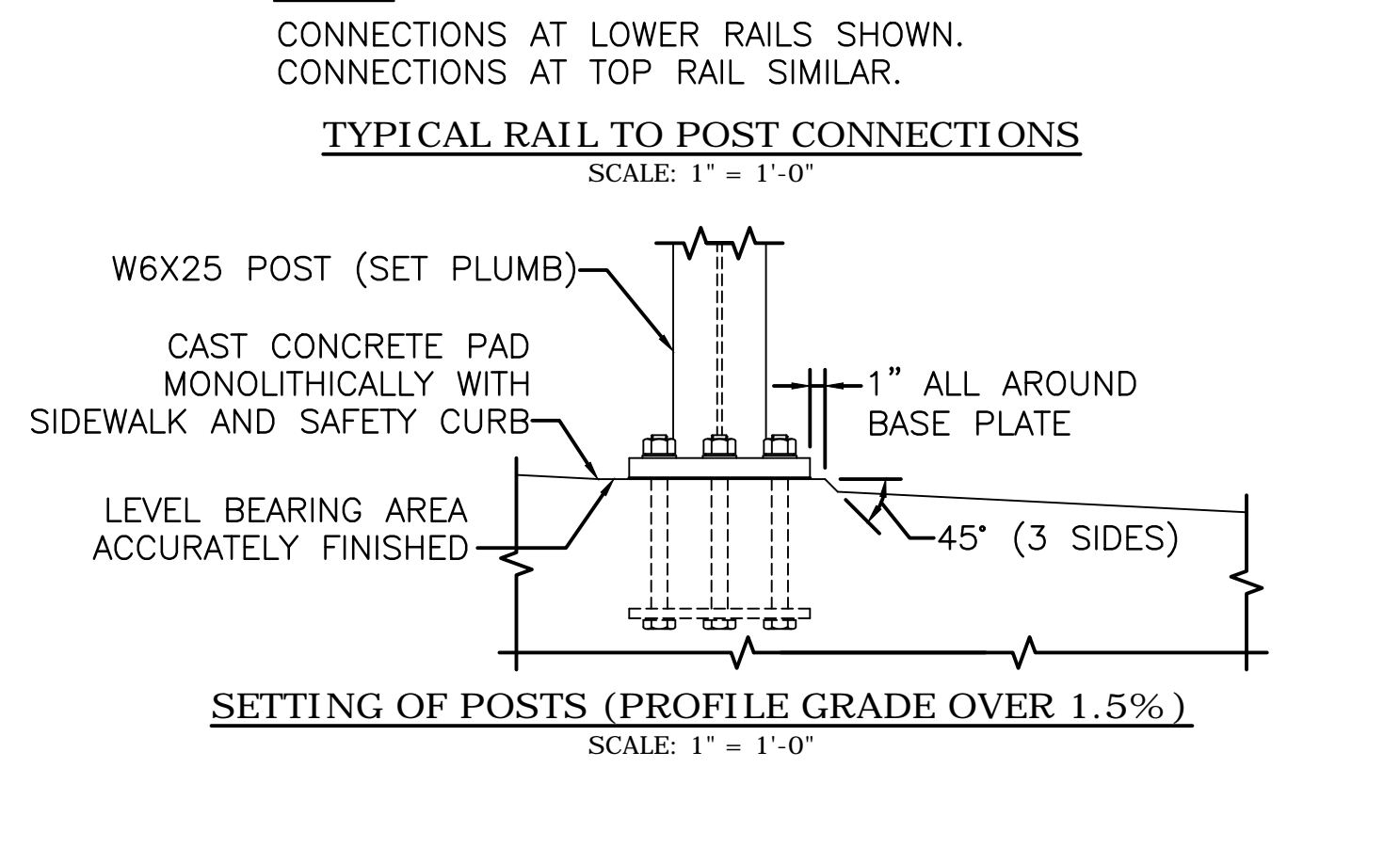
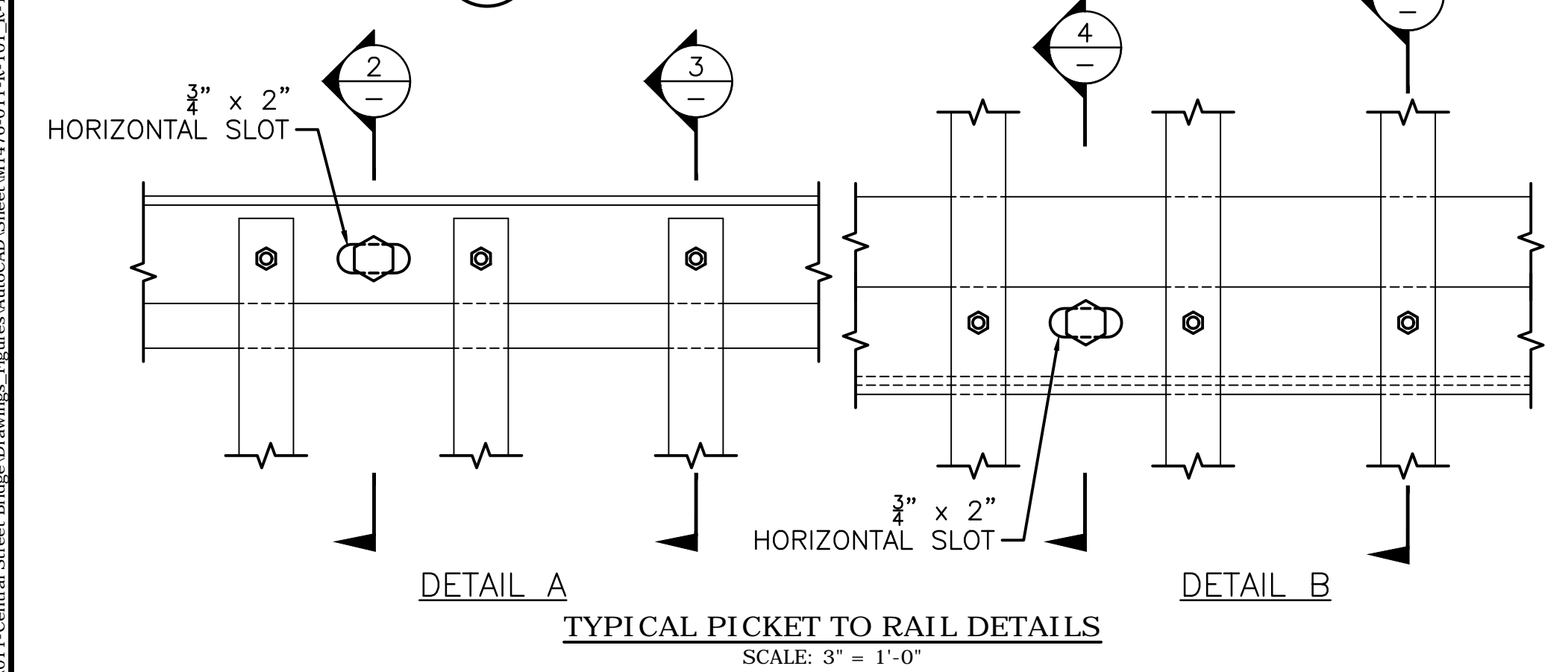
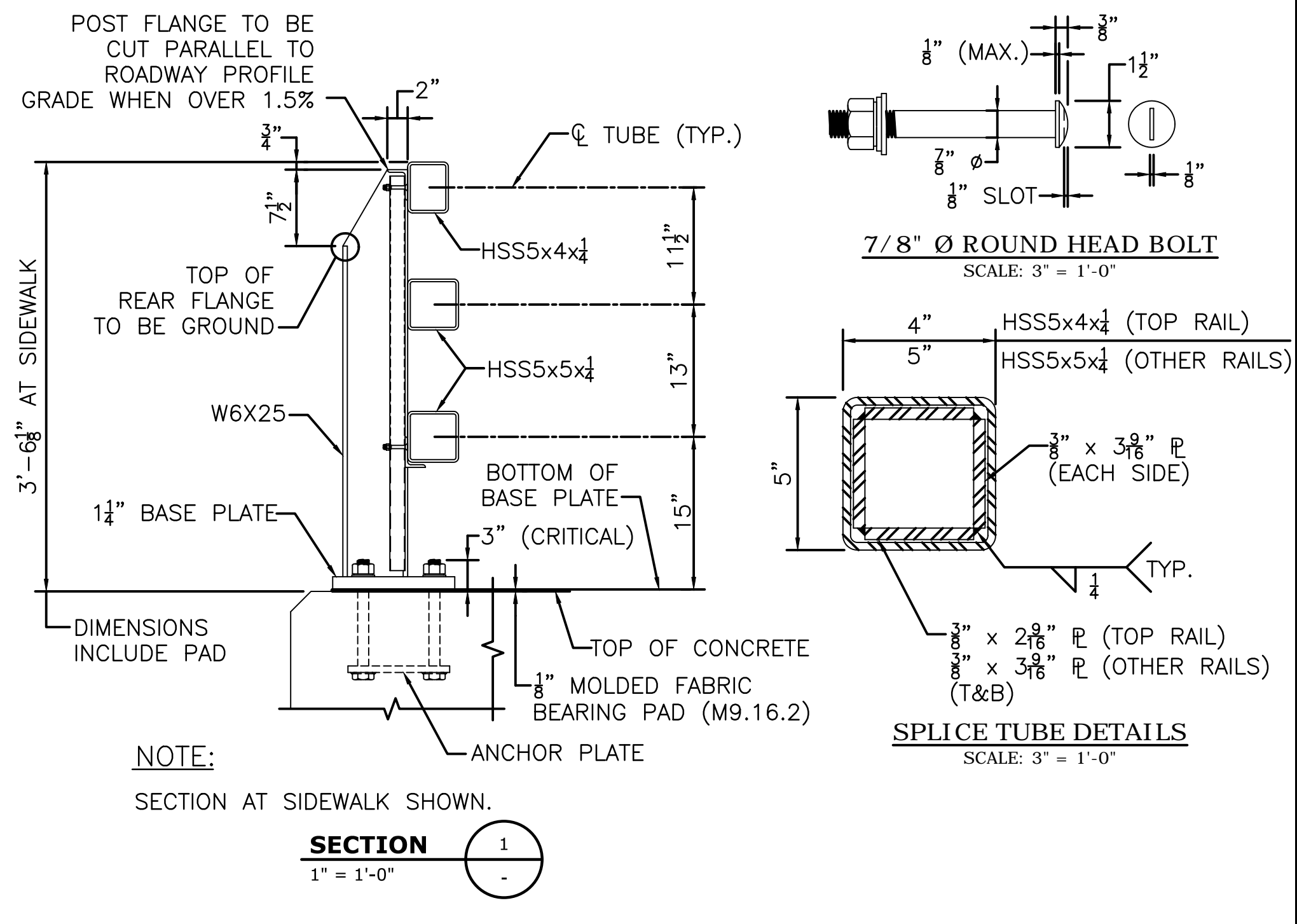
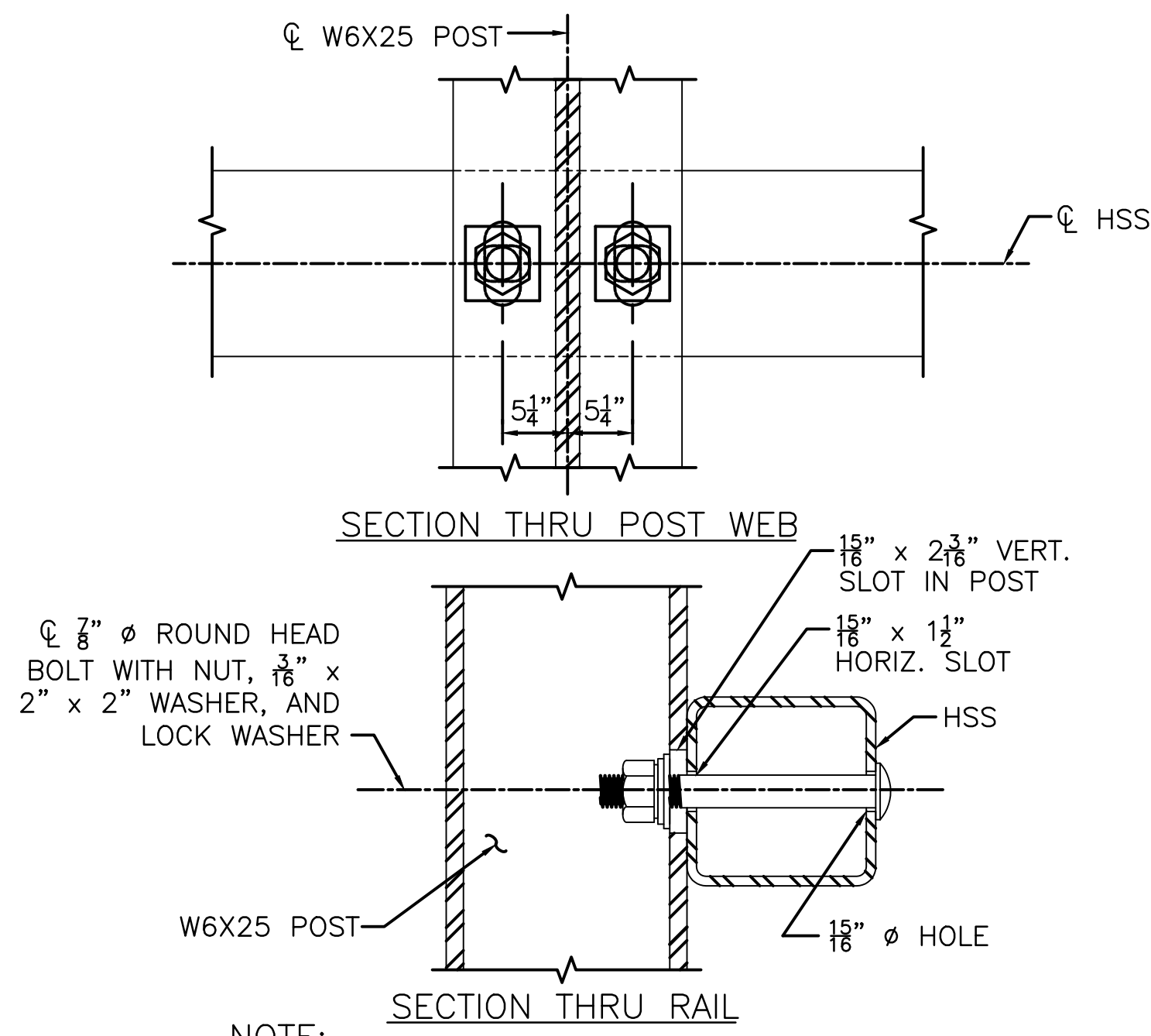
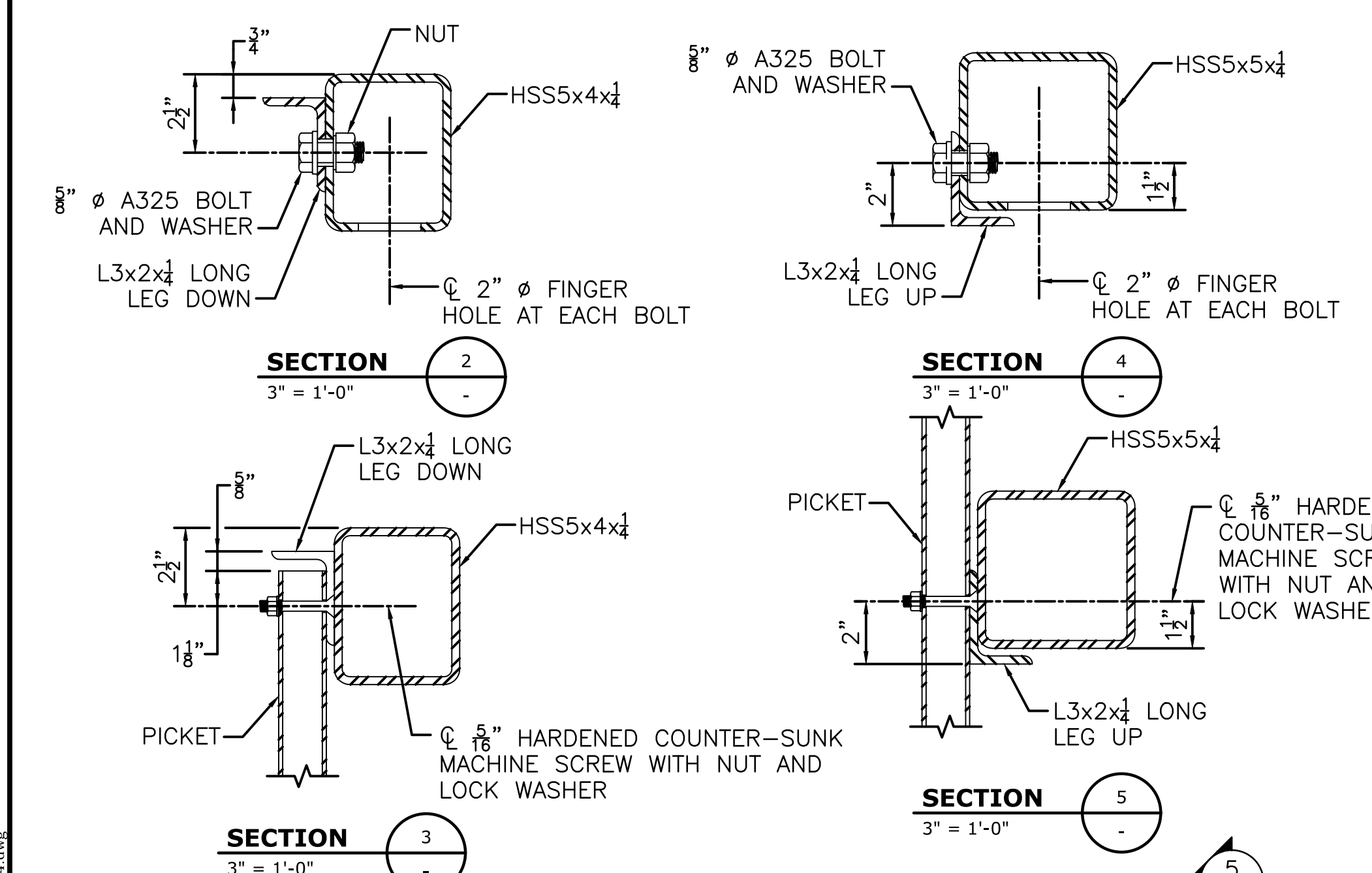
S-104



EXPANSION OR CONSTRUCTION JOINT

NOTE:
ELEVATION AT SIDEWALK SHOWN.

BRIDGE RAILING ELEVATION
SCALE: 1" = 1'-0"



RAILING NOTES:

- RAIL POST AND BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 50. HOLLOW RAILING STRUCTURAL TUBING (HSS) SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 500 WITH A CERTIFIED $F_y = 50$ KSI MINIMUM. THE MINIMUM HORIZONTAL BENDING RADII OF THE HSS TUBING SHALL BE 8 FEET. PICKET CARRIER ANGLES, ANCHOR PLATES, AND SPLICE TUBE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 36. PICKET TUBING SHALL CONFORM TO ASTM A 513 WITH $F_y = 36$ KSI MIN. OR A 500 GRADE B.
- ALL STEEL (EXCEPT THE 5/8" ANCHOR PLATE AND FASTENERS) SHALL BE GALVANIZED AND PAINTED DARK BRONZE (FEDERAL STD. 595B COLOR NO. 10045). ANCHOR PLATE SHALL BE GALVANIZED ONLY. HEADS OF 7/8" Ø ROUND HEAD BOLTS SHALL BE PAINTED TO MATCH RAIL.
- ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
- RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR (4) POSTS WITHOUT SPLICES WHERE POSSIBLE. RAILS SHALL BE SPLICED IN THE PANELS OVER EXPANSION JOINT.
- ENDS OF TUBE SECTIONS SHALL BE SAWED. GRIND SMOOTH EXPOSED EDGES. ALL CUT ENDS SHALL BE TRUE AND SMOOTH.
- ALL POSTS TO BE PLUMB WHEN PROFILE GRADE EXCEEDS 1.5%. FOR PROFILE GRADES LESS THAN 1.5%, POSTS SHALL BE SET PERPENDICULAR TO GRADE.
- POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK-GROUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.
- 7/8" Ø ROUND HEAD BOLTS SHALL CONFORM TO THE CHEMICAL AND PHYSICAL REQUIREMENTS OF AASHTO M 164.

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT. MASSDOT STANDARD DETAILS: MASSDOT 2013 LRFD BRIDGE MANUAL PART II CONVENTIONAL CONSTRUCTION S3-TL4 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO:	M1476-011	
DATE:	MARCH 2021	
FILE:	M1476-011-R-101_R-104.dwg	
DRAWN BY:	DRF	
CHECKED:	EAO	
APPROVED:	DLL	

S3-TL4 BARRIER DETAILS
SCALE: AS NOTED

Last Saved: 10/28/2020 12:29:09 PM By: AGR
 Tighe & Bond, J:\M1476\Manchester MA Hydro Study\01 Central Street Bridge Drawings_Egness\AutoCAD\Sheet\M1476-011-R-101_R-104.dwg

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

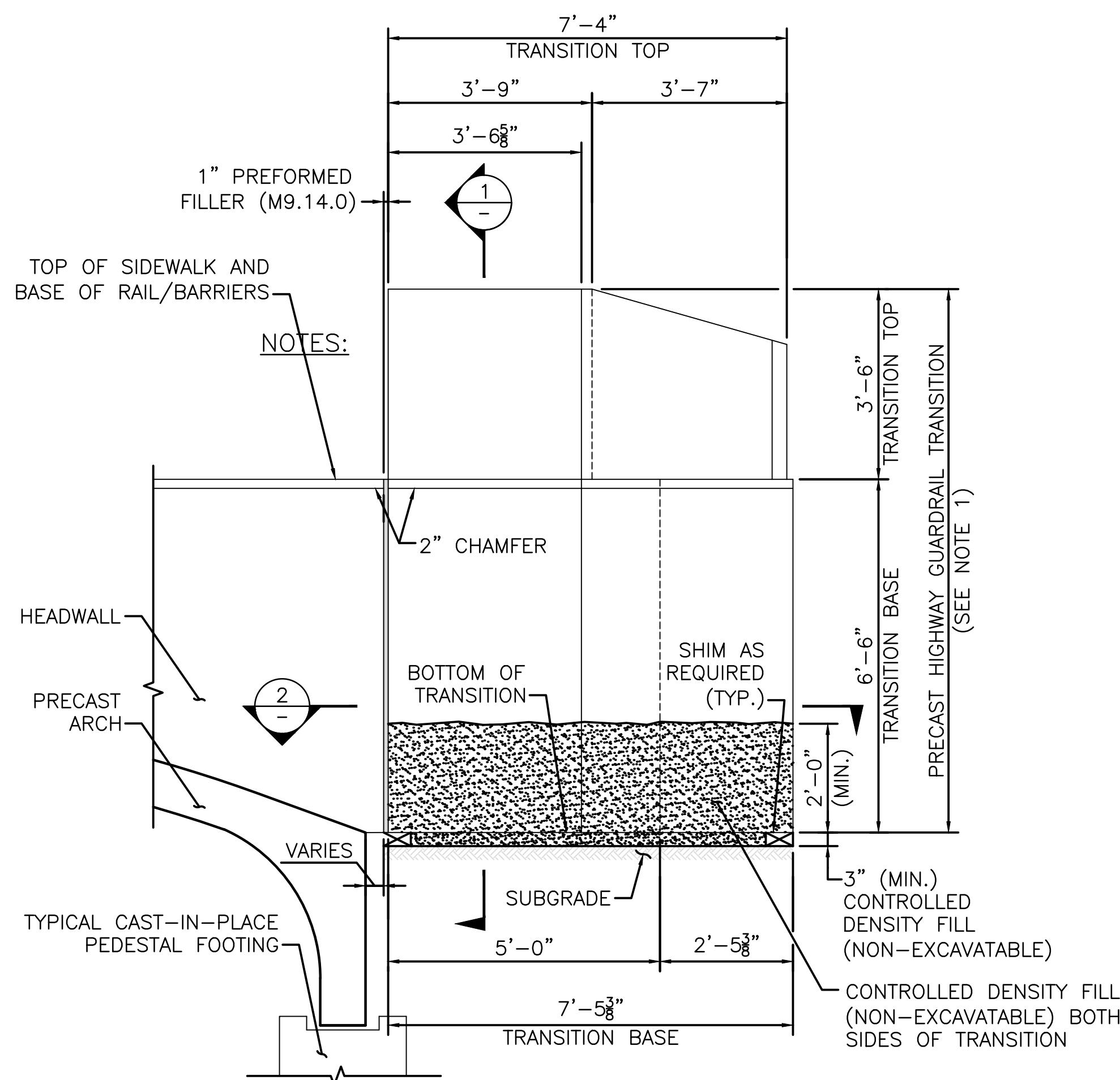
MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO:	M1476-011	
DATE:	MARCH 2021	
FILE:	M1476-011-R-101_R-104.dwg	
DRAWN BY:	DRF	
CHECKED:	EAO	
APPROVED:	DLL	

PRECAST HIGHWAY GUARDRAIL
TRANSITION AND S3-TL4
BARRIER DETAILS

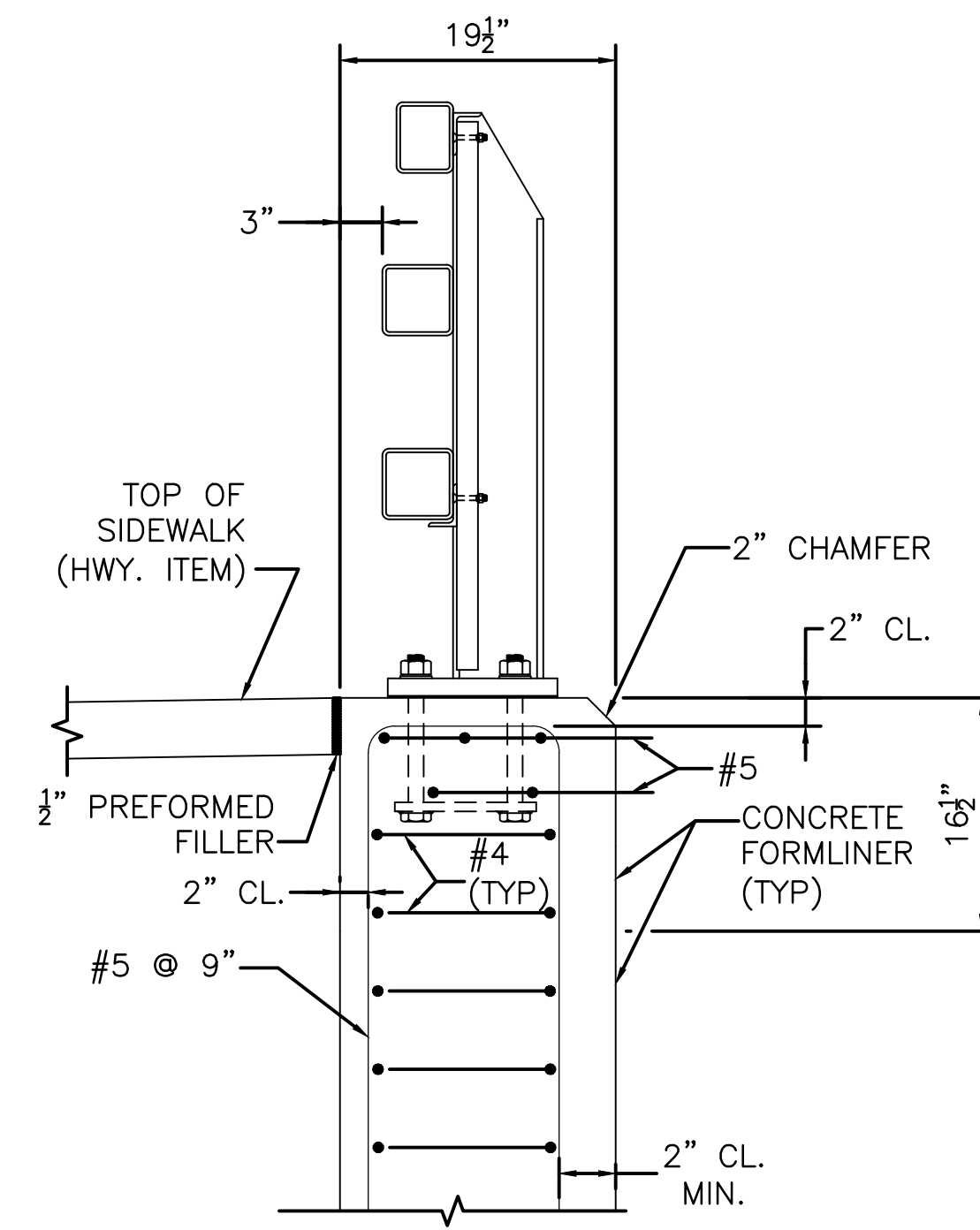
SCALE: AS NOTED



**PRECAST HIGHWAY GUARDRAIL TRANSITION
ELEVATION AT U-WINGWALL (MASSDOT 3.8.1)**
SCALE: 1/2" = 1'-0"

NOTES:

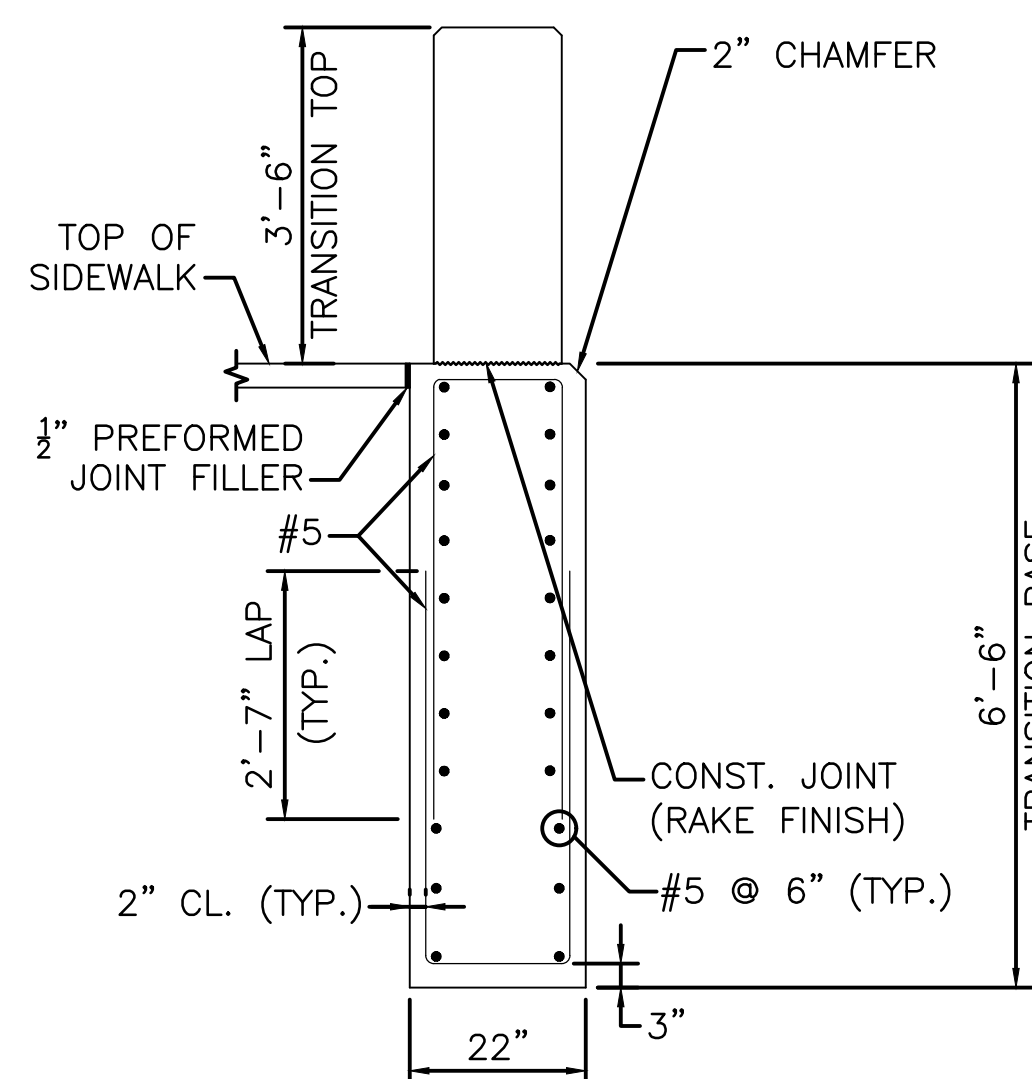
1. PRECAST GUARDRAIL TRANSITION SHALL BE 5000 PSI, 3/4 IN, 685 HP CEMENT CONCRETE.
2. GRAVEL BORROW SHALL BE PLACED AND THOROUGHLY COMPACTED TO THE GRADE OF 3" (MIN.) BELOW THE INTENDED BOTTOM OF THE PRECAST GUARDRAIL TRANSITION BASE AND TO A HEIGHT OF 2'-0" (MIN.) ON ALL SIDES OF THE TRANSITION BASE TO FORM A TRENCH IN WHICH TO SET THE TRANSITION. WHERE NO GRAVEL BORROW IS REQUIRED BELOW THE BASE, IT SHALL BE PLACED ON UNDISTURBED SOIL.
3. CONTRACTOR SHALL SET THE PRECAST GUARDRAIL TRANSITION TO THE REQUIRED ELEVATION AND ALIGNMENT, AND BACKFILL PRECAST GUARDRAIL TRANSITION WITH CONTROLLED DENSITY FILL (NON-EXCAVATABLE) TO THE ELEVATION SHOWN.



**S3-TL4 BARRIER SECTION THRU
BARRIER AT SIDEWALK (MASSDOT 9.2.7)**
SCALE: 1" = 1'-0"

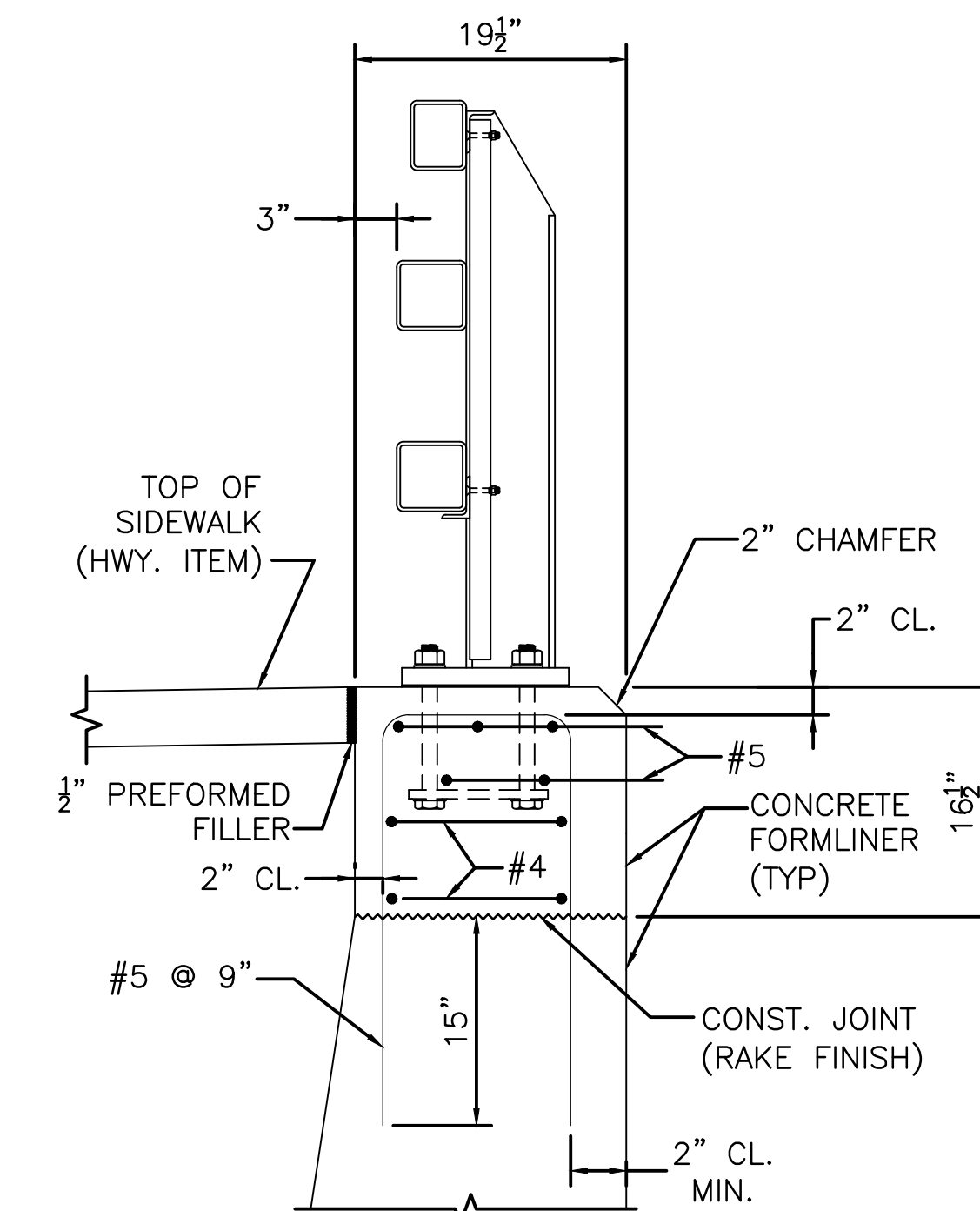
NOTES:

1. CONTRACTOR'S FABRICATOR IS RESPONSIBLE FOR DESIGN OF S3-TL4 CONNECTION TO HEADWALL AND HEADWALL CONNECTION TO PRECAST CONCRETE ARCH.
2. THIS STANDARD MASSDOT DETAIL SHOWS ADDITIONAL MINIMUM REINFORCEMENT FOR A CONNECTION TO A SLAB. IT MAY BE ASSUMED THAT THE SLAB IS THE TOP OF THE CONTRACTOR DESIGNED PRECAST ARCH.
3. CONTRACTOR'S FABRICATOR IS RESPONSIBLE FOR HEADWALL DESIGN.

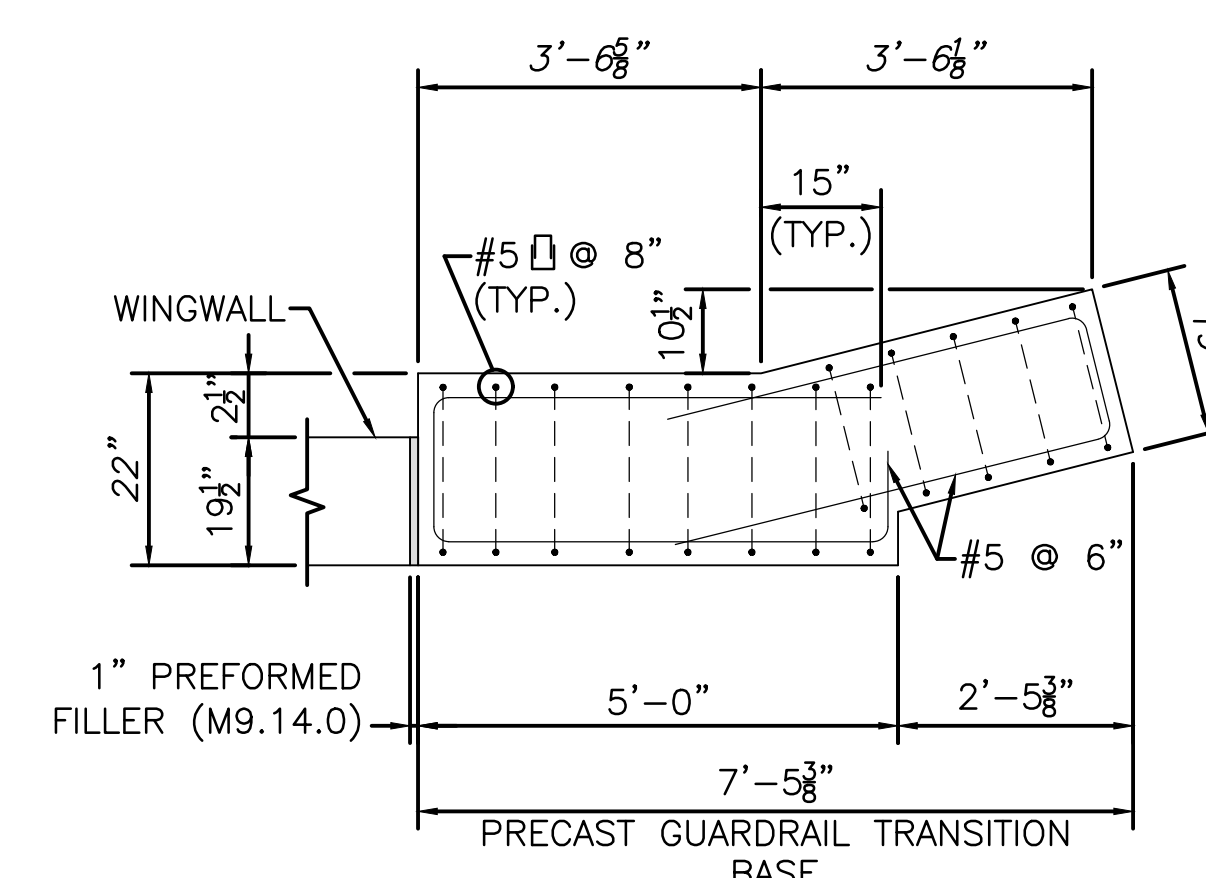


SECTION 1
1/2" = 1'-0"

**PRECAST HIGHWAY GUARDRAIL TRANSITION
VERTICAL SECTION FOR S3-TL4 BARRIER
AT SIDEWALK (MASSDOT 3.8.4)**



**S3-TL4 BARRIER TOP OF U-WINGWALL
DETAILS AT SIDEWALK (MASSDOT 9.3.12)**
SCALE: 1" = 1'-0"



NOTE:
WINGWALL REINFORCEMENT NOT SHOWN FOR CLARITY.

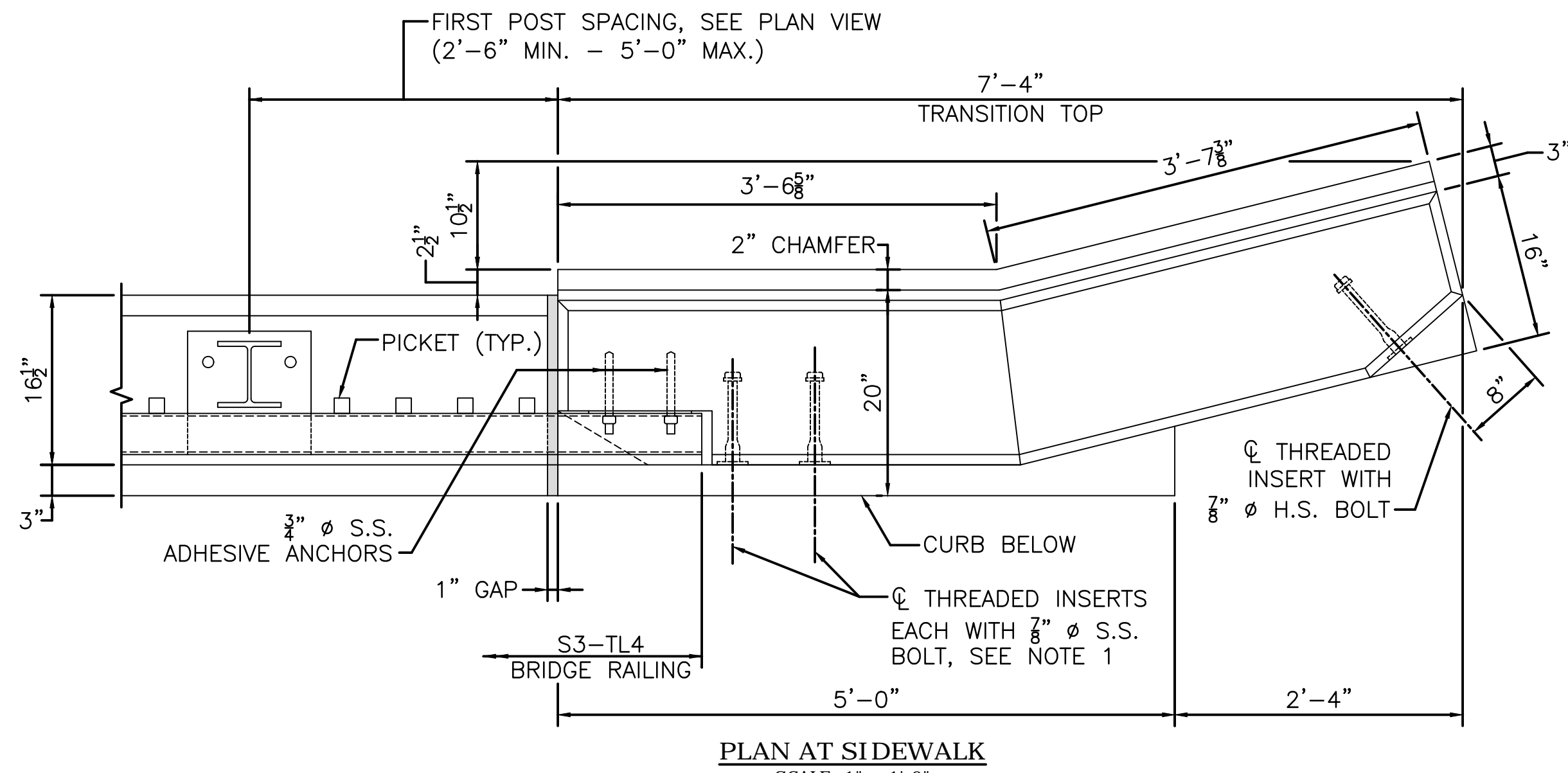
SECTION 2
1/2" = 1'-0"

**PRECAST HIGHWAY GUARDRAIL TRANSITION
HORIZONTAL SECTION (MASSDOT 3.8.5)**

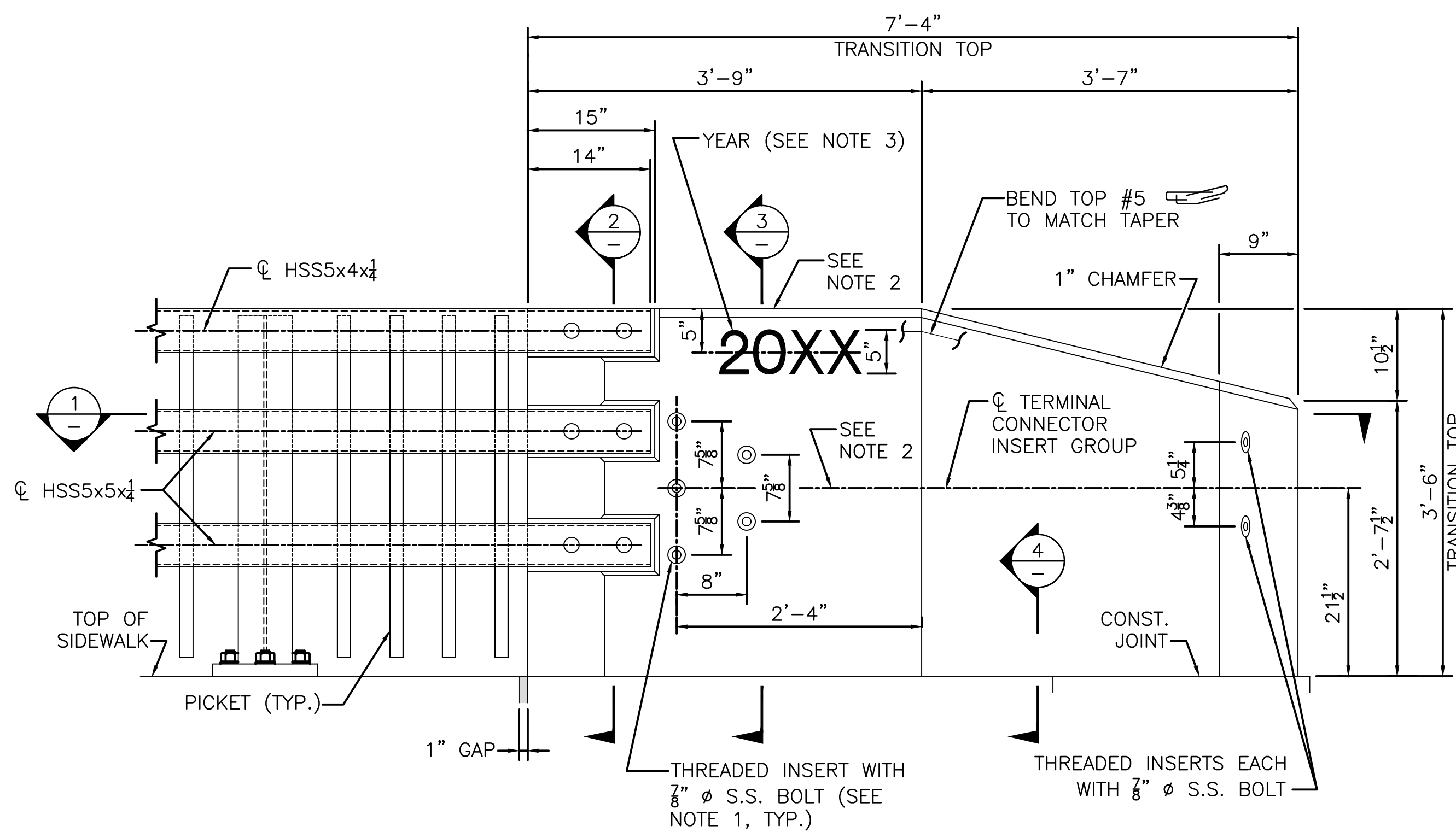
NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.
MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL
PART II CONVENTIONAL CONSTRUCTION
PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS

**COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**

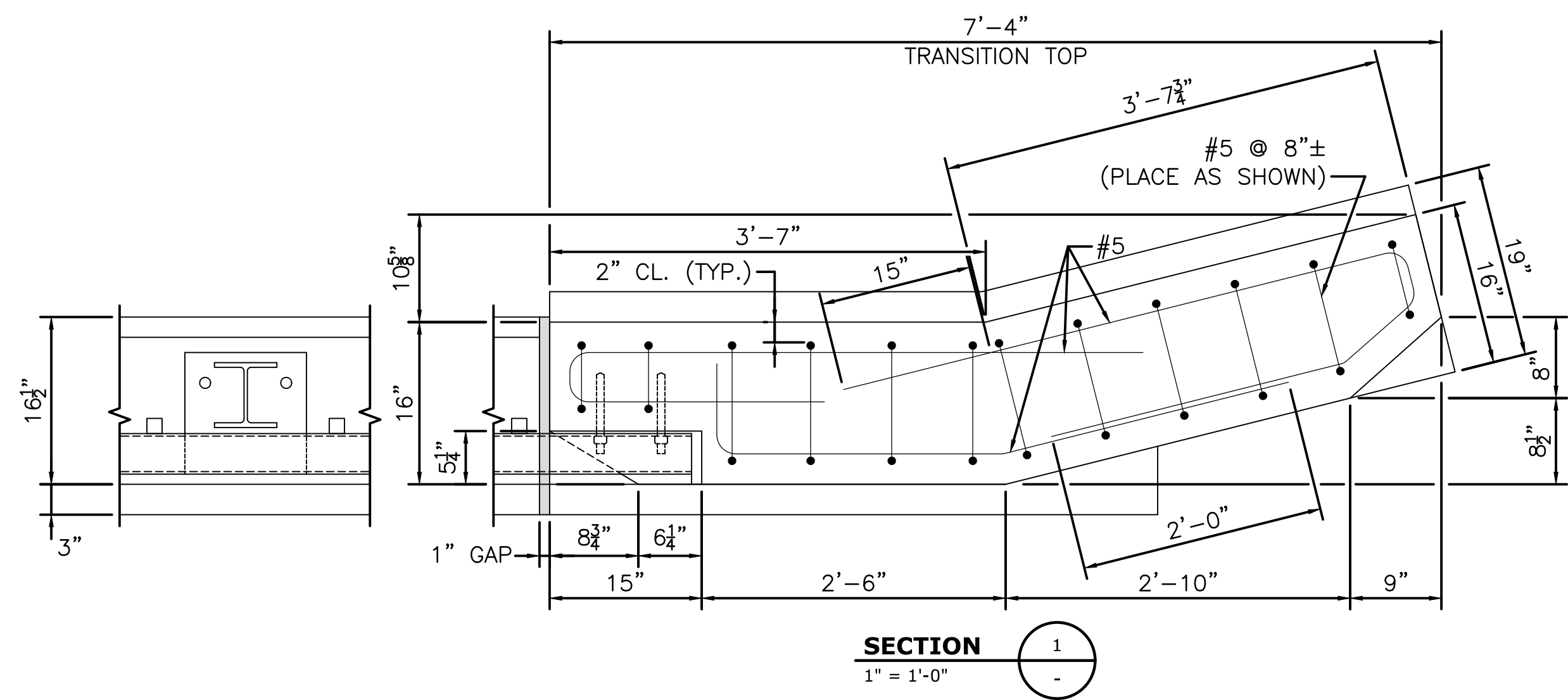
DISTRICT 4 BRIDGE ENGINEER DATE



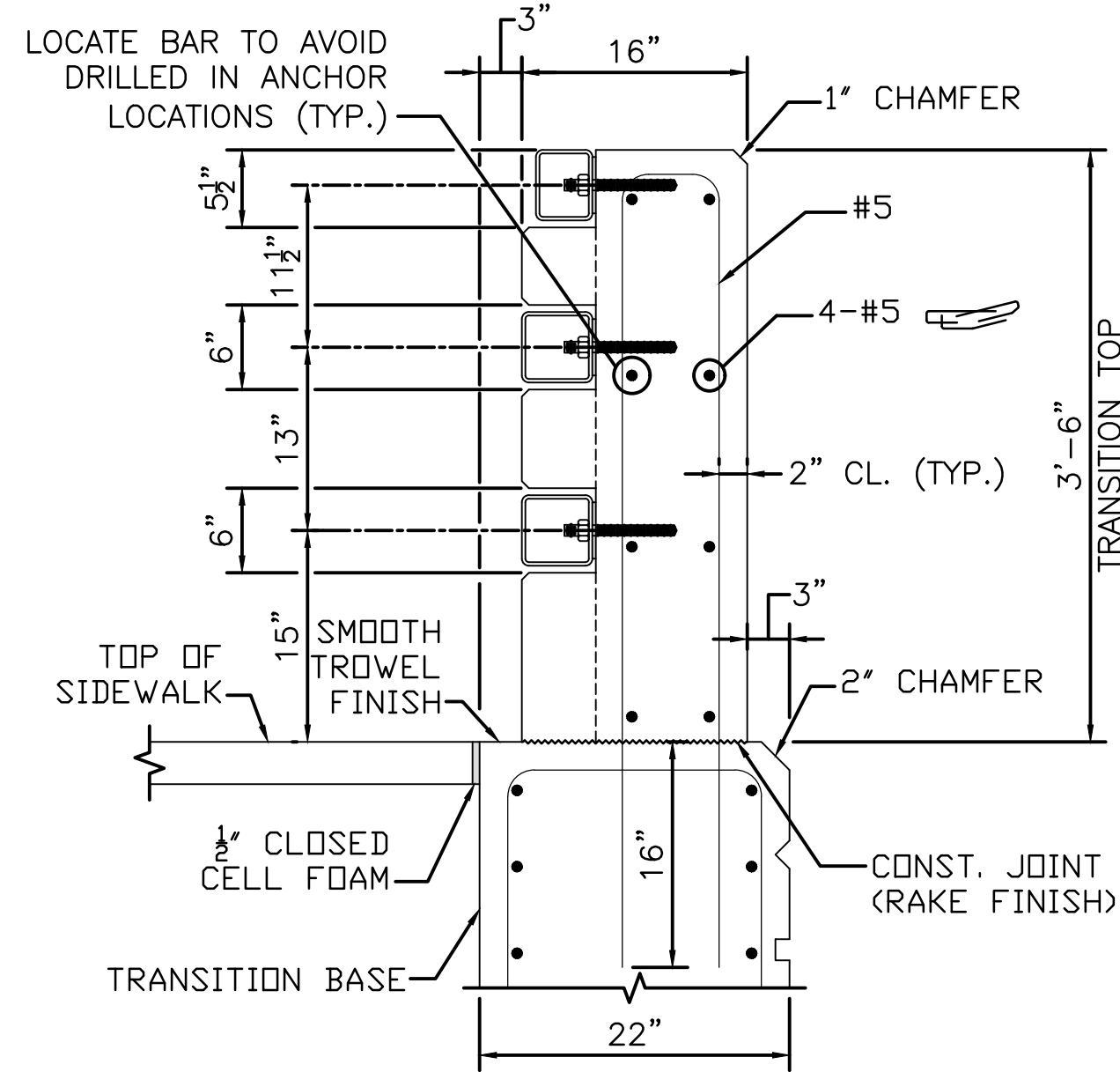
PLAN AT SIDEWALK
SCALE: 1" = 1'-0"



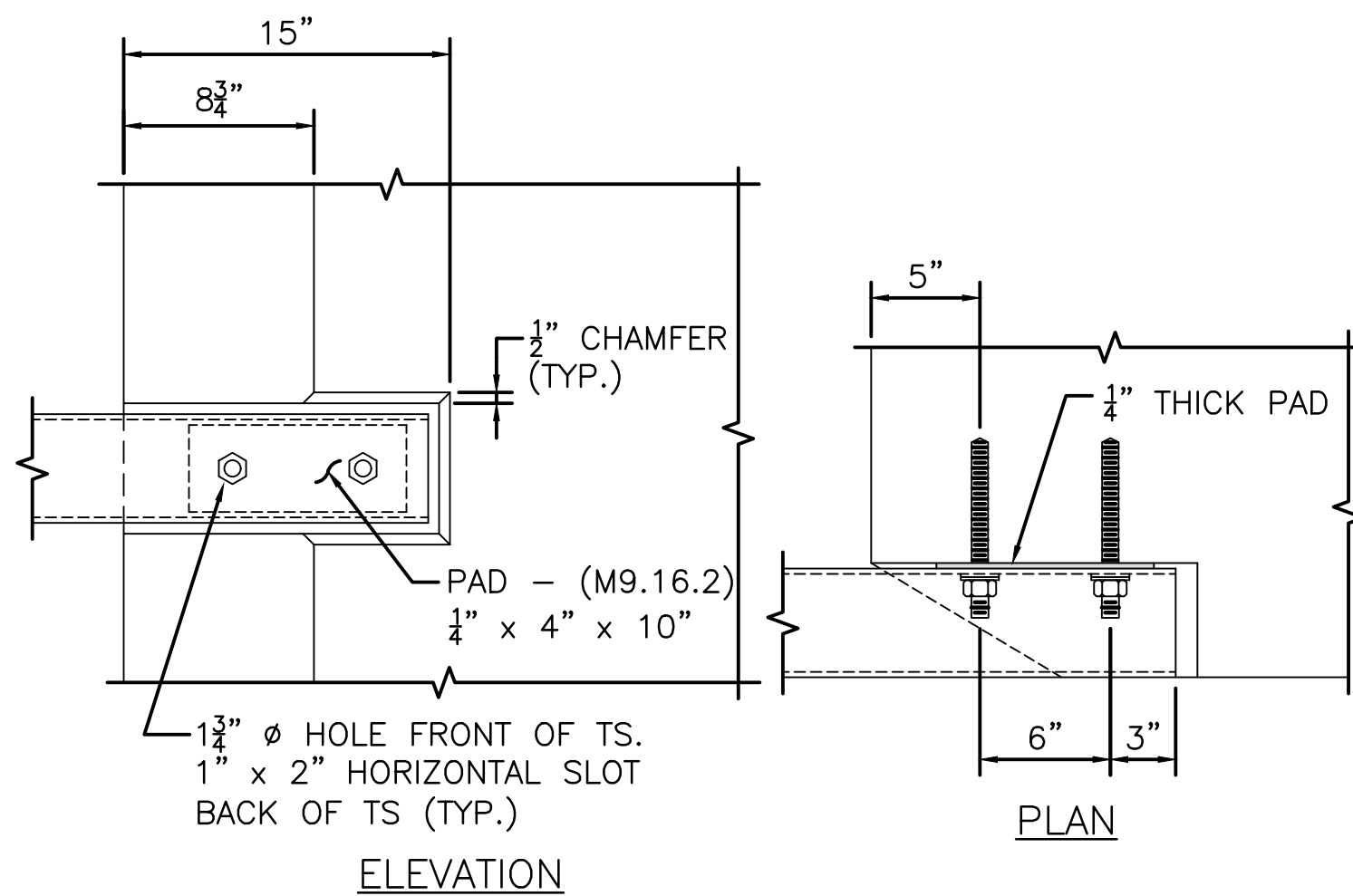
ELEVATION AT SIDEWALK
SCALE: 1" = 1'-0"



SECTION 1
1" = 1'-0"



SECTION 2
1" = 1'-0"

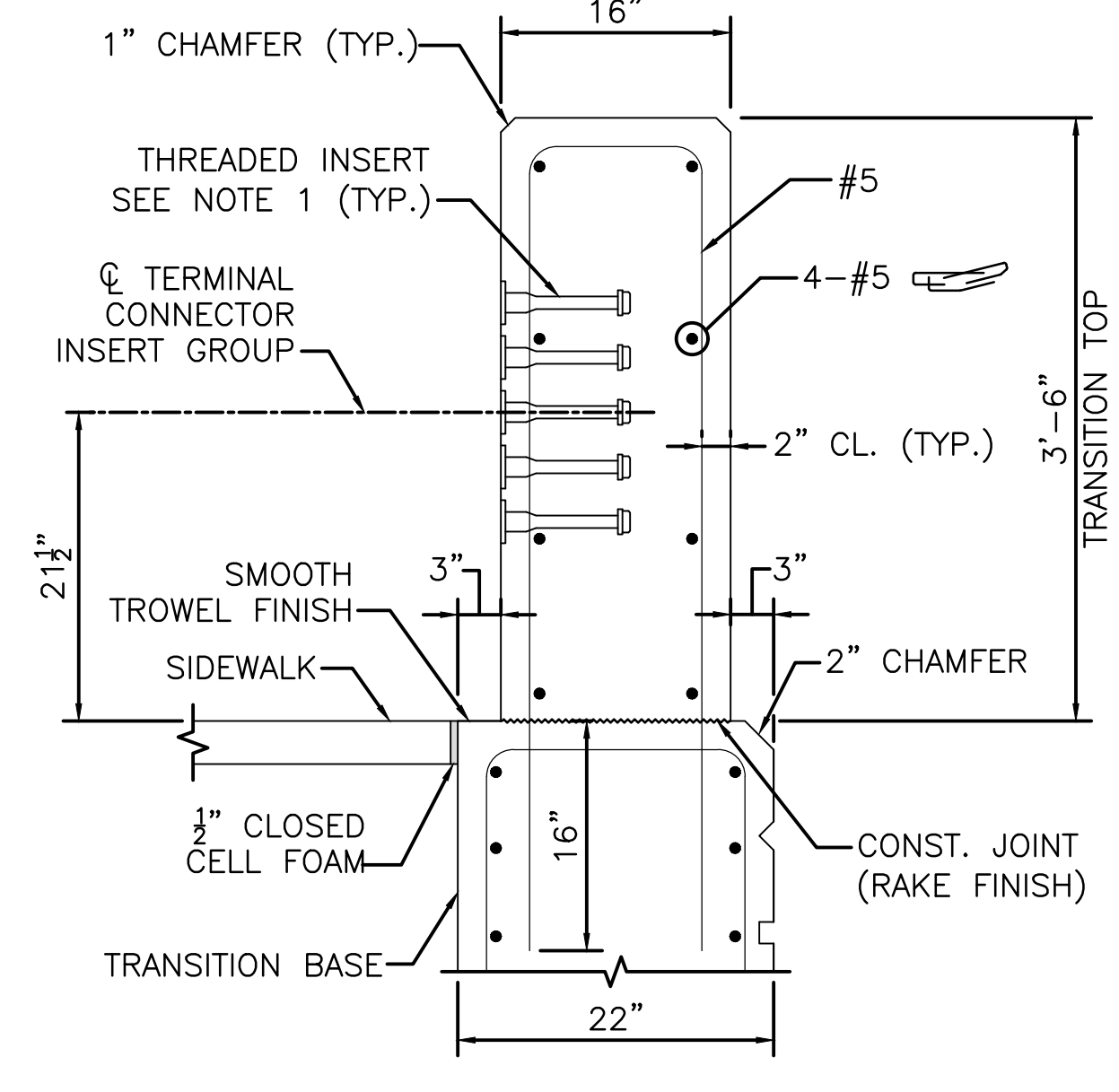


RAIL ATTACHMENT
SCALE: 1 1/2" = 1'-0"

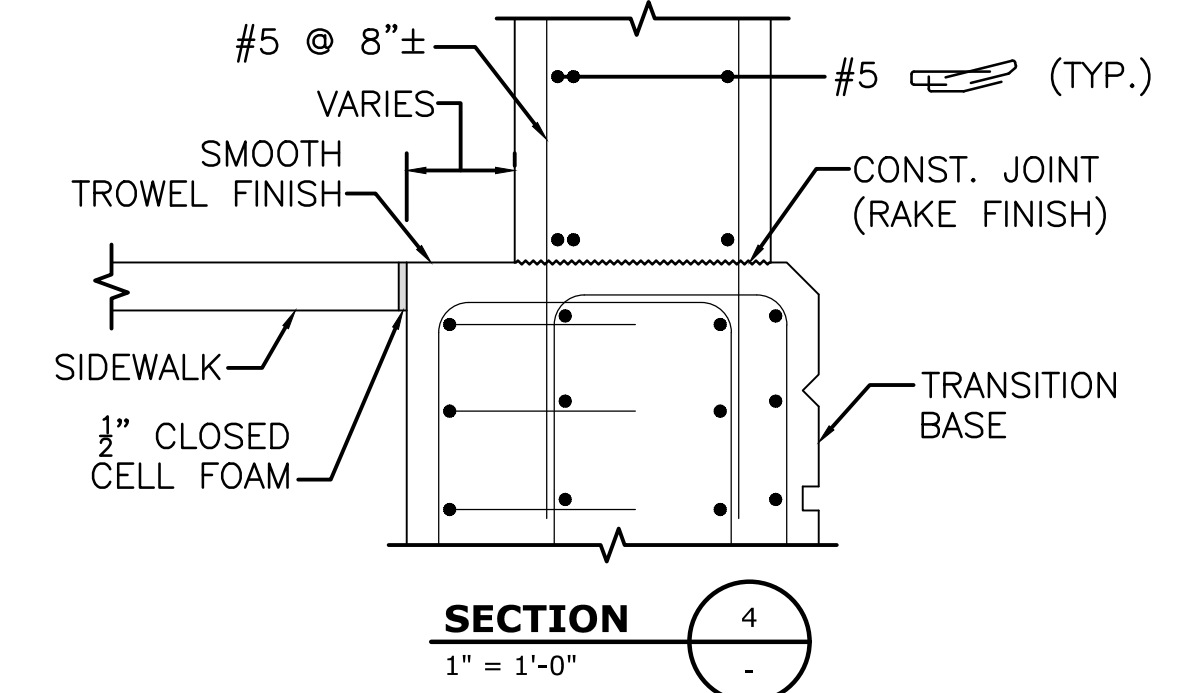
NOTES:

1. THREADED INSERTS SHALL BE PREQUALIFIED BY THE MANUFACTURER AS BEING CAPABLE OF DEVELOPING A NOMINAL SHEAR RESISTANCE OF 20 KIPS PER 7/8" Ø S.S. BOLT. S.S. BOLTS SHALL BE 7/8" Ø x 1 1/2" LONG FULLY THREADED AISI TYPE 304N STAINLESS STEEL. INSERTS FOR 7/8" S.S. BOLTS SHALL BE GALVANIZED AND CAST INTO THE TRANSITION.
2. FOR AN APPROACH GRADE UP TO 3%, THE TRANSITION MAY BE CAST SQUARE AND SET PLUMB WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SQUARE TO THE POST.

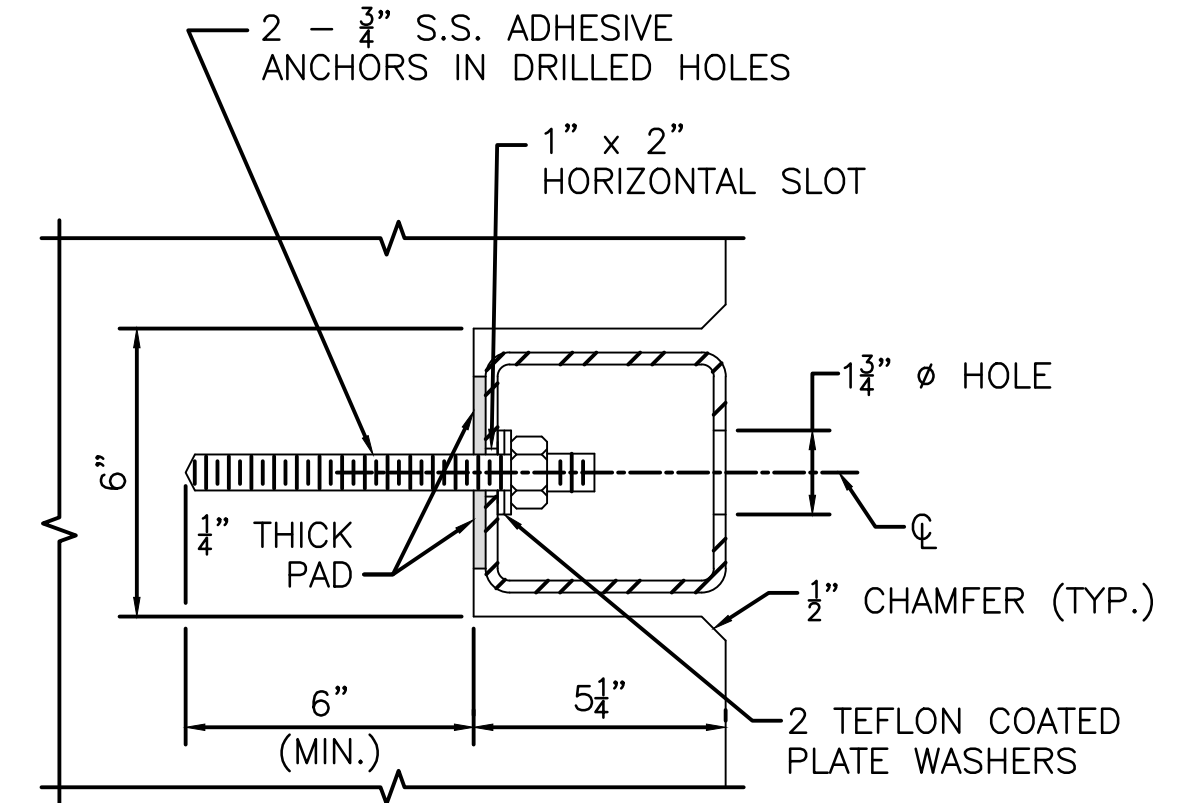
FOR AN APPROACH GRADE IN EXCESS OF 3%, THE TRANSITION TOP AND THE TOP OF CURB SHALL FOLLOW THE APPROACH GRADE. THE HEIGHT OF THE TRANSITION TOP SHALL VARY PROVIDED THAT THE MINIMUM DIMENSIONS SHOWN ON THE CONSTRUCTION DRAWINGS ARE MET. THE BOTTOM OF THE TRANSITION BASE SHALL BE SET LEVEL WITH THE MINIMUM EMBEDMENT DEPTH SHOWN. THE TERMINAL CONNECTOR INSERT GROUP SHALL BE SLOPED TO FOLLOW THE APPROACH GRADE.
3. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST GUARDRAIL TRANSITION IS CAST. USE THIS YEAR FOR ALL GUARDRAIL TRANSITIONS.
4. ALL CONCRETE FOR THE PRECAST HIGHWAY GUARDRAIL TRANSITION SHALL BE 5000 PSI, 3/4", 685 HP CEMENT CONCRETE.
5. LIFTING DEVICES (NOT SHOWN), INCLUDING THEIR NUMBER AND LOCATION, SHALL BE DESIGNED AND DETAILED BY THE PRECASTER. THEY SHALL BE GALVANIZED AND SHALL BE PLACED AND RECESSED IN POCKETS TO PROVIDE 1 1/2" CLEAR COVER TO THE FACE OF THE TRANSITION CONCRETE. THESE DEVICES SHALL BE CLEARLY SHOWN ON THE SHOP DRAWINGS ALONG WITH ALL SUPPORTING CALCULATIONS AND/OR CATALOG CUTS. ONCE THE PRECAST TRANSITION IS SET IN PLACE, THE LIFTING DEVICE POCKETS SHALL BE FILLED WITH A NON-SHRINK GROUT THAT MATCHES THE COLOR OF THE TRANSITION CONCRETE WHEN CURED AND THE FILLED POCKETS SHALL BE RUBBED WITH A CORUNDUM STONE TO BLEND OUT THE JOINTS.



SECTION 3
1" = 1'-0"



SECTION 4
1" = 1'-0"



SECTION 5
3" = 1'-0"

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARDS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.
MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL
PART II CONVENTIONAL CONSTRUCTION
TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR S3-TL4 BARRIER

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 4 BRIDGE ENGINEER DATE

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

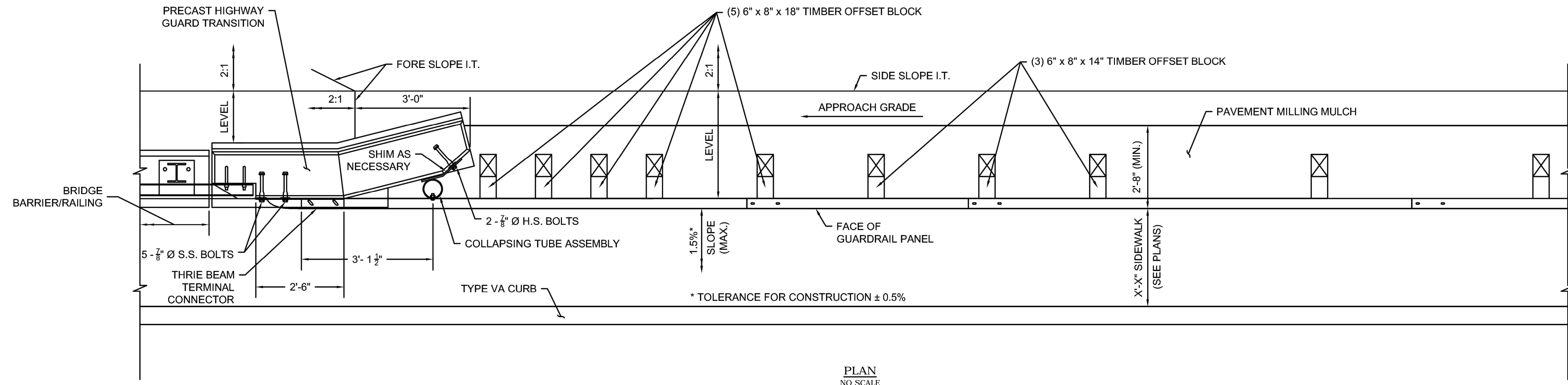
MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

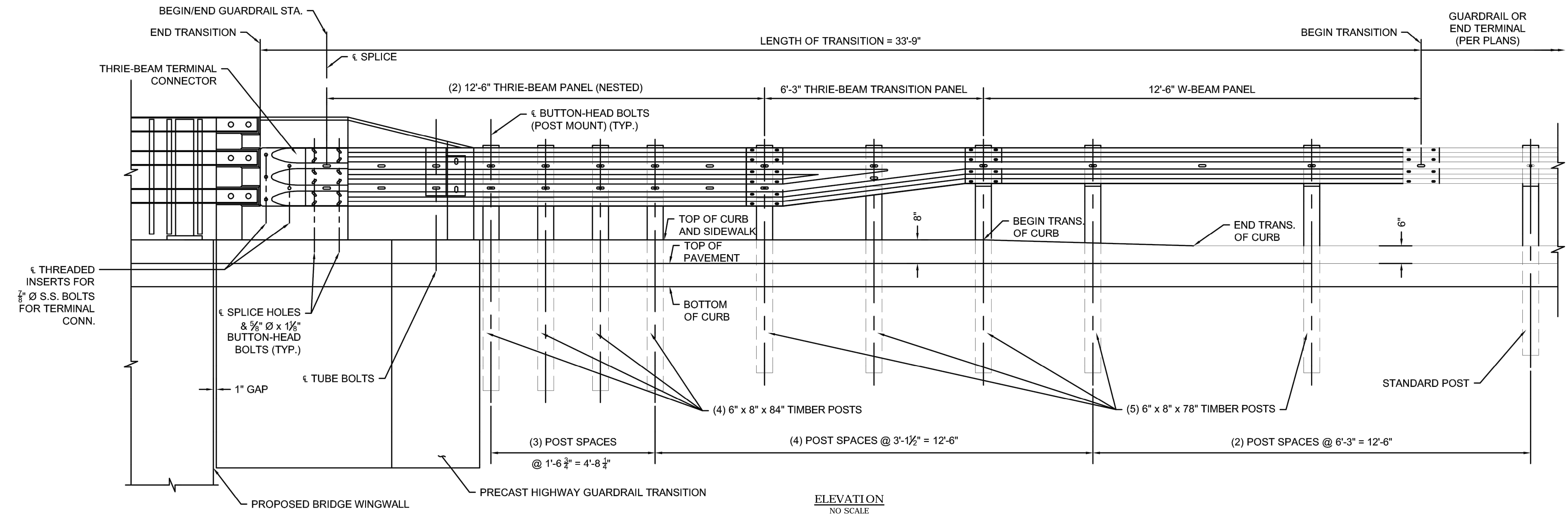
MARK	DATE	DESCRIPTION
0	3/12/2021	90% Drawings
PROJECT NO: M1476-011		
DATE: MARCH 2021		
FILE: M1476-011-R-101_R-104.dwg		
DRAWN BY: DRF		
CHECKED: EAO		
APPROVED: DLL		

TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR S3-TL4 BARRIER

SCALE: AS NOTED



PLAN
NO SCALE



ELEVATION
NO SCALE

TRANSITION TO BRIDGE RAIL (BACK OF SIDEWALK)
(MASSDOT 400.3.5)

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.
MASSDOT STANDARD DETAILS:
MASSDOT HIGHWAY DIVISION
CONSTRUCTION STANDARD DETAILS
GUARDRAIL TRANSITION TO BRIDGE RAIL (BACK OF SIDEWALK)

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

0	3/12/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	MARCH 2021	
FILE:	M1476-011-R-101_R-104.dwg	
DRAWN BY:	DRF	
CHECKED:	EAO	
APPROVED:	DLL	

GUARDRAIL TRANSITION TO
BRIDGE RAIL
(BACK OF SIDEWALK)

SCALE: AS NOTED

Last Saved: 10/28/2020 2:20pm By: GBR
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Tighe&Bond

APPENDIX C

Appendix B - Photographic Log

Client: Town of Manchester-by-the-Sea

Job Number: M-1476-011

Site: Central Street Bridge



Appendix B - Photographic Log

Client: Town of Manchester-by-the-Sea

Job Number: M-1476-011

Site: Central Street Bridge

Photograph No.: 3	Date: 8/13/2018	Direction Taken: West
--------------------------	------------------------	------------------------------

Description: A view of the downstream (Manchester Harbor) side of the bridge from Central Street.



Photograph No.: 4	Date: 8/13/2018	Direction Taken: West
--------------------------	------------------------	------------------------------

Description: View of the tide gate structure and bridge wall on the downstream side of Central Street Bridge.





Appendix B - Photographic Log

Client: Town of Manchester-by-the-Sea

Job Number: M-1476-011

Site: Central Street Bridge

Photograph No.: 5	Date: 8/13/2018	Direction Taken: East
Description: View of the tide gate on the downstream side of Central Street Bridge.		
		

Photograph No.: 6	Date: 8/13/2018	Direction Taken: South
Description: View of the underside of the porch adjacent to the upstream side of Central Street Bridge.		
		

Appendix B - Photographic Log

Client: Town of Manchester-by-the-Sea

Job Number: M-1476-011

Site: Central Street Bridge

Photograph No.: 7	Date: 8/13/2018	Direction Taken: South
Description: Looking downstream at the tide gate structure from within the bridge opening.		



Photograph No.: 8	Date: 8/13/2018	Direction Taken: North
Description: Looking upstream from within the bridge opening.		

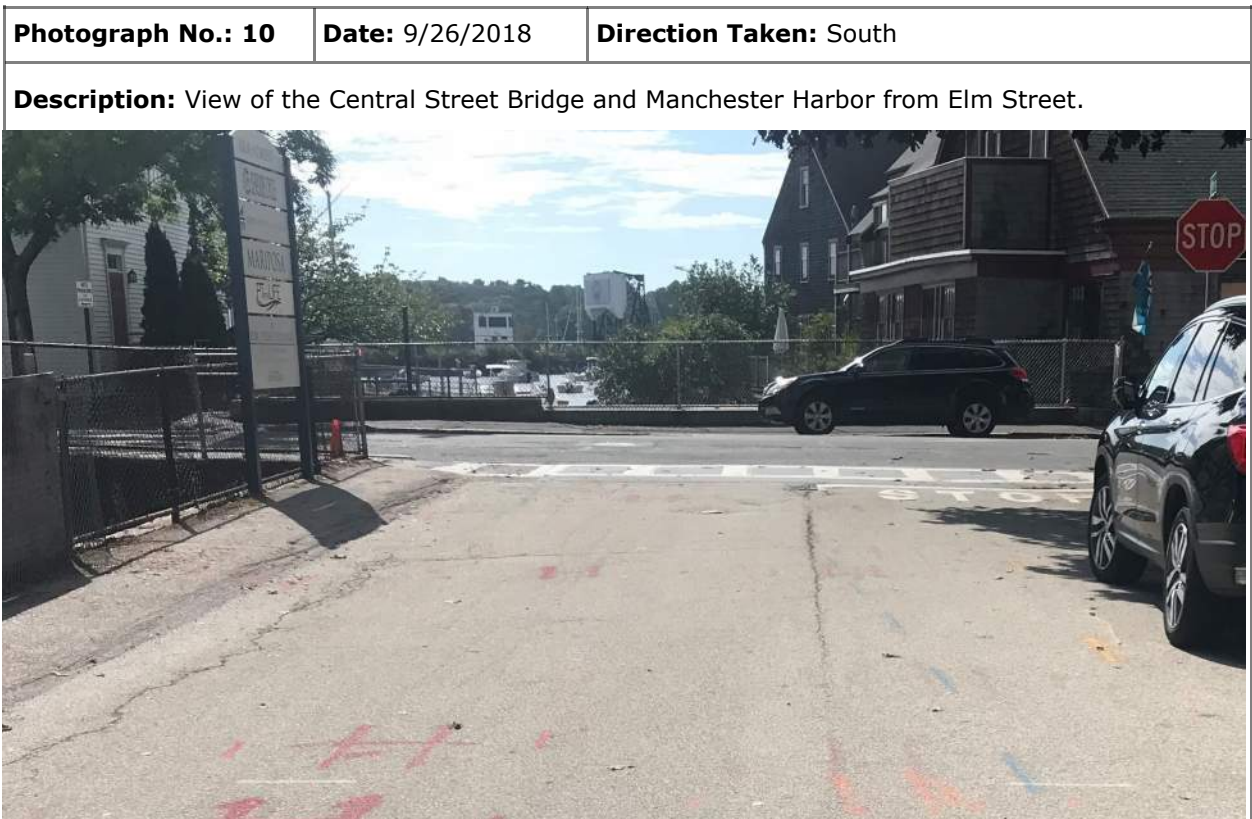
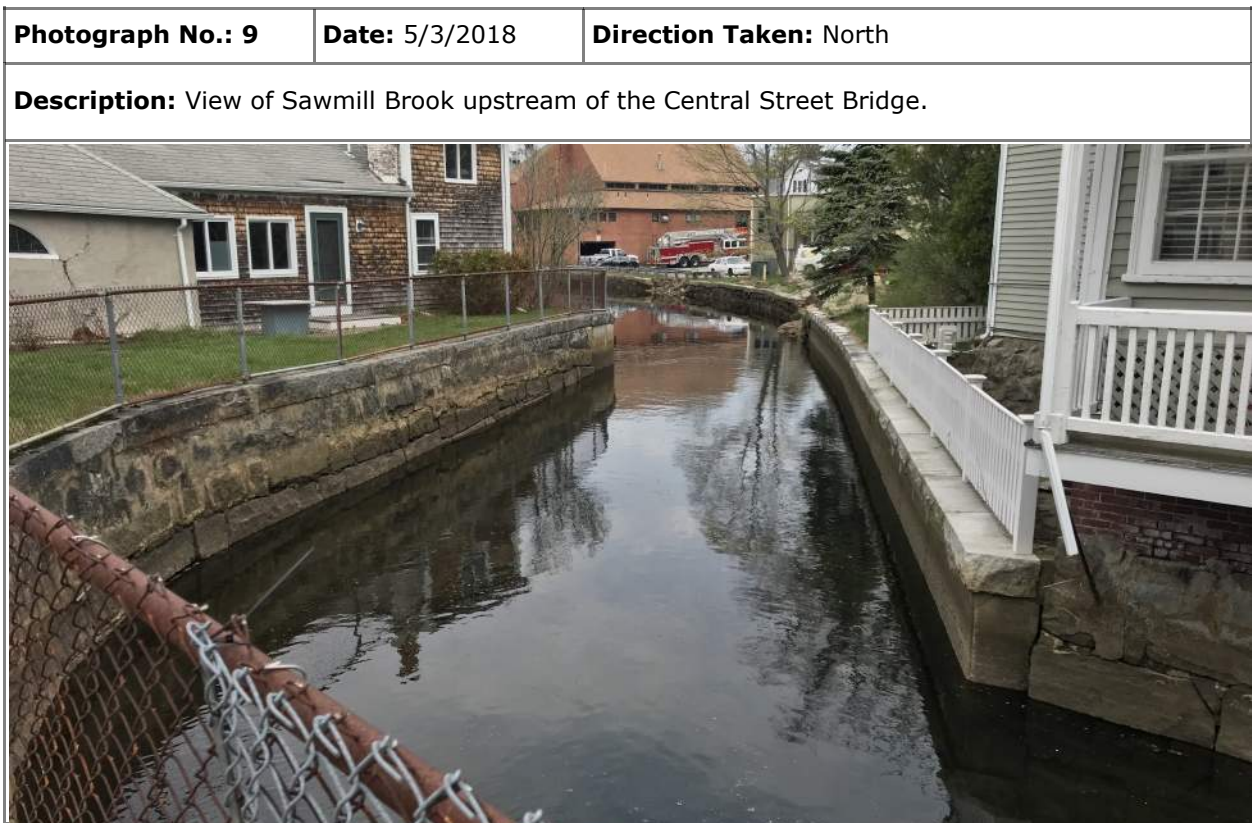


Appendix B - Photographic Log

Client: Town of Manchester-by-the-Sea

Job Number: M-1476-011

Site: Central Street Bridge



Tighe&Bond

APPENDIX D

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Sawmill Brook Tide Gate and Stream Restoration

Location / Address: In and along Sawmill Brook from Central Street just past Norwood Avenue (see locus map)

City / Town: Manchester-by-the-Sea, MA

Project Proponent

Name: Town of Manchester-by-the-Sea Mary Reilly, Grants Administrator (contact)

Address: 10 Central Street

City/Town/Zip/Telephone: Manchester-by-the-Sea/ 01944 / 978-525-6427

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name

Type of License or funding (specify)

See attached list

Project Description (narrative):

Manchester has been evaluating the removal of the tide gate and dam under Central Street and restoration of Central Pond and Sawmill Brook. Planning is at the feasibility evaluation level. Work would consist of replacement/widening of bridges/culverts and in-stream restoration between Central Avenue and Norwood Avenue. No work to existing buildings. See attached for additional narrative.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

No.

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

Not of any buildings, however, project may include rehabilitation of Central Street Bridge (MAN.909), which is listed on the National Register and is in the local historic district.

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

Project may include new construction of culverts and bridges, and stream restoration. Plans have not yet been prepared.

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A (continued)

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

Yes, Central Street Bridge (MAN.909) is listed on the national register and the local historic district. The attached project narrative provides additional information.

What is the total acreage of the project area?

Woodland _____	acres	Productive Resources:	
Wetland ~2.3 _____	acres	Agriculture _____	acres
Floodplain ~2.3 _____	acres	Forestry _____	acres
Open space _____	acres	Mining/Extraction _____	acres
Developed _____	acres	Total Project Acreage ~2.3 _____	acres

What is the acreage of the proposed new construction? _____ TBD _____ acres

What is the present land use of the project area?

Waterbodies/wetlands surrounded mostly by residential areas. Central Street is located in the Town's business district.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

See attached.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form:  Date: 1/15/18

Name: Janet Moonan, Tighe & Bond

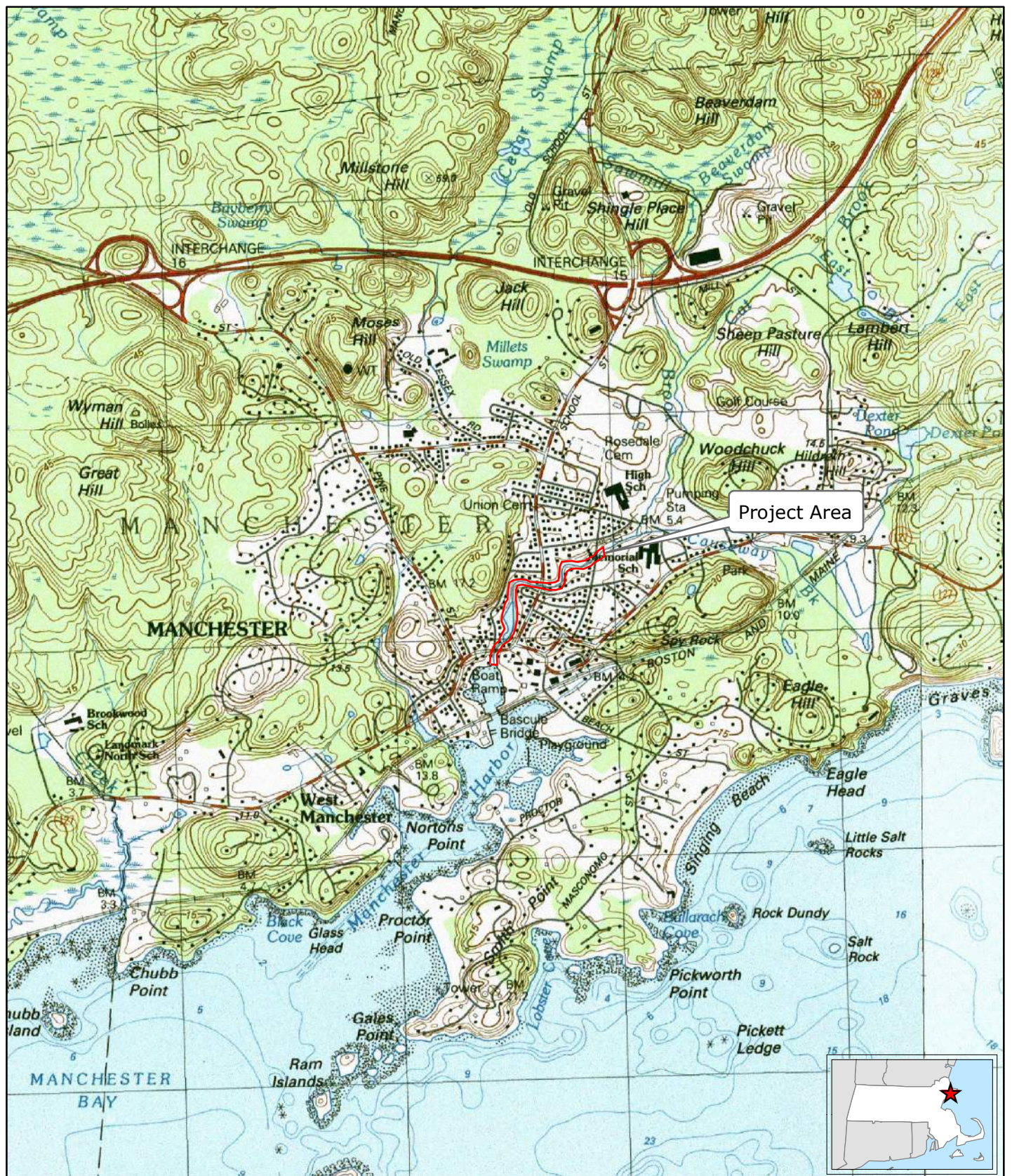
Address: One University Avenue, Suite 104

City/Town/Zip: Westwood, MA 02090

Telephone: 781-708-9826

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.



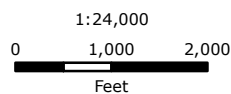
**FIGURE 1
SITE LOCUS**

Sawmill Brook
Project Area
Manchester-by-the-Sea, MA

January 2018

Tighe & Bond
Engineers | Environmental Specialists

Image provided by MassGIS based on USGS Topographic Map for Ashburnham, MA. Revised 1988. Circles indicate 500-foot & half-mile radii. Contour Interval: 3 Meters



Project Description (narrative) Continued:

Manchester-by-the Sea experiences a high frequency of flooding in the Sawmill Brook Watershed, particularly in the downtown area. Sawmill Brook is also experiencing water quality degradation (Chase, 2002). These deficiencies are a result of hydraulic restrictions within the Brook, (e.g., culverts and the Central Street tide gate), increased stormwater runoff from developed areas, a highly channelized stream system, and poor infiltration conditions. Flooding within the watershed and hydraulic restrictions of the storm drainage system has resulted in sedimentation of suitable spawning areas and restrictions for fish passage. These problems will be magnified in coming years due to climate change impacts on inland and coastal flooding.

The Brook contains numerous fish species including American eel and rainbow smelt. Sawmill Brook has been identified by the Massachusetts Division of Marine Fisheries as one of the region's only suitable spawning grounds for rainbow smelt. Smelt populations are dependent on high quality water and a specific gravelly substrate for spawning (Chase, 2006). Increased riverine flooding coupled with greater storm surge has the potential to adversely impact the existing smelt spawning areas by altering salinity, filling in gravelly substrate with fine sediment, and undermining structures leading to a collapse of the stream channel. Evaluation of the tide gate has identified design deficiencies that may also be linked to the decline in observed smelt egg masses. Central Pond bank erosion has increased due to winter floods in 2016 and 2017.

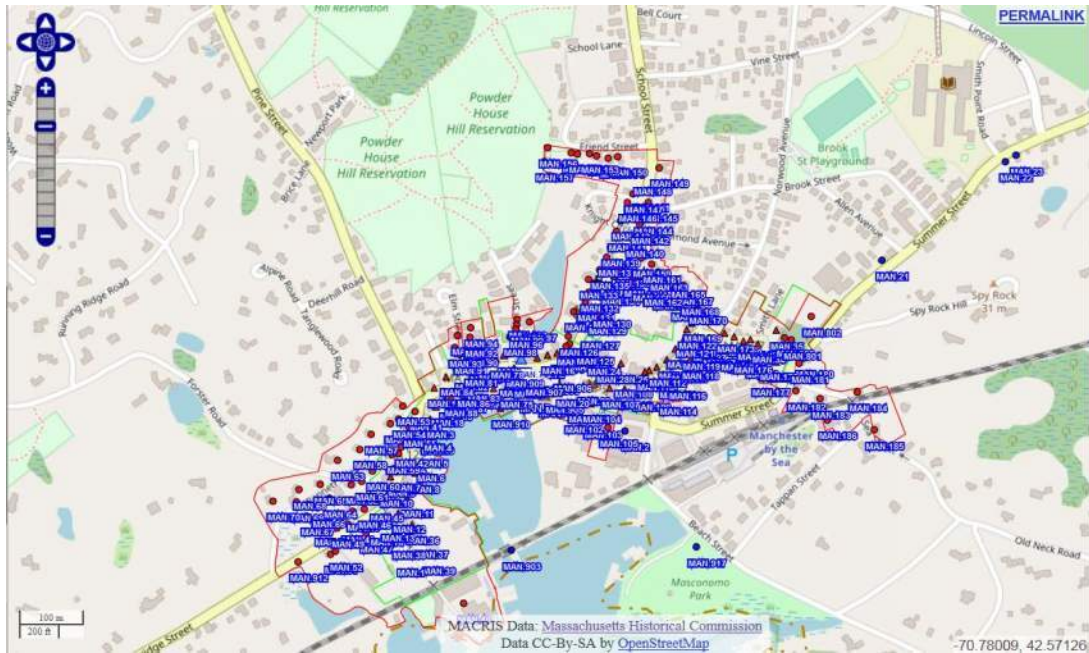
The Town has recently completed a two-year feasibility study of Sawmill Brook management strategies and identified a plan of action to mitigate flooding and improve one of the few remaining rainbow smelt habitat areas in the northeast. **Projects include removal or replacement of the Central Street tide gate, structural improvements to the culvert/dam at Central Street, culvert enlargements at School Street and Norwood Avenue, and restoration of Central Pond and in-stream segments of Sawmill Brook.** These projects have been discussed at multiple public meetings and are supported by the Manchester-by-the-Sea Board of Selectmen, state and federal permitting agencies.

The Town has received funding by the Massachusetts Environmental Trust and is currently completing physical studies to advance the project to a point where the Town can be confident that no unintended water level and/or water quality changes will occur when implementing the recommended restoration projects. This work includes a detailed survey of structures, water level monitoring, and evaluation of coastal flushing and characterization of sediment consistent with Massachusetts permitting requirements. Once completed, these tasks will allow the Town to advance the project to permitting and final design.

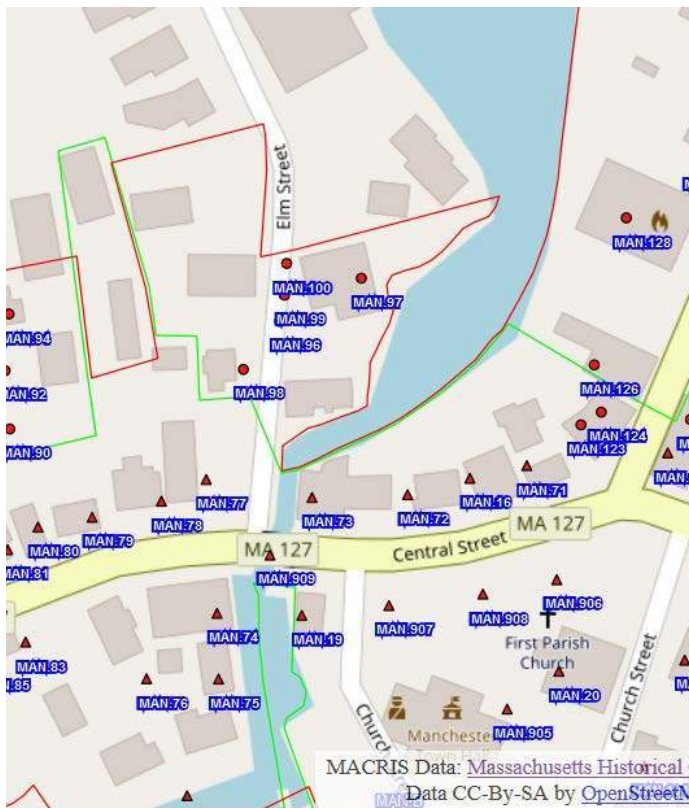
At this time, the Town is respectfully requesting that the Massachusetts Historical Commission review the project to identify any historic or archeological resources in the potential project area.

Historic or Archeological Properties

There are many properties listed abutting the proposed project area. However, these houses will not be impacted by the proposed work.



The Central Street Bridge (MAN.909) is listed on the National Register of Historic Places and is located in the local historic district.



Agency License or Funding

- Massachusetts Department of Transportation (MassDOT) Ch 85 Permits / Reviews
- Massachusetts Department of Environmental Protection (MassDEP) 401 Water Quality Certification
- MGL Chapter 91, The Massachusetts Public Waterfront Act - Waterways License
- United States of America Army Corps of Engineers (ACOE) Review / Permitting
- Massachusetts Wetlands Protection Act, Regulations, and Stormwater Management Handbook
- Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form and/or Environmental Impact Report



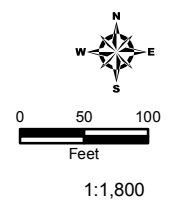
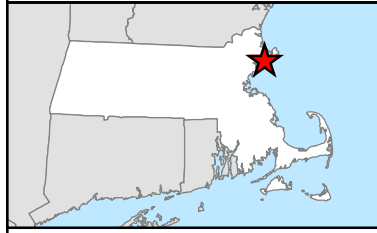
ORTHOGRAPH SITE PLAN

LEGEND

Project Area approx. extent shown in **RED**

All work is anticipated to occur between top of bank and existing retaining walls, along with culvert replacement/expansion at Central Street, School Street, and Norwood Avenue

LOCUS MAP



NOTES

Sawmill Brook Area
Manchester By the Sea,
Massachusetts

January 2018





The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

February 7, 2018

Janet Moonan
Tighe & Bond
1 University Avenue, Suite 104
Westwood, MA 02090

RE: Sawmill Brook Tide Gate and Stream Restoration, Sawmill Brook from Central Street to
Norwood Avenue, Manchester, MA; MHC# RC.63761

Dear Ms. Moonan:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Project Notification Form (PNF), received at this office on January 17, 2018, submitted for the project referenced above.

The proposed project consists of evaluating the removal of the tide gate and dam under Central Street and the restoration of Central Pond and Sawmill Brook in Manchester. The work will also include either the replacement or widening of bridges and culverts as well as in-stream restoration between Central Avenue and Norwood Avenue. The information submitted indicates that the project will receive permitting and/or licensing from the Massachusetts Department of Transportation (MassDOT), the Massachusetts Department of Environmental Protection (MassDEP), and the Army Corps of Engineers (ACE).

The PNF is incomplete (950 CMR 71.07(2)). The MHC requests that the following information be submitted in order to evaluate the area of potential effect for the project:

- Scaled existing and proposed project plans for the work proposed, including rehabilitation of Central Street Bridge. All scaled existing and proposed conditions project plans should be sized no larger than 11" x 17."
- Approval and/or comments from the Manchester Historic District Commission.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800) and Massachusetts General Laws, Chapter 9, Sections 26-27C (950 CMR 71). If you have questions or require additional information, please contact Nadia Waski at this office.

Sincerely,

A handwritten signature in blue ink, appearing to read "Linda Santoro".

Linda Santoro
Preservation Planner
Massachusetts Historical Commission



MANCHESTER-BY-THE-SEA
HISTORIC DISTRICT COMMISSION
Town Hall, 10 Central Street
Manchester-by-the-Sea, Massachusetts 01944-1399

April 4, 2019

Board of Selectmen
10 Central Street
Manchester, MA 01944

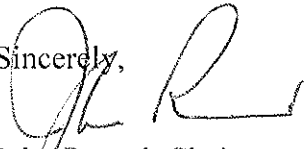
Re: Central Street Bridge Replacement Project

Dear Board of Selectmen:

On behalf of the Historic District Commission ("HDC") of the Town of Manchester-by-the-Sea, I am writing to show support for the Central Street Bridge Replacement Project. Mr. Nate Desrosiers of the Town Department of Public Works staff, preliminarily reviewed certain aesthetic details, such as railing and wall treatments with the Commission at its meeting on March 28, 2019. We understand that the overall project includes removal of the tide gate, replacement of the Central Street Bridge, new abutment walls and other related structural improvements. We also understand that these improvements are partially funded by a grant from the MassDOT Small Bridge program, and that the design is subject to applicable MassDOT bridge design standards. We look forward to working with the DPW to ensure that the furnishings will be consistent with the setting of the historic district.

The Central Street Bridge is listed as non-contributing to the Manchester Village Historic District on the National Register of Historic Places inventory; and, as such, the proposed project as presented is not anticipated to affect known historical properties. In addition, the furnishings as presented to the Commission appear to be generally consistent with the setting of the historic district.

Sincerely,


John Round, Chairman
On Behalf of the Historic District Commission

JR:aa

cc: Mr. Gregory Federspiel, Town Administrator
Mr. Charles Dam, Director, Department of Public Works
✓ Mr. Nate Desrosiers, Project and Facilities Manager, Department of Public Works

TRANSMITTALS

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Board of Underwater Archaeological Resources
Attn. Victor Mastone, Director
251 Causeway Street, Suite 800
Boston, MA 02114

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Tribal Historic Preservation Officer
Mashpee-Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)

Tighe&Bond

APPENDIX E

Town of ManchesterByTheSea
Abutters List

53-18
Central Pond Area

Subject Parcel ID:**Subject Property Location:**

ParcelID	Location	Owner	Co-Owner	Mailing Address	City	State	Zip
44 0 19	48 CENTRAL ST	HAWLEY ANDREW J.		P.O.BOX 537	MANCHESTER	MA	01944
44 0 20	44 CENTRAL ST	MAESTRANZI MAUREEN A	OBRIEN MICHAEL J	4 SIAS LN	WENHAM	MA	01984
44 0 21A	40 42A CENTRAL ST	RICE KIMBERLY ANNE		40 42 CENTRAL ST, UNIT 1	MANCHESTER	MA	01944
44 0 21B	40 42B CENTRAL ST	BARTSCH LAURA	BARTSCH JEFFREY	40 42 CENTRAL ST, UNIT B	MANCHESTER	MAD	01944
44 0 21C	40 42C CENTRAL ST	BARTLETT JOHN A	BARTLETT LISA SKINNER	40 42 CENTRL ST, UNIT 3	MANCHESTER	MAD	01944
44 0 22	38 CENTRAL ST	BARCLAY PAUL		38 CENTRAL STREET	MANCHESTER	MA	01944
45 0 1	1 PEELE HOUSE SQ	SEA ROCK ESTATE INC		5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
45 0 2	5 PEELE HOUSE SQ	SEA ROCK ESTATE INC		5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
45 0 23	10 CENTRAL ST	MANCHESTER TOWN OF	TOWN HALL + POLICE STA	10 CENTRAL ST	MANCHESTER	MA	01944
45 0 3	26 CENTRAL ST	WOOD DAVID N & MARYANN A		6 HIGHWOOD RD	MANCHESTER	MA	01944
45 0 36	2 PEELE HOUSE SQ	SEA ROCK ESTATE INC		5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
45 0 37	4 PEELE HOUSE SQ	SEA ROCK ESTATE INC		5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
45 0 4	TOWN COMMON	FIRST PARISH CHURCH	CONGREGATIONAL	P.O. BOX 187	MANCHESTER	MA	01944
45 0 4A	TOWN COMMON	T MOBILE	PROPERTY TAX DEPT	12920 SE 38TH ST	BELLEVUE	WA	98006
53 0 1	MORSE CT	SR ESTATE LLC	SERIES MORSE CT EXT	5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
53 0 10A	12 MORSE CT 1	MUNKHOLM CHRISTIANE		12 MORSE COURT, UNIT 2	MANCHESTER	MA	01944
53 0 10B	12 MORSE CT 2	MUNKHOLM CHRISTIANE		12 MORSE COURT, UNIT 2	MANCHESTER	MA	01944
53 0 11	35 CENTRAL ST	HALGREN DONALD & NANCY	NANCY W. HALGREN REVO	35 CENTRAL ST.	MANCHESTER	MA	01944
53 0 12	33 CENTRAL ST	JONATHAN B. LEAVITT TRUST OF	C/O PARISI MANAGEMENT C	75 NORTH MAIN ST. SUITE 1	EAST LONGMEAD	MA	01028
53 0 13	31 CENTRAL ST	PETER LEIGH, LLC		5 ANCIENT COUNTY WAY	MANCHESTER	MA	01944
53 0 14	5 MORSE CT	OMARA W KEVIN		5 MORSE COURT	MANCHESTER	MA	01944
53 0 15	7 MORSE CT	STEACH ROBERT	STEACH PATRICIA	11 PULASKI DR	MANCHESTER	MA	01944
53 0 16	5 7 SAW MILL CR	MANCHESTER SAW MILL REALTY	ADAM M ZAIGER, CHOATE,	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 17A	29 UNIT 1 CENTRAL ST	MEGA, LLC		40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 17B	29 UNIT 2 CENTRAL ST	MEGA, LLC		40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 17C	29 UNIT 3 CENTRAL ST	MEGA, LLC		40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 18A	0 ELM ST A	WADIA-ELLS SUSAN		0 ELM ST, UNIT A	MANCHESTER	MA	01944
53 0 18B	0 ELM ST B	MARTIN KRISTIN	HODGES, JR. JONATHAN B.	0 ELM ST., UNIT B	MANCHESTER	MA	01944
53 0 18C	0 ELM ST C	TORY ANTHONY D.	TORY JEMMA	0 ELM ST., UNIT C	MANCHESTER	MA	01944
53 0 18D	27 CENTRAL ST D	DUNGENESS MANCHESTER REA	CHARLES P. CLAPP, TR	10 COUNTRY RD	BOYNTON BEACH	FL	33436
53 0 19	2 ELM ST	MANCHESTER SAW MILL REALTY	ADAM M. ZAIGER, TRUSTE	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 20	21 23 SAW MILL CR	MANCHESTER SAW MILL REALTY	ADAM M ZAIGER, CHOATE,	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 21	22 ELM ST	PETER LEIGH, LLC.		5 ANCIENT COUNTY WAY	MANCHESTER	MA	01944
53 0 23	1 ELM ST	1 ELM ST LLC		5 ELM ST	MANCHESTER	MA	01944
53 0 24	ELM ST	MANCHESTER TOWN OF		10 CENTRAL ST	MANCHESTER	MA	01944
53 0 25	5 ELM ST	COWAN LIVIA A TR	C/O 5 ELM ST RLTY TR	5 ELM ST	MANCHESTER	MA	01944
53 0 26	17 23 ELM ST	127 PINE ST LTD PARTNERSHIP	C/O SUSAN WILENSKI	P.O. BOX 413	LONG KEY	FL	33001-0413
53 0 28	ELM ST	MANCHESTER TOWN OF		10 CENTRAL ST	MANCHESTER	MA	01944
53 0 30	21 CENTRAL ST	ASHLAND AVE LTD PARTNERSHI	C/O ROLANDA STURTEVAN	PO BOX 1522	MANCHESTER	MA	01944
53 0 31	11 CENTRAL ST	BOLENA LLC		40 BEACH ST, UNIT 304	MANCHESTER	MA	01944

Town of ManchesterByTheSea Abutters List

1:03:08PM

Subject Parcel ID:

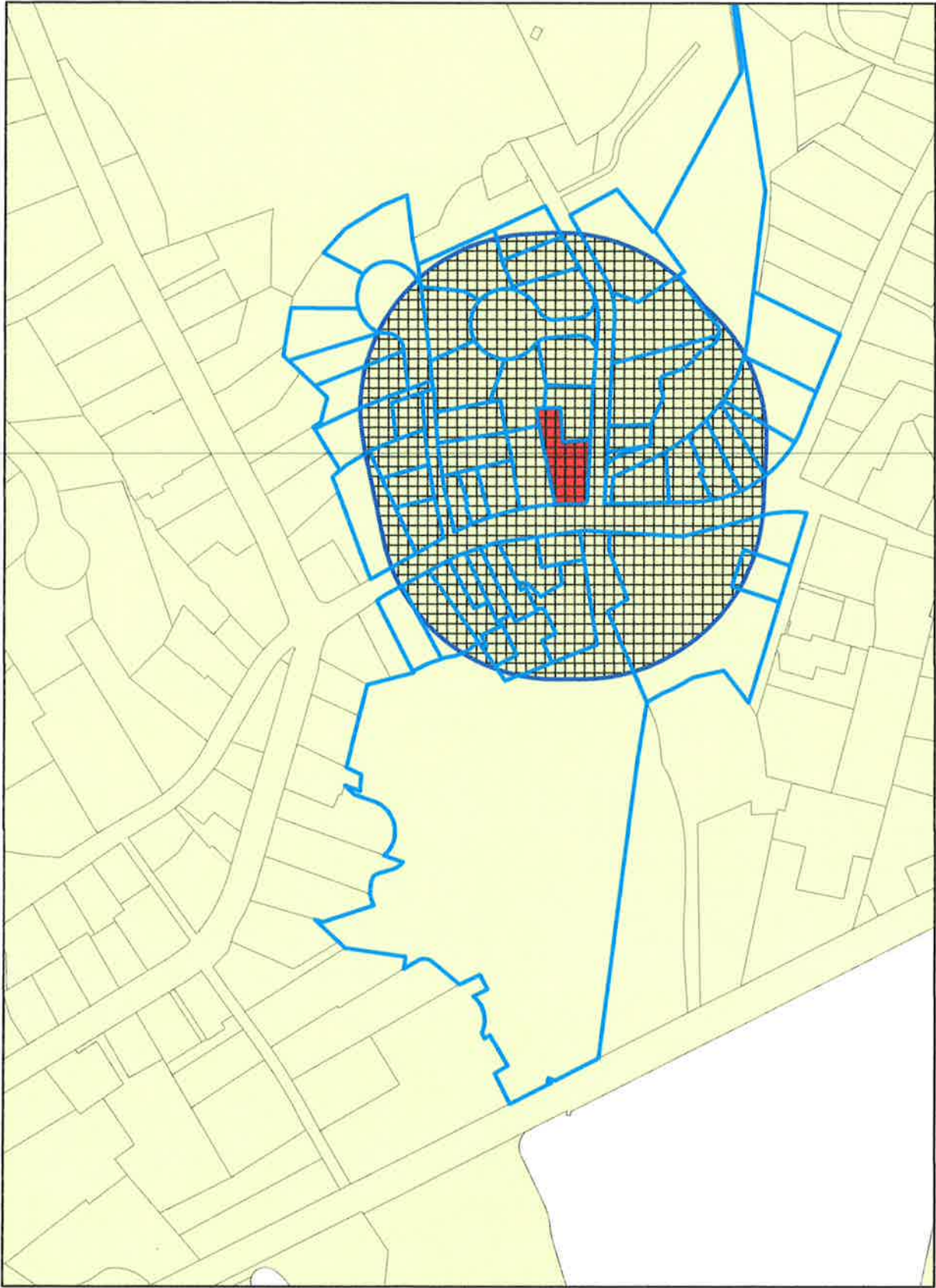
Subject Property Location:

ParcelID	Location	Owner	Co-Owner	Mailing Address	City	State	Zip
53 0 32	7 CENTRAL ST	7 CENTRAL NOMINEE TRUST ADA	C/O CHOATE, HALL, & STEV	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 33	2 SCHOOL ST	2 SCHOOL NOMINEE TRUST	C/O MEGA, LLC ADAM ZAIG	40 BEACH ST., UNIT 304	MANCHESTER	MA	01944
53 0 34	6 SCHOOL ST	HOOPERS GROCERY INC	C/O JAMIE KNEISEL TYLER I	14 EAGLE HEAD RD	MANCHESTER	MA	01944
53 0 36	12 SCHOOL ST	MANCHESTER TOWN OF	FIRE DEPARTMENT	12 SCHOOL ST	MANCHESTER	MA	01944
53 0 41	19 CENTRAL ST	19 CENTRAL ST. LLC	C/O CHARLES BENEVENTO	PO BOX 85	PRIDES CROSSIN	MA	01965
53 0 45A	24 A ELM ST	DILLON WENDY H		24 ELM ST. UNIT A	MANCHESTER	MA	01944
53 0 45B	24 B ELM ST	SUSAN R. JACKSON TRUST	SUSAN R. JACKSON, TR	24 ELM ST, UNIT B	MANCHESTER	MA	01944
53 0 45C	24 C ELM ST	HELLIWELL FABYAN HOLLY		1 OLD ESSEX RD.	MANCHESTER	MA	01944
53 0 45D	24 D ELM ST	MORGAN SUSAN		4 CANAL PARK #306	CAMBRIDGE	MA	02141
53 0 46	1 3 SAW MILL CR	MANCHESTER SAW MILL REALTY	ADAM M ZAIGER, CHOATE,	40 BEACH ST., UNIT 304	MANCHESTER	MA	01944
53 0 47	13 ELM ST	MBTS 13 ELM STREET LLC		100 CUMMINGS CENTER ST	BEVERLY	MA	01915
53 0 49	16 MORSE CT	SR ESTATE LLC	SERIES 16 MORSE CT	5C PEELE HOUSE SQ	MANCHESTER	MA	01944
53 0 5	39 CENTRAL ST	LEVENDUSKY JASON	LEVENDUSKY ABIGAIL	39 CENTRAL ST	MANCHESTER	MA	01944
53 0 50	18 MORSE CT	SR ESTATE LLC	SERIES 18 MORSE CT	5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
53 0 51	20 MORSE CT	SR ESTATE LLC	SERIES 20 MORSE CT	5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
53 0 53	24 MORSE CT	SR ESTATE LLC	SERIES 24 MORSE CT	5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
53 0 54	17 19 SAW MILL CR	MANCHESTER SAW MILL REALTY	ADAM M ZAIGER, CHOATE,	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 57	13 15 SAW MILL CR	MANCHESTER SAW MILL REALTY	ADAM M ZAIGER, CHOATE,	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 58	9 11 SAW MILL CR	MANCHESTER SAW MILL REALTY	ADAM M ZAIGER, CHOATE,	40 BEACH ST, UNIT 304	MANCHESTER	MA	01944
53 0 6	37 CENTRAL ST	BUSSONE ANTONIO		37 CENTRAL ST	MANCHESTER	MA	01944
53 0 7	6 MORSE CT	CARPENTER WILLIAM J	CARPENTER JEANNE T	7 VINE ST	MANCHESTER	MA	01944
53 0 8	8 MORSE CT	SEA ROCK ESTATE INC		5C PEELE HOUSE SQUARE	MANCHESTER	MA	01944
53 0 9	14 MORSE CT	FINNERTY MARK J	FINNERTY LORA P	14 MORSE CT	MANCHESTER	MA	01944

Parcel Count: **63**

End of Report

*Certified Abutters within
300' of Central Pond area,
as of September 3, 2020, for
Conservation Commission.
Virginia A. Thayer, MAA
Principal Assessor*



Tighe&Bond

APPENDIX F

OFFICIAL SPECIES LIST



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>

In Reply Refer To:

February 15, 2021

Consultation Code: 05E1NE00-2021-SLI-1361

Event Code: 05E1NE00-2021-E-04354

Project Name: Central Street Bridge Replacement Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>;

<http://www.towerkill.com>; and

<http://>

www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office

70 Commercial Street, Suite 300

Concord, NH 03301-5094

(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2021-SLI-1361

Event Code: 05E1NE00-2021-E-04354

Project Name: Central Street Bridge Replacement Project

Project Type: BRIDGE CONSTRUCTION / MAINTENANCE

Project Description: The Town of Manchester-by-the-Sea proposes to replace the Central Street Bridge through demolition of the existing 16-foot span and replacement with a 20-foot pre-cast concrete arch bridge. During the demolition of the exiting bridge an existing tide gate structure at the downstream face of the bridge will also be demolished and removed. The tide gate removal and increased hydraulic opening of the replacement bridge will significantly improve the tidal flushing at Sawmill Brook and Central Pond upstream of this road crossing and restore fish passage.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@42.575326399999994,-70.77280338714728,14z>



Counties: Essex County, Massachusetts

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Flowering Plants

NAME	STATUS
Small Whorled Pogonia <i>Isotria medeoloides</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

ESSENTIAL FISH HABITAT

EFH Data Notice: Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional Fishery Management Councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

[Greater Atlantic Regional Office](#)
[Atlantic Highly Migratory Species Management Division](#)

Query Results








































Degrees, Minutes, Seconds: Latitude = 42°34'33" N, Longitude = 71°13'36" W
 Decimal Degrees: Latitude = 42.58, Longitude = -70.77














































The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

*** WARNING ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Show	Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
			Atlantic Sea Scallop	ALL	New England	Amendment 14 to the Atlantic Sea Scallop FMP
			Atlantic Wolffish	ALL	New England	Amendment 14 to the Northeast Multispecies FMP
			Haddock	Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
			Winter Flounder	Eggs Juvenile Larvae/Adult	New England	Amendment 14 to the Northeast Multispecies FMP
			Little Skate	Juvenile Adult	New England	Amendment 2 to the Northeast Skate Complex FMP
			Ocean Pout	Adult Eggs Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
			Atlantic Herring	Juvenile Adult Larvae	New England	Amendment 3 to the Atlantic Herring FMP
			Atlantic Cod	Larvae Adult Juvenile Eggs	New England	Amendment 14 to the Northeast Multispecies FMP
			Pollock	Adult Juvenile Eggs Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
			Red Hake	Adult Eggs/Larvae/Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
			Silver Hake	Eggs/Larvae Adult	New England	Amendment 14 to the Northeast Multispecies FMP
			Yellowtail Flounder	Adult Juvenile Larvae Eggs	New England	Amendment 14 to the Northeast Multispecies FMP
			Monkfish	Juvenile	New England	Amendment 4 to the Monkfish FMP

Show	Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
			White Hake	Larvae Adult Eggs Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
			Windowpane Flounder	Adult Larvae Eggs Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
			Winter Skate	Adult Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
			American Plaice	Adult Juvenile Larvae Eggs	New England	Amendment 14 to the Northeast Multispecies FMP
			Acadian Redfish	Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
			Thorny Skate	Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
			Northern Shortfin Squid	Adult	Mid-Atlantic	Atlantic Mackerel, Squid, & Butterfish Amendment 11
			Longfin Inshore Squid	Juvenile Adult	Mid-Atlantic	Atlantic Mackerel, Squid, & Butterfish Amendment 11
			Atlantic Mackerel	Eggs Larvae Juvenile Adult	Mid-Atlantic	Atlantic Mackerel, Squid, & Butterfish Amendment 11
			Bluefish	Adult Juvenile	Mid-Atlantic	Bluefish
			Atlantic Butterfish	Eggs Larvae Adult	Mid-Atlantic	Atlantic Mackerel, Squid, & Butterfish Amendment 11
			Spiny Dogfish	Sub-Adult Female Adult Male Adult Female	Mid-Atlantic	Amendment 3 to the Spiny Dogfish FMP
			Atlantic Surfclam	Juvenile Adult	Mid-Atlantic	Surfclam and Ocean Quahog
			Scup	Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
			Black Sea Bass	Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.

****For links to all EFH text descriptions see the complete data inventory: [open data inventory -->](#)**

Mid-Atlantic Council HAPCs,

No spatial data for summer flounder SAV HAPC.

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means 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.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our inter-agency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

- 1) A description of the proposed action.
- 2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
- 3) The federal agency's conclusions regarding the effects of the action on EFH.
- 4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review time-lines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained in the [HCD Consultation website](#) and [NOAA's EFH Mapper](#) will assist you in completing this worksheet. All the information you need to determine which species and life stages are designated in your project location is accessible in the Mapper. When you first open the Mapper, choose the Greater Atlantic Region, then zoom into the area of interest and use the Location Query Tab to generate a table showing all the designated species and life stages at any given location. The tables can be printed. Just remember that EFH designations consist of a map and a text description: you need to check the text descriptions to make sure that the actual habitat conditions (e.g., depth, type of substrate) at the mapped location match the description. There are links to the text descriptions in the tables that pop up when you do a Location Query. You can also use the Mapper to display an entire EFH map for any species and life stage throughout the region and to display maps of Habitat Areas of Particular Concern (HAPCs), which are areas of particularly important EFH that receive extra scrutiny when a consultation is conducted. Spatial EFH data for your use in GIS can be downloaded by going to the [Data Inventory](#).

Please note that there is no map for summer flounder HAPC - it exists anywhere there is submerged aquatic vegetation (SAV) - and that the map and descriptions for Atlantic salmon EFH and HAPC are reached using a link in the **Warning** box that opens up when you first bring up the regional map. If you have any questions, please check with the appropriate [HCD staff member](#) for your area.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME:

DATE:

PROJECT NO.:

LOCATION (Water body, county, physical address):

PREPARER:

Step 1: Use [NOAA's EFH Mapper](#) to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS		
EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? List the species:		
Is the action located in or adjacent to EFH designated for larvae? List the species:		
Is the action located in or adjacent to EFH designated for juveniles? List the species:		

<p>Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species:</p>		
<p>If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5. If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.</p>		

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS	
Site Characteristics	Description
<p>Is the site intertidal, sub-tidal, or water column?</p>	
<p>What are the sediment characteristics?</p>	
<p>Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.</p>	
<p>Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.</p>	

<p>Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.</p>	
<p>Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.</p>	
<p>Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.</p>	
<p>Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?</p>	
<p>What is the typical salinity, depth and water temperature regime/range?</p>	
<p>What is the normal frequency of site disturbance, both natural and man-made?</p>	
<p>What is the area of proposed impact (work footprint & far afield)?</p>	

Step 3: This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS			
Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.			
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.			
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?			

<p>Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?</p>			
<p>Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.</p>			
<p>Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?</p>			
<p>Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.</p>			
<p>Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.</p>			

Will water depth change? What are the current and proposed depths?			
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.			
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.			
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.			
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.			
Does the action have the potential to impact prey species of federally managed fish with EFH designations?			

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. [NOAA's EFH Mapper](#) should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT			
Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
<u>Spawning</u> If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.			
<u>Nursery</u> If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.			
<u>Forage</u> If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.			
<u>Shelter</u> If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.			

<p>Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.</p>			
<p>Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.</p>			

Step 5: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: If information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT		
Federal Agency's EFH Determination		
<p>Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: (check the appropriate statement)</p>		<p>There is no adverse effect on EFH or no EFH is designated at the project site. EFH Consultation is not required.</p>
		<p>The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.</p>
		<p>The adverse effect on EFH is substantial. This is a request for an expanded EFH consultation.</p>

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act. Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT	
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	
American eel	
American shad	
Atlantic menhaden	
blue crab	
blue mussel	
blueback herring	

Eastern oyster	
horseshoe crab	
quahog	
soft-shell clams	
striped bass	
other species:	

Useful Links

[National Wetland Inventory Maps](#)

[EPA's National Estuaries Program](#)

[Northeast Regional Ocean Council \(NROC\) Data](#)

[Mid-Atlantic Regional Council on the Ocean \(MARCO\) Data](#)

Resources by State:

Maine

[Eelgrass maps](#)

[Maine Office of GIS Data Catalog](#)

[Casco Bay Estuary Partnership](#)

[Maine GIS Stream Habitat Viewer](#)

New Hampshire

[New Hampshire's Statewide GIS Clearinghouse, NH GRANIT](#)

[New Hampshire Coastal Viewer](#)

Massachusetts

[Eelgrass maps](#)

[MADMF Recommended Time of Year Restrictions Document](#)

[Massachusetts Bays National Estuary Program](#)

[Buzzards Bay National Estuary Program](#)

[Massachusetts Division of Marine Fisheries](#)

[Massachusetts Office of Coastal Zone Management](#)

Rhode Island

[Eelgrass maps](#)

[Narraganset Bay Estuary Program](#)

[Rhode Island Division of Marine Fisheries](#)

[Rhode Island Coastal Resources Management Council](#)

Connecticut

[Eelgrass Maps](#)

[Long Island Sound Study](#)

[CT GIS Resources](#)

[CT DEEP Office of Long Island Sound Programs and Fisheries](#)

[CT Bureau of Aquaculture Shellfish](#)

[Maps CT River Watershed Council](#)

New York

[Eelgrass report](#)

[Peconic Estuary Program](#)

[NY/NJ Harbor Estuary](#)

New Jersey

[Submerged Aquatic Vegetation mapping](#)

[Barnegat Bay Partnership](#)

Delaware

[Partnership for the Delaware Estuary](#)

[Center for Delaware Inland Bays](#)

Maryland

[Submerged Aquatic Vegetation mapping](#)

[MERLIN](#)

[Maryland Coastal Bays Program](#)

Virginia


[Submerged Aquatic Vegetation mapping](#)


Tighe&Bond

APPENDIX G



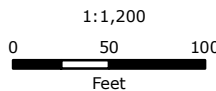
Legend

 Sediment Sample Location

 Town Boundary



Based on MassGIS Color Orthophotography (2019)



**FIGURE 1
ORTHOGRAPH**

Sawmill Brook Central Pond
Restoration Project
Sediment Sampling Locations
Manchester, Massachusetts

April 2020

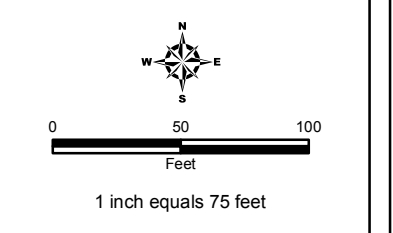
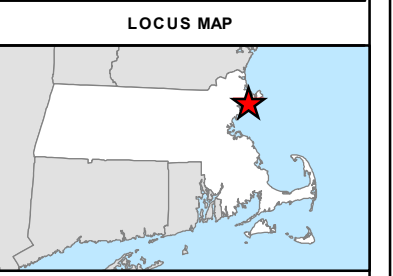


**ORTHOGRAPH
SITE PLAN**

LEGEND

Figure 1

**Sediment Profiles
Transect Locations**



NOTES

Transect locations are approximate on this figure.

Sawmill Brook Area
Manchester By the Sea,
Massachusetts

January 2018



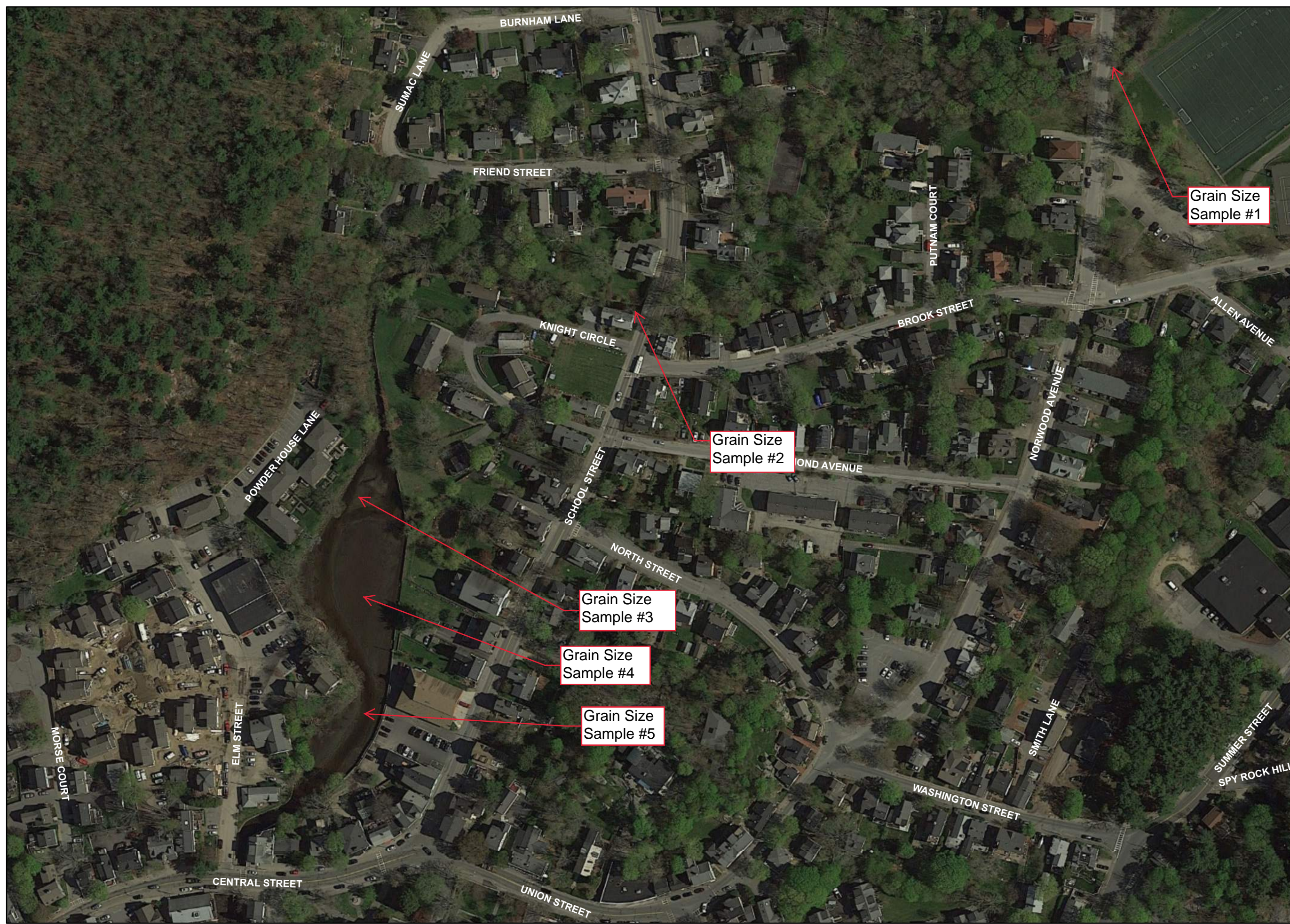


Figure 2
Sediment
Sample
Locations

LOCUS MAP



0 50 100
Feet

1 inch equals 150 feet

NOTES

Sawmill Brook Area
Manchester By the Sea,
Massachusetts

January 2018



TABLE 1
Sediment Analytical Results
Sawmill Brook Central Pond Restoration Project
Manchester-by-the-Sea, Massachusetts

Sample ID Sample Depth Sample Date	Units	S-1/GW-1	Freshwater Sediment Screening Criteria	COMM 97-01 Unlined Landfill	COMM 94-01 Lined Landfill	WALL-SED-1 0-18" 3/31/2020	WALL-SED-2 0-24" 3/31/2020	POND 1/23/2018	STREAM UP 1/23/2018	STREAM DOWN 1/23/2018
%Solids										
%Solids	%	NE	NE	NE	NE	66	57	-	-	-
Grain Size										
% Gravel	%	NE	NE	NE	NE	23.9	15.0	0.8	8.1	3.2
% Sand	%	NE	NE	NE	NE	56.0	36.5	44.5	53.4	72
% Silt & Clay	%	NE	NE	NE	NE	20.1	48.5	54.7	38.5	24.8
Total Petroleum Hydrocarbons - mg/kg										
TPH	mg/kg	1,000	NE	2,500	5,000	393	193	93.7	24.1	222
EPH - mg/kg										
C9-C18 Aliphatics1	mg/kg	1,000	NE	NE	NE	< 22.9	< 26.9	<22.2	<24	<24.3
C19-C36 Aliphatics1	mg/kg	3,000	NE	NE	NE	33.6	48.9	<26.9	<24	<32.1
C11-C22 Aromatics1,2	mg/kg	1,000	NE	NE	NE	82.8	< 27.4	<22.8	<24.5	<85.5
Total EPH	mg/kg	NE	NE	NE	NE					
Target PAHs - mg/kg										
Acenaphthene	mg/kg	4	NE	NE	NE	0.111	< 0.036	<0.037	<0.032	0.046
Acenaphthylene	mg/kg	1	NE	NE	NE	0.527	0.117	0.116	<0.032	0.516
Anthracene	mg/kg	1,000	0.057	NE	NE	0.978	0.101	0.120	0.016	0.677
Benzo(a)anthracene	mg/kg	7	0.110	NE	NE	3.01	0.372	0.399	0.112	2.52
Benzo(a)pyrene	mg/kg	2	0.150	NE	NE	3.64	0.462	0.465	0.156	2.10
Benzo(b)fluoranthene	mg/kg	7	NE	NE	NE	4.06	0.605	0.560	0.205	2.67
Benzo(g,h,i)perylene	mg/kg	1,000	NE	NE	NE	1.86	0.316	0.321	0.111	1.19
Benzo(k)fluoranthene	mg/kg	70	NE	NE	NE	1.20	0.167	0.176	0.061	0.735
Chrysene	mg/kg	70	0.17	NE	NE	2.94	0.503	0.456	0.168	2.27
Dibenzo(a,h)Anthracene	mg/kg	0.7	0.033	NE	NE	0.633	0.101	0.080	0.026	0.414
Fluoranthene	mg/kg	1,000	0.420	NE	NE	9.14	1.12	0.986	0.277	6.23
Fluorene	mg/kg	1,000	0.77	NE	NE	0.307	0.057	0.036	<0.013	0.029
Indeno(1,2,3-cd)Pyrene	mg/kg	7	NE	NE	NE	2.19	0.346	0.357	0.134	1.44
2-Methylnaphthalene	mg/kg	0.7	NE	NE	NE	0.049	<0.036	<0.037	<0.032	0.058
Naphthalene	mg/kg	4	0.180	NE	NE	0.211	0.049	0.039	<0.032	0.095
Phenanthrene	mg/kg	10	0.200	NE	NE	4.09	0.601	0.493	0.062	1.26
Pyrene	mg/kg	1,000	0.200	NE	NE	8.02	1.06	0.808	0.221	4.50
Total Metals⁽¹⁾ - mg/kg										
Antimony	mg/kg	20	NE	NE	NE	< 3.47	< 3.82	-	-	-
Arsenic	mg/kg	20	33	40	40	11.1	12.8	13.1	5.02	9.17
Barium	mg/kg	1000	NE	NE	NE	21.3	22.8	-	-	-
Beryllium	mg/kg	90	NE	NE	NE	0.82	1.08	-	-	-
Cadmium	mg/kg	70	5	30	80	0.57	0.45	0.67	0.21	0.35
Chromium	mg/kg	100	110	1000	1,000	14.3	16.0	15.3	7.92	8.35
Copper	mg/kg	NE	150	NE	NE	32.4	23.3	23.9	5.55	12.2
Lead	mg/kg	200	130	1000	2,000	174	192	167	29.2	90.6
Mercury	mg/kg	20	0.18	10	10	0.334	0.460	0.441	0.113	0.262
Nickel	mg/kg	600	49	NE	NE	9.06	10.5	8.50	3.64	3.64
Selenium	mg/kg	400	NE	NE	NE	< 3.47	< 3.82	-	-	-
Silver	mg/kg	100	NE	NE	NE	< 0.35	< 0.38	-	-	-
Thallium	mg/kg	8	NE	NE	NE	< 3.47	< 3.82	-	-	-
Vanadium	mg/kg	400	NE	NE	NE	19.7	21.3	-	-	-
Zinc	mg/kg	1000	460	NE	NE	146	137	129	39.2	70.8
TCLP Metals - mg/L										
TCLP Lead	mg/L	NE	NE	5	5	1.60	0.274	-	-	-
VOCS - mg/kg										
1,1,1,2-Tetrachloroethane	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075

TABLE 1
Sediment Analytical Results
Sawmill Brook Central Pond Restoration Project
Manchester-by-the-Sea, Massachusetts

Sample ID	Units	S-1/GW-1	Freshwater Sediment Screening Criteria	COMM 97-01 Unlined Landfill	COMM 94-01 Lined Landfill	WALL-SED-1 0-18"	WALL-SED-2 0-24"	POND	STREAM UP	STREAM DOWN
Sample Depth						3/31/2020	3/31/2020	1/23/2018	1/23/2018	1/23/2018
Sample Date										
1,1,1-Trichloroethane	mg/kg	30	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,1,2,2-Tetrachloroethane	mg/kg	0.005	NE	NE	NE	< 0.002	< 0.0023	<0.0034	<0.0027	<0.003
1,1,2-Trichloroethane	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,1-Dichloroethane	mg/kg	0.4	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,1-Dichloroethene	mg/kg	3	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,1-Dichloropropene	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2,3-Trichlorobenzene	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2,3-Trichloropropane	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2,4-Trichlorobenzene	mg/kg	2	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2,4-Trimethylbenzene	mg/kg	1000	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2-Dibromo-3-Chloropropane	mg/kg	10	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2-Dibromoethane	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2-Dichlorobenzene	mg/kg	9	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2-Dichloroethane	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,2-Dichloropropane	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,3,5-Trimethylbenzene	mg/kg	10	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,3-Dichlorobenzene	mg/kg	3	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,3-Dichloropropane	mg/kg	500	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,4-Dichlorobenzene	mg/kg	0.7	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
1,4-Dioxane	mg/kg	0.2	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
2,2-Dichloropropane	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
2-Butanone	mg/kg	4	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
2-Chlorotoluene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
2-Hexanone	mg/kg	100	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
4-Chlorotoluene	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
4-Isopropyltoluene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
4-Methyl-2-Pentanone	mg/kg	0.4	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
Acetone	mg/kg	6	NE	NE	NE	0.0466	0.157	0.0562	0.0233	0.034
Benzene	mg/kg	2	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Bromobenzene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Bromochloromethane	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Bromodichloromethane	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Bromoform	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Bromomethane	mg/kg	0.5	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
Carbon Disulfide	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Carbon Tetrachloride	mg/kg	5	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Chlorobenzene	mg/kg	1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Chloroethane	mg/kg	100	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
Chloroform	mg/kg	0.2	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Chloromethane	mg/kg	100	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
cis-1,2-Dichloroethene	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
cis-1,3-Dichloropropene	mg/kg	0.01	NE	NE	NE	< 0.0023	< 0.0026	<0.0086	<0.0069	<0.0075
Dibromochloromethane	mg/kg	0.005	NE	NE	NE	< 0.0022	< 0.0025	<0.0034	<0.0027	<0.003
Dibromomethane	mg/kg	500	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Dichlorodifluoromethane	mg/kg	1000	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149
Diethyl Ether	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Di-isopropyl ether	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Ethyl tertiary-butyl ether	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Ethylbenzene	mg/kg	40	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Hexachlorobutadiene	mg/kg	30	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Isopropylbenzene	mg/kg	1000	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Methyl tert-Butyl Ether	mg/kg	0.1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Methylene Chloride	mg/kg	0.1	NE	NE	NE	< 0.0135	< 0.0154	<0.172	<0.137	<0.149

TABLE 1
Sediment Analytical Results
Sawmill Brook Central Pond Restoration Project
Manchester-by-yhe-Sea, Massachusetts

Sample ID						WALL-SED-1	WALL-SED-2	POND	STREAM UP	STREAM DOWN
Sample Depth	Units	S-1/GW-1	Freshwater Sediment	COMM 97-01 Unlined	COMM 94-01 Lined	0-18"	0-24"			
Sample Date			Screening Criteria	Landfill	Landfill	3/31/2020	3/31/2020	1/23/2018	1/23/2018	1/23/2018
Naphthalene	mg/kg	4	NE	0.5	1	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
n-Butylbenzene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
n-Propylbenzene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
sec-Butylbenzene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Styrene	mg/kg	3	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
tert-Butylbenzene	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Tertiary-amy methyl ether	mg/kg	NE	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Tetrachloroethene	mg/kg	1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Tetrahydrofuran	mg/kg	500	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Toluene	mg/kg	30	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
trans-1,2-Dichloroethene	mg/kg	1	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
trans-1,3-Dichloropropene	mg/kg	0.01	NE	NE	NE	< 0.0022	< 0.0025	<0.0086	<0.0069	<0.0075
Trichloroethene	mg/kg	0.3	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Trichlorofluoromethane	mg/kg	1000	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Vinyl Chloride	mg/kg	0.7	NE	NE	NE	< 0.0135	< 0.0154	<0.0172	<0.0137	<0.0149
Xylene O	mg/kg	100	NE	NE	NE	< 0.0067	< 0.0077	<0.0086	<0.0069	<0.0075
Xylene P,M	mg/kg	100	NE	NE	NE	< 0.0135	< 0.0154	<0.0172	<0.0137	<0.0149
Xylenes (Total)	mg/kg	100	NE	NE	NE	< 0.00893	< 0.00877	<0.0172	<0.0137	<0.0149
Total VOCs	mg/kg	NE	NE	4	10	0.0466	0.157	-	-	-
SVOCs - mg/kg										
1,2,4-Trichlorobenzene	mg/kg	2	NE	NE	NE	< 0.015	< 0.018	-	-	-
1,2-Dichlorobenzene	mg/kg	9	NE	NE	NE	< 0.484	< 0.604	-	-	-
1,3-Dichlorobenzene	mg/kg	3	NE	NE	NE	< 0.015	< 0.018	-	-	-
1,4-Dichlorobenzene	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
2,4,5-Trichlorophenol	mg/kg	4	NE	NE	NE	< 0.484	< 0.604	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
2,4-Dichlorophenol	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
2,4-Dimethylphenol	mg/kg	0.7	NE	NE	NE	0.072	< 0.018	-	-	-
2,4-Dinitrophenol	mg/kg	3	NE	NE	NE	< 0.81	< 1.01	-	-	-
2,4-Dinitrotoluene	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
2,6-Dinitrotoluene	mg/kg	100	NE	NE	NE	< 0.484	< 0.604	-	-	-
2-Chloronaphthalene	mg/kg	1000	NE	NE	NE	< 0.484	< 0.604	-	-	-
2-Chlorophenol	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
2-Methylnaphthalene	mg/kg	0.7	NE	NE	NE	0.268	0.028	-	-	-
2-Methylphenol	mg/kg	500	NE	NE	NE	< 0.484	< 0.604	-	-	-
2-Nitrophenol	mg/kg	100	NE	NE	NE	< 0.484	< 0.604	-	-	-
3,3'-Dichlorobenzidine	mg/kg	3	NE	NE	NE	< 0.015	< 0.018	-	-	-
3+4-Methylphenol	mg/kg	500	NE	NE	NE	< 0.969	< 1.21	-	-	-
4-Bromophenyl-phenylether	mg/kg	100	NE	NE	NE	< 0.484	< 0.604	-	-	-
4-Chloroaniline	mg/kg	1	NE	NE	NE	< 0.022	< 0.027	-	-	-
4-Nitrophenol	mg/kg	100	NE	NE	NE	< 2.43	< 3.03	-	-	-
Acenaphthene	mg/kg	4	NE	NE	NE	< 0.484	< 0.604	-	-	-
Acenaphthylene	mg/kg	1	NE	NE	NE	2.20	0.371	-	-	-
Acetophenone	mg/kg	1000	NE	NE	NE	< 0.969	< 1.21	-	-	-
Aniline	mg/kg	1000	NE	NE	NE	< 2.43	< 3.03	-	-	-
Anthracene	mg/kg	1000	NE	NE	NE	2.04	< 0.604	-	-	-
Azobenzene	mg/kg	50	NE	NE	NE	< 0.484	< 0.604	-	-	-
Benzo(a)anthracene	mg/kg	7	NE	NE	NE	5.60	0.614	-	-	-
Benzo(a)pyrene	mg/kg	2	NE	NE	NE	5.99	0.729	-	-	-
Benzo(b)fluoranthene	mg/kg	7	NE	NE	NE	5.02	0.710	-	-	-
Benzo(g,h,i)perylene	mg/kg	1000	NE	NE	NE	2.88	< 0.604	-	-	-
Benzo(k)fluoranthene	mg/kg	70	NE	NE	NE	4.20	< 0.604	-	-	-
bis(2-Chloroethoxy)methane	mg/kg	500	NE	NE	NE	< 0.484	< 0.604	-	-	-

TABLE 1
Sediment Analytical Results
Sawmill Brook Central Pond Restoration Project
Manchester-by-yhe-Sea, Massachusetts

Sample ID						WALL-SED-1	WALL-SED-2	POND	STREAM UP	STREAM DOWN
Sample Depth	Units	S-1/GW-1	Freshwater Sediment	COMM 97-01 Unlined	COMM 94-01 Lined	0-18"	0-24"			
Sample Date			Screening Criteria	Landfill	Landfill	3/31/2020	3/31/2020	1/23/2018	1/23/2018	1/23/2018
bis(2-Chloroethyl)ether	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
bis(2-chloroisopropyl)Ether	mg/kg	0.7	NE	NE	NE	< 0.019	< 0.024	-	-	-
bis(2-Ethylhexyl)phthalate	mg/kg	90	NE	NE	NE	< 0.484	< 0.604	-	-	-
Butylbenzylphthalate	mg/kg	100	NE	NE	NE	< 0.484	< 0.604	-	-	-
Chrysene	mg/kg	70	NE	NE	NE	5.86	0.742	-	-	-
Dibenzo(a,h)Anthracene	mg/kg	0.7	NE	NE	NE	0.983	0.134	-	-	-
Dibenzofuran	mg/kg	100	NE	NE	NE	0.811	< 0.604	-	-	-
Diethylphthalate	mg/kg	10	NE	NE	NE	< 0.484	< 0.604	-	-	-
Dimethylphthalate	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
Di-n-butylphthalate	mg/kg	50	NE	NE	NE	< 0.484	< 0.604	-	-	-
Di-n-octylphthalate	mg/kg	1000	NE	NE	NE	< 0.484	< 0.604	-	-	-
Fluoranthene	mg/kg	1000	NE	NE	NE	18.4	1.66	-	-	-
Fluorene	mg/kg	1000	NE	NE	NE	1.61	< 0.604	-	-	-
Hexachlorobenzene	mg/kg	0.7	NE	NE	NE	< 0.015	< 0.018	-	-	-
Hexachlorobutadiene	mg/kg	30	NE	NE	NE	< 0.484	< 0.604	-	-	-
Hexachloroethane	mg/kg	0.7	NE	NE	NE	< 0.016	< 0.02	-	-	-
Indeno(1,2,3-cd)Pyrene	mg/kg	7	NE	NE	NE	2.81	< 0.604	-	-	-
Isophorone	mg/kg	100	NE	NE	NE	< 0.484	< 0.604	-	-	-
Naphthalene	mg/kg	4	NE	NE	NE	0.511	< 0.604	-	-	-
Nitrobenzene	mg/kg	500	NE	NE	NE	< 0.484	< 0.604	-	-	-
N-Nitrosodimethylamine	mg/kg	3	NE	NE	NE	< 0.484	< 0.604	-	-	-
Pentachlorophenol	mg/kg	10	NE	NE	NE	< 0.436	< 0.544	-	-	-
Phenanthrene	mg/kg	1	NE	NE	NE	12.0	0.871	-	-	-
Phenol	mg/kg	1	NE	NE	NE	0.113	< 0.02	-	-	-
Pyrene	mg/kg	1000	NE	NE	NE	15.9	1.53	-	-	-
Pyridine	mg/kg	NE	NE	NE	NE	< 2.43	< 3.03	-	-	-
Total SVOCs	mg/kg	NE	NE	100	100	87.268	7.389	-	-	-
PCB- Congeners - mg/kg										
BZ#8	mg/kg	NE	NE	NE	NE	0.00310	0.00337	<0.00048	<0.00042	<0.00043
BZ#18	mg/kg	NE	NE	NE	NE	< 0.00040	< 0.00047	<0.00048	<0.00042	0.00453
BZ#28	mg/kg	NE	NE	NE	NE	0.00105	0.00179	0.00228	<0.00042	<0.00043
BZ#44 [2C]	mg/kg	NE	NE	NE	NE	0.00130	0.00111	<0.00048	<0.00042	<0.00043
BZ#52 [2C]	mg/kg	NE	NE	NE	NE	0.00249	0.00256	0.00221	<0.00042	<0.00043
BZ#66	mg/kg	NE	NE	NE	NE	0.00116	< 0.00047	<0.00048	<0.00042	<0.00043
BZ#101	mg/kg	NE	NE	NE	NE	0.00555	0.0423	0.0277	<0.00042	0.0101
BZ#105	mg/kg	NE	NE	NE	NE	0.00179	0.00426	<0.00048	<0.00042	<0.00043
BZ#118	mg/kg	NE	NE	NE	NE	0.00224	0.00453	0.00440	<0.00042	<0.00043
BZ#128	mg/kg	NE	NE	NE	NE	<0.00040	0.00091	0.00108	<0.00042	<0.00043
BZ#138	mg/kg	NE	NE	NE	NE	0.00158	0.00368	0.00524	<0.00042	0.00162
BZ#153	mg/kg	NE	NE	NE	NE	0.00169	< 0.00047	0.00500	<0.00042	<0.00043
BZ#170	mg/kg	NE	NE	NE	NE	0.00080	0.00175	0.00246	<0.00042	0.00283
BZ#180	mg/kg	NE	NE	NE	NE	0.00273	0.00586	0.00435	<0.00042	<0.00043
BZ#187	mg/kg	NE	NE	NE	NE	0.00128	0.00286	0.00286	<0.00042	0.00084
BZ#195	mg/kg	NE	NE	NE	NE	< 0.00040	< 0.00047	<0.00048	<0.00042	<0.00043
BZ#206	mg/kg	NE	NE	NE	NE	0.00060	0.00099	0.00095	<0.00042	0.00104
BZ#209	mg/kg	NE	NE	NE	NE	< 0.00040	0.00120	0.00124	<0.00042	0.00095
Total PCB Congeners	mg/kg	NE	NE	NE	NE	0.02736	0.07717	0.00192	0.00588	0.00387
Classical Chemistry										
Conductivity	umhos/cm	NE	NE	4,000	8,000	3,580	3,780	-	-	-
Corrosivity (pH)	SU	NE	NE	2.0-12.5	2.0-12.5	7.90	6.92	-	-	-
Flashpoint	°F	NE	NE	>140	>140	> 200	> 200	-	-	-
Reactive Cyanide	mg/kg	NE	NE	250	250	< 2	< 2	-	-	-
Reactive Sulfide	mg/kg	NE	NE	500	500	< 2	< 2	-	-	-

TABLE 1

Sediment Analytical Results
 Sawmill Brook Central Pond Restoration Project
 Manchester-by-the-Sea, Massachusetts

Sample ID	Units	S-1/GW-1	Freshwater Sediment Screening Criteria	COMM 97-01 Unlined Landfill	COMM 94-01 Lined Landfill	WALL-SED-1 0-18"	WALL-SED-2 0-24"	POND	STREAM UP	STREAM DOWN
Sample Depth										
Sample Date						3/31/2020	3/31/2020	1/23/2018	1/23/2018	1/23/2018
Total Organic Carbon	mg/kg	NE	NE	NE	NE	22,700	36,500	40,300	32,800	28,100

Notes

TEC/ PECs= threshold effects concentration/ probable effects concentration

(1) Total Metals samples were air dried

TPH = total petroleum hydrocarbons

EPH = extractable petroleum hydrocarbons

VOCs = volatile organic compounds

SVOCs = semi volatile organic compounds

PCBs = polychlorinated biphenyls

<x.xx = not detected at laboratory detection limit

c/s = compound specific

ND = not detected at compound specific detection limit

Results reported in milligrams per kilogram (mg/kg) unless otherwise noted

Bold and Boxed- Results exceed the MassDEP S-1/GW-1 Standard

Bold - Results exceed the Freshwater Sediment Screening Criteria - Probable Effects Concentrations (McDondald et al, 2000)


- = Not sampled

CERTIFICATE OF ANALYSIS

Gary Hedman
Tighe & Bond
4 Barlows Landing Road, Unit 15
Pocasset, MA 02559

RE: Sawmill Brook - 401WQ (221476)
ESS Laboratory Work Order Number: 1801552

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.



Laurel Stoddard
Laboratory Director

REVIEWED**By ESS Laboratory at 11:16 am, Feb 13, 2018****Analytical Summary**

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

CTS - Cranston, RI

Grain Size Analysis



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

SAMPLE RECEIPT

The following samples were received on January 30, 2018 for the analyses specified on the enclosed Chain of Custody Record.

Low Level VOA vials were frozen by Client on January 25, 2018 at 10:00.

<u>Lab Number</u>	<u>Sample Name</u>	<u>Matrix</u>	<u>Analysis</u>
1801552-01	Pond	Soil	§, 2540G, 8082, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH
1801552-02	Stream Up	Soil	§, 2540G, 8082, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH
1801552-03	Stream Down	Soil	§, 2540G, 8082, 8260B Low, EPH8270, EPH8270SIM, LK, MADEP-EPH
1801552-04	Pond - air dried	Soil	6010C, 7471B
1801552-05	Stream Up - air dried	Soil	6010C, 7471B
1801552-06	Stream Down - air dried	Soil	6010C, 7471B



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

PROJECT NARRATIVE

8082 Polychlorinated Biphenyls (PCB) / Congeners

- 1801552-01 [Lower value is used due to matrix interferences \(LC\).](#)
 BZ#101 , BZ#138 , BZ#170 , BZ#187 , BZ#209 [2C] , BZ#28 [2C] , BZ#52 [2C]
- 1801552-01 [Percent difference between primary and confirmation results exceeds 40% \(P\).](#)
 BZ#101 , BZ#138 , BZ#170 , BZ#187 , BZ#209 [2C] , BZ#28 [2C] , BZ#52 [2C]
- 1801552-03 [Lower value is used due to matrix interferences \(LC\).](#)
 BZ#138 , BZ#170 , BZ#18 , BZ#209 [2C]
- 1801552-03 [Percent difference between primary and confirmation results exceeds 40% \(P\).](#)
 BZ#138 , BZ#170 , BZ#18 , BZ#209 [2C]

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

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- [Definitions of Quality Control Parameters](#)
- [Semivolatile Organics Internal Standard Information](#)
- [Semivolatile Organics Surrogate Information](#)
- [Volatile Organics Internal Standard Information](#)
- [Volatile Organics Surrogate Information](#)
- [EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

- 1010A - Flashpoint
- 6010C - ICP
- 6020A - ICP MS
- 7010 - Graphite Furnace
- 7196A - Hexavalent Chromium
- 7470A - Aqueous Mercury
- 7471B - Solid Mercury
- 8011 - EDB/DBCP/TCP
- 8015C - GRO/DRO
- 8081B - Pesticides
- 8082A - PCB
- 8100M - TPH
- 8151A - Herbicides
- 8260B - VOA
- 8270D - SVOA
- 8270D SIM - SVOA Low Level
- 9014 - Cyanide
- 9038 - Sulfate
- 9040C - Aqueous pH
- 9045D - Solid pH (Corrosivity)
- 9050A - Specific Conductance
- 9056A - Anions (IC)
- 9060A - TOC
- 9095B - Paint Filter
- MADEP 04-1.1 - EPH / VPH

Prep Methods

- 3005A - Aqueous ICP Digestion
- 3020A - Aqueous Graphite Furnace / ICP MS Digestion
- 3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
- 3060A - Solid Hexavalent Chromium Digestion
- 3510C - Separatory Funnel Extraction
- 3520C - Liquid / Liquid Extraction
- 3540C - Manual Soxhlet Extraction
- 3541 - Automated Soxhlet Extraction
- 3546 - Microwave Extraction
- 3580A - Waste Dilution
- 5030B - Aqueous Purge and Trap
- 5030C - Aqueous Purge and Trap
- 5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Pond
 Date Sampled: 01/23/18 13:00
 Percent Solids: 56
 Initial Volume: 5.2
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-01
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,1,1-Trichloroethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,1,2,2-Tetrachloroethane	ND (0.0034)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,1,2-Trichloroethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,1-Dichloroethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,1-Dichloroethene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,1-Dichloropropene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2,3-Trichlorobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2,3-Trichloropropane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2,4-Trichlorobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2,4-Trimethylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2-Dibromo-3-Chloropropane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2-Dibromoethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2-Dichlorobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2-Dichloroethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,2-Dichloropropane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,3,5-Trimethylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,3-Dichlorobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,3-Dichloropropane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,4-Dichlorobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
1,4-Dioxane	ND (0.172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
2,2-Dichloropropane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
2-Butanone	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
2-Chlorotoluene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
2-Hexanone	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
4-Chlorotoluene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
4-Isopropyltoluene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
4-Methyl-2-Pentanone	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Acetone	0.0562 (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Benzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Bromobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Bromochloromethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Pond
Date Sampled: 01/23/18 13:00
Percent Solids: 56
Initial Volume: 5.2
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Bromoform	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Bromomethane	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Carbon Disulfide	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Carbon Tetrachloride	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Chlorobenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Chloroethane	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Chloroform	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Chloromethane	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
cis-1,2-Dichloroethene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
cis-1,3-Dichloropropene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Dibromochloromethane	ND (0.0034)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Dibromomethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Dichlorodifluoromethane	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Diethyl Ether	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Di-isopropyl ether	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Ethyl tertiary-butyl ether	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Ethylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Hexachlorobutadiene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Isopropylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Methyl tert-Butyl Ether	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Methylene Chloride	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Naphthalene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
n-Butylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
n-Propylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
sec-Butylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Styrene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
tert-Butylbenzene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Tertiary-amyl methyl ether	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Tetrachloroethene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Tetrahydrofuran	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Toluene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Pond
Date Sampled: 01/23/18 13:00
Percent Solids: 56
Initial Volume: 5.2
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
trans-1,3-Dichloropropene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Trichloroethene	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Trichlorofluoromethane	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Vinyl Chloride	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Xylene O	ND (0.0086)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Xylene P,M	ND (0.0172)		8260B Low		1	01/31/18 16:01	C8A0392	CA83109
Xylenes (Total)	ND (0.0172)		8260B Low		1	01/31/18 16:01		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>91 %</i>		<i>70-130</i>
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>91 %</i>		<i>70-130</i>
<i>Surrogate: Dibromofluoromethane</i>	<i>91 %</i>		<i>70-130</i>
<i>Surrogate: Toluene-d8</i>	<i>101 %</i>		<i>70-130</i>



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Pond
 Date Sampled: 01/23/18 13:00
 Percent Solids: 56
 Initial Volume: 30.3
 Final Volume: 2
 Extraction Method: 3540C

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-01
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: TJ
 Prepared: 1/31/18 16:00

8082 Polychlorinated Biphenyls (PCB) / Congeners

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
BZ#8	ND (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#18	ND (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#28 [2C]	LC, P 0.00228 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#44	ND (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#52 [2C]	LC, P 0.00221 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#66	ND (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#101	LC, P 0.0277 (0.00239)		8082		5	02/08/18 15:05	C8B0071	CA83105
BZ#105	ND (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#118	0.00440 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#128	0.00108 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#138	LC, P 0.00524 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#153	0.00500 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#170	LC, P 0.00246 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#180	0.00435 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#187	LC, P 0.00286 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#195	ND (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#206 [2C]	0.00095 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105
BZ#209 [2C]	LC, P 0.00124 (0.00048)		8082		1	02/07/18 4:06	C8B0071	CA83105

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: Tetrachloro-m-xylene</i>	77 %		30-150
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	80 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Pond
Date Sampled: 01/23/18 13:00

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-01
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Grain Size	See Attached (N/A)								
Percent Moisture	44 (1)		2540G		1	CCP	01/30/18 18:06	%	CA83028
Total Organic Carbon (Average)	40300 (92.7)		LK		1	NAR	02/02/18 21:33	mg/kg	[CALC]



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Pond
 Date Sampled: 01/23/18 13:00
 Percent Solids: 56
 Initial Volume: 24.1
 Final Volume: 1
 Extraction Method: 3546

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-01
 Sample Matrix: Soil
 Units: mg/kg dry

Prepared: 2/1/18 15:02

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (22.2)		MADEP-EPH		1	ZLC	02/01/18 19:00	C8B0005	CB80106
C19-C36 Aliphatics1	26.9 (22.2)		MADEP-EPH		1	ZLC	02/01/18 19:00	C8B0005	CB80106
C11-C22 Unadjusted Aromatics1	26.6 (22.2)		EPH8270		1	ZLC	02/02/18 3:06	C8B0006	CB80106
C11-C22 Aromatics1,2	ND (22.8)		EPH8270			VSC	02/02/18 17:02		[CALC]
2-Methylnaphthalene	ND (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Acenaphthene	ND (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Naphthalene	0.039 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Phenanthrene	0.493 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Acenaphthylene	0.116 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Anthracene	0.120 (0.015)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Benzo(a)anthracene	0.399 (0.015)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Benzo(a)pyrene	0.465 (0.015)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Benzo(b)fluoranthene	0.560 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Benzo(g,h,i)perylene	0.321 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Benzo(k)fluoranthene	0.176 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Chrysene	0.456 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Dibenzo(a,h)Anthracene	0.080 (0.015)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Fluoranthene	0.986 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Fluorene	0.036 (0.015)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Indeno(1,2,3-cd)Pyrene	0.357 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106
Pyrene	0.808 (0.037)		EPH8270SIM		1	VSC	02/02/18 17:02	C8B0029	CB80106

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1-Chlorooctadecane</i>	75 %		40-140
<i>Surrogate: 2-Bromonaphthalene</i>	105 %		40-140
<i>Surrogate: 2-Fluorobiphenyl</i>	93 %		40-140
<i>Surrogate: O-Terphenyl</i>	80 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Stream Up
 Date Sampled: 01/23/18 13:30
 Percent Solids: 63
 Initial Volume: 5.8
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-02
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,1,1-Trichloroethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,1,2,2-Tetrachloroethane	ND (0.0027)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,1,2-Trichloroethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,1-Dichloroethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,1-Dichloroethene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,1-Dichloropropene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2,3-Trichlorobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2,3-Trichloropropane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2,4-Trichlorobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2,4-Trimethylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2-Dibromo-3-Chloropropane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2-Dibromoethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2-Dichlorobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2-Dichloroethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,2-Dichloropropane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,3,5-Trimethylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,3-Dichlorobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,3-Dichloropropane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,4-Dichlorobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
1,4-Dioxane	ND (0.137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
2,2-Dichloropropane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
2-Butanone	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
2-Chlorotoluene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
2-Hexanone	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
4-Chlorotoluene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
4-Isopropyltoluene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
4-Methyl-2-Pentanone	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Acetone	0.0233 (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Benzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Bromobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Bromochloromethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Stream Up
 Date Sampled: 01/23/18 13:30
 Percent Solids: 63
 Initial Volume: 5.8
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-02
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Bromoform	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Bromomethane	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Carbon Disulfide	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Carbon Tetrachloride	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Chlorobenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Chloroethane	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Chloroform	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Chloromethane	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
cis-1,2-Dichloroethene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
cis-1,3-Dichloropropene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Dibromochloromethane	ND (0.0027)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Dibromomethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Dichlorodifluoromethane	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Diethyl Ether	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Di-isopropyl ether	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Ethyl tertiary-butyl ether	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Ethylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Hexachlorobutadiene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Isopropylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Methyl tert-Butyl Ether	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Methylene Chloride	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Naphthalene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
n-Butylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
n-Propylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
sec-Butylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Styrene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
tert-Butylbenzene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Tertiary-amyl methyl ether	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Tetrachloroethene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Tetrahydrofuran	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Toluene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Stream Up
 Date Sampled: 01/23/18 13:30
 Percent Solids: 63
 Initial Volume: 5.8
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-02
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
trans-1,3-Dichloropropene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Trichloroethene	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Trichlorofluoromethane	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Vinyl Chloride	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Xylene O	ND (0.0069)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Xylene P,M	ND (0.0137)		8260B Low		1	01/31/18 16:26	C8A0392	CA83109
Xylenes (Total)	ND (0.0137)		8260B Low		1	01/31/18 16:26		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	90 %		70-130
<i>Surrogate: 4-Bromofluorobenzene</i>	92 %		70-130
<i>Surrogate: Dibromofluoromethane</i>	91 %		70-130
<i>Surrogate: Toluene-d8</i>	101 %		70-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Stream Up
 Date Sampled: 01/23/18 13:30
 Percent Solids: 63
 Initial Volume: 30.8
 Final Volume: 2
 Extraction Method: 3540C

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-02
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: TJ
 Prepared: 1/31/18 16:00

8082 Polychlorinated Biphenyls (PCB) / Congeners

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
BZ#8	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#18	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#28	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#44	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#52	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#66	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#101	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#105	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#118	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#128	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#138	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#153	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#170	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#180 [2C]	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#187	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#195	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#206	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105
BZ#209	ND (0.00042)		8082		1	02/07/18 4:40	C8B0071	CA83105

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: Tetrachloro-m-xylene</i>	75 %		30-150
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	78 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Up
Date Sampled: 01/23/18 13:30

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-02
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Grain Size	See Attached (N/A)								
Percent Moisture	37 (1)		2540G		1	CCP	01/30/18 18:06	%	CA83028
Total Organic Carbon (Average)	32800 (81.4)		LK		1	NAR	02/02/18 22:23	mg/kg	[CALC]



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Up
Date Sampled: 01/23/18 13:30
Percent Solids: 63
Initial Volume: 24.9
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-02
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 2/1/18 15:02

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (24.0)		MADEP-EPH		1	ZLC	02/01/18 19:48	C8B0005	CB80106
C19-C36 Aliphatics1	ND (24.0)		MADEP-EPH		1	ZLC	02/01/18 19:48	C8B0005	CB80106
C11-C22 Unadjusted Aromatics1	ND (24.0)		EPH8270		1	ZLC	02/02/18 3:43	C8B0006	CB80106
C11-C22 Aromatics1,2	ND (24.5)		EPH8270			VSC	02/02/18 17:50		[CALC]
2-Methylnaphthalene	ND (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Acenaphthene	ND (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Naphthalene	ND (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Phenanthrene	0.062 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Acenaphthylene	ND (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Anthracene	0.016 (0.013)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Benzo(a)anthracene	0.112 (0.013)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Benzo(a)pyrene	0.156 (0.013)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Benzo(b)fluoranthene	0.205 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Benzo(g,h,i)perylene	0.111 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Benzo(k)fluoranthene	0.061 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Chrysene	0.168 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Dibenzo(a,h)Anthracene	0.026 (0.013)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Fluoranthene	0.277 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Fluorene	ND (0.013)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Indeno(1,2,3-cd)Pyrene	0.134 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106
Pyrene	0.221 (0.032)		EPH8270SIM		1	VSC	02/02/18 17:50	C8B0029	CB80106

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1-Chlorooctadecane</i>	67 %		40-140
<i>Surrogate: 2-Bromonaphthalene</i>	113 %		40-140
<i>Surrogate: 2-Fluorobiphenyl</i>	98 %		40-140
<i>Surrogate: O-Terphenyl</i>	85 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Down
Date Sampled: 01/23/18 14:00
Percent Solids: 63
Initial Volume: 5.3
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,1,1-Trichloroethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,1,2,2-Tetrachloroethane	ND (0.0030)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,1,2-Trichloroethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,1-Dichloroethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,1-Dichloroethene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,1-Dichloropropene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2,3-Trichlorobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2,3-Trichloropropane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2,4-Trichlorobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2,4-Trimethylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2-Dibromo-3-Chloropropane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2-Dibromoethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2-Dichlorobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2-Dichloroethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,2-Dichloropropane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,3,5-Trimethylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,3-Dichlorobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,3-Dichloropropane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,4-Dichlorobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
1,4-Dioxane	ND (0.149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
2,2-Dichloropropane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
2-Butanone	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
2-Chlorotoluene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
2-Hexanone	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
4-Chlorotoluene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
4-Isopropyltoluene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
4-Methyl-2-Pentanone	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Acetone	0.0340 (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Benzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Bromobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Bromochloromethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Down
Date Sampled: 01/23/18 14:00
Percent Solids: 63
Initial Volume: 5.3
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Bromoform	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Bromomethane	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Carbon Disulfide	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Carbon Tetrachloride	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Chlorobenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Chloroethane	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Chloroform	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Chloromethane	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
cis-1,2-Dichloroethene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
cis-1,3-Dichloropropene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Dibromochloromethane	ND (0.0030)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Dibromomethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Dichlorodifluoromethane	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Diethyl Ether	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Di-isopropyl ether	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Ethyl tertiary-butyl ether	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Ethylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Hexachlorobutadiene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Isopropylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Methyl tert-Butyl Ether	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Methylene Chloride	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Naphthalene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
n-Butylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
n-Propylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
sec-Butylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Styrene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
tert-Butylbenzene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Tertiary-amyl methyl ether	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Tetrachloroethene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Tetrahydrofuran	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Toluene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Stream Down
 Date Sampled: 01/23/18 14:00
 Percent Solids: 63
 Initial Volume: 5.3
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-03
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
trans-1,3-Dichloropropene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Trichloroethene	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Trichlorofluoromethane	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Vinyl Chloride	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Xylene O	ND (0.0075)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Xylene P,M	ND (0.0149)		8260B Low		1	01/31/18 16:52	C8A0392	CA83109
Xylenes (Total)	ND (0.0149)		8260B Low		1	01/31/18 16:52		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	95 %		70-130
<i>Surrogate: 4-Bromofluorobenzene</i>	92 %		70-130
<i>Surrogate: Dibromofluoromethane</i>	93 %		70-130
<i>Surrogate: Toluene-d8</i>	100 %		70-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Down
Date Sampled: 01/23/18 14:00
Percent Solids: 63
Initial Volume: 30.1
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: TJ
Prepared: 1/31/18 16:00

8082 Polychlorinated Biphenyls (PCB) / Congeners

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
BZ#8	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#18	LC, P 0.00453 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#28	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#44	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#52	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#66	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#101 [2C]	0.0101 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#105	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#118	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#128	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#138	LC, P 0.00162 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#153	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#170	LC, P 0.00283 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#180	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#187	0.00084 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#195	ND (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#206 [2C]	0.00104 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105
BZ#209 [2C]	LC, P 0.00095 (0.00043)		8082		1	02/07/18 5:15	C8B0071	CA83105

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: Tetrachloro-m-xylene</i>	68 %		30-150
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	89 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Down
Date Sampled: 01/23/18 14:00

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-03
Sample Matrix: Soil

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Grain Size	See Attached (N/A)								
Percent Moisture	37 (1)		2540G		1	CCP	01/30/18 18:06	%	CA83028
Total Organic Carbon (Average)	28100 (88.4)		LK		1	NAR	02/02/18 22:39	mg/kg	[CALC]



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Down
Date Sampled: 01/23/18 14:00
Percent Solids: 63
Initial Volume: 24.4
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-03
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 2/1/18 15:02

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (24.3)		MADEP-EPH		1	ZLC	02/01/18 20:35	C8B0005	CB80106
C19-C36 Aliphatics1	32.1 (24.3)		MADEP-EPH		1	ZLC	02/01/18 20:35	C8B0005	CB80106
C11-C22 Unadjusted Aromatics1	112 (24.3)		EPH8270		1	ZLC	02/02/18 4:19	C8B0006	CB80106
C11-C22 Aromatics1,2	85.5 (25.4)		EPH8270			VSC	02/05/18 14:33		[CALC]
2-Methylnaphthalene	0.058 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Acenaphthene	0.046 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Naphthalene	0.095 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Phenanthrene	1.26 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Acenaphthylene	0.516 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Anthracene	0.677 (0.013)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Benzo(a)anthracene	2.52 (0.013)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Benzo(a)pyrene	2.10 (0.013)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Benzo(b)fluoranthene	2.67 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Benzo(g,h,i)perylene	1.19 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Benzo(k)fluoranthene	0.735 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Chrysene	2.27 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Dibenzo(a,h)Anthracene	0.414 (0.013)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Fluoranthene	6.23 (0.324)		EPH8270SIM		10	VSC	02/05/18 14:33	C8B0029	CB80106
Fluorene	0.029 (0.013)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Indeno(1,2,3-cd)Pyrene	1.44 (0.032)		EPH8270SIM		1	VSC	02/02/18 18:39	C8B0029	CB80106
Pyrene	4.50 (0.324)		EPH8270SIM		10	VSC	02/05/18 14:33	C8B0029	CB80106

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1-Chlorooctadecane</i>	70 %		40-140
<i>Surrogate: 2-Bromonaphthalene</i>	101 %		40-140
<i>Surrogate: 2-Fluorobiphenyl</i>	91 %		40-140
<i>Surrogate: O-Terphenyl</i>	82 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Pond - air dried
Date Sampled: 01/23/18 13:00
Percent Solids: 100

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	13.1 (1.95)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131
Cadmium	0.67 (0.39)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131
Chromium	15.3 (0.78)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131
Copper	23.9 (1.95)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131
Lead	167 (3.91)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131
Mercury	0.441 (0.049)		7471B		5	BJV	02/02/18 14:59	2.01	40	CB80133
Nickel	8.50 (1.95)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131
Zinc	129 (1.95)		6010C		2	KJK	02/02/18 14:35	5.12	100	CB80131



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ
Client Sample ID: Stream Up - air dried
Date Sampled: 01/23/18 13:30
Percent Solids: 100

ESS Laboratory Work Order: 1801552
ESS Laboratory Sample ID: 1801552-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	5.02 (0.98)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131
Cadmium	0.21 (0.20)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131
Chromium	7.92 (0.39)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131
Copper	5.55 (0.98)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131
Lead	29.2 (1.96)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131
Mercury	0.113 (0.008)		7471B		1	BJV	02/02/18 14:24	2.44	40	CB80133
Nickel	3.64 (0.98)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131
Zinc	39.2 (0.98)		6010C		1	KJK	02/02/18 14:27	5.09	100	CB80131



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ
 Client Sample ID: Stream Down - air dried
 Date Sampled: 01/23/18 14:00
 Percent Solids: 100

ESS Laboratory Work Order: 1801552
 ESS Laboratory Sample ID: 1801552-06
 Sample Matrix: Soil
 Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Arsenic	9.17 (1.00)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131
Cadmium	0.35 (0.20)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131
Chromium	8.35 (0.40)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131
Copper	12.2 (1.00)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131
Lead	90.6 (1.99)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131
Mercury	0.262 (0.042)		7471B		5	BJV	02/02/18 15:03	2.37	40	CB80133
Nickel	3.64 (1.00)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131
Zinc	70.8 (1.00)		6010C		1	KJK	02/02/18 14:32	5.02	100	CB80131



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CB80131 - 3050B										
Blank										
Arsenic	ND	2.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Copper	ND	2.50	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Arsenic	106	7.04	mg/kg wet	123.0		86	80-120			
Cadmium	199	1.41	mg/kg wet	224.0		89	80-120			
Chromium	156	2.82	mg/kg wet	179.0		87	80-120			
Copper	69.7	7.04	mg/kg wet	78.90		88	80-120			
Lead	125	14.1	mg/kg wet	145.0		86	80-120			
Nickel	117	7.04	mg/kg wet	143.0		82	80-120			
LCS										
Zinc	202	7.25	mg/kg wet	256.0		79	71-102			
LCS Dup										
Arsenic	114	7.14	mg/kg wet	123.0		93	80-120	8	20	
Cadmium	186	1.43	mg/kg wet	224.0		83	80-120	7	20	
Chromium	164	2.86	mg/kg wet	179.0		92	80-120	5	20	
Copper	74.5	7.14	mg/kg wet	78.90		94	80-120	7	20	
Lead	131	14.3	mg/kg wet	145.0		90	80-120	5	20	
Nickel	123	7.14	mg/kg wet	143.0		86	80-120	5	20	
LCS Dup										
Zinc	197	7.04	mg/kg wet	256.0		77	71-102	3	20	
Batch CB80133 - 7471A										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	11.3	1.48	mg/kg wet	18.60		61	41-94			
LCS Dup										
Mercury	11.7	1.55	mg/kg wet	18.60		63	41-94	3	20	
Reference										
Mercury	0.955	0.152	mg/kg wet	1000		0.1	0-200			

5035/8260B Volatile Organic Compounds / Low Level

Batch CA83109 - 5035

Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0020	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch CA83109 - 5035

1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0020	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch CA83109 - 5035

Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Xylenes (Total)	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	0.0451		mg/kg wet	0.05000		90	70-130			
Surrogate: 4-Bromofluorobenzene	0.0467		mg/kg wet	0.05000		93	70-130			
Surrogate: Dibromofluoromethane	0.0452		mg/kg wet	0.05000		90	70-130			
Surrogate: Toluene-d8	0.0505		mg/kg wet	0.05000		101	70-130			

LCS

1,1,1,2-Tetrachloroethane	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
1,1,1-Trichloroethane	0.0531	0.0050	mg/kg wet	0.05000		106	70-130			
1,1,2,2-Tetrachloroethane	0.0583	0.0020	mg/kg wet	0.05000		117	70-130			
1,1,2-Trichloroethane	0.0566	0.0050	mg/kg wet	0.05000		113	70-130			
1,1-Dichloroethane	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
1,1-Dichloroethene	0.0538	0.0050	mg/kg wet	0.05000		108	70-130			
1,1-Dichloropropene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130			
1,2,3-Trichlorobenzene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
1,2,3-Trichloropropane	0.0552	0.0050	mg/kg wet	0.05000		110	70-130			
1,2,4-Trichlorobenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130			
1,2,4-Trimethylbenzene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130			
1,2-Dibromo-3-Chloropropane	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
1,2-Dibromoethane	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
1,2-Dichlorobenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
1,2-Dichloroethane	0.0549	0.0050	mg/kg wet	0.05000		110	70-130			
1,2-Dichloropropane	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
1,3,5-Trimethylbenzene	0.0538	0.0050	mg/kg wet	0.05000		108	70-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch CA83109 - 5035

1,3-Dichlorobenzene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130			
1,3-Dichloropropane	0.0589	0.0050	mg/kg wet	0.05000		118	70-130			
1,4-Dichlorobenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
1,4-Dioxane	1.02	0.100	mg/kg wet	1.000		102	70-130			
2,2-Dichloropropane	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
2-Butanone	0.286	0.0100	mg/kg wet	0.2500		114	70-130			
2-Chlorotoluene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130			
2-Hexanone	0.280	0.0100	mg/kg wet	0.2500		112	70-130			
4-Chlorotoluene	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
4-Isopropyltoluene	0.0528	0.0050	mg/kg wet	0.05000		106	70-130			
4-Methyl-2-Pentanone	0.265	0.0100	mg/kg wet	0.2500		106	70-130			
Acetone	0.274	0.0100	mg/kg wet	0.2500		110	70-130			
Benzene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
Bromobenzene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130			
Bromochloromethane	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
Bromodichloromethane	0.0492	0.0050	mg/kg wet	0.05000		98	70-130			
Bromoform	0.0474	0.0050	mg/kg wet	0.05000		95	70-130			
Bromomethane	0.0544	0.0100	mg/kg wet	0.05000		109	70-130			
Carbon Disulfide	0.0564	0.0050	mg/kg wet	0.05000		113	70-130			
Carbon Tetrachloride	0.0465	0.0050	mg/kg wet	0.05000		93	70-130			
Chlorobenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
Chloroethane	0.0528	0.0100	mg/kg wet	0.05000		106	70-130			
Chloroform	0.0535	0.0050	mg/kg wet	0.05000		107	70-130			
Chloromethane	0.0557	0.0100	mg/kg wet	0.05000		111	70-130			
cis-1,2-Dichloroethene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130			
cis-1,3-Dichloropropene	0.0486	0.0050	mg/kg wet	0.05000		97	70-130			
Dibromochloromethane	0.0499	0.0020	mg/kg wet	0.05000		100	70-130			
Dibromomethane	0.0544	0.0050	mg/kg wet	0.05000		109	70-130			
Dichlorodifluoromethane	0.0522	0.0100	mg/kg wet	0.05000		104	70-130			
Diethyl Ether	0.0587	0.0050	mg/kg wet	0.05000		117	70-130			
Di-isopropyl ether	0.0557	0.0050	mg/kg wet	0.05000		111	70-130			
Ethyl tertiary-butyl ether	0.0486	0.0050	mg/kg wet	0.05000		97	70-130			
Ethylbenzene	0.0546	0.0050	mg/kg wet	0.05000		109	70-130			
Hexachlorobutadiene	0.0528	0.0050	mg/kg wet	0.05000		106	70-130			
Isopropylbenzene	0.0507	0.0050	mg/kg wet	0.05000		101	70-130			
Methyl tert-Butyl Ether	0.0553	0.0050	mg/kg wet	0.05000		111	70-130			
Methylene Chloride	0.0514	0.0100	mg/kg wet	0.05000		103	70-130			
Naphthalene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
n-Butylbenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130			
n-Propylbenzene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130			
sec-Butylbenzene	0.0528	0.0050	mg/kg wet	0.05000		106	70-130			
Styrene	0.0499	0.0050	mg/kg wet	0.05000		100	70-130			
tert-Butylbenzene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130			
Tertiary-amyl methyl ether	0.0463	0.0050	mg/kg wet	0.05000		93	70-130			
Tetrachloroethene	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA83109 - 5035										
Tetrahydrofuran	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
Toluene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130			
trans-1,2-Dichloroethene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
trans-1,3-Dichloropropene	0.0477	0.0050	mg/kg wet	0.05000		95	70-130			
Trichloroethene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
Trichlorofluoromethane	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
Vinyl Chloride	0.0570	0.0100	mg/kg wet	0.05000		114	70-130			
Xylene O	0.0562	0.0050	mg/kg wet	0.05000		112	70-130			
Xylene P,M	0.111	0.0100	mg/kg wet	0.1000		111	70-130			
Xylenes (Total)	0.168	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	0.0491		mg/kg wet	0.05000		98	70-130			
Surrogate: 4-Bromofluorobenzene	0.0511		mg/kg wet	0.05000		102	70-130			
Surrogate: Dibromofluoromethane	0.0502		mg/kg wet	0.05000		100	70-130			
Surrogate: Toluene-d8	0.0512		mg/kg wet	0.05000		102	70-130			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0486	0.0050	mg/kg wet	0.05000		97	70-130	2	20	
1,1,1-Trichloroethane	0.0531	0.0050	mg/kg wet	0.05000		106	70-130	0.1	20	
1,1,2,2-Tetrachloroethane	0.0587	0.0020	mg/kg wet	0.05000		117	70-130	0.7	20	
1,1,2-Trichloroethane	0.0554	0.0050	mg/kg wet	0.05000		111	70-130	2	20	
1,1-Dichloroethane	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	0.7	20	
1,1-Dichloroethene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	0.6	20	
1,1-Dichloropropene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	0.3	20	
1,2,3-Trichlorobenzene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130	1	20	
1,2,3-Trichloropropane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130	0.6	20	
1,2,4-Trichlorobenzene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130	2	20	
1,2,4-Trimethylbenzene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	0.1	20	
1,2-Dibromo-3-Chloropropane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130	2	20	
1,2-Dibromoethane	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	4	20	
1,2-Dichlorobenzene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	0.3	20	
1,2-Dichloroethane	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	1	20	
1,2-Dichloropropane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130	0.7	20	
1,3,5-Trimethylbenzene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	0.6	20	
1,3-Dichlorobenzene	0.0521	0.0050	mg/kg wet	0.05000		104	70-130	0.8	20	
1,3-Dichloropropane	0.0569	0.0050	mg/kg wet	0.05000		114	70-130	3	20	
1,4-Dichlorobenzene	0.0538	0.0050	mg/kg wet	0.05000		108	70-130	0.3	20	
1,4-Dioxane	1.02	0.100	mg/kg wet	1.000		102	70-130	0.2	20	
2,2-Dichloropropane	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	0.5	20	
2-Butanone	0.284	0.0100	mg/kg wet	0.2500		113	70-130	0.7	20	
2-Chlorotoluene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	0.3	20	
2-Hexanone	0.271	0.0100	mg/kg wet	0.2500		108	70-130	3	20	
4-Chlorotoluene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	0.6	20	
4-Isopropyltoluene	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	0.4	20	
4-Methyl-2-Pentanone	0.263	0.0100	mg/kg wet	0.2500		105	70-130	1	20	
Acetone	0.273	0.0100	mg/kg wet	0.2500		109	70-130	0.5	20	
Benzene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	0.8	20	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA83109 - 5035										
Bromobenzene	0.0531	0.0050	mg/kg wet	0.05000		106	70-130	1	20	
Bromochloromethane	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	1	20	
Bromodichloromethane	0.0487	0.0050	mg/kg wet	0.05000		97	70-130	1	20	
Bromoform	0.0468	0.0050	mg/kg wet	0.05000		94	70-130	1	20	
Bromomethane	0.0532	0.0100	mg/kg wet	0.05000		106	70-130	2	20	
Carbon Disulfide	0.0563	0.0050	mg/kg wet	0.05000		113	70-130	0.2	20	
Carbon Tetrachloride	0.0464	0.0050	mg/kg wet	0.05000		93	70-130	0.2	20	
Chlorobenzene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130	4	20	
Chloroethane	0.0527	0.0100	mg/kg wet	0.05000		105	70-130	0.2	20	
Chloroform	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	1	20	
Chloromethane	0.0542	0.0100	mg/kg wet	0.05000		108	70-130	3	20	
cis-1,2-Dichloroethene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	0.6	20	
cis-1,3-Dichloropropene	0.0486	0.0050	mg/kg wet	0.05000		97	70-130	0.08	20	
Dibromochloromethane	0.0484	0.0020	mg/kg wet	0.05000		97	70-130	3	20	
Dibromomethane	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	2	20	
Dichlorodifluoromethane	0.0513	0.0100	mg/kg wet	0.05000		103	70-130	2	20	
Diethyl Ether	0.0589	0.0050	mg/kg wet	0.05000		118	70-130	0.4	20	
Di-isopropyl ether	0.0557	0.0050	mg/kg wet	0.05000		111	70-130	0.07	20	
Ethyl tertiary-butyl ether	0.0484	0.0050	mg/kg wet	0.05000		97	70-130	0.6	20	
Ethylbenzene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130	2	20	
Hexachlorobutadiene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	3	20	
Isopropylbenzene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
Methyl tert-Butyl Ether	0.0552	0.0050	mg/kg wet	0.05000		110	70-130	0.2	20	
Methylene Chloride	0.0509	0.0100	mg/kg wet	0.05000		102	70-130	0.9	20	
Naphthalene	0.0509	0.0050	mg/kg wet	0.05000		102	70-130	2	20	
n-Butylbenzene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	0.5	20	
n-Propylbenzene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130	1	20	
sec-Butylbenzene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130	1	20	
Styrene	0.0489	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
tert-Butylbenzene	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	0.7	20	
Tertiary-amyl methyl ether	0.0461	0.0050	mg/kg wet	0.05000		92	70-130	0.4	20	
Tetrachloroethene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	3	20	
Tetrahydrofuran	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	0.8	20	
Toluene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130	2	20	
trans-1,2-Dichloroethene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	0.4	20	
trans-1,3-Dichloropropene	0.0479	0.0050	mg/kg wet	0.05000		96	70-130	0.5	20	
Trichloroethene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130	2	20	
Trichlorofluoromethane	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	0.9	20	
Vinyl Chloride	0.0554	0.0100	mg/kg wet	0.05000		111	70-130	3	20	
Xylene O	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	2	20	
Xylene P,M	0.108	0.0100	mg/kg wet	0.1000		108	70-130	3	20	
Xylenes (Total)	0.163	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	0.0489		mg/kg wet	0.05000		98	70-130			
Surrogate: 4-Bromofluorobenzene	0.0493		mg/kg wet	0.05000		99	70-130			
Surrogate: Dibromofluoromethane	0.0500		mg/kg wet	0.05000		100	70-130			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch CA83109 - 5035

Surrogate: Toluene-d8 0.0507 mg/kg wet 0.05000 101 70-130

8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch CA83105 - 3540C

Blank

BZ#101	ND	0.00027	mg/kg wet
BZ#101 [2C]	ND	0.00027	mg/kg wet
BZ#105	ND	0.00027	mg/kg wet
BZ#105 [2C]	ND	0.00027	mg/kg wet
BZ#118	ND	0.00027	mg/kg wet
BZ#118 [2C]	ND	0.00027	mg/kg wet
BZ#128	ND	0.00027	mg/kg wet
BZ#128 [2C]	ND	0.00027	mg/kg wet
BZ#138	ND	0.00027	mg/kg wet
BZ#138 [2C]	ND	0.00027	mg/kg wet
BZ#153	ND	0.00027	mg/kg wet
BZ#153 [2C]	ND	0.00027	mg/kg wet
BZ#170	ND	0.00027	mg/kg wet
BZ#170 [2C]	ND	0.00027	mg/kg wet
BZ#18	ND	0.00027	mg/kg wet
BZ#18 [2C]	ND	0.00027	mg/kg wet
BZ#180	ND	0.00027	mg/kg wet
BZ#180 [2C]	ND	0.00027	mg/kg wet
BZ#187	ND	0.00027	mg/kg wet
BZ#187 [2C]	ND	0.00027	mg/kg wet
BZ#195	ND	0.00027	mg/kg wet
BZ#195 [2C]	ND	0.00027	mg/kg wet
BZ#206	ND	0.00027	mg/kg wet
BZ#206 [2C]	ND	0.00027	mg/kg wet
BZ#209	ND	0.00027	mg/kg wet
BZ#209 [2C]	ND	0.00027	mg/kg wet
BZ#28	ND	0.00027	mg/kg wet
BZ#28 [2C]	ND	0.00027	mg/kg wet
BZ#44	ND	0.00027	mg/kg wet
BZ#44 [2C]	ND	0.00027	mg/kg wet
BZ#52	ND	0.00027	mg/kg wet
BZ#52 [2C]	ND	0.00027	mg/kg wet
BZ#66	ND	0.00027	mg/kg wet
BZ#66 [2C]	ND	0.00027	mg/kg wet
BZ#8	ND	0.00027	mg/kg wet
BZ#8 [2C]	ND	0.00027	mg/kg wet

Surrogate: Tetrachloro-m-xylene 0.00269 mg/kg wet 0.003333 81 30-150
 Surrogate: Tetrachloro-m-xylene [2C] 0.00263 mg/kg wet 0.003333 79 30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch CA83105 - 3540C

LCS

BZ#101	0.00314	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#101 [2C]	0.00290	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#105	0.00295	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#105 [2C]	0.00300	0.00027	mg/kg wet	0.003333		90	40-140			
BZ#118	0.00308	0.00027	mg/kg wet	0.003333		93	40-140			
BZ#118 [2C]	0.00286	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#128	0.00326	0.00027	mg/kg wet	0.003333		98	40-140			
BZ#128 [2C]	0.00306	0.00027	mg/kg wet	0.003333		92	40-140			
BZ#138	0.00309	0.00027	mg/kg wet	0.003333		93	40-140			
BZ#138 [2C]	0.00295	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#153	0.00317	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#153 [2C]	0.00291	0.00027	mg/kg wet	0.003333		87	40-140			
BZ#170	0.00317	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#170 [2C]	0.00317	0.00027	mg/kg wet	0.003333		95	40-140			
BZ#18	0.00302	0.00027	mg/kg wet	0.003333		91	40-140			
BZ#18 [2C]	0.00278	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#180	0.00323	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#180 [2C]	0.00318	0.00027	mg/kg wet	0.003333		96	40-140			
BZ#187	0.00313	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#187 [2C]	0.00292	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#195	0.00324	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#195 [2C]	0.00322	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#206	0.00325	0.00027	mg/kg wet	0.003333		98	40-140			
BZ#206 [2C]	0.00314	0.00027	mg/kg wet	0.003333		94	40-140			
BZ#209	0.00323	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#209 [2C]	0.00300	0.00027	mg/kg wet	0.003333		90	40-140			
BZ#28	0.00301	0.00027	mg/kg wet	0.003333		90	40-140			
BZ#28 [2C]	0.00274	0.00027	mg/kg wet	0.003333		82	40-140			
BZ#44	0.00276	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#44 [2C]	0.00286	0.00027	mg/kg wet	0.003333		86	40-140			
BZ#52	0.00278	0.00027	mg/kg wet	0.003333		83	40-140			
BZ#52 [2C]	0.00282	0.00027	mg/kg wet	0.003333		85	40-140			
BZ#66	0.00320	0.00027	mg/kg wet	0.003333		96	40-140			
BZ#66 [2C]	0.00293	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#8	0.00323	0.00027	mg/kg wet	0.003333		97	40-140			
BZ#8 [2C]	0.00337	0.00027	mg/kg wet	0.003333		101	40-140			

Surrogate: Tetrachloro-m-xylene	0.00269		mg/kg wet	0.003333		81	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.00265		mg/kg wet	0.003333		79	30-150			

LCS Dup

BZ#101	0.00319	0.00027	mg/kg wet	0.003333		96	40-140	1	50	
BZ#101 [2C]	0.00282	0.00027	mg/kg wet	0.003333		84	40-140	3	50	
BZ#105	0.00301	0.00027	mg/kg wet	0.003333		90	40-140	2	50	
BZ#105 [2C]	0.00303	0.00027	mg/kg wet	0.003333		91	40-140	0.9	50	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch CA83105 - 3540C

BZ#118	0.00319	0.00027	mg/kg wet	0.003333		96	40-140	3	50	
BZ#118 [2C]	0.00285	0.00027	mg/kg wet	0.003333		85	40-140	0.3	50	
BZ#128	0.00330	0.00027	mg/kg wet	0.003333		99	40-140	1	50	
BZ#128 [2C]	0.00306	0.00027	mg/kg wet	0.003333		92	40-140	0.08	50	
BZ#138	0.00315	0.00027	mg/kg wet	0.003333		94	40-140	2	50	
BZ#138 [2C]	0.00294	0.00027	mg/kg wet	0.003333		88	40-140	0.3	50	
BZ#153	0.00320	0.00027	mg/kg wet	0.003333		96	40-140	0.9	50	
BZ#153 [2C]	0.00290	0.00027	mg/kg wet	0.003333		87	40-140	0.3	50	
BZ#170	0.00324	0.00027	mg/kg wet	0.003333		97	40-140	2	50	
BZ#170 [2C]	0.00320	0.00027	mg/kg wet	0.003333		96	40-140	0.9	50	
BZ#18	0.00302	0.00027	mg/kg wet	0.003333		91	40-140	0.1	50	
BZ#18 [2C]	0.00275	0.00027	mg/kg wet	0.003333		83	40-140	1	50	
BZ#180	0.00330	0.00027	mg/kg wet	0.003333		99	40-140	2	50	
BZ#180 [2C]	0.00318	0.00027	mg/kg wet	0.003333		96	40-140	0.01	50	
BZ#187	0.00321	0.00027	mg/kg wet	0.003333		96	40-140	2	50	
BZ#187 [2C]	0.00291	0.00027	mg/kg wet	0.003333		87	40-140	0.5	50	
BZ#195	0.00326	0.00027	mg/kg wet	0.003333		98	40-140	0.8	50	
BZ#195 [2C]	0.00320	0.00027	mg/kg wet	0.003333		96	40-140	0.6	50	
BZ#206	0.00333	0.00027	mg/kg wet	0.003333		100	40-140	2	50	
BZ#206 [2C]	0.00316	0.00027	mg/kg wet	0.003333		95	40-140	0.7	50	
BZ#209	0.00330	0.00027	mg/kg wet	0.003333		99	40-140	2	50	
BZ#209 [2C]	0.00301	0.00027	mg/kg wet	0.003333		90	40-140	0.3	50	
BZ#28	0.00310	0.00027	mg/kg wet	0.003333		93	40-140	3	50	
BZ#28 [2C]	0.00276	0.00027	mg/kg wet	0.003333		83	40-140	0.7	50	
BZ#44	0.00282	0.00027	mg/kg wet	0.003333		85	40-140	2	50	
BZ#44 [2C]	0.00289	0.00027	mg/kg wet	0.003333		87	40-140	0.9	50	
BZ#52	0.00294	0.00027	mg/kg wet	0.003333		88	40-140	5	50	
BZ#52 [2C]	0.00286	0.00027	mg/kg wet	0.003333		86	40-140	1	50	
BZ#66	0.00328	0.00027	mg/kg wet	0.003333		98	40-140	2	50	
BZ#66 [2C]	0.00294	0.00027	mg/kg wet	0.003333		88	40-140	0.6	50	
BZ#8	0.00326	0.00027	mg/kg wet	0.003333		98	40-140	0.9	50	
BZ#8 [2C]	0.00332	0.00027	mg/kg wet	0.003333		99	40-140	1	50	

Surrogate: Tetrachloro-m-xylene	0.00265		mg/kg wet	0.003333		79	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.00256		mg/kg wet	0.003333		77	30-150			

Classical Chemistry

Batch CB80218 - General Preparation

Blank										
Total Organic Carbon (1)	ND	100	mg/kg							
Total Organic Carbon (2)	ND	100	mg/kg							
Total Organic Carbon (Average)	ND	100	mg/kg							

LCS										
Total Organic Carbon (1)	10200	100	mg/kg	10000		102	80-120			
Total Organic Carbon (2)	10300	100	mg/kg	10000		103	80-120			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Classical Chemistry

Batch CB80218 - [CALC]

Total Organic Carbon (Average)	10300	100	mg/kg							
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LCS Dup

Total Organic Carbon (1)	9940	100	mg/kg	10000		99	80-120	3	200	
Total Organic Carbon (2)	9660	100	mg/kg	10000		97	80-120	7	200	
Total Organic Carbon (Average)	9800	100	mg/kg							

Reference

Total Organic Carbon (Average)	1.60		mg/kg							
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MADEP-EPH Extractable Petroleum Hydrocarbons

Batch CB80106 - 3546

Blank

C19-C36 Aliphatics1	ND	12.0	mg/kg wet							
C9-C18 Aliphatics1	ND	12.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacotane (C30)	ND	0.5	mg/kg wet							

Surrogate: 1-Chlorooctadecane	1.49		mg/kg wet	2.000		74	40-140			
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Blank

C11-C22 Aromatics1,2	ND	12.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	12.0	mg/kg wet							

Surrogate: 2-Bromonaphthalene	1.87		mg/kg wet	2.000		94	40-140			
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Surrogate: 2-Fluorobiphenyl	1.77		mg/kg wet	2.000		89	40-140			
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Surrogate: O-Terphenyl	1.69		mg/kg wet	2.000		84	40-140			
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Blank

2-Methylnaphthalene	ND	0.020	mg/kg wet							
Acenaphthene	ND	0.020	mg/kg wet							
Acenaphthylene	ND	0.020	mg/kg wet							
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.020	mg/kg wet							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch C880106 - 3546										
Benzo(g,h,i)perylene	ND	0.020	mg/kg wet							
Benzo(k)fluoranthene	ND	0.020	mg/kg wet							
C11-C22 Aromatics _{1,2}	ND	0.280	mg/kg wet							
Chrysene	ND	0.020	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.020	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.020	mg/kg wet							
Naphthalene	ND	0.020	mg/kg wet							
Phenanthrene	ND	0.020	mg/kg wet							
Pyrene	ND	0.020	mg/kg wet							
LCS										
C19-C36 Aliphatics ₁	15.9	15.0	mg/kg wet	16.00		100	40-140			
C9-C18 Aliphatics ₁	9.3	15.0	mg/kg wet	12.00		78	40-140			
Decane (C10)	1.1	0.5	mg/kg wet	2.000		57	40-140			
Docosane (C22)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Dodecane (C12)	1.3	0.5	mg/kg wet	2.000		63	40-140			
Eicosane (C20)	1.7	0.5	mg/kg wet	2.000		85	40-140			
Hexacosane (C26)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Hexadecane (C16)	1.6	0.5	mg/kg wet	2.000		81	40-140			
Hexatriacontane (C36)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Nonadecane (C19)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Nonane (C9)	0.9	0.5	mg/kg wet	2.000		46	30-140			
Octacosane (C28)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Octadecane (C18)	1.6	0.5	mg/kg wet	2.000		82	40-140			
Tetracosane (C24)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Tetradecane (C14)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Triacontane (C30)	1.8	0.5	mg/kg wet	2.000		89	40-140			
<i>Surrogate: 1-Chlorooctadecane</i>	<i>1.74</i>		mg/kg wet	<i>2.000</i>		<i>87</i>	<i>40-140</i>			
LCS										
C11-C22 Aromatics _{1,2}	30.7	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics ₁	30.7	15.0	mg/kg wet	34.00		90	40-140			
<i>Surrogate: 2-Bromonaphthalene</i>	<i>2.15</i>		mg/kg wet	<i>2.000</i>		<i>107</i>	<i>40-140</i>			
<i>Surrogate: 2-Fluorobiphenyl</i>	<i>1.86</i>		mg/kg wet	<i>2.000</i>		<i>93</i>	<i>40-140</i>			
<i>Surrogate: O-Terphenyl</i>	<i>1.83</i>		mg/kg wet	<i>2.000</i>		<i>91</i>	<i>40-140</i>			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	1.52	0.040	mg/kg wet	2.000		76	40-140			
Acenaphthene	1.82	0.040	mg/kg wet	2.000		91	40-140			
Acenaphthylene	1.99	0.040	mg/kg wet	2.000		99	40-140			
Anthracene	1.87	0.016	mg/kg wet	2.000		93	40-140			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch C880106 - 3546										
Benzo(a)anthracene	1.79	0.016	mg/kg wet	2.000		89	40-140			
Benzo(a)pyrene	1.85	0.016	mg/kg wet	2.000		93	40-140			
Benzo(b)fluoranthene	1.80	0.040	mg/kg wet	2.000		90	40-140			
Benzo(g,h,i)perylene	1.79	0.040	mg/kg wet	2.000		89	40-140			
Benzo(k)fluoranthene	1.77	0.040	mg/kg wet	2.000		88	40-140			
C11-C22 Aromatics1,2	ND	0.560	mg/kg wet							
Chrysene	1.83	0.040	mg/kg wet	2.000		91	40-140			
Dibenzo(a,h)Anthracene	1.94	0.016	mg/kg wet	2.000		97	40-140			
Fluoranthene	1.87	0.040	mg/kg wet	2.000		93	40-140			
Fluorene	1.92	0.016	mg/kg wet	2.000		96	40-140			
Indeno(1,2,3-cd)Pyrene	2.04	0.040	mg/kg wet	2.000		102	40-140			
Naphthalene	1.57	0.040	mg/kg wet	2.000		79	40-140			
Phenanthrene	1.77	0.040	mg/kg wet	2.000		89	40-140			
Pyrene	1.77	0.040	mg/kg wet	2.000		88	40-140			
LCS Dup										
C19-C36 Aliphatics1	16.1	15.0	mg/kg wet	16.00		101	40-140	1	25	
C9-C18 Aliphatics1	9.3	15.0	mg/kg wet	12.00		77	40-140	0.7	25	
Decane (C10)	1.2	0.5	mg/kg wet	2.000		58	40-140	1	25	
Docosane (C22)	1.8	0.5	mg/kg wet	2.000		89	40-140	3	25	
Dodecane (C12)	1.3	0.5	mg/kg wet	2.000		64	40-140	2	25	
Eicosane (C20)	1.8	0.5	mg/kg wet	2.000		88	40-140	3	25	
Hexacosane (C26)	1.8	0.5	mg/kg wet	2.000		90	40-140	4	25	
Hexadecane (C16)	1.7	0.5	mg/kg wet	2.000		84	40-140	3	25	
Hexatriacontane (C36)	1.8	0.5	mg/kg wet	2.000		90	40-140	4	25	
Nonadecane (C19)	1.8	0.5	mg/kg wet	2.000		89	40-140	3	25	
Nonane (C9)	0.9	0.5	mg/kg wet	2.000		46	30-140	0.9	25	
Octacosane (C28)	1.8	0.5	mg/kg wet	2.000		91	40-140	4	25	
Octadecane (C18)	1.7	0.5	mg/kg wet	2.000		84	40-140	3	25	
Tetracosane (C24)	1.8	0.5	mg/kg wet	2.000		89	40-140	4	25	
Tetradecane (C14)	1.4	0.5	mg/kg wet	2.000		72	40-140	3	25	
Triacontane (C30)	1.9	0.5	mg/kg wet	2.000		93	40-140	4	25	
<i>Surrogate: 1-Chlorooctadecane</i>	<i>1.79</i>		<i>mg/kg wet</i>	<i>2.000</i>		<i>89</i>	<i>40-140</i>			
LCS Dup										
C11-C22 Aromatics1,2	29.9	15.0	mg/kg wet							
C11-C22 Unadjusted Aromatics1	29.9	15.0	mg/kg wet	34.00		88	40-140	3	25	
<i>Surrogate: 2-Bromonaphthalene</i>	<i>1.88</i>		<i>mg/kg wet</i>	<i>2.000</i>		<i>94</i>	<i>40-140</i>			
<i>Surrogate: 2-Fluorobiphenyl</i>	<i>1.72</i>		<i>mg/kg wet</i>	<i>2.000</i>		<i>86</i>	<i>40-140</i>			
<i>Surrogate: O-Terphenyl</i>	<i>1.81</i>		<i>mg/kg wet</i>	<i>2.000</i>		<i>90</i>	<i>40-140</i>			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	1.56	0.040	mg/kg wet	2.000		78	40-140	3	30	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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MADEP-EPH Extractable Petroleum Hydrocarbons

Batch C880106 - 3546

Acenaphthene	1.84	0.040	mg/kg wet	2.000		92	40-140	1	30	
Acenaphthylene	2.01	0.040	mg/kg wet	2.000		101	40-140	1	30	
Anthracene	1.89	0.016	mg/kg wet	2.000		95	40-140	2	30	
Benzo(a)anthracene	1.83	0.016	mg/kg wet	2.000		92	40-140	3	30	
Benzo(a)pyrene	1.88	0.016	mg/kg wet	2.000		94	40-140	1	30	
Benzo(b)fluoranthene	1.88	0.040	mg/kg wet	2.000		94	40-140	4	30	
Benzo(g,h,i)perylene	1.84	0.040	mg/kg wet	2.000		92	40-140	3	30	
Benzo(k)fluoranthene	1.74	0.040	mg/kg wet	2.000		87	40-140	1	30	
C11-C22 Aromatics1,2	ND	0.560	mg/kg wet							
Chrysene	1.86	0.040	mg/kg wet	2.000		93	40-140	2	30	
Dibenzo(a,h)Anthracene	1.92	0.016	mg/kg wet	2.000		96	40-140	0.6	30	
Fluoranthene	1.88	0.040	mg/kg wet	2.000		94	40-140	0.5	30	
Fluorene	1.93	0.016	mg/kg wet	2.000		97	40-140	0.7	30	
Indeno(1,2,3-cd)Pyrene	2.08	0.040	mg/kg wet	2.000		104	40-140	2	30	
Naphthalene	1.63	0.040	mg/kg wet	2.000		81	40-140	3	30	
Phenanthrene	1.79	0.040	mg/kg wet	2.000		90	40-140	1	30	
Pyrene	1.81	0.040	mg/kg wet	2.000		91	40-140	2	30	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

Notes and Definitions

- Z-08 See Attached
- U Analyte included in the analysis, but not detected
- P Percent difference between primary and confirmation results exceeds 40% (P).
- LC Lower value is used due to matrix interferences (LC).
- D Diluted.
- ND Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- MDL Method Detection Limit
- MRL Method Reporting Limit
- LOD Limit of Detection
- LOQ Limit of Quantitation
- DL Detection Limit
- I/V Initial Volume
- F/V Final Volume
- § Subcontracted analysis; see attached report
- 1 Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
- 2 Range result excludes concentrations of target analytes eluting in that range.
- 3 Range result excludes the concentration of the C9-C10 aromatic range.
- Avg Results reported as a mathematical average.
- NR No Recovery
- [CALC] Calculated Analyte
- SUB Subcontracted analysis; see attached report
- RL Reporting Limit
- EDL Estimated Detection Limit



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - 401WQ

ESS Laboratory Work Order: 1801552

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
<http://www.maine.gov/dhhs/meecd/environmental-health/dwp/partners/labCert.shtml>

Massachusetts Potable and Non Potable Water: M-RI002
<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
<http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx>

SOILS LABORATORY TESTING ASSIGNMENT SHEET



195 Frances Ave., Cranston, RI 02910
401-467-6454

Project Name Sawmill Brook Client Company Tighe & Bond
 ESS Project No. 1801552 Client Email _____
 Project Manager Michelle Miranda Site Location _____
 Date Received 1/30/2018 (by _____) Date Assigned _____

Collected By _____
Date Required 2/6/2018

Sample Information			Identification Tests											Soil Strength		Consol.		Notes							
Boring/ Test Pit No.	Sample or depth	Sample date	ESS Sample ID	Water Cont. %	LL & PL %	Org. %	Bulk %	Sieve -200 %	Hyd -2µ %	G _s	Tube Den- sity	Sand	Clay	Permeability	Mod. Std.	CBR	Un- con- fined		UU	CIU	Stand ard	E.O.P.	#		
				D2216	D4318	D2974	D422	D854	D2434	D5084	D1557	D698	D1883	D2166	D2850	D4767	D2435	D2435							
Pond		1/23/18	1801552-01					X																**	
Stream Up		1/23/18	1801552-02					X																**	
Stream Down		1/23/18	1801552-03					X																**	

Notes: ** = Sieve # 4,10,40,60,200

ESS Laboratory

Division of Thielsch Engineering, Inc.
 185 Frances Avenue, Cranston RI 02910
 Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1801552

Turn Time 5 Days
 Regulatory State _____
 Is this project for any of the following?:
 OCT RCP MA MCP ORGP

Reporting Limits 401 Water Quality
 Electronic Data Checker Excel
 Deliverables Other (Please Specify →)

Company Name Tighe & Bond Project # 221476 Project Name Sawmill Brook
 Contact Person Gary Hedman Address 4 Barlows Landing Road
 City Pocasset State MA Zip Code 02559 PO # _____
 Telephone Number 508-304-6357 FAX Number _____ Email Address Ghedman@tighebond.com

Analysis
 *Metals and Percent Water
 EPH w/ PAH Low Level
 PCB NOAA 18 Congeners
 VOC LL
 VOC High
 TOC - LloydKahn
 Grain Size
 TPH
 MCP 14 Metals (hold)
 SVOCs (hold)

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TPH	MCP 14 Metals (hold)	SVOCs (hold)
01	1/23/18	1300	Composite	Soil	Pond	X	X	X	X	X	X	X	X		
02	1/23/18	1330	Composite	Soil	Stream Up	X	X	X	X	X	X	X	X		
03	1/23/18	1400	Composite	Soil	Stream Down	X	X	X	X	X	X	X	X		
04	1/23/18	1300	C	S	Pond - air dried	X									
05	1/23/18	1330	C	S	Stream Up - air dried	X									
06	1/23/18	1400	C	S	Stream Down - air dried	X									

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
 Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
 Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAc2, NaOH 9-NH4Cl 10-DI H2O 11-Other*
 Number of Containers per Sample: 1 1 1 2 1 1 1 1

Laboratory Use Only
 Cooler Present: Drop Off
 Seals Intact: Pickup
 Cooler Temperature: 1.9 10/9/18

Sampled by: Gary Hedman
 Comments: **Please specify "Other" preservative and containers types in this space**
 *Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn added air dried samples for metals. mkm 2/5/18
all frozen by G.H. @ 1000 1/25/18 *per A.C. w*

Relinquished by: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 13:35	Received By: (Signature, Date & Time) <u>[Signature]</u> 1-30-18 13:35	Relinquished By: (Signature, Date & Time) <u>[Signature]</u> 1-30-18 1430	Received By: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 1515
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ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1801552
Reporting Limits 401 Water Quality
Electronic <input checked="" type="checkbox"/> Data Checker <input checked="" type="checkbox"/> Excel
Deliverables <input type="checkbox"/> Other (Please Specify --)

Company Name Tighe & Bond	Project # 221476	Project Name Sawmill Brook
Contact Person Gary Hedman	Address 4 Barlows Landing Road	
City Pocasset	State MA	Zip Code 02559
Telephone Number 508-304-6357	FAX Number	PO #
Email Address Ghedman@tighebond.com		

Analysis	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TPH	MCP 14 Metals (hold)	SVOCs (hold)							
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ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID
01	1/23/18	1300	Composite	Soil	Pond
02	1/23/18	1330	Composite	Soil	Stream Up
03	1/23/18	1400	Composite	Soil	Stream Down

X	X	X	X	X	X	X	X	X									
X	X	X	X	X	X	X	X	X									
X	X	X	X	X	X	X	X	X									

Container Type:	AC-Air Cassette	AG-Amber Glass	B-BOD Bottle	C-Cubitainer	J-Jar	O-Other	P-Poly	S-Sterile	V-Vial	AG	AG	AG	V	V	AG	O	AG
Container Volume:	1-100 mL	2-2.5 gal	3-250 mL	4-300 mL	5-500 mL	6-1L	7-VOA	8-2 oz	9-4 oz	10-8 oz	11-Other*	10	10	10	7	7	8
Preservation Code:	1-Non Preserved	2-HCl	3-H2SO4	4-HNO3	5-NaOH	6-Methanol	7-Na2S2O3	8-ZnAce, NaOH	9-NH4Cl	10-DI H2O	11-Other*	1	1	1	10	6	1
Number of Containers per Sample:	1	1	1	2	1	1	1	1	1	1	1						

Laboratory Use Only	
Cooler Present: <input checked="" type="checkbox"/>	<input type="checkbox"/> Drop Off
Seals Intact: <input checked="" type="checkbox"/>	<input type="checkbox"/> Pickup
Cooler Temperature: <u>1.9 100°F</u>	

Sampled by: Gary Hedman

Comments: Please specify "Other" preservative and containers types in this space

* Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn

all frozen by G.H. @ 1000 1/25/18 per A.C. w

Relinquished by: (Signature, Date & Time)

[Signature] 1/30/18 13:35

Relinquished by: (Signature, Date & Time)

Received By: (Signature, Date & Time)

[Signature] 1-30-18 13:35

Received By: (Signature, Date & Time)

Relinquished By: (Signature, Date & Time)

[Signature] 1-30-18 1430

Relinquished By: (Signature, Date & Time)

Received By: (Signature, Date & Time)

[Signature] 1/30/18 1515

Received By: (Signature, Date & Time)



CERTIFICATE OF ANALYSIS

Gary Hedman
 Tighe & Bond
 4 Barlows Landing Road, Unit 15
 Pocasset, MA 02559

RE: Sawmill Brook - MCP (221476)
ESS Laboratory Work Order Number: 1801551

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
 Laboratory Director

REVIEWED
 By ESS Laboratory at 2:32 pm, Feb 06, 2018

Analytical Summary

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

SAMPLE RECEIPT

The following samples were received on January 30, 2018 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for EPH were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1801551-01	Pond	Soil	8100M
1801551-02	Stream Up	Soil	8100M
1801551-03	Stream Down	Soil	8100M



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

[Definitions of Quality Control Parameters](#)

[Semivolatile Organics Internal Standard Information](#)

[Semivolatile Organics Surrogate Information](#)

[Volatile Organics Internal Standard Information](#)

[Volatile Organics Surrogate Information](#)

[EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

- 1010A - Flashpoint
- 6010C - ICP
- 6020A - ICP MS
- 7010 - Graphite Furnace
- 7196A - Hexavalent Chromium
- 7470A - Aqueous Mercury
- 7471B - Solid Mercury
- 8011 - EDB/DBCP/TCP
- 8015C - GRO/DRO
- 8081B - Pesticides
- 8082A - PCB
- 8100M - TPH
- 8151A - Herbicides
- 8260B - VOA
- 8270D - SVOA
- 8270D SIM - SVOA Low Level
- 9014 - Cyanide
- 9038 - Sulfate
- 9040C - Aqueous pH
- 9045D - Solid pH (Corrosivity)
- 9050A - Specific Conductance
- 9056A - Anions (IC)
- 9060A - TOC
- 9095B - Paint Filter
- MADEP 04-1.1 - EPH / VPH

Prep Methods

- 3005A - Aqueous ICP Digestion
- 3020A - Aqueous Graphite Furnace / ICP MS Digestion
- 3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
- 3060A - Solid Hexavalent Chromium Digestion
- 3510C - Separatory Funnel Extraction
- 3520C - Liquid / Liquid Extraction
- 3540C - Manual Soxhlet Extraction
- 3541 - Automated Soxhlet Extraction
- 3546 - Microwave Extraction
- 3580A - Waste Dilution
- 5030B - Aqueous Purge and Trap
- 5030C - Aqueous Purge and Trap
- 5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1801551-01 through 1801551-03**

Matrices: () Ground Water/Surface Water Soil/Sediment () Drinking Water () Air () Other: _____

CAM Protocol (check all that apply below):

- | | | | | | |
|---|--|--|---|--|---|
| <input type="checkbox"/> 8260 VOC
CAM II A | <input type="checkbox"/> 7470/7471 Hg
CAM III B | <input type="checkbox"/> MassDEP VPH
(GC/PID/FID)
CAM IV A | <input type="checkbox"/> 8082 PCB
CAM V A | <input type="checkbox"/> 9014 Total
Cyanide/PAC
CAM VI A | <input type="checkbox"/> 6860 Perchlorate
CAM VIII B |
| <input type="checkbox"/> 8270 SVOC
CAM II B | <input type="checkbox"/> 7010 Metals
CAM III C | <input type="checkbox"/> MassDEP VPH
(GC/MS)
CAM IV B | <input type="checkbox"/> 8081 Pesticides
CAM V C | <input type="checkbox"/> 7196 Hex Cr
CAM VI B | <input type="checkbox"/> MassDEP APH
CAM IX A |
| <input type="checkbox"/> 6010 Metals
CAM III A | <input type="checkbox"/> 6020 Metals
CAM III D | <input checked="" type="checkbox"/> MassDEP EPH
CAM IV B | <input type="checkbox"/> 8151 Herbicides
CAM V C | <input type="checkbox"/> Explosives
CAM VIII A | <input type="checkbox"/> TO-15 VOC
CAM IX B |

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

- A Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times? Yes No ()
- B Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed? Yes No ()
- C Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances? Yes No ()
- D Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"? Yes No ()
- E VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). Yes No ()
b. APH and TO-15 Methods only: Was the complete analyte list reported for each method? Yes () No ()
- F Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)? Yes No ()

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

- G Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? Yes No ()*
Data User Note: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.
- H Were all QC performance standards specified in the CAM protocol(s) achieved? Yes No ()*
- I Were results reported for the complete analyte list specified in the selected CAM protocol(s)? Yes () No *

**All negative responses must be addressed in an attached laboratory narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Printed Name: Laurel Stoddard

Date: February 06, 2018
Position: Laboratory Director



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP
Client Sample ID: Pond
Date Sampled: 01/23/18 13:00
Percent Solids: 60
Initial Volume: 19
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1801551
ESS Laboratory Sample ID: 1801551-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: SMR
Prepared: 1/31/18 9:45

8100M Total Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Total Petroleum Hydrocarbons	93.7 (17.5)		8100M		1	02/02/18 19:46	C8B0040	CA83007
		<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>				
<i>Surrogate: O-Terphenyl</i>		97 %		40-140				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - MCP
 Client Sample ID: Stream Up
 Date Sampled: 01/23/18 13:30
 Percent Solids: 66
 Initial Volume: 20.6
 Final Volume: 1
 Extraction Method: 3546

ESS Laboratory Work Order: 1801551
 ESS Laboratory Sample ID: 1801551-02
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: SMR
 Prepared: 1/31/18 9:45

8100M Total Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Total Petroleum Hydrocarbons	24.1 (14.7)		8100M		1	02/02/18 20:24	C8B0040	CA83007
		<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>				
<i>Surrogate: O-Terphenyl</i>		104 %		40-140				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - MCP
 Client Sample ID: Stream Down
 Date Sampled: 01/23/18 14:00
 Percent Solids: 76
 Initial Volume: 19.2
 Final Volume: 1
 Extraction Method: 3546

ESS Laboratory Work Order: 1801551
 ESS Laboratory Sample ID: 1801551-03
 Sample Matrix: Soil
 Units: mg/kg dry
 Analyst: SMR
 Prepared: 1/31/18 9:45

8100M Total Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Total Petroleum Hydrocarbons	222 (13.7)		8100M		1	02/02/18 21:03	C8B0040	CA83007
		<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>				
<i>Surrogate: O-Terphenyl</i>		105 %		40-140				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
---------	--------	-----	-------	-------------	---------------	------	-------------	-----	-----------	-----------

8100M Total Petroleum Hydrocarbons

Batch CA83007 - 3546

Blank

Decane (C10)	ND	0.2	mg/kg wet
Docosane (C22)	ND	0.2	mg/kg wet
Dodecane (C12)	ND	0.2	mg/kg wet
Eicosane (C20)	ND	0.2	mg/kg wet
Hexacosane (C26)	ND	0.2	mg/kg wet
Hexadecane (C16)	ND	0.2	mg/kg wet
Hexatriacontane (C36)	ND	0.2	mg/kg wet
Nonadecane (C19)	ND	0.2	mg/kg wet
Nonane (C9)	ND	0.2	mg/kg wet
Octacosane (C28)	ND	0.2	mg/kg wet
Octadecane (C18)	ND	0.2	mg/kg wet
Tetracosane (C24)	ND	0.2	mg/kg wet
Tetradecane (C14)	ND	0.2	mg/kg wet
Total Petroleum Hydrocarbons	ND	10.0	mg/kg wet
Triacontane (C30)	ND	0.2	mg/kg wet

Surrogate: O-Terphenyl 5.82 mg/kg wet 5.000 116 40-140

LCS

Decane (C10)	2.4	0.2	mg/kg wet	2.500	95	40-140
Docosane (C22)	2.6	0.2	mg/kg wet	2.500	105	40-140
Dodecane (C12)	2.6	0.2	mg/kg wet	2.500	104	40-140
Eicosane (C20)	2.6	0.2	mg/kg wet	2.500	104	40-140
Hexacosane (C26)	2.6	0.2	mg/kg wet	2.500	104	40-140
Hexadecane (C16)	2.6	0.2	mg/kg wet	2.500	103	40-140
Hexatriacontane (C36)	2.6	0.2	mg/kg wet	2.500	106	40-140
Nonadecane (C19)	2.6	0.2	mg/kg wet	2.500	104	40-140
Nonane (C9)	2.0	0.2	mg/kg wet	2.500	80	30-140
Octacosane (C28)	2.6	0.2	mg/kg wet	2.500	104	40-140
Octadecane (C18)	2.5	0.2	mg/kg wet	2.500	102	40-140
Tetracosane (C24)	2.6	0.2	mg/kg wet	2.500	105	40-140
Tetradecane (C14)	2.6	0.2	mg/kg wet	2.500	103	40-140
Total Petroleum Hydrocarbons	36.3	10.0	mg/kg wet	35.00	104	40-140
Triacontane (C30)	2.6	0.2	mg/kg wet	2.500	104	40-140

Surrogate: O-Terphenyl 6.10 mg/kg wet 5.000 122 40-140

LCS Dup

Decane (C10)	2.4	0.2	mg/kg wet	2.500	96	40-140	0.7	25
Docosane (C22)	2.6	0.2	mg/kg wet	2.500	104	40-140	1	25
Dodecane (C12)	2.6	0.2	mg/kg wet	2.500	103	40-140	0.8	25
Eicosane (C20)	2.6	0.2	mg/kg wet	2.500	103	40-140	1	25
Hexacosane (C26)	2.6	0.2	mg/kg wet	2.500	103	40-140	1	25
Hexadecane (C16)	2.5	0.2	mg/kg wet	2.500	102	40-140	1	25
Hexatriacontane (C36)	2.7	0.2	mg/kg wet	2.500	107	40-140	2	25
Nonadecane (C19)	2.6	0.2	mg/kg wet	2.500	103	40-140	1	25



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8100M Total Petroleum Hydrocarbons										
Batch CA83007 - 3546										
Nonane (C9)	2.0	0.2	mg/kg wet	2.500		82	30-140	1	25	
Octacosane (C28)	2.6	0.2	mg/kg wet	2.500		103	40-140	0.7	25	
Octadecane (C18)	2.5	0.2	mg/kg wet	2.500		100	40-140	1	25	
Tetracosane (C24)	2.6	0.2	mg/kg wet	2.500		104	40-140	0.9	25	
Tetradecane (C14)	2.5	0.2	mg/kg wet	2.500		102	40-140	1	25	
Total Petroleum Hydrocarbons	35.6	10.0	mg/kg wet	35.00		102	40-140	2	25	
Triacotane (C30)	2.6	0.2	mg/kg wet	2.500		103	40-140	0.7	25	
<i>Surrogate: O-Terphenyl</i>	<i>5.90</i>		<i>mg/kg wet</i>	<i>5.000</i>		<i>118</i>	<i>40-140</i>			



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

Notes and Definitions

- U Analyte included in the analysis, but not detected
- ND Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- MDL Method Detection Limit
- MRL Method Reporting Limit
- LOD Limit of Detection
- LOQ Limit of Quantitation
- DL Detection Limit
- I/V Initial Volume
- F/V Final Volume
- § Subcontracted analysis; see attached report
- 1 Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
- 2 Range result excludes concentrations of target analytes eluting in that range.
- 3 Range result excludes the concentration of the C9-C10 aromatic range.
- Avg Results reported as a mathematical average.
- NR No Recovery
- [CALC] Calculated Analyte
- SUB Subcontracted analysis; see attached report
- RL Reporting Limit
- EDL Estimated Detection Limit



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - MCP

ESS Laboratory Work Order: 1801551

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179

<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002

<http://www.maine.gov/dhhs/meecd/environmental-health/dwp/partners/labCert.shtml>

Massachusetts Potable and Non Potable Water: M-RI002

<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424

<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313

<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006

http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752

<http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx>

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1801551

Date Received: 1/30/2018

Shipped/Delivered Via: ESS Courier

Project Due Date: 2/6/2018

Days for Project: 5 Day

1. Air bill manifest present? No
Air No.: NA

6. Does COC match bottles? Yes

2. Were custody seals present? No

7. Is COC complete and correct? Yes

3. Is radiation count <100 CPM? Yes

8. Were samples received intact? Yes

4. Is a Cooler Present? Yes
Temp: 1.9 Iced with: Ice

9. Were labs informed about **short holds & rushes**? Yes / No / NA

5. Was COC signed and dated by client? Yes

10. Were any analyses received outside of hold time? Yes No

11. Any Subcontracting needed? Yes / No
ESS Sample IDs: _____
Analysis: _____
TAT: _____

12. Were VOAs received? Yes / No
a. Air bubbles in aqueous VOAs? Yes / No
b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
a. If metals preserved upon receipt: Date: _____ Time: _____ By: _____
b. Low Level VOA vials frozen: Date: _____ Time: _____ By: _____

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
a. Was there a need to contact the client? Yes / No
Who was contacted? _____ Date: _____ Time: _____ By: _____

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
01	198995	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	198994	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
03	198993	Yes	NA	Yes	8 oz. Jar - Unpres	NP	

2nd Review
Are barcode labels on correct containers? Yes / No

Completed By: [Signature] Date & Time: 1/30/18 1542
Reviewed By: [Signature] Date & Time: 1/30/18 1603
Delivered By: [Signature] Date & Time: 1/30/18 1603

ESS Laboratory

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 Tel. (401) 461-7181 Fax (401) 461-4486
 www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 180/551

Turn Time: 5 Days
 Regulatory State: _____
 Is this project for any of the following?:
 OCT RCP MA MCP ORGP

Reporting Limits: 401 Water Quality
 Electronic Deliverables: Data Checker Excel
 Other (Please Specify →)

Company Name: Tighe & Bond
 Contact Person: Gary Hedman
 Project #: 221476
 Project Name: Sawmill Brook
 Address: 4 Barlows Landing Road
 City: Pocasset State: MA Zip Code: 02559 PO #: _____
 Telephone Number: 508-304-6357 FAX Number: _____ Email Address: Ghedman@tighebond.com

Analysis	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TPH	MCP 14 Metals (hold)	SVOCs (hold)								

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TPH	MCP 14 Metals (hold)	SVOCs (hold)																						
01	1/23/18	1300	Composite	Soil	Pond	X	X	X	X	X	X	X	X	X	X																						
02	1/23/18	1330	Composite	Soil	Stream Up	X	X	X	X	X	X	X	X	X	X																						
03	1/23/18	1400	Composite	Soil	Stream Down	X	X	X	X	X	X	X	X	X	X																						

Dr. Client
24 1/23/18

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial	AG	AG	AG	V	V	AG	O	AG																															
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2oz 9-4 oz 10-8 oz 11-Other*	10	10	10	7	7	8	11	10																															
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*	1	1	1	10	6	1	1	1																															
Number of Containers per Sample:										1	1	1	2	1	1	1	1																						

Laboratory Use Only

Cooler Present: Drop Off
 Seals Intact: Pickup
 Cooler Temperature: 1.9 100g

Sampled by: Gary Hedman
 Comments: _____
 *Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn
 Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time) <i>[Signature]</i> 1/30/18 13:35	Received By: (Signature, Date & Time) <i>[Signature]</i> 1-30-18 13:35	Relinquished By: (Signature, Date & Time) <i>[Signature]</i> 1-30-18 1430	Received By: (Signature, Date & Time) <i>[Signature]</i> 1/30/18 1515
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)



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 Cranston RI, 02910
 Phone: (401)-467-6454
 Fax: (401)-467-2398
<http://www.thielsch.com>

Client Information:
 ESS / Tighe & Bond
 Cranston, RI
 PM: Michelle Mirenda
 Assigned By: M. Mirenda

Laboratory Information
 Project Name:
Sawmill Brook
 ESS Project Number: 1801552
 Report Date: 02.02.18

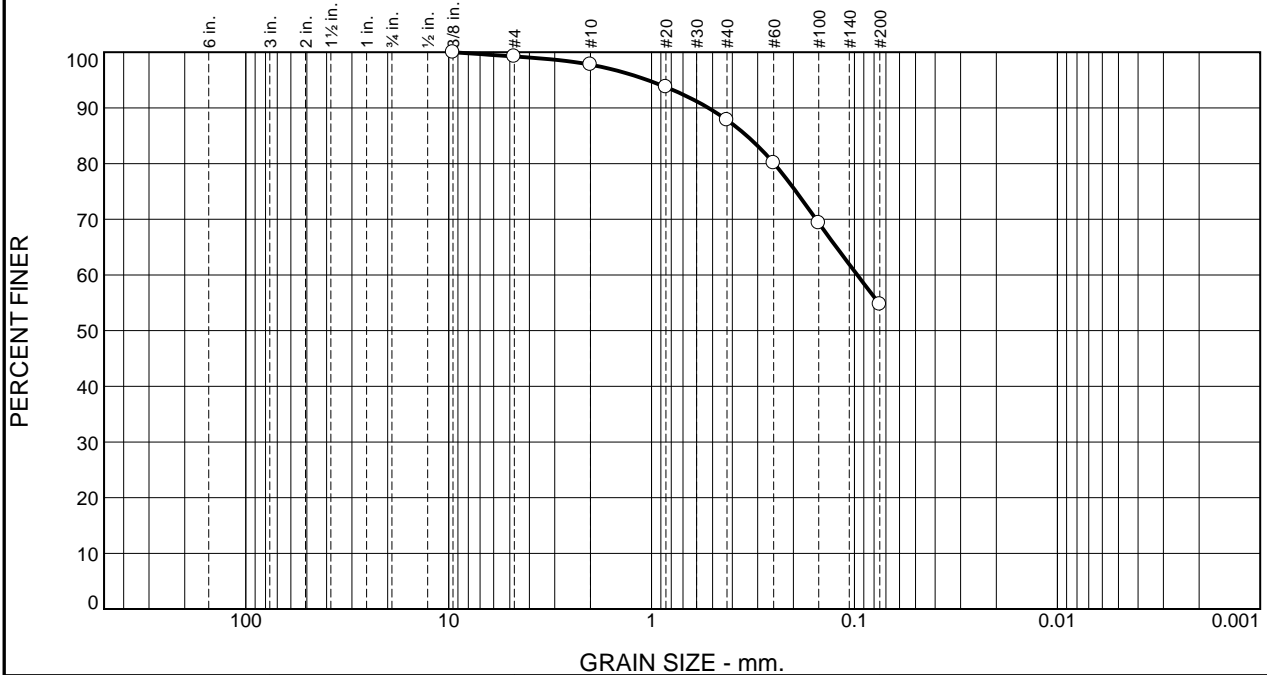
LABORATORY TESTING DATA SHEET

Material ID	ESS Sample No.	Sample Date	CTS Laboratory No.	Identification Tests							Density		Strength Tests				Laboratory Log and Soil Description	
				Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	γ_d MAX (pcf) W_{opt} (%)	γ_d MAX (pcf) W_{opt} (%) Corrected	CBR Setup as % of Proctor	CBR Dry unit wt. pcf	CBR Water Content %	CBR @ 0.1" @ 0.2"		
Pond	1801552-01	01.23.18	18-S-098				0.8	44.5	54.7									Dark Brown sandy silt
Stream Up	1801552-02	01.23.18	18-S-099				8.1	53.4	38.5									Dark Brown sandy silt
Stream Down	1801552-03	01.23.18	18-S-100				3.2	72.0	24.8									Dark Brown silty sand

Reviewed By 

Date Reviewed: 02.06.18

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	1.4	10.0	33.1	54.7	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375"	100.0		
#4	99.2		
#10	97.8		
#20	93.7		
#40	87.8		
#60	80.1		
#100	69.3		
#200	54.7		

* (no specification provided)

Material Description

Dark Brown sandy silt

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D₉₀= 0.5246 D₈₅= 0.3392 D₆₀= 0.0968
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks

Material was visually checked for plasticity and rolled to 1/8th inch.

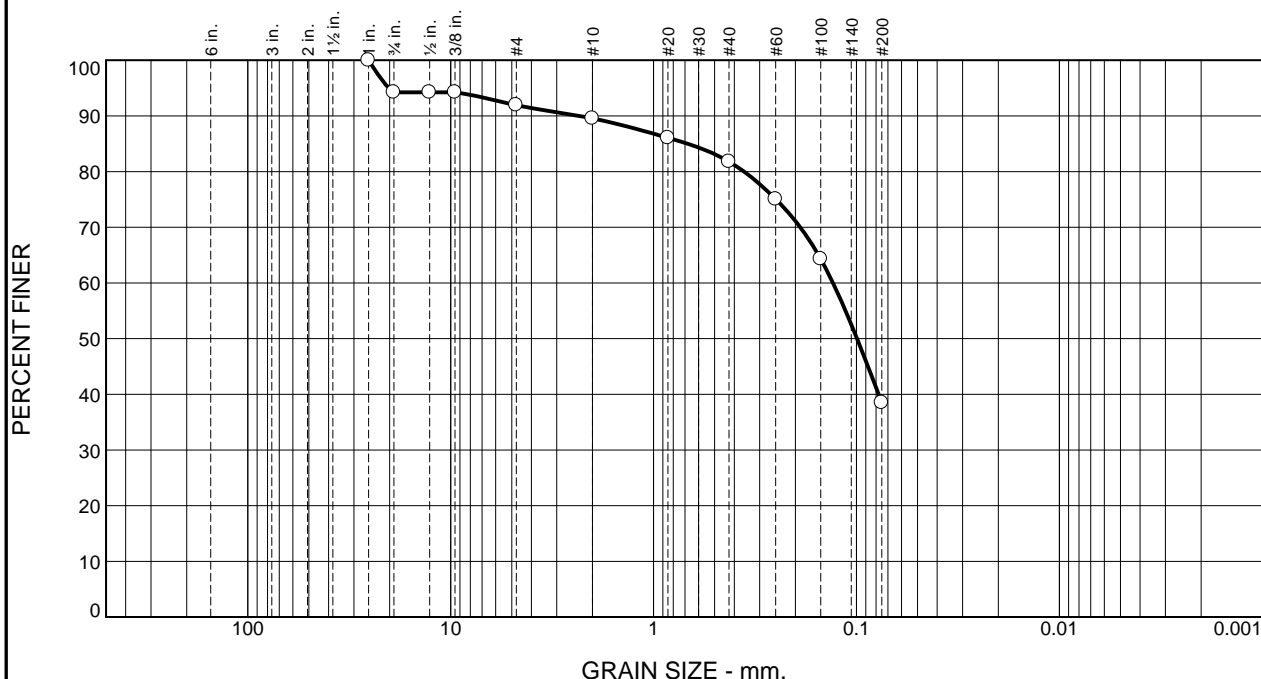
Date Received: 1.31.18 Date Tested: 2.2.18
Tested By: JF
Checked By: Matthew Colman P.E.
Title: Laboratory Manager

Source of Sample: Exploratory Samples
Sample Number: Pond

Date Sampled: 01.23.18

Thielsch Engineering Inc. Cranston, RI	Client: ESS / Tighe & Bond Project: Sawmill Brook Project No: 1801552
Figure 1801552-01	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.8	2.3	2.4	7.7	43.3	38.5	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	94.2		
0.5"	94.2		
0.375"	94.2		
#4	91.9		
#10	89.5		
#20	86.1		
#40	81.8		
#60	75.0		
#100	64.3		
#200	38.5		

* (no specification provided)

Material Description

Dark Brown silty sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D₉₀= 2.3329 D₈₅= 0.6792 D₆₀= 0.1305
D₅₀= 0.0994 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Remarks

Material was visually checked for plasticity and rolled to 1/8th inch.

Date Received: 1.31.18 Date Tested: 2.2.18

Tested By: JF

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Exploratory Samples
Sample Number: Stream Up

Date Sampled: 01.23.18

Thielsch Engineering Inc.

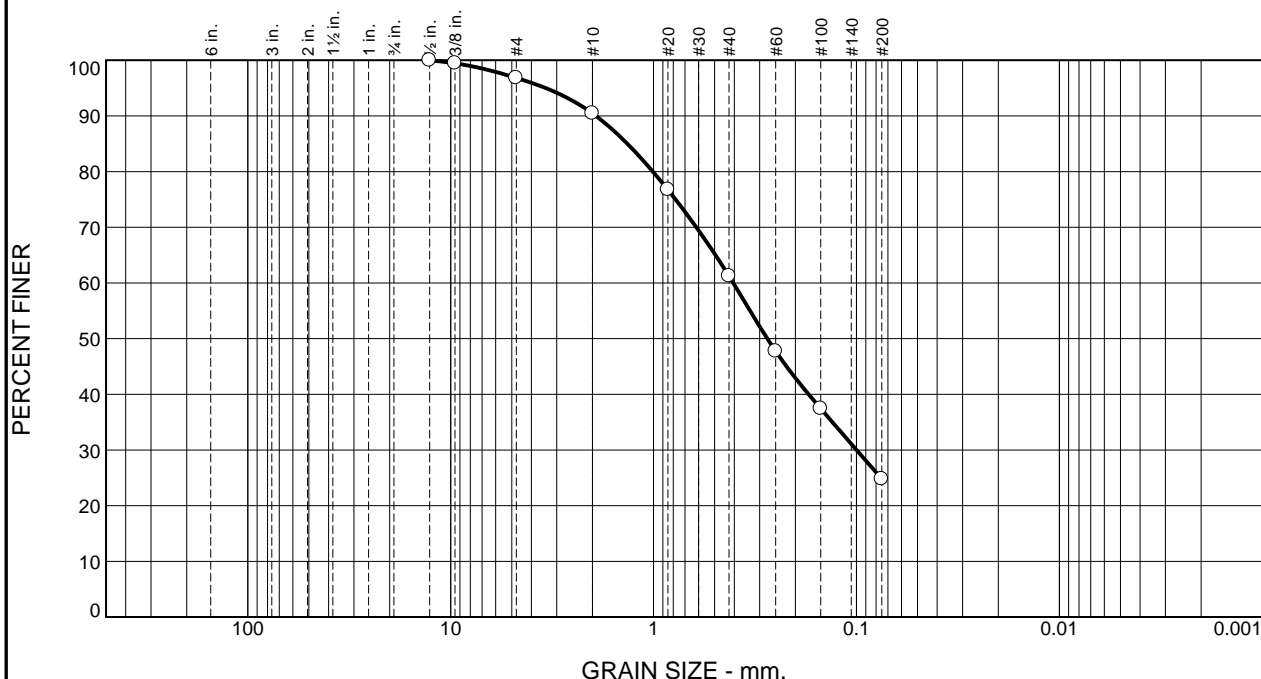
Client: ESS / Tighe & Bond
Project: Sawmill Brook

Cranston, RI

Project No: 1801552

Figure 1801552-02

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.2	6.3	29.3	36.4	24.8	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.5"	100.0		
0.375"	99.5		
#4	96.8		
#10	90.5		
#20	76.7		
#40	61.2		
#60	47.7		
#100	37.4		
#200	24.8		

* (no specification provided)

Material Description

Dark Brown silty sand

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D₉₀= 1.9234 D₈₅= 1.3463 D₆₀= 0.4048
D₅₀= 0.2750 D₃₀= 0.0999 D₁₅=
D₁₀= C_u= C_c=

Remarks

Date Received: 1.31.18 Date Tested: 2.2.18

Tested By: JF

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

Source of Sample: Exploratory Samples
Sample Number: Stream Down

Date Sampled: 01.23.18

Thielsch Engineering Inc. Cranston, RI	Client: ESS / Tighe & Bond Project: Sawmill Brook Project No: 1801552
Figure 1801552-03	

ESS Laboratory

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www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1801552

Turn Time 5 Days
 Regulatory State _____
 Is this project for any of the following?:
 OCT RCP MA MCP ORGP

Reporting Limits 401 Water Quality
 Electronic Data Checker Excel
 Deliverables Other (Please Specify →)

Company Name Tighe & Bond Project # 221476 Project Name Sawmill Brook
 Contact Person Gary Hedman Address 4 Barlows Landing Road
 City Pocasset State MA Zip Code 02559 PO # _____
 Telephone Number 508-304-6357 FAX Number _____ Email Address Ghedman@tighebond.com

Analysis	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TPH	MCP 14 Metals (hold)	SVOCs (hold)											
----------	---------------------------	----------------------	-----------------------	--------	----------	-----------------	------------	-----	----------------------	--------------	--	--	--	--	--	--	--	--	--	--	--

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID
01	1/23/18	1300	Composite	Soil	Pond
02	1/23/18	1330	Composite	Soil	Stream Up
03	1/23/18	1400	Composite	Soil	Stream Down
04	1/23/18	1300	C	S	Pond - air dried
05	1/23/18	1330	C	S	Stream Up - air dried
06	1/23/18	1400	C	S	Stream Down - air dried

X	X	X	X	X	X	X	X	X													
X	X	X	X	X	X	X	X	X													
X	X	X	X	X	X	X	X	X													
X																					
X																					

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
 Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
 Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
 Number of Containers per Sample: 1 1 1 2 1 1 1 1

AG	AG	AG	V	V	AG	O	AG														
10	10	10	7	7	8	11	10														
1	1	1	10	6	1	1	1														

Laboratory Use Only
 Cooler Present: Drop Off
 Seals Intact: Pickup
 Cooler Temperature: 1.9 12/28

Sampled by: Gary Hedman
 Comments: Please specify "Other" preservative and containers types in this space
 *Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn added air dried samples for metals. mkm 2/5/18
all frozen by G.H. @ 1000 1/25/18 per A.C. w

Relinquished by: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 13:35	Received By: (Signature, Date & Time) <u>[Signature]</u> 1-30-18 12:35	Relinquished By: (Signature, Date & Time) <u>[Signature]</u> 1-30-18 14:30	Received By: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 1515
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ESS Laboratory

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Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1801552

Reporting Limits 401 Water Quality

Electronic Data Checker Excel

Deliverables Other (Please Specify →)

Turn Time 5 Days

Regulatory State

Is this project for any of the following?:
 OCT RCP MA MCP ORGP

Company Name: Tighe & Bond
Project #: 221476
Project Name: Sawmill Brook

Contact Person: Gary Hedman
Address: 4 Barlows Landing Road

City: Pocasset State: MA Zip Code: 02559 PO #

Telephone Number: 508-304-6357 FAX Number Email Address: Ghedman@tighebond.com

Analysis															
	*Metals and Percent Water	EPH w/ PAH Low Level	PCB NOAA 18 Congeners	VOC LL	VOC High	TOC - LloydKahn	Grain Size	TPH	MCP 14 Metals (hold)	SVOCs (hold)					
01	X	X	X	X	X	X	X	X							
02	X	X	X	X	X	X	X	X							
03	X	X	X	X	X	X	X	X							
															Per Client @ 1/30/18

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial

Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Number of Containers per Sample:

Laboratory Use Only

Cooler Present: Drop Off

Seals Intact: Pickup

Cooler Temperature: 1.9 °C

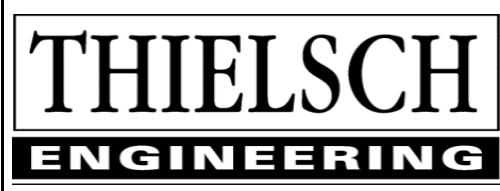
Sampled by: Gary Hedman

Comments: Please specify "Other" preservative and containers types in this space

* Metals - As, Cd, Cr, Cu, Pb, Hg, Ni, Zn

U frozen by G.H. @ 1000 1/25/18 per A.C.

Relinquished by: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 13:35	Received By: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 14:35	Relinquished By: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 14:30	Received By: (Signature, Date & Time) <u>[Signature]</u> 1/30/18 15:15
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195 Frances Avenue
 Cranston RI, 02910
 Phone: (401)-467-6454
 Fax: (401)-467-2398
<http://www.thielsch.com>
Let's Build a Solid Foundation

Client Information:
 Tighe & Bond
 Worcester, MA
 PM: Gary Hedman
 Assigned By: Gary Hedman
 Tighe & Bond Number: M-1476-0

Project Information:
Sawmill Brook / Norwood Ave.
Manchester-by-the-Sea, MA
 TEI Project Number: 74-18-0002.104
 Summary Page: 1 of 1
 Report Date: 03.08.18

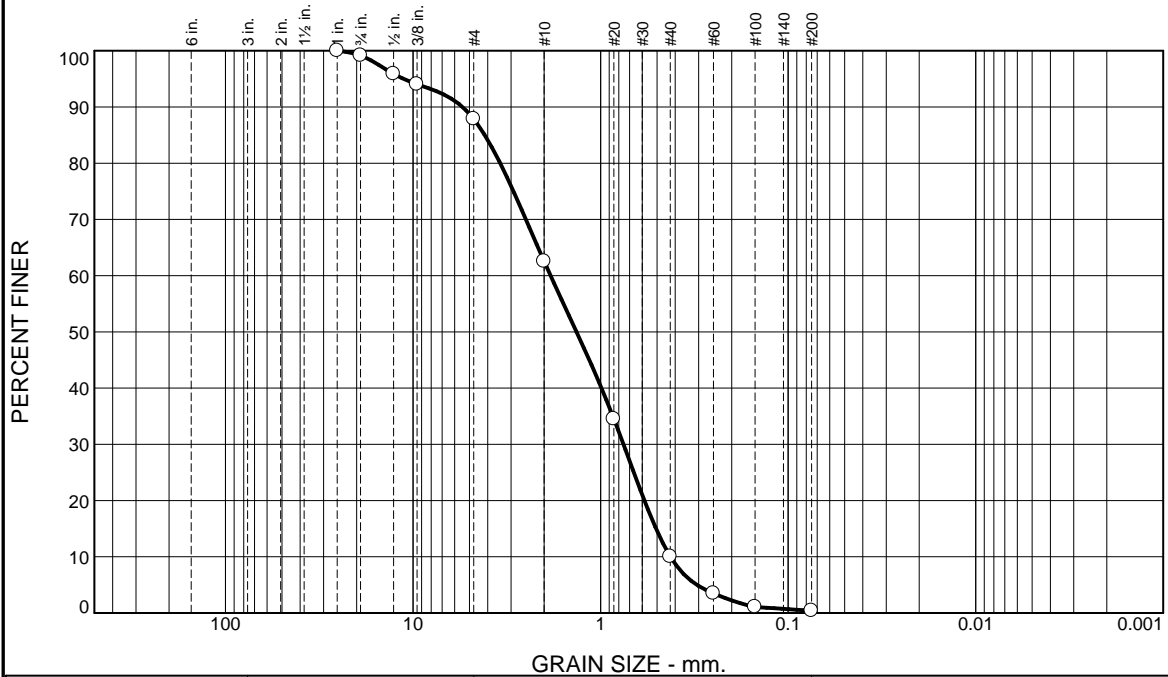
LABORATORY TESTING DATA SHEET

Source	Material	Depth (ft)	Laboratory No.	Identification Tests						Corrosivity Tests							Laboratory Log and Soil Description		
				Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Sulfide (mg/kg)	Redox Potential (mv)	Electrical Resist. As Received Ohm-cm	Electrical Resist. Saturated Ohm-cm		Other	
Norwood Ave	Sed B	0-2	18-S-228				12.1	87.5	0.4										Brown poorly graded sand (SP)
School St	Sed A	0-2	18-S-229				55.0	44.9	0.1										Brown poorly graded gravel with sand (GP)

Reviewed By 

Date Reviewed 03.09.2018

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.8	11.3	25.3	52.6	9.6	0.4	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	99.2		
0.5"	95.9		
0.375"	94.0		
#4	87.9		
#10	62.6		
#20	34.5		
#40	10.0		
#60	3.5		
#100	1.1		
#200	0.4		

* (no specification provided)

Material Description

Brown poorly graded sand (SP)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D₉₀= 5.4497 D₈₅= 4.1436 D₆₀= 1.8477
D₅₀= 1.3432 D₃₀= 0.7555 D₁₅= 0.5061
D₁₀= 0.4242 C_u= 4.36 C_c= 0.73

Remarks

Sample contained leaf litter.

Date Received: 03.07.18 Date Tested: 03.08.18

Tested By: MN

Checked By: Matthew Colman P.E.

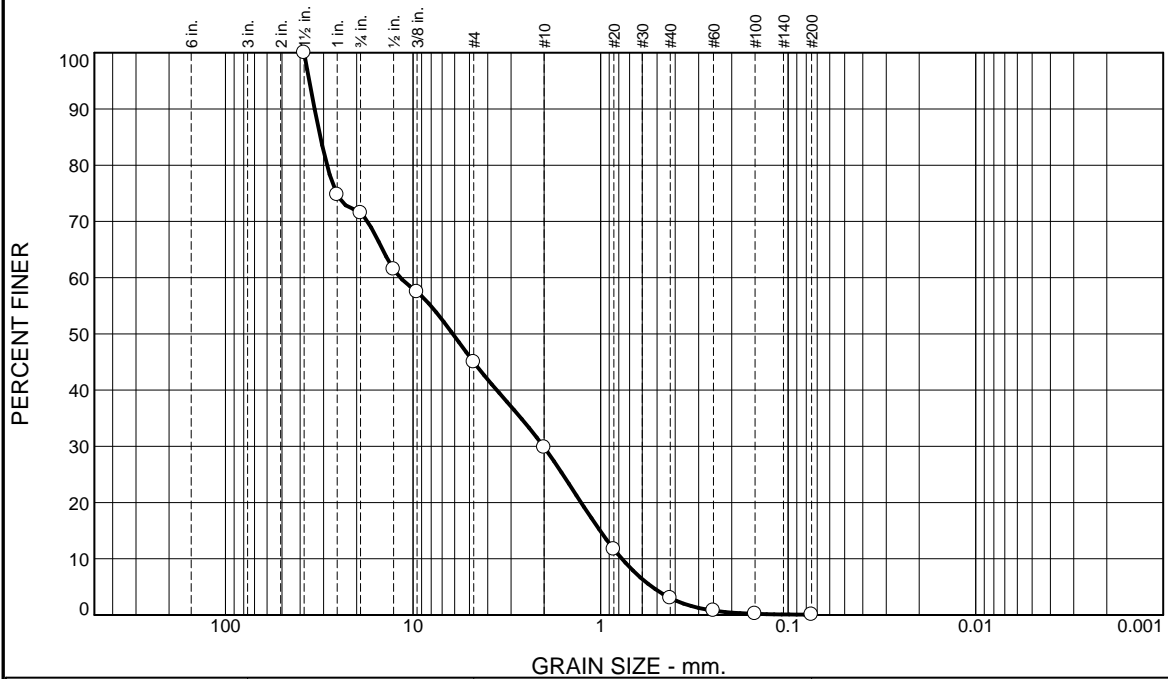
Title: Laboratory Manager

Source of Sample: Borings Depth: 0-2'
Sample Number: Norwood Ave Sed B

Date Sampled:

Thielsch Engineering Inc. Cranston, RI	Client: Tighe & Bond Project: Sawmill Brook / Norwood Ave Manchester-by-the-Sea, MA Project No: M-1476-9
Figure 18-S-228	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	28.5	26.5	15.2	26.8	2.9	0.1	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5"	100.0		
1"	74.8		
0.75"	71.5		
0.5"	61.5		
0.375"	57.5		
#4	45.0		
#10	29.8		
#20	11.7		
#40	3.0		
#60	0.8		
#100	0.2		
#200	0.1		

Material Description

Brown poorly graded gravel with sand (GP)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= GP AASHTO (M 145)= A-1-a

Coefficients

D₉₀= 33.4811 D₈₅= 31.1932 D₆₀= 11.7020
D₅₀= 6.1380 D₃₀= 2.0177 D₁₅= 1.0071
D₁₀= 0.7706 C_u= 15.19 C_c= 0.45

Remarks

Sample contained leaf litter.

Date Received: 03.07.18 Date Tested: 03.08.18

Tested By: MN

Checked By: Matthew Colman P.E.

Title: Laboratory Manager

* (no specification provided)

Source of Sample: Borings Depth: 0-2'
Sample Number: School St. Sed A

Date Sampled:

Thielsch Engineering Inc.	Client: Tighe & Bond
Cranston, RI	Project: Sawmill Brook / Norwood Ave Manchester-by-the-Sea, MA
	Project No: M-1476-9
	Figure 18-S-229



CERTIFICATE OF ANALYSIS

Gary Hedman
Tighe & Bond
4 Barlows Landing Road, Unit 15
Pocasset, MA 02559

RE: Sawmill Brook - Saugus - MGP - 401WQ (22-1476-0143)
ESS Laboratory Work Order Number: 20C0943

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED

By ESS Laboratory at 11:46 am, Apr 13, 2020

Analytical Summary

The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

CTS - Cranston, RI

Grain Size, Grain Size Analysis



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

SAMPLE RECEIPT

The following samples were received on March 31, 2020 for the analyses specified on the enclosed Chain of Custody Record.

The following Semivolatile Organic compounds are reported to the MDL in order to reach <10% RCS-1 limits:

1,2,4-Trichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2,4,6-Trichlorophenol, 2,4-Dichlorophenol, 2,4-Dimethylphenol, 2,4-Dinitrophenol, 2,4-Dinitrotoluene, 2-Chlorophenol, 2-Methylnaphthalene, 3,3'-Dichlorobenzidine, 4-Chloroaniline, Acenaphthylene, bis(2-Chloroethyl)ether, bis(2-chloroisopropyl)Ether, Dibenzo(a,h)Anthracene, Dimethylphthalate, Hexachlorobenzene, Hexachloroethane, Pentachlorophenol and Phenol.

The following Volatile Organic compounds are reported to the MDL in order to reach <10% RCS-1 limits:

1,1,2,2-Tetrachloroethane, 1,4-Dioxane, cis-1,3-Dichloropropene, Dibromochloromethane and trans-1,3-Dichloropropene.

Low Level VOA vials were frozen by ESS Laboratory on March 31, 2020 at 1809.

Lab Number	Sample Name	Matrix	Analysis
20C0943-01	Wall-Sed-1	Sediment	1010, 1311, 1311/6010C, 2580, 7.3.3.2, 7.3.4.1, 8082A Cong, 8100M, 8260B, 8260B Low, 8270D, 9045, 9050A, EPH8270, EPH8270SIM, MADEP-EPH, SUB, TOC-LK
20C0943-02	Wall-Sed-2	Sediment	1010, 1311, 1311/6010C, 2580, 7.3.3.2, 7.3.4.1, 8082A Cong, 8100M, 8260B, 8260B Low, 8270D, 9045, 9050A, EPH8270, EPH8270SIM, MADEP-EPH, SUB, TOC-LK
20C0943-03	Wall-Sed-1 - air dried	Sediment	6010C, 6020A, 7471B
20C0943-04	Wall-Sed-2 - air dried	Sediment	6010C, 7471B



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

PROJECT NARRATIVE

8082 Polychlorinated Biphenyls (PCB) / Congeners

- 20C0943-01 [Lower value is used due to matrix interferences \(LC\).](#)
BZ#138 , BZ#153 [2C] , BZ#170 , BZ#28 , BZ#44 , BZ#52 [2C] , BZ#66 , BZ#8 [2C]
- 20C0943-01 [Percent difference between primary and confirmation results exceeds 40% \(P\).](#)
BZ#138 , BZ#153 [2C] , BZ#170 , BZ#28 , BZ#44 , BZ#52 [2C] , BZ#66 , BZ#8 [2C]
- 20C0943-02 [Lower value is used due to matrix interferences \(LC\).](#)
BZ#101 , BZ#105 [2C] , BZ#138 , BZ#170 , BZ#209 , BZ#28 , BZ#44 , BZ#52 [2C] , BZ#8 [2C]
- 20C0943-02 [Percent difference between primary and confirmation results exceeds 40% \(P\).](#)
BZ#101 , BZ#105 [2C] , BZ#138 , BZ#170 , BZ#209 , BZ#28 , BZ#44 , BZ#52 [2C] , BZ#8 [2C]

8270D Semi-Volatile Organic Compounds

- D0D0019-CCV1 [Calibration required quadratic regression \(Q\).](#)
2,4-Dinitrophenol (127% @ 80-120%), Pentachlorophenol (114% @ 80-120%)
- D0D0019-CCV1 [Continuing Calibration %Diff/Drift is above control limit \(CD+\).](#)
2,4-Dinitrophenol (27% @ 20%), Pyridine (22% @ 20%)
- D0D0031-CCV1 [Calibration required quadratic regression \(Q\).](#)
2,4-Dinitrophenol (68% @ 80-120%), Pentachlorophenol (128% @ 80-120%)
- D0D0031-CCV1 [Continuing Calibration %Diff/Drift is above control limit \(CD+\).](#)
Pentachlorophenol (28% @ 20%)
- D0D0031-CCV1 [Continuing Calibration %Diff/Drift is below control limit \(CD-\).](#)
2,4-Dinitrophenol (32% @ 20%)
- DD00105-BS1 [Blank Spike recovery is below lower control limit \(B-\).](#)
4-Chloroaniline (34% @ 40-140%)
- DD00105-BSD1 [Blank Spike recovery is below lower control limit \(B-\).](#)
4-Chloroaniline (35% @ 40-140%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

- [Definitions of Quality Control Parameters](#)
- [Semivolatile Organics Internal Standard Information](#)
- [Semivolatile Organics Surrogate Information](#)
- [Volatile Organics Internal Standard Information](#)
- [Volatile Organics Surrogate Information](#)
- [EPH and VPH Alkane Lists](#)



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

- 1010A - Flashpoint
- 6010C - ICP
- 6020A - ICP MS
- 7010 - Graphite Furnace
- 7196A - Hexavalent Chromium
- 7470A - Aqueous Mercury
- 7471B - Solid Mercury
- 8011 - EDB/DBCP/TCP
- 8015C - GRO/DRO
- 8081B - Pesticides
- 8082A - PCB
- 8100M - TPH
- 8151A - Herbicides
- 8260B - VOA
- 8270D - SVOA
- 8270D SIM - SVOA Low Level
- 9014 - Cyanide
- 9038 - Sulfate
- 9040C - Aqueous pH
- 9045D - Solid pH (Corrosivity)
- 9050A - Specific Conductance
- 9056A - Anions (IC)
- 9060A - TOC
- 9095B - Paint Filter
- MADEP 04-1.1 - EPH
- MADEP 18-2.1 - VPH

Prep Methods

- 3005A - Aqueous ICP Digestion
- 3020A - Aqueous Graphite Furnace / ICP MS Digestion
- 3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
- 3060A - Solid Hexavalent Chromium Digestion
- 3510C - Separatory Funnel Extraction
- 3520C - Liquid / Liquid Extraction
- 3540C - Manual Soxhlet Extraction
- 3541 - Automated Soxhlet Extraction
- 3546 - Microwave Extraction
- 3580A - Waste Dilution
- 5030B - Aqueous Purge and Trap
- 5030C - Aqueous Purge and Trap
- 5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/L

Extraction Method: 3005A TCLP

1311 TCLP Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>TCLP Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	1.60 (0.050)		1311/6010C		1	KJK	04/03/20 19:57	50	50	DD00331



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 5.6
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,1,1-Trichloroethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,1,2,2-Tetrachloroethane	ND (0.0020)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,1,2-Trichloroethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,1-Dichloroethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,1-Dichloroethene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,1-Dichloropropene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2,3-Trichlorobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2,3-Trichloropropane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2,4-Trichlorobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2,4-Trimethylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2-Dibromo-3-Chloropropane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2-Dibromoethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2-Dichlorobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2-Dichloroethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,2-Dichloropropane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,3,5-Trimethylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,3-Dichlorobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,3-Dichloropropane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,4-Dichlorobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
1,4-Dioxane	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
2,2-Dichloropropane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
2-Butanone	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
2-Chlorotoluene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
2-Hexanone	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
4-Chlorotoluene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
4-Isopropyltoluene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
4-Methyl-2-Pentanone	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Acetone	0.0466 (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Benzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Bromobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Bromochloromethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 5.6
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Bromoform	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Bromomethane	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Carbon Disulfide	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Carbon Tetrachloride	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Chlorobenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Chloroethane	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Chloroform	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Chloromethane	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
cis-1,2-Dichloroethene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
cis-1,3-Dichloropropene	ND (0.0023)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Dibromochloromethane	ND (0.0022)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Dibromomethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Dichlorodifluoromethane	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Diethyl Ether	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Di-isopropyl ether	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Ethyl tertiary-butyl ether	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Ethylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Hexachlorobutadiene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Isopropylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Methyl tert-Butyl Ether	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Methylene Chloride	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Naphthalene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
n-Butylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
n-Propylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
sec-Butylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Styrene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
tert-Butylbenzene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Tertiary-amyl methyl ether	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Tetrachloroethene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Tetrahydrofuran	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Toluene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
 Client Sample ID: Wall-Sed-1
 Date Sampled: 03/31/20 12:30
 Percent Solids: 66
 Initial Volume: 5.6
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 20C0943
 ESS Laboratory Sample ID: 20C0943-01
 Sample Matrix: Sediment
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
trans-1,3-Dichloropropene	ND (0.0022)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Trichloroethene	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Trichlorofluoromethane	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Vinyl Chloride	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Xylene O	ND (0.0067)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Xylene P,M	ND (0.0135)		8260B Low		1	04/01/20 14:38	D0D0024	DD00144
Xylenes (Total)	ND (0.00893)		8260B		1	04/01/20 14:38		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	112 %		70-130
<i>Surrogate: 4-Bromofluorobenzene</i>	96 %		70-130
<i>Surrogate: Dibromofluoromethane</i>	101 %		70-130
<i>Surrogate: Toluene-d8</i>	98 %		70-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 30.9
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 4/6/20 14:00

8082 Polychlorinated Biphenyls (PCB) / Congeners

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
BZ#8 [2C]	P, LC 0.00310 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#18	ND (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#28	P, LC 0.00105 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#44	P, LC 0.00130 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#52 [2C]	P, LC 0.00249 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#66	P, LC 0.00116 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#101	0.00555 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#105 [2C]	0.00179 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#118	0.00224 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#128	ND (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#138	P, LC 0.00158 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#153 [2C]	P, LC 0.00169 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#170	P, LC 0.00080 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#180	0.00273 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#187 [2C]	0.00128 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#195 [2C]	ND (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#206 [2C]	0.00060 (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604
BZ#209	ND (0.00040)		8082A Cong		1	04/09/20 0:14	D0D0142	DD00604

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
Surrogate: Tetrachloro-m-xylene	53 %		30-150
Surrogate: Tetrachloro-m-xylene [2C]	63 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 19.3
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: CAD
Prepared: 4/1/20 15:09

8100M Total Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Total Petroleum Hydrocarbons	393 (15.7)		8100M		1	04/02/20 3:36	D0D0002	DD00106
		<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>				
<i>Surrogate: O-Terphenyl</i>		87 %		40-140				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 15.6
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 4/1/20 9:30

8270D Semi-Volatile Organic Compounds

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,2,4-Trichlorobenzene	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
1,2-Dichlorobenzene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
1,3-Dichlorobenzene	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
1,4-Dichlorobenzene	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,4,5-Trichlorophenol	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,4,6-Trichlorophenol	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,4-Dichlorophenol	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,4-Dimethylphenol	0.072 (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,4-Dinitrophenol	ND (0.810)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,4-Dinitrotoluene	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2,6-Dinitrotoluene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2-Chloronaphthalene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2-Chlorophenol	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2-Methylnaphthalene	0.268 (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2-Methylphenol	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
2-Nitrophenol	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
3,3'-Dichlorobenzidine	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
3+4-Methylphenol	ND (0.969)		8270D		1	04/03/20 0:53	D0D0031	DD00105
4-Bromophenyl-phenylether	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
4-Chloroaniline	ND (0.022)		8270D		1	04/03/20 0:53	D0D0031	DD00105
4-Nitrophenol	ND (2.43)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Acenaphthene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Acenaphthylene	2.20 (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Acetophenone	ND (0.969)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Aniline	ND (2.43)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Anthracene	2.04 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Azobenzene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Benzo(a)anthracene	5.60 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Benzo(a)pyrene	5.99 (0.243)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Benzo(b)fluoranthene	5.02 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Benzo(g,h,i)perylene	2.88 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Benzo(k)fluoranthene	4.20 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 15.6
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 4/1/20 9:30

8270D Semi-Volatile Organic Compounds

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
bis(2-Chloroethoxy)methane	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
bis(2-Chloroethyl)ether	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
bis(2-chloroisopropyl)Ether	ND (0.019)		8270D		1	04/03/20 0:53	D0D0031	DD00105
bis(2-Ethylhexyl)phthalate	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Butylbenzylphthalate	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Chrysene	5.86 (0.243)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Dibenzo(a,h)Anthracene	0.983 (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Dibenzofuran	0.811 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Diethylphthalate	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Dimethylphthalate	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Di-n-butylphthalate	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Di-n-octylphthalate	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Fluoranthene	18.4 (4.84)		8270D		10	04/03/20 23:15	D0D0031	DD00105
Fluorene	1.61 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Hexachlorobenzene	ND (0.015)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Hexachlorobutadiene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Hexachloroethane	ND (0.016)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Indeno(1,2,3-cd)Pyrene	2.81 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Isophorone	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Naphthalene	0.511 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Nitrobenzene	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
N-Nitrosodimethylamine	ND (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Pentachlorophenol	ND (0.436)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Phenanthrene	12.0 (0.484)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Phenol	0.113 (0.016)		8270D		1	04/03/20 0:53	D0D0031	DD00105
Pyrene	15.9 (4.84)		8270D		10	04/03/20 23:15	D0D0031	DD00105
Pyridine	ND (2.43)		8270D		1	04/03/20 0:53	D0D0031	DD00105

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	48 %		30-130
<i>Surrogate: 2,4,6-Tribromophenol</i>	81 %		30-130
<i>Surrogate: 2-Chlorophenol-d4</i>	54 %		30-130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 15.6
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 4/1/20 9:30

8270D Semi-Volatile Organic Compounds

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
<i>Surrogate: 2-Fluorobiphenyl</i>		53 %		30-130				
<i>Surrogate: 2-Fluorophenol</i>		54 %		30-130				
<i>Surrogate: Nitrobenzene-d5</i>		49 %		30-130				
<i>Surrogate: Phenol-d6</i>		57 %		30-130				
<i>Surrogate: p-Terphenyl-d14</i>		77 %		30-130				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Conductivity	WL 3580 (5)		9050A		1	CCP	04/02/20 15:11	umhos/cm	DD00232
Corrosivity (pH)	7.90 (N/A)		9045		1	CCP	03/31/20 19:26	S.U.	DC03140
Corrosivity (pH) Sample Temp	Soil pH measured in water at 20.4 °C.								
Eh (ORP)	WL 123 (N/A)		2580		1	CCP	03/31/20 19:26	mv	DC03142
Flashpoint	> 200 (N/A)		1010		1	CCP	04/02/20 16:30	°F	DD00251
Reactive Cyanide	ND (2.0)		7.3.3.2		1	EEM	04/02/20 10:48	mg/kg	DD00218
Reactive Sulfide	ND (2.0)		7.3.4.1		1	EEM	04/02/20 10:48	mg/kg	DD00218
Total Organic Carbon (Average)	22700 (94.7)		TOC-LK		1	CCP	04/01/20 19:00	mg/kg	[CALC]



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 24.8
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 4/1/20 9:30

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (22.9)		MADEP-EPH		1	CAD	04/03/20 19:51	D0D0068	DC03103
C19-C36 Aliphatics1	33.6 (22.9)		MADEP-EPH		1	CAD	04/03/20 19:51	D0D0068	DC03103
C11-C22 Unadjusted Aromatics1	126 (22.9)		EPH8270		1	CAD	04/01/20 17:58	D0D0008	DC03103
C11-C22 Aromatics1,2	82.8 (24.5)		EPH8270			VSC	04/03/20 0:25		[CALC]
2-Methylnaphthalene	0.049 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Acenaphthene	0.111 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Naphthalene	0.211 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Phenanthrene	4.09 (0.305)		EPH8270SIM		10	VSC	04/03/20 0:25	D0D0054	DC03103
Acenaphthylene	0.527 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Anthracene	0.978 (0.012)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Benzo(a)anthracene	3.01 (0.012)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Benzo(a)pyrene	3.64 (0.122)		EPH8270SIM		10	VSC	04/03/20 0:25	D0D0054	DC03103
Benzo(b)fluoranthene	4.06 (0.305)		EPH8270SIM		10	VSC	04/03/20 0:25	D0D0054	DC03103
Benzo(g,h,i)perylene	1.86 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Benzo(k)fluoranthene	1.20 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Chrysene	2.94 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Dibenzo(a,h)Anthracene	0.633 (0.012)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Fluoranthene	9.14 (0.305)		EPH8270SIM		10	VSC	04/03/20 0:25	D0D0054	DC03103
Fluorene	0.307 (0.012)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Indeno(1,2,3-cd)Pyrene	2.19 (0.030)		EPH8270SIM		1	VSC	04/02/20 23:37	D0D0054	DC03103
Pyrene	8.02 (0.305)		EPH8270SIM		10	VSC	04/03/20 0:25	D0D0054	DC03103

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1-Chlorooctadecane</i>	68 %		40-140
<i>Surrogate: 2-Bromonaphthalene</i>	97 %		40-140
<i>Surrogate: 2-Fluorobiphenyl</i>	90 %		40-140
<i>Surrogate: O-Terphenyl</i>	78 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment

Subcontracted Analysis

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Grain Size	See Attached (N/A)								



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1
Date Sampled: 03/31/20 12:30
Percent Solids: 66
Initial Volume: 100
Final Volume: 2000
Extraction Method: 1311

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-01
Sample Matrix: Sediment
Units: °C
Analyst: MKS
Prepared: 4/2/20 16:50

TCLP Extraction by 1311

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Batch</u>
Temperature (Min C)	20.0 (N/A)		1311		1	MKS	04/03/20 10:50	DD00249
Temperature (Max C)	20.6 (N/A)		1311		1	MKS	04/03/20 10:50	DD00249
Temperature (Range)	Temperature is not within 23 +/-2 °C. (N/A)							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/L

Extraction Method: 3005A TCLP

1311 TCLP Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>TCLP Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Lead	0.274 (0.050)		1311/6010C		1	KJK	04/03/20 20:01	50	50	DD00331



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
 Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
 Client Sample ID: Wall-Sed-2
 Date Sampled: 03/31/20 14:00
 Percent Solids: 57
 Initial Volume: 5.7
 Final Volume: 10
 Extraction Method: 5035

ESS Laboratory Work Order: 20C0943
 ESS Laboratory Sample ID: 20C0943-02
 Sample Matrix: Sediment
 Units: mg/kg dry
 Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,1,1,2-Tetrachloroethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,1,1-Trichloroethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,1,2,2-Tetrachloroethane	ND (0.0023)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,1,2-Trichloroethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,1-Dichloroethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,1-Dichloroethene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,1-Dichloropropene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2,3-Trichlorobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2,3-Trichloropropane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2,4-Trichlorobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2,4-Trimethylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2-Dibromo-3-Chloropropane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2-Dibromoethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2-Dichlorobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2-Dichloroethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,2-Dichloropropane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,3,5-Trimethylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,3-Dichlorobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,3-Dichloropropane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,4-Dichlorobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
1,4-Dioxane	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
2,2-Dichloropropane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
2-Butanone	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
2-Chlorotoluene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
2-Hexanone	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
4-Chlorotoluene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
4-Isopropyltoluene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
4-Methyl-2-Pentanone	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Acetone	0.157 (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Benzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Bromobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Bromochloromethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 5.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Bromodichloromethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Bromoform	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Bromomethane	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Carbon Disulfide	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Carbon Tetrachloride	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Chlorobenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Chloroethane	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Chloroform	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Chloromethane	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
cis-1,2-Dichloroethene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
cis-1,3-Dichloropropene	ND (0.0026)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Dibromochloromethane	ND (0.0025)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Dibromomethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Dichlorodifluoromethane	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Diethyl Ether	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Di-isopropyl ether	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Ethyl tertiary-butyl ether	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Ethylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Hexachlorobutadiene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Isopropylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Methyl tert-Butyl Ether	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Methylene Chloride	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Naphthalene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
n-Butylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
n-Propylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
sec-Butylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Styrene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
tert-Butylbenzene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Tertiary-amyl methyl ether	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Tetrachloroethene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Tetrahydrofuran	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Toluene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 5.7
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
trans-1,2-Dichloroethene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
trans-1,3-Dichloropropene	ND (0.0025)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Trichloroethene	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Trichlorofluoromethane	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Vinyl Chloride	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Xylene O	ND (0.0077)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Xylene P,M	ND (0.0154)		8260B Low		1	04/01/20 15:03	D0D0024	DD00144
Xylenes (Total)	ND (0.00877)		8260B		1	04/01/20 15:03		[CALC]

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>117 %</i>		<i>70-130</i>
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>94 %</i>		<i>70-130</i>
<i>Surrogate: Dibromofluoromethane</i>	<i>102 %</i>		<i>70-130</i>
<i>Surrogate: Toluene-d8</i>	<i>98 %</i>		<i>70-130</i>



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 30
Final Volume: 2
Extraction Method: 3540C

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: DMC
Prepared: 4/6/20 14:00

8082 Polychlorinated Biphenyls (PCB) / Congeners

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
BZ#8 [2C]	P, LC 0.00337 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#18	ND (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#28	P, LC 0.00179 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#44	P, LC 0.00111 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#52 [2C]	P, LC 0.00256 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#66	ND (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#101	P, LC 0.0423 (0.00474)		8082A Cong		10	04/09/20 9:17	D0D0142	DD00604
BZ#105 [2C]	P, LC 0.00426 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#118	0.00453 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#128 [2C]	0.00091 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#138	P, LC 0.00368 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#153	ND (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#170	P, LC 0.00175 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#180	0.00586 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#187 [2C]	0.00286 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#195 [2C]	ND (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#206 [2C]	0.00099 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604
BZ#209	P, LC 0.00120 (0.00047)		8082A Cong		1	04/09/20 0:46	D0D0142	DD00604

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: Tetrachloro-m-xylene</i>	55 %		30-150
<i>Surrogate: Tetrachloro-m-xylene [2C]</i>	65 %		30-150



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 20.6
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: CAD
Prepared: 4/1/20 15:09

8100M Total Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
Total Petroleum Hydrocarbons	193 (17.0)		8100M		1	04/02/20 4:10	D0D0002	DD00106
		<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>				
<i>Surrogate: O-Terphenyl</i>		81 %		40-140				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 14.5
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 4/1/20 9:30

8270D Semi-Volatile Organic Compounds

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
1,2,4-Trichlorobenzene	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
1,2-Dichlorobenzene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
1,3-Dichlorobenzene	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
1,4-Dichlorobenzene	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,4,5-Trichlorophenol	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,4,6-Trichlorophenol	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,4-Dichlorophenol	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,4-Dimethylphenol	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,4-Dinitrophenol	ND (1.01)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,4-Dinitrotoluene	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2,6-Dinitrotoluene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2-Chloronaphthalene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2-Chlorophenol	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2-Methylnaphthalene	0.028 (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2-Methylphenol	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
2-Nitrophenol	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
3,3'-Dichlorobenzidine	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
3+4-Methylphenol	ND (1.21)		8270D		1	04/03/20 1:20	D0D0031	DD00105
4-Bromophenyl-phenylether	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
4-Chloroaniline	ND (0.027)		8270D		1	04/03/20 1:20	D0D0031	DD00105
4-Nitrophenol	ND (3.03)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Acenaphthene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Acenaphthylene	0.371 (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Acetophenone	ND (1.21)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Aniline	ND (3.03)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Anthracene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Azobenzene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Benzo(a)anthracene	0.614 (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Benzo(a)pyrene	0.729 (0.303)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Benzo(b)fluoranthene	0.710 (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Benzo(g,h,i)perylene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Benzo(k)fluoranthene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 14.5
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 4/1/20 9:30

8270D Semi-Volatile Organic Compounds

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
bis(2-Chloroethoxy)methane	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
bis(2-Chloroethyl)ether	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
bis(2-chloroisopropyl)Ether	ND (0.024)		8270D		1	04/03/20 1:20	D0D0031	DD00105
bis(2-Ethylhexyl)phthalate	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Butylbenzylphthalate	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Chrysene	0.742 (0.303)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Dibenzo(a,h)Anthracene	0.134 (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Dibenzofuran	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Diethylphthalate	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Dimethylphthalate	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Di-n-butylphthalate	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Di-n-octylphthalate	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Fluoranthene	1.66 (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Fluorene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Hexachlorobenzene	ND (0.018)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Hexachlorobutadiene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Hexachloroethane	ND (0.020)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Indeno(1,2,3-cd)Pyrene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Isophorone	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Naphthalene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Nitrobenzene	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
N-Nitrosodimethylamine	ND (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Pentachlorophenol	ND (0.544)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Phenanthrene	0.871 (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Phenol	ND (0.020)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Pyrene	1.53 (0.604)		8270D		1	04/03/20 1:20	D0D0031	DD00105
Pyridine	ND (3.03)		8270D		1	04/03/20 1:20	D0D0031	DD00105

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	<i>56 %</i>		<i>30-130</i>
<i>Surrogate: 2,4,6-Tribromophenol</i>	<i>93 %</i>		<i>30-130</i>
<i>Surrogate: 2-Chlorophenol-d4</i>	<i>63 %</i>		<i>30-130</i>



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 14.5
Final Volume: 0.5
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry
Analyst: TJ
Prepared: 4/1/20 9:30

8270D Semi-Volatile Organic Compounds

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
<i>Surrogate: 2-Fluorobiphenyl</i>		61 %		30-130				
<i>Surrogate: 2-Fluorophenol</i>		63 %		30-130				
<i>Surrogate: Nitrobenzene-d5</i>		57 %		30-130				
<i>Surrogate: Phenol-d6</i>		66 %		30-130				
<i>Surrogate: p-Terphenyl-d14</i>		83 %		30-130				



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment

Classical Chemistry

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Conductivity	WL 3780 (5)		9050A		1	CCP	04/02/20 15:11	umhos/cm	DD00232
Corrosivity (pH)	6.92 (N/A)		9045		1	CCP	03/31/20 19:26	S.U.	DC03140
Corrosivity (pH) Sample Temp	Soil pH measured in water at 20.7 °C.								
Eh (ORP)	WL 157 (N/A)		2580		1	CCP	03/31/20 19:26	mv	DC03142
Flashpoint	> 200 (N/A)		1010		1	CCP	04/02/20 16:30	°F	DD00251
Reactive Cyanide	ND (2.0)		7.3.3.2		1	EEM	04/02/20 10:48	mg/kg	DD00218
Reactive Sulfide	ND (2.0)		7.3.4.1		1	EEM	04/02/20 10:48	mg/kg	DD00218
Total Organic Carbon (Average)	36500 (96.6)		TOC-LK		1	CCP	04/01/20 19:17	mg/kg	[CALC]



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 24.5
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: mg/kg dry

Prepared: 4/1/20 9:30

MADEP-EPH Extractable Petroleum Hydrocarbons

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Sequence</u>	<u>Batch</u>
C9-C18 Aliphatics1	ND (26.9)		MADEP-EPH		1	CAD	04/03/20 21:26	D0D0068	DC03103
C19-C36 Aliphatics1	48.9 (26.9)		MADEP-EPH		1	CAD	04/03/20 21:26	D0D0068	DC03103
C11-C22 Unadjusted Aromatics1	26.9 (26.9)		EPH8270		1	CAD	04/01/20 17:22	D0D0008	DC03103
C11-C22 Aromatics1,2	ND (27.4)		EPH8270			VSC	04/02/20 22:50		[CALC]
2-Methylnaphthalene	ND (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Acenaphthene	ND (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Naphthalene	0.049 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Phenanthrene	0.601 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Acenaphthylene	0.117 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Anthracene	0.101 (0.014)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Benzo(a)anthracene	0.372 (0.014)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Benzo(a)pyrene	0.462 (0.014)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Benzo(b)fluoranthene	0.605 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Benzo(g,h,i)perylene	0.316 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Benzo(k)fluoranthene	0.167 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Chrysene	0.503 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Dibenzo(a,h)Anthracene	0.101 (0.014)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Fluoranthene	1.12 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Fluorene	0.057 (0.014)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Indeno(1,2,3-cd)Pyrene	0.346 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103
Pyrene	1.06 (0.036)		EPH8270SIM		1	VSC	04/02/20 22:50	D0D0054	DC03103

	<i>%Recovery</i>	<i>Qualifier</i>	<i>Limits</i>
<i>Surrogate: 1-Chlorooctadecane</i>	79 %		40-140
<i>Surrogate: 2-Bromonaphthalene</i>	97 %		40-140
<i>Surrogate: 2-Fluorobiphenyl</i>	94 %		40-140
<i>Surrogate: O-Terphenyl</i>	94 %		40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment

Subcontracted Analysis

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Units</u>	<u>Batch</u>
Grain Size	See Attached (N/A)								



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2
Date Sampled: 03/31/20 14:00
Percent Solids: 57
Initial Volume: 100
Final Volume: 2000
Extraction Method: 1311

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-02
Sample Matrix: Sediment
Units: °C
Analyst: MKS
Prepared: 4/2/20 16:50

TCLP Extraction by 1311

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>Batch</u>
Temperature (Min C)	20.0 (N/A)		1311		1	MKS	04/03/20 10:50	DD00249
Temperature (Max C)	20.6 (N/A)		1311		1	MKS	04/03/20 10:50	DD00249
Temperature (Range)	Temperature is not within 23 +/-2 °C. (N/A)							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-1 - air dried
Date Sampled: 03/31/20 12:30
Percent Solids: 100

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-03
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Antimony	ND (3.47)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Arsenic	11.1 (1.74)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Barium	21.3 (1.74)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Beryllium	0.82 (0.08)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Cadmium	0.57 (0.17)		6020A		1	NAR	04/06/20 11:43	5.77	100	DD00130
Chromium	14.3 (0.69)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Copper	32.4 (1.74)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Lead	174 (3.47)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Mercury	0.334 (0.087)		7471B		10	MKS	04/02/20 9:58	2.28	40	DD00131
Nickel	9.06 (1.74)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Selenium	ND (3.47)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Silver	ND (0.35)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Thallium	ND (3.47)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Vanadium	19.7 (0.69)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130
Zinc	146 (1.74)		6010C		2	KJK	04/02/20 4:37	5.77	100	DD00130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ
Client Sample ID: Wall-Sed-2 - air dried
Date Sampled: 03/31/20 14:00
Percent Solids: 99

ESS Laboratory Work Order: 20C0943
ESS Laboratory Sample ID: 20C0943-04
Sample Matrix: Sediment
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

<u>Analyte</u>	<u>Results (MRL)</u>	<u>MDL</u>	<u>Method</u>	<u>Limit</u>	<u>DF</u>	<u>Analyst</u>	<u>Analyzed</u>	<u>I/V</u>	<u>F/V</u>	<u>Batch</u>
Antimony	ND (3.82)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Arsenic	12.8 (1.91)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Barium	22.8 (1.91)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Beryllium	1.08 (0.08)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Cadmium	0.45 (0.38)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Chromium	16.0 (0.76)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Copper	23.3 (1.91)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Lead	192 (3.82)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Mercury	0.460 (0.090)		7471B		10	MKS	04/02/20 10:00	2.24	40	DD00131
Nickel	10.5 (1.91)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Selenium	ND (3.82)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Silver	ND (0.38)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Thallium	ND (3.82)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Vanadium	21.3 (0.76)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130
Zinc	137 (1.91)		6010C		2	KJK	04/02/20 4:41	5.3	100	DD00130



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Total Metals

Batch DD00130 - 3050B

Blank

Antimony	ND	5.00	mg/kg wet
Arsenic	ND	2.50	mg/kg wet
Barium	ND	2.50	mg/kg wet
Beryllium	ND	0.11	mg/kg wet
Cadmium	ND	0.50	mg/kg wet
Chromium	ND	1.00	mg/kg wet
Copper	ND	2.50	mg/kg wet
Lead	ND	5.00	mg/kg wet
Nickel	ND	2.50	mg/kg wet
Selenium	ND	5.00	mg/kg wet
Silver	ND	0.50	mg/kg wet
Thallium	ND	5.00	mg/kg wet
Vanadium	ND	1.00	mg/kg wet
Zinc	ND	2.50	mg/kg wet

Blank

Cadmium	ND	0.50	mg/kg wet
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LCS

Antimony	43.2	15.2	mg/kg wet	51.30	84	80-120
Arsenic	184	7.58	mg/kg wet	202.0	91	80-120
Barium	329	7.58	mg/kg wet	343.0	96	80-120
Beryllium	47.2	0.33	mg/kg wet	52.10	91	80-120
Cadmium	128	1.52	mg/kg wet	149.0	86	80-120
Chromium	168	3.03	mg/kg wet	182.0	92	80-120
Copper	209	7.58	mg/kg wet	225.0	93	80-120
Lead	313	15.2	mg/kg wet	333.0	94	80-120
Nickel	157	7.58	mg/kg wet	167.0	94	80-120
Selenium	158	15.2	mg/kg wet	169.0	93	80-120
Silver	44.4	1.52	mg/kg wet	48.90	91	80-120
Thallium	65.4	15.2	mg/kg wet	82.30	79	62-139
Vanadium	215	3.03	mg/kg wet	227.0	95	80-120
Zinc	411	7.58	mg/kg wet	459.0	90	80-120

LCS

Cadmium	150	7.58	mg/kg wet	149.0	101	80-120
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LCS Dup

Antimony	43.5	14.1	mg/kg wet	51.30	85	80-120	0.7	20
Arsenic	202	7.04	mg/kg wet	202.0	100	80-120	9	20
Barium	344	7.04	mg/kg wet	343.0	100	80-120	5	20
Beryllium	49.8	0.31	mg/kg wet	52.10	96	80-120	6	20
Cadmium	135	1.41	mg/kg wet	149.0	91	80-120	6	20
Chromium	180	2.82	mg/kg wet	182.0	99	80-120	7	20
Copper	224	7.04	mg/kg wet	225.0	100	80-120	7	20
Lead	340	14.1	mg/kg wet	333.0	102	80-120	8	20
Nickel	167	7.04	mg/kg wet	167.0	100	80-120	6	20



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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Total Metals

Batch DD00130 - 3050B

Selenium	172	14.1	mg/kg wet	169.0		102	80-120	8	20	
Silver	46.5	1.41	mg/kg wet	48.90		95	80-120	5	20	
Thallium	71.6	14.1	mg/kg wet	82.30		87	62-139	9	20	
Vanadium	231	2.82	mg/kg wet	227.0		102	80-120	7	20	
Zinc	436	7.04	mg/kg wet	459.0		95	80-120	6	20	

LCS Dup

Cadmium	155	7.04	mg/kg wet	149.0		104	80-120	3	30	
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Batch DD00131 - 7471B

Blank

Mercury	ND	0.033	mg/kg wet							
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LCS

Mercury	7.74	0.600	mg/kg wet	7.760		100	80-120			
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LCS Dup

Mercury	8.20	0.521	mg/kg wet	7.760		106	80-120	6	20	
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1311 TCLP Metals

Batch DD00331 - 3005A_TCLP

Blank

Lead	ND	0.050	mg/L							
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LCS

Lead	0.472	0.050	mg/L	0.5000		94	80-120			
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LCS Dup

Lead	0.467	0.050	mg/L	0.5000		93	80-120	1	20	
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5035/8260B Volatile Organic Compounds / Low Level

Batch DD00144 - 5035

Blank

1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0015	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch DD00144 - 5035

1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.0100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0017	mg/kg wet							
Dibromochloromethane	ND	0.0016	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch DD00144 - 5035

Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0016	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	0.0533		mg/kg wet	0.05000		107	70-130			
Surrogate: 4-Bromofluorobenzene	0.0495		mg/kg wet	0.05000		99	70-130			
Surrogate: Dibromofluoromethane	0.0496		mg/kg wet	0.05000		99	70-130			
Surrogate: Toluene-d8	0.0482		mg/kg wet	0.05000		96	70-130			

LCS

1,1,1,2-Tetrachloroethane	0.0539	0.0050	mg/kg wet	0.05000		108	70-130			
1,1,1-Trichloroethane	0.0497	0.0050	mg/kg wet	0.05000		99	70-130			
1,1,2,2-Tetrachloroethane	0.0475	0.0015	mg/kg wet	0.05000		95	70-130			
1,1,2-Trichloroethane	0.0471	0.0050	mg/kg wet	0.05000		94	70-130			
1,1-Dichloroethane	0.0453	0.0050	mg/kg wet	0.05000		91	70-130			
1,1-Dichloroethene	0.0468	0.0050	mg/kg wet	0.05000		94	70-130			
1,1-Dichloropropene	0.0479	0.0050	mg/kg wet	0.05000		96	70-130			
1,2,3-Trichlorobenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130			
1,2,3-Trichloropropane	0.0466	0.0050	mg/kg wet	0.05000		93	70-130			
1,2,4-Trichlorobenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130			
1,2,4-Trimethylbenzene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130			
1,2-Dibromo-3-Chloropropane	0.0410	0.0050	mg/kg wet	0.05000		82	70-130			
1,2-Dibromoethane	0.0508	0.0050	mg/kg wet	0.05000		102	70-130			
1,2-Dichlorobenzene	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
1,2-Dichloroethane	0.0510	0.0050	mg/kg wet	0.05000		102	70-130			
1,2-Dichloropropane	0.0465	0.0050	mg/kg wet	0.05000		93	70-130			
1,3,5-Trimethylbenzene	0.0487	0.0050	mg/kg wet	0.05000		97	70-130			
1,3-Dichlorobenzene	0.0493	0.0050	mg/kg wet	0.05000		99	70-130			
1,3-Dichloropropane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
1,4-Dichlorobenzene	0.0486	0.0050	mg/kg wet	0.05000		97	70-130			
1,4-Dioxane	0.888	0.0100	mg/kg wet	1.000		89	70-130			
2,2-Dichloropropane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
2-Butanone	0.235	0.0100	mg/kg wet	0.2500		94	70-130			
2-Chlorotoluene	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
2-Hexanone	0.226	0.0100	mg/kg wet	0.2500		90	70-130			
4-Chlorotoluene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
4-Isopropyltoluene	0.0475	0.0050	mg/kg wet	0.05000		95	70-130			
4-Methyl-2-Pentanone	0.231	0.0100	mg/kg wet	0.2500		93	70-130			
Acetone	0.232	0.0100	mg/kg wet	0.2500		93	70-130			



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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch DD00144 - 5035

Benzene	0.0458	0.0050	mg/kg wet	0.05000		92	70-130			
Bromobenzene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
Bromochloromethane	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
Bromodichloromethane	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
Bromoform	0.0468	0.0050	mg/kg wet	0.05000		94	70-130			
Bromomethane	0.0487	0.0100	mg/kg wet	0.05000		97	70-130			
Carbon Disulfide	0.0427	0.0050	mg/kg wet	0.05000		85	70-130			
Carbon Tetrachloride	0.0535	0.0050	mg/kg wet	0.05000		107	70-130			
Chlorobenzene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130			
Chloroethane	0.0424	0.0100	mg/kg wet	0.05000		85	70-130			
Chloroform	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
Chloromethane	0.0468	0.0100	mg/kg wet	0.05000		94	70-130			
cis-1,2-Dichloroethene	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
cis-1,3-Dichloropropene	0.0534	0.0017	mg/kg wet	0.05000		107	70-130			
Dibromochloromethane	0.0501	0.0016	mg/kg wet	0.05000		100	70-130			
Dibromomethane	0.0484	0.0050	mg/kg wet	0.05000		97	70-130			
Dichlorodifluoromethane	0.0462	0.0100	mg/kg wet	0.05000		92	70-130			
Diethyl Ether	0.0447	0.0050	mg/kg wet	0.05000		89	70-130			
Di-isopropyl ether	0.0477	0.0050	mg/kg wet	0.05000		95	70-130			
Ethyl tertiary-butyl ether	0.0487	0.0050	mg/kg wet	0.05000		97	70-130			
Ethylbenzene	0.0482	0.0050	mg/kg wet	0.05000		96	70-130			
Hexachlorobutadiene	0.0531	0.0050	mg/kg wet	0.05000		106	70-130			
Isopropylbenzene	0.0486	0.0050	mg/kg wet	0.05000		97	70-130			
Methyl tert-Butyl Ether	0.0498	0.0050	mg/kg wet	0.05000		100	70-130			
Methylene Chloride	0.0471	0.0100	mg/kg wet	0.05000		94	70-130			
Naphthalene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
n-Butylbenzene	0.0470	0.0050	mg/kg wet	0.05000		94	70-130			
n-Propylbenzene	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
sec-Butylbenzene	0.0464	0.0050	mg/kg wet	0.05000		93	70-130			
Styrene	0.0498	0.0050	mg/kg wet	0.05000		100	70-130			
tert-Butylbenzene	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
Tertiary-amyl methyl ether	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
Tetrachloroethene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
Tetrahydrofuran	0.0398	0.0050	mg/kg wet	0.05000		80	70-130			
Toluene	0.0456	0.0050	mg/kg wet	0.05000		91	70-130			
trans-1,2-Dichloroethene	0.0466	0.0050	mg/kg wet	0.05000		93	70-130			
trans-1,3-Dichloropropene	0.0465	0.0016	mg/kg wet	0.05000		93	70-130			
Trichloroethene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130			
Trichlorofluoromethane	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
Vinyl Chloride	0.0494	0.0100	mg/kg wet	0.05000		99	70-130			
Xylene O	0.0502	0.0050	mg/kg wet	0.05000		100	70-130			
Xylene P,M	0.0994	0.0100	mg/kg wet	0.1000		99	70-130			
Surrogate: 1,2-Dichloroethane-d4	0.0490		mg/kg wet	0.05000		98	70-130			
Surrogate: 4-Bromofluorobenzene	0.0500		mg/kg wet	0.05000		100	70-130			
Surrogate: Dibromofluoromethane	0.0482		mg/kg wet	0.05000		96	70-130			



CERTIFICATE OF ANALYSIS

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch DD00144 - 5035

<i>Surrogate: Toluene-d8</i>	<i>0.0489</i>		mg/kg wet	<i>0.05000</i>		<i>98</i>	<i>70-130</i>			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0597	0.0050	mg/kg wet	0.05000		119	70-130	10	20	
1,1,1-Trichloroethane	0.0546	0.0050	mg/kg wet	0.05000		109	70-130	9	20	
1,1,2,2-Tetrachloroethane	0.0506	0.0015	mg/kg wet	0.05000		101	70-130	6	20	
1,1,2-Trichloroethane	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	8	20	
1,1-Dichloroethane	0.0492	0.0050	mg/kg wet	0.05000		98	70-130	8	20	
1,1-Dichloroethene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	9	20	
1,1-Dichloropropene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130	10	20	
1,2,3-Trichlorobenzene	0.0570	0.0050	mg/kg wet	0.05000		114	70-130	10	20	
1,2,3-Trichloropropane	0.0511	0.0050	mg/kg wet	0.05000		102	70-130	9	20	
1,2,4-Trichlorobenzene	0.0560	0.0050	mg/kg wet	0.05000		112	70-130	9	20	
1,2,4-Trimethylbenzene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130	8	20	
1,2-Dibromo-3-Chloropropane	0.0461	0.0050	mg/kg wet	0.05000		92	70-130	12	20	
1,2-Dibromoethane	0.0559	0.0050	mg/kg wet	0.05000		112	70-130	10	20	
1,2-Dichlorobenzene	0.0536	0.0050	mg/kg wet	0.05000		107	70-130	8	20	
1,2-Dichloroethane	0.0553	0.0050	mg/kg wet	0.05000		111	70-130	8	20	
1,2-Dichloropropane	0.0502	0.0050	mg/kg wet	0.05000		100	70-130	8	20	
1,3,5-Trimethylbenzene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130	8	20	
1,3-Dichlorobenzene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130	7	20	
1,3-Dichloropropane	0.0540	0.0050	mg/kg wet	0.05000		108	70-130	8	20	
1,4-Dichlorobenzene	0.0521	0.0050	mg/kg wet	0.05000		104	70-130	7	20	
1,4-Dioxane	0.963	0.0100	mg/kg wet	1.000		96	70-130	8	20	
2,2-Dichloropropane	0.0546	0.0050	mg/kg wet	0.05000		109	70-130	9	20	
2-Butanone	0.259	0.0100	mg/kg wet	0.2500		104	70-130	10	20	
2-Chlorotoluene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130	8	20	
2-Hexanone	0.250	0.0100	mg/kg wet	0.2500		100	70-130	10	20	
4-Chlorotoluene	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	7	20	
4-Isopropyltoluene	0.0513	0.0050	mg/kg wet	0.05000		103	70-130	8	20	
4-Methyl-2-Pentanone	0.255	0.0100	mg/kg wet	0.2500		102	70-130	10	20	
Acetone	0.258	0.0100	mg/kg wet	0.2500		103	70-130	11	20	
Benzene	0.0498	0.0050	mg/kg wet	0.05000		100	70-130	8	20	
Bromobenzene	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	8	20	
Bromochloromethane	0.0531	0.0050	mg/kg wet	0.05000		106	70-130	8	20	
Bromodichloromethane	0.0583	0.0050	mg/kg wet	0.05000		117	70-130	8	20	
Bromoform	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	10	20	
Bromomethane	0.0517	0.0100	mg/kg wet	0.05000		103	70-130	6	20	
Carbon Disulfide	0.0465	0.0050	mg/kg wet	0.05000		93	70-130	9	20	
Carbon Tetrachloride	0.0588	0.0050	mg/kg wet	0.05000		118	70-130	9	20	
Chlorobenzene	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	9	20	
Chloroethane	0.0464	0.0100	mg/kg wet	0.05000		93	70-130	9	20	
Chloroform	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	8	20	
Chloromethane	0.0512	0.0100	mg/kg wet	0.05000		102	70-130	9	20	
cis-1,2-Dichloroethene	0.0522	0.0050	mg/kg wet	0.05000		104	70-130	9	20	



CERTIFICATE OF ANALYSIS

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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5035/8260B Volatile Organic Compounds / Low Level

Batch DD00144 - 5035

cis-1,3-Dichloropropene	0.0587	0.0017	mg/kg wet	0.05000		117	70-130	9	20	
Dibromochloromethane	0.0544	0.0016	mg/kg wet	0.05000		109	70-130	8	20	
Dibromomethane	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	8	20	
Dichlorodifluoromethane	0.0507	0.0100	mg/kg wet	0.05000		101	70-130	9	20	
Diethyl Ether	0.0494	0.0050	mg/kg wet	0.05000		99	70-130	10	20	
Di-isopropyl ether	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	8	20	
Ethyl tertiary-butyl ether	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	9	20	
Ethylbenzene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130	9	20	
Hexachlorobutadiene	0.0572	0.0050	mg/kg wet	0.05000		114	70-130	7	20	
Isopropylbenzene	0.0524	0.0050	mg/kg wet	0.05000		105	70-130	8	20	
Methyl tert-Butyl Ether	0.0538	0.0050	mg/kg wet	0.05000		108	70-130	8	20	
Methylene Chloride	0.0509	0.0100	mg/kg wet	0.05000		102	70-130	8	20	
Naphthalene	0.0560	0.0050	mg/kg wet	0.05000		112	70-130	11	20	
n-Butylbenzene	0.0509	0.0050	mg/kg wet	0.05000		102	70-130	8	20	
n-Propylbenzene	0.0515	0.0050	mg/kg wet	0.05000		103	70-130	7	20	
sec-Butylbenzene	0.0496	0.0050	mg/kg wet	0.05000		99	70-130	7	20	
Styrene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	8	20	
tert-Butylbenzene	0.0531	0.0050	mg/kg wet	0.05000		106	70-130	8	20	
Tertiary-amyl methyl ether	0.0580	0.0050	mg/kg wet	0.05000		116	70-130	8	20	
Tetrachloroethene	0.0568	0.0050	mg/kg wet	0.05000		114	70-130	7	20	
Tetrahydrofuran	0.0441	0.0050	mg/kg wet	0.05000		88	70-130	10	20	
Toluene	0.0502	0.0050	mg/kg wet	0.05000		100	70-130	9	20	
trans-1,2-Dichloroethene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	9	20	
trans-1,3-Dichloropropene	0.0512	0.0016	mg/kg wet	0.05000		102	70-130	10	20	
Trichloroethene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130	7	20	
Trichlorofluoromethane	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	8	20	
Vinyl Chloride	0.0547	0.0100	mg/kg wet	0.05000		109	70-130	10	20	
Xylene O	0.0549	0.0050	mg/kg wet	0.05000		110	70-130	9	20	
Xylene P,M	0.108	0.0100	mg/kg wet	0.1000		108	70-130	8	20	
Surrogate: 1,2-Dichloroethane-d4	0.0493		mg/kg wet	0.05000		99	70-130			
Surrogate: 4-Bromofluorobenzene	0.0500		mg/kg wet	0.05000		100	70-130			
Surrogate: Dibromofluoromethane	0.0486		mg/kg wet	0.05000		97	70-130			
Surrogate: Toluene-d8	0.0488		mg/kg wet	0.05000		98	70-130			

8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch DD00604 - 3540C

Blank

BZ#101	ND	0.00027	mg/kg wet							
BZ#101 [2C]	ND	0.00027	mg/kg wet							
BZ#105	ND	0.00027	mg/kg wet							
BZ#105 [2C]	ND	0.00027	mg/kg wet							
BZ#118	ND	0.00027	mg/kg wet							
BZ#118 [2C]	ND	0.00027	mg/kg wet							
BZ#128	ND	0.00027	mg/kg wet							
BZ#128 [2C]	ND	0.00027	mg/kg wet							



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8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch DD00604 - 3540C

BZ#138	ND	0.00027	mg/kg wet							
BZ#138 [2C]	ND	0.00027	mg/kg wet							
BZ#153	ND	0.00027	mg/kg wet							
BZ#153 [2C]	ND	0.00027	mg/kg wet							
BZ#170	ND	0.00027	mg/kg wet							
BZ#170 [2C]	ND	0.00027	mg/kg wet							
BZ#18	ND	0.00027	mg/kg wet							
BZ#18 [2C]	ND	0.00027	mg/kg wet							
BZ#180	ND	0.00027	mg/kg wet							
BZ#180 [2C]	ND	0.00027	mg/kg wet							
BZ#187	ND	0.00027	mg/kg wet							
BZ#187 [2C]	ND	0.00027	mg/kg wet							
BZ#195	ND	0.00027	mg/kg wet							
BZ#195 [2C]	ND	0.00027	mg/kg wet							
BZ#206	ND	0.00027	mg/kg wet							
BZ#206 [2C]	ND	0.00027	mg/kg wet							
BZ#209	ND	0.00027	mg/kg wet							
BZ#209 [2C]	ND	0.00027	mg/kg wet							
BZ#28	ND	0.00027	mg/kg wet							
BZ#28 [2C]	ND	0.00027	mg/kg wet							
BZ#44	ND	0.00027	mg/kg wet							
BZ#44 [2C]	ND	0.00027	mg/kg wet							
BZ#52	ND	0.00027	mg/kg wet							
BZ#52 [2C]	ND	0.00027	mg/kg wet							
BZ#66	ND	0.00027	mg/kg wet							
BZ#66 [2C]	ND	0.00027	mg/kg wet							
BZ#8	ND	0.00027	mg/kg wet							
BZ#8 [2C]	ND	0.00027	mg/kg wet							

Surrogate: Tetrachloro-m-xylene	0.00336		mg/kg wet	0.003333		101	30-150
Surrogate: Tetrachloro-m-xylene [2C]	0.00346		mg/kg wet	0.003333		104	30-150

LCS

BZ#101	0.00326	0.00027	mg/kg wet	0.003333		98	40-140
BZ#101 [2C]	0.00311	0.00027	mg/kg wet	0.003333		93	40-140
BZ#105	0.00374	0.00027	mg/kg wet	0.003333		112	40-140
BZ#105 [2C]	0.00362	0.00027	mg/kg wet	0.003333		108	40-140
BZ#118	0.00350	0.00027	mg/kg wet	0.003333		105	40-140
BZ#118 [2C]	0.00340	0.00027	mg/kg wet	0.003333		102	40-140
BZ#128	0.00348	0.00027	mg/kg wet	0.003333		104	40-140
BZ#128 [2C]	0.00368	0.00027	mg/kg wet	0.003333		110	40-140
BZ#138	0.00360	0.00027	mg/kg wet	0.003333		108	40-140
BZ#138 [2C]	0.00349	0.00027	mg/kg wet	0.003333		105	40-140
BZ#153	0.00354	0.00027	mg/kg wet	0.003333		106	40-140
BZ#153 [2C]	0.00336	0.00027	mg/kg wet	0.003333		101	40-140
BZ#170	0.00382	0.00027	mg/kg wet	0.003333		115	40-140



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch DD00604 - 3540C

BZ#170 [2C]	0.00373	0.00027	mg/kg wet	0.003333		112	40-140			
BZ#18	0.00294	0.00027	mg/kg wet	0.003333		88	40-140			
BZ#18 [2C]	0.00343	0.00027	mg/kg wet	0.003333		103	40-140			
BZ#180	0.00365	0.00027	mg/kg wet	0.003333		110	40-140			
BZ#180 [2C]	0.00374	0.00027	mg/kg wet	0.003333		112	40-140			
BZ#187	0.00350	0.00027	mg/kg wet	0.003333		105	40-140			
BZ#187 [2C]	0.00340	0.00027	mg/kg wet	0.003333		102	40-140			
BZ#195	0.00389	0.00027	mg/kg wet	0.003333		117	40-140			
BZ#195 [2C]	0.00381	0.00027	mg/kg wet	0.003333		114	40-140			
BZ#206	0.00383	0.00027	mg/kg wet	0.003333		115	40-140			
BZ#206 [2C]	0.00364	0.00027	mg/kg wet	0.003333		109	40-140			
BZ#209	0.00374	0.00027	mg/kg wet	0.003333		112	40-140			
BZ#209 [2C]	0.00357	0.00027	mg/kg wet	0.003333		107	40-140			
BZ#28	0.00341	0.00027	mg/kg wet	0.003333		102	40-140			
BZ#28 [2C]	0.00306	0.00027	mg/kg wet	0.003333		92	40-140			
BZ#44	0.00336	0.00027	mg/kg wet	0.003333		101	40-140			
BZ#44 [2C]	0.00340	0.00027	mg/kg wet	0.003333		102	40-140			
BZ#52	0.00305	0.00027	mg/kg wet	0.003333		92	40-140			
BZ#52 [2C]	0.00296	0.00027	mg/kg wet	0.003333		89	40-140			
BZ#66	0.00355	0.00027	mg/kg wet	0.003333		106	40-140			
BZ#66 [2C]	0.00342	0.00027	mg/kg wet	0.003333		103	40-140			
BZ#8	0.00335	0.00027	mg/kg wet	0.003333		100	40-140			
BZ#8 [2C]	0.00308	0.00027	mg/kg wet	0.003333		92	40-140			

Surrogate: Tetrachloro-m-xylene	0.00340		mg/kg wet	0.003333		102	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.00350		mg/kg wet	0.003333		105	30-150			

LCS Dup

BZ#101	0.00298	0.00027	mg/kg wet	0.003333		90	40-140	9	50	
BZ#101 [2C]	0.00285	0.00027	mg/kg wet	0.003333		86	40-140	9	50	
BZ#105	0.00330	0.00027	mg/kg wet	0.003333		99	40-140	12	50	
BZ#105 [2C]	0.00329	0.00027	mg/kg wet	0.003333		99	40-140	9	50	
BZ#118	0.00323	0.00027	mg/kg wet	0.003333		97	40-140	8	50	
BZ#118 [2C]	0.00308	0.00027	mg/kg wet	0.003333		92	40-140	10	50	
BZ#128	0.00319	0.00027	mg/kg wet	0.003333		96	40-140	9	50	
BZ#128 [2C]	0.00337	0.00027	mg/kg wet	0.003333		101	40-140	9	50	
BZ#138	0.00334	0.00027	mg/kg wet	0.003333		100	40-140	8	50	
BZ#138 [2C]	0.00319	0.00027	mg/kg wet	0.003333		96	40-140	9	50	
BZ#153	0.00315	0.00027	mg/kg wet	0.003333		95	40-140	12	50	
BZ#153 [2C]	0.00306	0.00027	mg/kg wet	0.003333		92	40-140	9	50	
BZ#170	0.00352	0.00027	mg/kg wet	0.003333		106	40-140	8	50	
BZ#170 [2C]	0.00344	0.00027	mg/kg wet	0.003333		103	40-140	8	50	
BZ#18	0.00269	0.00027	mg/kg wet	0.003333		81	40-140	9	50	
BZ#18 [2C]	0.00312	0.00027	mg/kg wet	0.003333		94	40-140	10	50	
BZ#180	0.00339	0.00027	mg/kg wet	0.003333		102	40-140	7	50	
BZ#180 [2C]	0.00344	0.00027	mg/kg wet	0.003333		103	40-140	8	50	



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Quality Control Data

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8082 Polychlorinated Biphenyls (PCB) / Congeners

Batch DD00604 - 3540C

BZ#187	0.00325	0.00027	mg/kg wet	0.003333		97	40-140	8	50	
BZ#187 [2C]	0.00312	0.00027	mg/kg wet	0.003333		93	40-140	9	50	
BZ#195	0.00354	0.00027	mg/kg wet	0.003333		106	40-140	9	50	
BZ#195 [2C]	0.00344	0.00027	mg/kg wet	0.003333		103	40-140	10	50	
BZ#206	0.00352	0.00027	mg/kg wet	0.003333		105	40-140	9	50	
BZ#206 [2C]	0.00334	0.00027	mg/kg wet	0.003333		100	40-140	9	50	
BZ#209	0.00345	0.00027	mg/kg wet	0.003333		104	40-140	8	50	
BZ#209 [2C]	0.00325	0.00027	mg/kg wet	0.003333		98	40-140	9	50	
BZ#28	0.00312	0.00027	mg/kg wet	0.003333		94	40-140	9	50	
BZ#28 [2C]	0.00282	0.00027	mg/kg wet	0.003333		85	40-140	8	50	
BZ#44	0.00308	0.00027	mg/kg wet	0.003333		92	40-140	9	50	
BZ#44 [2C]	0.00310	0.00027	mg/kg wet	0.003333		93	40-140	9	50	
BZ#52	0.00292	0.00027	mg/kg wet	0.003333		87	40-140	5	50	
BZ#52 [2C]	0.00272	0.00027	mg/kg wet	0.003333		82	40-140	9	50	
BZ#66	0.00330	0.00027	mg/kg wet	0.003333		99	40-140	7	50	
BZ#66 [2C]	0.00317	0.00027	mg/kg wet	0.003333		95	40-140	8	50	
BZ#8	0.00303	0.00027	mg/kg wet	0.003333		91	40-140	10	50	
BZ#8 [2C]	0.00281	0.00027	mg/kg wet	0.003333		84	40-140	9	50	

Surrogate: Tetrachloro-m-xylene	0.00298		mg/kg wet	0.003333		89	30-150			
Surrogate: Tetrachloro-m-xylene [2C]	0.00300		mg/kg wet	0.003333		90	30-150			

8100M Total Petroleum Hydrocarbons

Batch DD00106 - 3546

Blank

Decane (C10)	ND	0.2	mg/kg wet							
Docosane (C22)	ND	0.2	mg/kg wet							
Dodecane (C12)	ND	0.2	mg/kg wet							
Eicosane (C20)	ND	0.2	mg/kg wet							
Hexacosane (C26)	ND	0.2	mg/kg wet							
Hexadecane (C16)	ND	0.2	mg/kg wet							
Hexatriacontane (C36)	ND	0.2	mg/kg wet							
Nonadecane (C19)	ND	0.2	mg/kg wet							
Nonane (C9)	ND	0.2	mg/kg wet							
Octacosane (C28)	ND	0.2	mg/kg wet							
Octadecane (C18)	ND	0.2	mg/kg wet							
Tetracosane (C24)	ND	0.2	mg/kg wet							
Tetradecane (C14)	ND	0.2	mg/kg wet							
Total Petroleum Hydrocarbons	ND	10.0	mg/kg wet							
Triacontane (C30)	ND	0.2	mg/kg wet							

Surrogate: O-Terphenyl	4.56		mg/kg wet	5.000		91	40-140			
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LCS

Decane (C10)	2.4	0.2	mg/kg wet	2.500		95	40-140			
Docosane (C22)	2.7	0.2	mg/kg wet	2.500		108	40-140			



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8100M Total Petroleum Hydrocarbons

Batch DD00106 - 3546

Dodecane (C12)	2.5	0.2	mg/kg wet	2.500		99	40-140			
Eicosane (C20)	2.7	0.2	mg/kg wet	2.500		107	40-140			
Hexacosane (C26)	2.7	0.2	mg/kg wet	2.500		109	40-140			
Hexadecane (C16)	2.6	0.2	mg/kg wet	2.500		105	40-140			
Hexatriacontane (C36)	3.0	0.2	mg/kg wet	2.500		120	40-140			
Nonadecane (C19)	2.7	0.2	mg/kg wet	2.500		110	40-140			
Nonane (C9)	2.2	0.2	mg/kg wet	2.500		87	30-140			
Octacosane (C28)	2.8	0.2	mg/kg wet	2.500		110	40-140			
Octadecane (C18)	2.6	0.2	mg/kg wet	2.500		105	40-140			
Tetracosane (C24)	2.7	0.2	mg/kg wet	2.500		109	40-140			
Tetradecane (C14)	2.5	0.2	mg/kg wet	2.500		101	40-140			
Total Petroleum Hydrocarbons	36.9	10.0	mg/kg wet	35.00		105	40-140			
Triacotane (C30)	2.7	0.2	mg/kg wet	2.500		109	40-140			

Surrogate: O-Terphenyl

4.97 mg/kg wet 5.000 99 40-140

LCS Dup

Decane (C10)	2.3	0.2	mg/kg wet	2.500		91	40-140	4	25	
Docosane (C22)	2.6	0.2	mg/kg wet	2.500		106	40-140	2	25	
Dodecane (C12)	2.4	0.2	mg/kg wet	2.500		96	40-140	3	25	
Eicosane (C20)	2.6	0.2	mg/kg wet	2.500		105	40-140	3	25	
Hexacosane (C26)	2.6	0.2	mg/kg wet	2.500		106	40-140	3	25	
Hexadecane (C16)	2.6	0.2	mg/kg wet	2.500		102	40-140	3	25	
Hexatriacontane (C36)	2.9	0.2	mg/kg wet	2.500		117	40-140	3	25	
Nonadecane (C19)	2.7	0.2	mg/kg wet	2.500		107	40-140	3	25	
Nonane (C9)	2.1	0.2	mg/kg wet	2.500		83	30-140	5	25	
Octacosane (C28)	2.7	0.2	mg/kg wet	2.500		107	40-140	3	25	
Octadecane (C18)	2.6	0.2	mg/kg wet	2.500		103	40-140	3	25	
Tetracosane (C24)	2.6	0.2	mg/kg wet	2.500		106	40-140	3	25	
Tetradecane (C14)	2.4	0.2	mg/kg wet	2.500		98	40-140	3	25	
Total Petroleum Hydrocarbons	35.8	10.0	mg/kg wet	35.00		102	40-140	3	25	
Triacotane (C30)	2.7	0.2	mg/kg wet	2.500		106	40-140	3	25	

Surrogate: O-Terphenyl

4.78 mg/kg wet 5.000 96 40-140

8270D Semi-Volatile Organic Compounds

Batch DD00105 - 3546

Blank

1,2,4-Trichlorobenzene	ND	0.010	mg/kg wet							
1,2-Dichlorobenzene	ND	0.333	mg/kg wet							
1,3-Dichlorobenzene	ND	0.010	mg/kg wet							
1,4-Dichlorobenzene	ND	0.010	mg/kg wet							
2,4,5-Trichlorophenol	ND	0.333	mg/kg wet							
2,4,6-Trichlorophenol	ND	0.010	mg/kg wet							
2,4-Dichlorophenol	ND	0.010	mg/kg wet							
2,4-Dimethylphenol	ND	0.010	mg/kg wet							



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8270D Semi-Volatile Organic Compounds

Batch DD00105 - 3546

2,4-Dinitrophenol	ND	0.557	mg/kg wet
2,4-Dinitrotoluene	ND	0.010	mg/kg wet
2,6-Dinitrotoluene	ND	0.333	mg/kg wet
2-Chloronaphthalene	ND	0.333	mg/kg wet
2-Chlorophenol	ND	0.010	mg/kg wet
2-Methylnaphthalene	ND	0.010	mg/kg wet
2-Methylphenol	ND	0.333	mg/kg wet
2-Nitrophenol	ND	0.333	mg/kg wet
3,3'-Dichlorobenzidine	ND	0.010	mg/kg wet
3+4-Methylphenol	ND	0.667	mg/kg wet
4-Bromophenyl-phenylether	ND	0.333	mg/kg wet
4-Chloroaniline	ND	0.015	mg/kg wet
4-Nitrophenol	ND	1.67	mg/kg wet
Acenaphthene	ND	0.333	mg/kg wet
Acenaphthylene	ND	0.010	mg/kg wet
Acetophenone	ND	0.667	mg/kg wet
Aniline	ND	1.67	mg/kg wet
Anthracene	ND	0.333	mg/kg wet
Azobenzene	ND	0.333	mg/kg wet
Benzo(a)anthracene	ND	0.333	mg/kg wet
Benzo(a)pyrene	ND	0.167	mg/kg wet
Benzo(b)fluoranthene	ND	0.333	mg/kg wet
Benzo(g,h,i)perylene	ND	0.333	mg/kg wet
Benzo(k)fluoranthene	ND	0.333	mg/kg wet
bis(2-Chloroethoxy)methane	ND	0.333	mg/kg wet
bis(2-Chloroethyl)ether	ND	0.010	mg/kg wet
bis(2-chloroisopropyl)Ether	ND	0.013	mg/kg wet
bis(2-Ethylhexyl)phthalate	ND	0.333	mg/kg wet
Butylbenzylphthalate	ND	0.333	mg/kg wet
Chrysene	ND	0.167	mg/kg wet
Dibenzo(a,h)Anthracene	ND	0.010	mg/kg wet
Dibenzofuran	ND	0.333	mg/kg wet
Diethylphthalate	ND	0.333	mg/kg wet
Dimethylphthalate	ND	0.010	mg/kg wet
Di-n-butylphthalate	ND	0.333	mg/kg wet
Di-n-octylphthalate	ND	0.333	mg/kg wet
Fluoranthene	ND	0.333	mg/kg wet
Fluorene	ND	0.333	mg/kg wet
Hexachlorobenzene	ND	0.010	mg/kg wet
Hexachlorobutadiene	ND	0.333	mg/kg wet
Hexachloroethane	ND	0.011	mg/kg wet
Indeno(1,2,3-cd)Pyrene	ND	0.333	mg/kg wet
Isophorone	ND	0.333	mg/kg wet
Naphthalene	ND	0.333	mg/kg wet
Nitrobenzene	ND	0.333	mg/kg wet



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8270D Semi-Volatile Organic Compounds

Batch DD00105 - 3546

N-Nitrosodimethylamine	ND	0.333	mg/kg wet							
Pentachlorophenol	ND	0.300	mg/kg wet							
Phenanthrene	ND	0.333	mg/kg wet							
Phenol	ND	0.011	mg/kg wet							
Pyrene	ND	0.333	mg/kg wet							
Pyridine	ND	1.67	mg/kg wet							
Surrogate: 1,2-Dichlorobenzene-d4	2.22		mg/kg wet	3.333		67	30-130			
Surrogate: 2,4,6-Tribromophenol	3.42		mg/kg wet	5.000		68	30-130			
Surrogate: 2-Chlorophenol-d4	3.49		mg/kg wet	5.000		70	30-130			
Surrogate: 2-Fluorobiphenyl	2.36		mg/kg wet	3.333		71	30-130			
Surrogate: 2-Fluorophenol	3.58		mg/kg wet	5.000		72	30-130			
Surrogate: Nitrobenzene-d5	2.32		mg/kg wet	3.333		70	30-130			
Surrogate: Phenol-d6	3.56		mg/kg wet	5.000		71	30-130			
Surrogate: p-Terphenyl-d14	2.68		mg/kg wet	3.333		81	30-130			

LCS

1,2,4-Trichlorobenzene	2.37	0.010	mg/kg wet	3.333		71	40-140			
1,2-Dichlorobenzene	2.36	0.333	mg/kg wet	3.333		71	40-140			
1,3-Dichlorobenzene	2.35	0.010	mg/kg wet	3.333		71	40-140			
1,4-Dichlorobenzene	2.34	0.010	mg/kg wet	3.333		70	40-140			
2,4,5-Trichlorophenol	2.62	0.333	mg/kg wet	3.333		78	30-130			
2,4,6-Trichlorophenol	2.55	0.010	mg/kg wet	3.333		77	30-130			
2,4-Dichlorophenol	2.59	0.010	mg/kg wet	3.333		78	30-130			
2,4-Dimethylphenol	2.58	0.010	mg/kg wet	3.333		77	30-130			
2,4-Dinitrophenol	3.22	0.557	mg/kg wet	3.333		96	30-130			
2,4-Dinitrotoluene	2.85	0.010	mg/kg wet	3.333		86	40-140			
2,6-Dinitrotoluene	2.72	0.333	mg/kg wet	3.333		82	40-140			
2-Chloronaphthalene	2.34	0.333	mg/kg wet	3.333		70	40-140			
2-Chlorophenol	2.48	0.010	mg/kg wet	3.333		74	30-130			
2-Methylnaphthalene	2.33	0.010	mg/kg wet	3.333		70	40-140			
2-Methylphenol	2.49	0.333	mg/kg wet	3.333		75	30-130			
2-Nitrophenol	2.40	0.333	mg/kg wet	3.333		72	30-130			
3,3'-Dichlorobenzidine	2.10	0.010	mg/kg wet	3.333		63	40-140			
3+4-Methylphenol	4.73	0.667	mg/kg wet	6.667		71	30-130			
4-Bromophenyl-phenylether	2.62	0.333	mg/kg wet	3.333		79	40-140			
4-Chloroaniline	1.12	0.015	mg/kg wet	3.333		34	40-140			B-
4-Nitrophenol	2.75	1.67	mg/kg wet	3.333		83	30-130			
Acenaphthene	2.37	0.333	mg/kg wet	3.333		71	40-140			
Acenaphthylene	2.18	0.010	mg/kg wet	3.333		65	40-140			
Acetophenone	2.28	0.667	mg/kg wet	3.333		68	40-140			
Aniline	1.72	1.67	mg/kg wet	3.333		52	40-140			
Anthracene	2.63	0.333	mg/kg wet	3.333		79	40-140			
Azobenzene	2.47	0.333	mg/kg wet	3.333		74	40-140			
Benzo(a)anthracene	2.88	0.333	mg/kg wet	3.333		86	40-140			
Benzo(a)pyrene	3.06	0.167	mg/kg wet	3.333		92	40-140			
Benzo(b)fluoranthene	3.21	0.333	mg/kg wet	3.333		96	40-140			



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8270D Semi-Volatile Organic Compounds

Batch DD00105 - 3546

Benzo(g,h,i)perylene	2.65	0.333	mg/kg wet	3.333		79	40-140			
Benzo(k)fluoranthene	3.08	0.333	mg/kg wet	3.333		93	40-140			
bis(2-Chloroethoxy)methane	2.37	0.333	mg/kg wet	3.333		71	40-140			
bis(2-Chloroethyl)ether	2.36	0.010	mg/kg wet	3.333		71	40-140			
bis(2-chloroisopropyl)Ether	2.31	0.013	mg/kg wet	3.333		69	40-140			
bis(2-Ethylhexyl)phthalate	2.82	0.333	mg/kg wet	3.333		85	40-140			
Butylbenzylphthalate	3.01	0.333	mg/kg wet	3.333		90	40-140			
Chrysene	2.86	0.167	mg/kg wet	3.333		86	40-140			
Dibenzo(a,h)Anthracene	2.77	0.010	mg/kg wet	3.333		83	40-140			
Dibenzofuran	2.43	0.333	mg/kg wet	3.333		73	40-140			
Diethylphthalate	2.74	0.333	mg/kg wet	3.333		82	40-140			
Dimethylphthalate	2.57	0.010	mg/kg wet	3.333		77	40-140			
Di-n-butylphthalate	2.92	0.333	mg/kg wet	3.333		88	40-140			
Di-n-octylphthalate	2.98	0.333	mg/kg wet	3.333		89	40-140			
Fluoranthene	2.86	0.333	mg/kg wet	3.333		86	40-140			
Fluorene	2.58	0.333	mg/kg wet	3.333		78	40-140			
Hexachlorobenzene	2.66	0.010	mg/kg wet	3.333		80	40-140			
Hexachlorobutadiene	2.42	0.333	mg/kg wet	3.333		73	40-140			
Hexachloroethane	2.38	0.011	mg/kg wet	3.333		71	40-140			
Indeno(1,2,3-cd)Pyrene	2.73	0.333	mg/kg wet	3.333		82	40-140			
Isophorone	2.01	0.333	mg/kg wet	3.333		60	40-140			
Naphthalene	2.35	0.333	mg/kg wet	3.333		70	40-140			
Nitrobenzene	2.37	0.333	mg/kg wet	3.333		71	40-140			
N-Nitrosodimethylamine	2.62	0.333	mg/kg wet	3.333		78	40-140			
Pentachlorophenol	3.11	0.300	mg/kg wet	3.333		93	30-130			
Phenanthrene	2.66	0.333	mg/kg wet	3.333		80	40-140			
Phenol	2.46	0.011	mg/kg wet	3.333		74	30-130			
Pyrene	2.83	0.333	mg/kg wet	3.333		85	40-140			
Pyridine	2.31	1.67	mg/kg wet	3.333		69	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	2.45		mg/kg wet	3.333		74	30-130			
Surrogate: 2,4,6-Tribromophenol	4.22		mg/kg wet	5.000		84	30-130			
Surrogate: 2-Chlorophenol-d4	3.90		mg/kg wet	5.000		78	30-130			
Surrogate: 2-Fluorobiphenyl	2.53		mg/kg wet	3.333		76	30-130			
Surrogate: 2-Fluorophenol	3.96		mg/kg wet	5.000		79	30-130			
Surrogate: Nitrobenzene-d5	2.52		mg/kg wet	3.333		76	30-130			
Surrogate: Phenol-d6	3.86		mg/kg wet	5.000		77	30-130			
Surrogate: p-Terphenyl-d14	2.99		mg/kg wet	3.333		90	30-130			

LCS Dup

1,2,4-Trichlorobenzene	2.04	0.010	mg/kg wet	3.333		61	40-140	15	30	
1,2-Dichlorobenzene	1.98	0.333	mg/kg wet	3.333		59	40-140	17	30	
1,3-Dichlorobenzene	1.99	0.010	mg/kg wet	3.333		60	40-140	17	30	
1,4-Dichlorobenzene	1.97	0.010	mg/kg wet	3.333		59	40-140	17	30	
2,4,5-Trichlorophenol	2.53	0.333	mg/kg wet	3.333		76	30-130	3	30	
2,4,6-Trichlorophenol	2.36	0.010	mg/kg wet	3.333		71	30-130	8	30	
2,4-Dichlorophenol	2.22	0.010	mg/kg wet	3.333		67	30-130	16	30	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8270D Semi-Volatile Organic Compounds

Batch DD00105 - 3546

2,4-Dimethylphenol	2.23	0.010	mg/kg wet	3.333		67	30-130	14	30	
2,4-Dinitrophenol	3.30	0.557	mg/kg wet	3.333		99	30-130	2	30	
2,4-Dinitrotoluene	2.80	0.010	mg/kg wet	3.333		84	40-140	2	30	
2,6-Dinitrotoluene	2.67	0.333	mg/kg wet	3.333		80	40-140	2	30	
2-Chloronaphthalene	2.05	0.333	mg/kg wet	3.333		61	40-140	13	30	
2-Chlorophenol	2.05	0.010	mg/kg wet	3.333		62	30-130	19	30	
2-Methylnaphthalene	2.02	0.010	mg/kg wet	3.333		60	40-140	15	30	
2-Methylphenol	2.04	0.333	mg/kg wet	3.333		61	30-130	20	30	
2-Nitrophenol	2.05	0.333	mg/kg wet	3.333		62	30-130	15	30	
3,3'-Dichlorobenzidine	2.27	0.010	mg/kg wet	3.333		68	40-140	7	30	
3+4-Methylphenol	3.95	0.667	mg/kg wet	6.667		59	30-130	18	30	
4-Bromophenyl-phenylether	2.68	0.333	mg/kg wet	3.333		80	40-140	2	30	
4-Chloroaniline	1.17	0.015	mg/kg wet	3.333		35	40-140	5	30	B-
4-Nitrophenol	2.63	1.67	mg/kg wet	3.333		79	30-130	5	30	
Acenaphthene	2.16	0.333	mg/kg wet	3.333		65	40-140	9	30	
Acenaphthylene	1.97	0.010	mg/kg wet	3.333		59	40-140	10	30	
Acetophenone	1.90	0.667	mg/kg wet	3.333		57	40-140	18	30	
Aniline	1.52	1.67	mg/kg wet	3.333		46	40-140	13	30	
Anthracene	2.68	0.333	mg/kg wet	3.333		80	40-140	2	30	
Azobenzene	2.52	0.333	mg/kg wet	3.333		75	40-140	2	30	
Benzo(a)anthracene	2.94	0.333	mg/kg wet	3.333		88	40-140	2	30	
Benzo(a)pyrene	3.11	0.167	mg/kg wet	3.333		93	40-140	2	30	
Benzo(b)fluoranthene	3.12	0.333	mg/kg wet	3.333		94	40-140	3	30	
Benzo(g,h,i)perylene	2.84	0.333	mg/kg wet	3.333		85	40-140	7	30	
Benzo(k)fluoranthene	3.30	0.333	mg/kg wet	3.333		99	40-140	7	30	
bis(2-Chloroethoxy)methane	2.04	0.333	mg/kg wet	3.333		61	40-140	15	30	
bis(2-Chloroethyl)ether	1.99	0.010	mg/kg wet	3.333		60	40-140	17	30	
bis(2-chloroisopropyl)Ether	1.96	0.013	mg/kg wet	3.333		59	40-140	17	30	
bis(2-Ethylhexyl)phthalate	3.02	0.333	mg/kg wet	3.333		91	40-140	7	30	
Butylbenzylphthalate	3.25	0.333	mg/kg wet	3.333		97	40-140	7	30	
Chrysene	2.91	0.167	mg/kg wet	3.333		87	40-140	2	30	
Dibenzo(a,h)Anthracene	2.86	0.010	mg/kg wet	3.333		86	40-140	3	30	
Dibenzofuran	2.27	0.333	mg/kg wet	3.333		68	40-140	7	30	
Diethylphthalate	2.72	0.333	mg/kg wet	3.333		82	40-140	0.6	30	
Dimethylphthalate	2.52	0.010	mg/kg wet	3.333		76	40-140	2	30	
Di-n-butylphthalate	2.94	0.333	mg/kg wet	3.333		88	40-140	0.5	30	
Di-n-octylphthalate	3.26	0.333	mg/kg wet	3.333		98	40-140	9	30	
Fluoranthene	2.77	0.333	mg/kg wet	3.333		83	40-140	3	30	
Fluorene	2.50	0.333	mg/kg wet	3.333		75	40-140	3	30	
Hexachlorobenzene	2.72	0.010	mg/kg wet	3.333		82	40-140	2	30	
Hexachlorobutadiene	2.06	0.333	mg/kg wet	3.333		62	40-140	16	30	
Hexachloroethane	2.00	0.011	mg/kg wet	3.333		60	40-140	17	30	
Indeno(1,2,3-cd)Pyrene	2.85	0.333	mg/kg wet	3.333		85	40-140	4	30	
Isophorone	1.71	0.333	mg/kg wet	3.333		51	40-140	16	30	
Naphthalene	2.01	0.333	mg/kg wet	3.333		60	40-140	16	30	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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8270D Semi-Volatile Organic Compounds

Batch DD00105 - 3546

Nitrobenzene	2.04	0.333	mg/kg wet	3.333		61	40-140	15	30	
N-Nitrosodimethylamine	2.70	0.333	mg/kg wet	3.333		81	40-140	3	30	
Pentachlorophenol	3.13	0.300	mg/kg wet	3.333		94	30-130	0.6	30	
Phenanthrene	2.68	0.333	mg/kg wet	3.333		80	40-140	0.7	30	
Phenol	2.03	0.011	mg/kg wet	3.333		61	30-130	19	30	
Pyrene	3.12	0.333	mg/kg wet	3.333		94	40-140	10	30	
Pyridine	1.96	1.67	mg/kg wet	3.333		59	40-140	16	30	
Surrogate: 1,2-Dichlorobenzene-d4	1.99		mg/kg wet	3.333		60	30-130			
Surrogate: 2,4,6-Tribromophenol	4.10		mg/kg wet	5.000		82	30-130			
Surrogate: 2-Chlorophenol-d4	3.11		mg/kg wet	5.000		62	30-130			
Surrogate: 2-Fluorobiphenyl	2.13		mg/kg wet	3.333		64	30-130			
Surrogate: 2-Fluorophenol	3.18		mg/kg wet	5.000		64	30-130			
Surrogate: Nitrobenzene-d5	2.08		mg/kg wet	3.333		62	30-130			
Surrogate: Phenol-d6	3.08		mg/kg wet	5.000		62	30-130			
Surrogate: p-Terphenyl-d14	3.17		mg/kg wet	3.333		95	30-130			

Classical Chemistry

Batch DC03051 - General Preparation

Blank										
Total Organic Carbon (1)	ND	100	mg/kg							
Total Organic Carbon (2)	ND	100	mg/kg							

LCS										
Total Organic Carbon (1)	9110	100	mg/kg	10000		91	80-120			
Total Organic Carbon (2)	9550	100	mg/kg	10000		96	80-120			

LCS Dup										
Total Organic Carbon (1)	9700	100	mg/kg	10000		97	80-120	6	20	
Total Organic Carbon (2)	9380	100	mg/kg	10000		94	80-120	2	20	

Batch DD00218 - General Preparation

Blank										
Reactive Cyanide	ND	2.0	mg/kg							
Reactive Sulfide	ND	2.0	mg/kg							

LCS										
Reactive Cyanide	4.3	2.0	mg/kg	100.3		4	0.68-5.41			
Reactive Sulfide	ND	2.0	mg/kg	10.00		0	0-44			

Batch DD00232 - General Preparation

Blank										
Conductivity	ND	5	umhos/cm							

LCS										
Conductivity	1370		umhos/cm	1411		97	90-110			

Batch DD00251 - General Preparation

Reference										
Flashpoint	81		°F	81.00		99	97.9-102.1			



CERTIFICATE OF ANALYSIS

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ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
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MADEP-EPH Extractable Petroleum Hydrocarbons

Batch DC03103 - 3546

Blank

C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							

Surrogate: 1-Chlorooctadecane 1.59 mg/kg wet 2.020 78 40-140

Blank

C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
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Surrogate: 2-Bromonaphthalene 47.8 mg/L 50.00 96 40-140

Surrogate: 2-Fluorobiphenyl 43.2 mg/L 50.00 86 40-140

Surrogate: O-Terphenyl 1.75 mg/kg wet 2.008 87 40-140

Blank

2-Methylnaphthalene	ND	0.020	mg/kg wet							
Acenaphthene	ND	0.020	mg/kg wet							
Acenaphthylene	ND	0.020	mg/kg wet							
Anthracene	ND	0.008	mg/kg wet							
Benzo(a)anthracene	ND	0.008	mg/kg wet							
Benzo(a)pyrene	ND	0.008	mg/kg wet							
Benzo(b)fluoranthene	ND	0.020	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.020	mg/kg wet							
Benzo(k)fluoranthene	ND	0.020	mg/kg wet							
Chrysene	ND	0.020	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.008	mg/kg wet							
Fluoranthene	ND	0.020	mg/kg wet							
Fluorene	ND	0.008	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.020	mg/kg wet							
Naphthalene	ND	0.020	mg/kg wet							
Phenanthrene	ND	0.020	mg/kg wet							
Pyrene	ND	0.020	mg/kg wet							

LCS

C19-C36 Aliphatics1	15.0	15.0	mg/kg wet	16.00		94	40-140			
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CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DC03103 - 3546										
C9-C18 Aliphatics1	9.6	15.0	mg/kg wet	12.00		80	40-140			
Decane (C10)	1.0	0.5	mg/kg wet	2.000		49	40-140			
Docosane (C22)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Dodecane (C12)	1.2	0.5	mg/kg wet	2.000		59	40-140			
Eicosane (C20)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Hexacosane (C26)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Hexadecane (C16)	1.7	0.5	mg/kg wet	2.000		85	40-140			
Hexatriacontane (C36)	1.6	0.5	mg/kg wet	2.000		78	40-140			
Nonadecane (C19)	1.7	0.5	mg/kg wet	2.000		85	40-140			
Nonane (C9)	0.8	0.5	mg/kg wet	2.000		39	30-140			
Octacosane (C28)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Octadecane (C18)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Tetracosane (C24)	1.7	0.5	mg/kg wet	2.000		86	40-140			
Tetradecane (C14)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Triacontane (C30)	1.7	0.5	mg/kg wet	2.000		83	40-140			
<i>Surrogate: 1-Chlorooctadecane</i>	<i>1.82</i>		mg/kg wet	<i>2.020</i>		<i>90</i>	<i>40-140</i>			
LCS										
C11-C22 Unadjusted Aromatics1	31.1	15.0	mg/kg wet	34.00		91	40-140			
<i>Surrogate: 2-Bromonaphthalene</i>	<i>52.9</i>		mg/L	<i>50.00</i>		<i>106</i>	<i>40-140</i>			
<i>Surrogate: 2-Fluorobiphenyl</i>	<i>51.5</i>		mg/L	<i>50.00</i>		<i>103</i>	<i>40-140</i>			
<i>Surrogate: O-Terphenyl</i>	<i>1.95</i>		mg/kg wet	<i>2.008</i>		<i>97</i>	<i>40-140</i>			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	1.64	0.100	mg/kg wet	2.000		82	40-140			
Acenaphthene	1.80	0.100	mg/kg wet	2.000		90	40-140			
Acenaphthylene	1.92	0.100	mg/kg wet	2.000		96	40-140			
Anthracene	1.86	0.040	mg/kg wet	2.000		93	40-140			
Benzo(a)anthracene	1.78	0.040	mg/kg wet	2.000		89	40-140			
Benzo(a)pyrene	2.09	0.040	mg/kg wet	2.000		104	40-140			
Benzo(b)fluoranthene	1.99	0.100	mg/kg wet	2.000		100	40-140			
Benzo(g,h,i)perylene	1.84	0.100	mg/kg wet	2.000		92	40-140			
Benzo(k)fluoranthene	1.98	0.100	mg/kg wet	2.000		99	40-140			
Chrysene	1.92	0.100	mg/kg wet	2.000		96	40-140			
Dibenzo(a,h)Anthracene	2.02	0.040	mg/kg wet	2.000		101	40-140			
Fluoranthene	2.07	0.100	mg/kg wet	2.000		104	40-140			
Fluorene	1.89	0.040	mg/kg wet	2.000		95	40-140			
Indeno(1,2,3-cd)Pyrene	2.16	0.100	mg/kg wet	2.000		108	40-140			
Naphthalene	1.50	0.100	mg/kg wet	2.000		75	40-140			
Phenanthrene	1.82	0.100	mg/kg wet	2.000		91	40-140			
Pyrene	2.07	0.100	mg/kg wet	2.000		104	40-140			
LCS Dup										



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DC03103 - 3546										
C19-C36 Aliphatics1	14.6	15.0	mg/kg wet	16.00		91	40-140	3	25	
C9-C18 Aliphatics1	8.7	15.0	mg/kg wet	12.00		73	40-140	9	25	
Decane (C10)	0.9	0.5	mg/kg wet	2.000		43	40-140	13	25	
Docosane (C22)	1.7	0.5	mg/kg wet	2.000		86	40-140	2	25	
Dodecane (C12)	1.0	0.5	mg/kg wet	2.000		51	40-140	15	25	
Eicosane (C20)	1.7	0.5	mg/kg wet	2.000		86	40-140	2	25	
Hexacosane (C26)	1.7	0.5	mg/kg wet	2.000		84	40-140	2	25	
Hexadecane (C16)	1.6	0.5	mg/kg wet	2.000		81	40-140	5	25	
Hexatriacontane (C36)	1.5	0.5	mg/kg wet	2.000		76	40-140	3	25	
Nonadecane (C19)	1.7	0.5	mg/kg wet	2.000		84	40-140	1	25	
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		35	30-140	12	25	
Octacosane (C28)	1.7	0.5	mg/kg wet	2.000		84	40-140	2	25	
Octadecane (C18)	1.7	0.5	mg/kg wet	2.000		85	40-140	2	25	
Tetracosane (C24)	1.7	0.5	mg/kg wet	2.000		85	40-140	2	25	
Tetradecane (C14)	1.3	0.5	mg/kg wet	2.000		64	40-140	12	25	
Triacontane (C30)	1.6	0.5	mg/kg wet	2.000		81	40-140	2	25	
<i>Surrogate: 1-Chlorooctadecane</i>	<i>1.74</i>		mg/kg wet	<i>2.020</i>		<i>86</i>	<i>40-140</i>			
LCS Dup										
C11-C22 Unadjusted Aromatics1	31.2	15.0	mg/kg wet	34.00		92	40-140	0.3	25	
<i>Surrogate: 2-Bromonaphthalene</i>	<i>51.6</i>		mg/L	<i>50.00</i>		<i>103</i>	<i>40-140</i>			
<i>Surrogate: 2-Fluorobiphenyl</i>	<i>48.9</i>		mg/L	<i>50.00</i>		<i>98</i>	<i>40-140</i>			
<i>Surrogate: O-Terphenyl</i>	<i>1.95</i>		mg/kg wet	<i>2.008</i>		<i>97</i>	<i>40-140</i>			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	1.61	0.100	mg/kg wet	2.000		81	40-140	2	30	
Acenaphthene	1.86	0.100	mg/kg wet	2.000		93	40-140	3	30	
Acenaphthylene	1.92	0.100	mg/kg wet	2.000		96	40-140	0.2	30	
Anthracene	2.02	0.040	mg/kg wet	2.000		101	40-140	8	30	
Benzo(a)anthracene	1.88	0.040	mg/kg wet	2.000		94	40-140	6	30	
Benzo(a)pyrene	2.10	0.040	mg/kg wet	2.000		105	40-140	0.6	30	
Benzo(b)fluoranthene	2.02	0.100	mg/kg wet	2.000		101	40-140	1	30	
Benzo(g,h,i)perylene	1.89	0.100	mg/kg wet	2.000		94	40-140	3	30	
Benzo(k)fluoranthene	2.00	0.100	mg/kg wet	2.000		100	40-140	1	30	
Chrysene	2.04	0.100	mg/kg wet	2.000		102	40-140	6	30	
Dibenzo(a,h)Anthracene	2.08	0.040	mg/kg wet	2.000		104	40-140	3	30	
Fluoranthene	2.23	0.100	mg/kg wet	2.000		111	40-140	7	30	
Fluorene	2.00	0.040	mg/kg wet	2.000		100	40-140	5	30	
Indeno(1,2,3-cd)Pyrene	2.20	0.100	mg/kg wet	2.000		110	40-140	2	30	
Naphthalene	1.46	0.100	mg/kg wet	2.000		73	40-140	3	30	
Phenanthrene	1.99	0.100	mg/kg wet	2.000		100	40-140	9	30	
Pyrene	2.06	0.100	mg/kg wet	2.000		103	40-140	0.3	30	



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

Notes and Definitions

- Z18 Temperature is not within 23 +/-2 °C.
- Z-10a Soil pH measured in water at 20.7 °C.
- Z-10 Soil pH measured in water at 20.4 °C.
- Z-08 See Attached
- WL Results obtained from a deionized water leach of the sample.
- U Analyte included in the analysis, but not detected
- Q Calibration required quadratic regression (Q).
- P Percent difference between primary and confirmation results exceeds 40% (P).
- LC Lower value is used due to matrix interferences (LC).
- D Diluted.
- CD+ Continuing Calibration %Diff/Drift is above control limit (CD+).
- CD- Continuing Calibration %Diff/Drift is below control limit (CD-).
- B- Blank Spike recovery is below lower control limit (B-).
- > Greater than.
- ND Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- MDL Method Detection Limit
- MRL Method Reporting Limit
- LOD Limit of Detection
- LOQ Limit of Quantitation
- DL Detection Limit
- I/V Initial Volume
- F/V Final Volume
- § Subcontracted analysis; see attached report
- 1 Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
- 2 Range result excludes concentrations of target analytes eluting in that range.
- 3 Range result excludes the concentration of the C9-C10 aromatic range.
- Avg Results reported as a mathematical average.
- NR No Recovery
- [CALC] Calculated Analyte
- SUB Subcontracted analysis; see attached report
- RL Reporting Limit
- EDL Estimated Detection Limit
- MF Membrane Filtration
- MPN Most Probably Number
- TNTC Too numerous to Count
- CFU Colony Forming Units



CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond

Client Project ID: Sawmill Brook - Saugus - MGP - 401WQ

ESS Laboratory Work Order: 20C0943

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179

<http://www.health.ri.gov/find/labs/analytical/ESS.pdf>

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750

http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutOfStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002

<http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml>

Massachusetts Potable and Non Potable Water: M-RI002

<http://public.dep.state.ma.us/Labcert/Labcert.aspx>

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424

<http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm>

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313

<http://www.wadsworth.org/labcert/elap/comm.html>

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006

http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752

<http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx>



195 Frances Avenue
 Cranston RI, 02910
 Phone: (401)-467-6454
 Fax: (401)-467-2398
thielsch.com
Let's Build a Solid Foundation

Client Information:
 Tighe & Bond
 Pocasset, MA
 PM: Emma Larkin
 Assigned By: Emma Larkin
 Collected By: E. Larkin

Project Information:
MBTS - Sawmill Brook
 ESS Project Number: 20C0943
 Summary Page: 1 of 1
 Report Date: 04.03.2020

LABORATORY TESTING DATA SHEET, Report No.: 7420-D-102

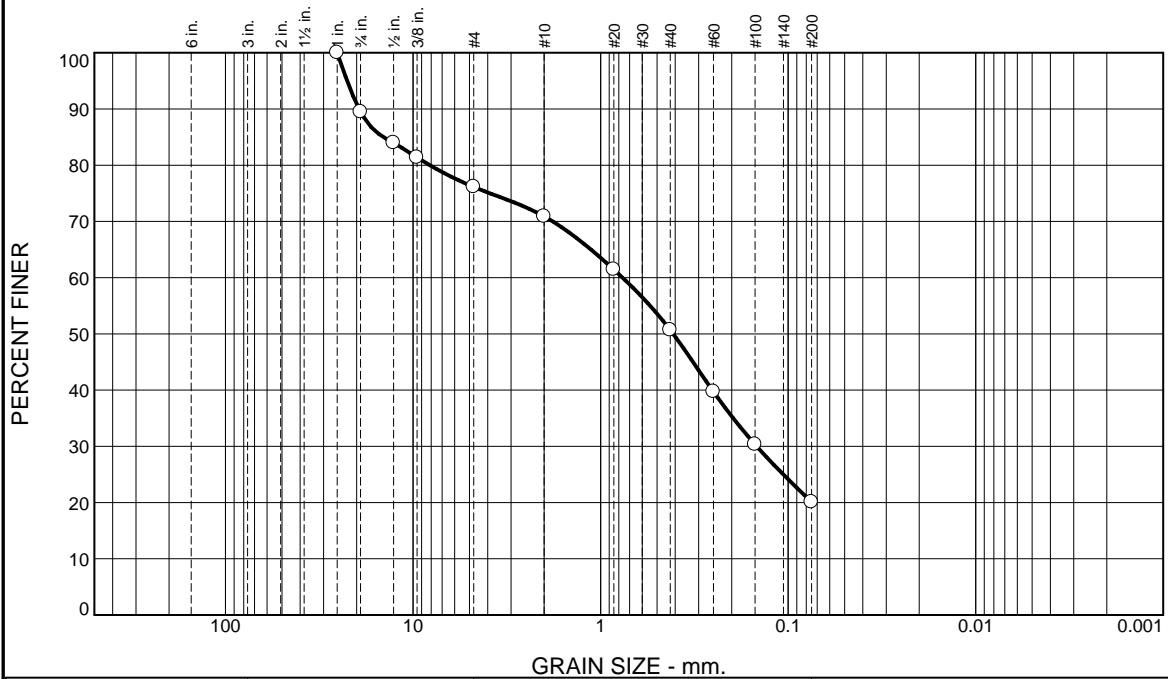
Source	Sample No.	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests							Laboratory Log and Soil Description	
			As Received Water Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	G _s	Dry unit wt. pcf	Test Water Content %	γ _d MAX (pcf) W _{opt} (%)	γ _d MAX (pcf) W _{opt} (%) (Corr.)	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"		Permeability cm/sec
			D2216	D4318		D6913			D2974	D854			D1557						
Composite	WALL-SED-1	20C0943-01				23.9	56.0	20.1										Very Dark Brown fine grained peat with gravel	
Composite	WALL-SED-2	20C0943-02				15.0	36.5	48.5										Very Dark Brown fine grained peat with gravel	

Date Received: 04.01.2020

Reviewed By: *SKW*

Date Reviewed: 04.06.2020

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.5	13.4	5.2	20.2	30.6	20.1	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
0.75"	89.5		
0.5"	84.0		
0.375"	81.4		
#4	76.1		
#10	70.9		
#20	61.4		
#40	50.7		
#60	39.7		
#100	30.3		
#200	20.1		

* (no specification provided)

Material Description

Very Dark Brown fine grained peat with gravel

Atterberg Limits (ASTM D 4318)

PL= _____ LL= _____ PI= _____

Classification

USCS (D 2487)= Pt _____ AASHTO (M 145)= A-8

Coefficients

D₉₀= 19.3993 D₈₅= 14.3900 D₆₀= 0.7640
D₅₀= 0.4101 D₃₀= 0.1470 D₁₅= _____
D₁₀= _____ C_u= _____ C_c= _____

Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Date Received: 04.01.2020 Date Tested: 04.03.2020

Tested By: JM _____

Checked By: Steven Accetta _____

Title: Laboratory Coordinator _____

Source of Sample: Composite
Sample Number: WALL-SED-1

Date Sampled: 03.31.2020

Thielsch Engineering Inc.

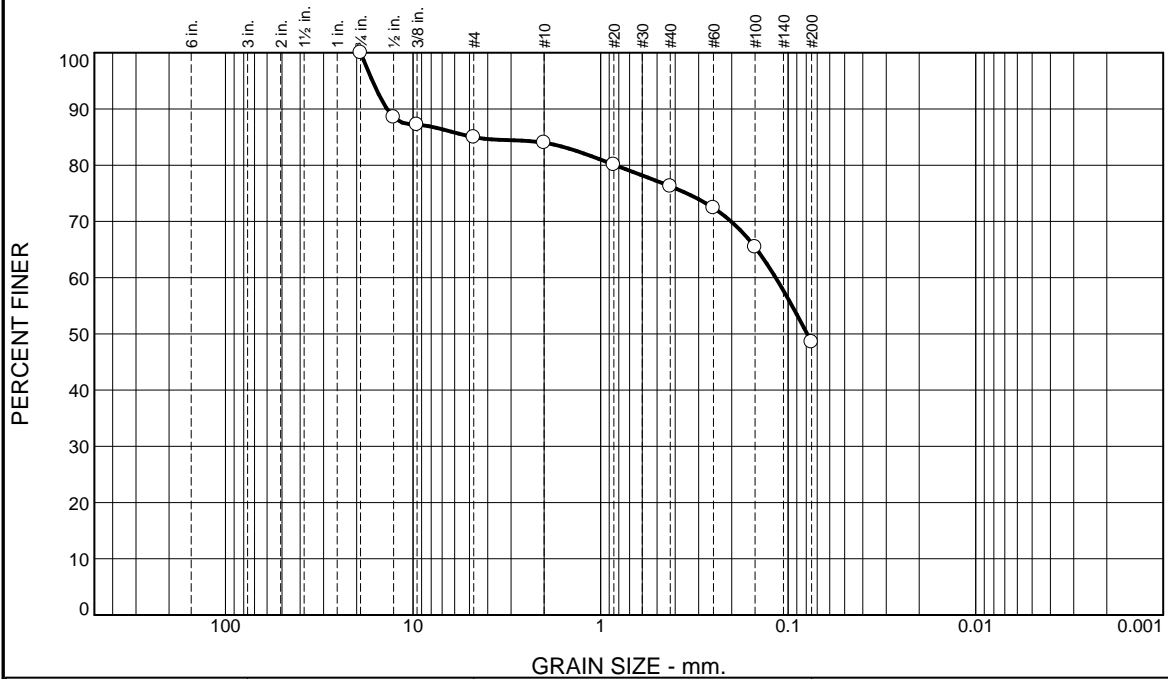
Client: Tighe & Bond
Project: MBTS - Sawmill Brook

Cranston, RI

Project No: 20C0943

Figure 20C0943-01

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	15.0	1.0	7.7	27.8	48.5	

Test Results (D6913 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.75"	100.0		
0.5"	88.6		
0.375"	87.2		
#4	85.0		
#10	84.0		
#20	80.1		
#40	76.3		
#60	72.4		
#100	65.4		
#200	48.5		

Material Description

Very Dark Brown fine grained peat with gravel

Atterberg Limits (ASTM D 4318)

PL= _____ LL= _____ PI= _____

Classification

USCS (D 2487)= Pt _____ AASHTO (M 145)= A-8

Coefficients

D₉₀= 13.7646 D₈₅= 4.7594 D₆₀= 0.1165
D₅₀= 0.0791 D₃₀= _____ D₁₅= _____
D₁₀= _____ C_u= _____ C_c= _____

Remarks

Sample visually classified as plastic. Sample rolled to 1/8".

Date Received: 04.01.2020 Date Tested: 04.03.2020

Tested By: JM _____

Checked By: Steven Accetta _____

Title: Laboratory Coordinator _____

* (no specification provided)

Source of Sample: Composite
Sample Number: WALL-SED-2

Date Sampled: 03.31.2020

Thielsch Engineering Inc.
Cranston, RI

Client: Tighe & Bond
Project: MBTS - Sawmill Brook
Project No: 20C0943

Figure 20C0943-02

CFS

ESS Laboratory

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 www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time: 5-Day Rush:
 Regulatory State: Massachusetts
 Is this project for any of the following?:
 MA-MCP CT-RCP RGP Remediation

Project # 22-1476-0147
 Project Name MBTS - Sawmill Brook
 Address 4 Barlows Landing
 Zip Code 02559 PO #
 Email Address elarkin@tighebond.com

ESS Lab # 2000443
 Reporting Limits 401 Water Quality Cert / RCS-1 / Saugus Aggregate

Electronic Deliverables Limit Checker Excel
 Other (Please Specify) → EDD to Jill Libby

Analysis		VOCs - Low Level (HOLD)	VOCs - High Level	SVOCs	MCP 14 Metals With Copper	EPH with PAH	PCB NOAA Congeners	TPH	TOC - Loyd Kahn	Conductivity	Reactivity	pH	Ignitability	Grain Size	ORP
1	3/31/20 12:30	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	3/31/20 14:00	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Company Name Tighe & Bond
 Contact Person Emma Larkin
 City Pocasset
 State MA
 Telephone Number (508) 304-6355
 FAX Number
 Sample ID WALL-SED-1
 WALL-SED-2

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID
1	3/31/20	12:30	Grab/Composite	Sediment	WALL-SED-1
2	3/31/20	14:00	Grab/Composite	Sediment	WALL-SED-2

Container Type	1-Non Preserved	2-HCl	3-H2SO4	4-HNO3	5-NeOH	6-Methanol	7-Na2S2O3	8-ZnAc2	NaOH	9-NH4Cl	10-DI H2O	11-Other	V	AG
AG-Amber Glass														
B-BOD Bottle														
G-Glass														
P-Poly														
S-Sterile														
V-Vial														
O-Other														
Number of Containers:													3	5

Sampled by: E-LARKIN
 Laboratory Use Only
 Cooler Present:
 Seals Intact:
 Cooler Temperature: NA °C (Temp: 0.8)

Comments: Please specify "Other" preservative and containers types in this space
 VOC sample was grab; Run LL VOC if HL does not have sufficient reporting limits for 401 WQC / Saugus Aggregate, include Pyridine on SVOCs; run Hx Cr if total Cr > 100 mg/kg; run TCLP if 20X rule is exceeded; Email CC to ghadman@tighebond.com; other: 2 DI Vials, 1 MeOH Vial

Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)
<i>Emma Larkin</i> 3/31/20 14:30	<i>J. Larkin</i> 3/31/20 17:00
<i>Emma Larkin</i> 3/31/20 17:47	<i>J. Larkin</i> 3/31/20 17:00

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB
 Shipped/Delivered Via: ESS Courier

ESS Project ID: 20C0943
 Date Received: 3/31/2020
 Project Due Date: 4/7/2020
 Days for Project: 5 Day

1. Air bill manifest present? No
 Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
 Temp: 0.8 Iced with: Ice
5. Was COC signed and dated by client? Yes

6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. Were labs informed about short holds & rushes? Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
 ESS Sample IDs: _____
 Analysis: _____
 TAT: _____

12. Were VOAs received? Yes / No
 a. Air bubbles in aqueous VOAs? Yes / No
 b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
 a. If metals preserved upon receipt: Date: 3/31/20 Time: 1509 By: AI
 b. Low Level VOA vials frozen: Date: _____ Time: _____ By: _____

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
 a. Was there a need to contact the client? Yes / No
 Who was contacted? _____ Date: _____ Time: _____ By: _____

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	28562	Yes	N/A	Yes	8 oz jar	NP	
1	28564	Yes	N/A	Yes	8 oz jar	NP	
1	28565	Yes	N/A	Yes	8 oz jar	NP	
1	28568	Yes	N/A	Yes	4 oz. Jar	NP	
1	28569	Yes	N/A	Yes	2 oz. Jar	NP	
1	28572	Yes	N/A	Yes	VOA Vial	MeOH	
1	28574	Yes	N/A	Yes	VOA Vial	DI Water	
1	28575	Yes	N/A	Yes	VOA Vial	DI Water	
2	28563	Yes	N/A	Yes	8 oz jar	NP	
2	28566	Yes	N/A	Yes	8 oz jar	NP	
2	28567	Yes	N/A	Yes	8 oz jar	NP	
2	28570	Yes	N/A	Yes	4 oz. Jar	NP	
2	28571	Yes	N/A	Yes	2 oz. Jar	NP	
2	28573	Yes	N/A	Yes	VOA Vial	MeOH	
2	28576	Yes	N/A	Yes	VOA Vial	DI Water	
2	28577	Yes	N/A	Yes	VOA Vial	DI Water	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPBTB

ESS Project ID: 20C0943

Date Received: 3/31/2020

2nd Review

Were all containers scanned into storage/lab?

Initials AG

Are barcode labels on correct containers?

Yes / No

Are all Flashpoint stickers attached/container ID # circled?

Yes / No / NA

Are all Hex Chrome stickers attached?

Yes / No / NA

Are all QC stickers attached?

Yes / No / NA

Are VOA stickers attached if bubbles noted?

Yes / No / NA

Completed

By: Amber Garcia

Date & Time: 03/31/20 17:52

Reviewed

By: AM

Date & Time: 3/31/20 1806

Delivered

By: AM

Date & Time: 3/31/20 1806

ESS Laboratory

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CHAIN OF CUSTODY

ESS Lab # 2000943
 Reporting Limits: 401 Water Quality Cert / RCS-1 / Saugus Aggregate

Turn Time: 5-Day Rush:
 Regulatory State: Massachusetts
 Is this project for any of the following?:
 MA-MCP CT-RCP RGP Remediation

Electronic Limit Checker Excel
 Deliverables Other (Please Specify) → EDD to Jill Libby

Company Name: Tighe & Bond
 Project #: 22-1476-01475
 Project Name: MBTS - Sawmill Brook
 Contact Person: Emma Larkin
 Address: 4 Barlows Landing
 City: Pocasset State: MA
 Zip Code: 02559 PO #:
 Telephone Number (508) 304-6355
 FAX Number:
 Email Address: elarkin@tighebond.com

Analysis:
 VOCs - Low Level (HOLD)
 VOCs - High Level
 SVOCs
 MCP 14 Metals With Copper
 EPH with PAH
 PCB NOAA Congeners
 TPH
 TOC - Loyd Kahn
 Conductivity
 Reactivity
 pH
 Ignitability
 Grain Size
 ORP
 TCLP LEAD

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VOCs - Low Level (HOLD)	VOCs - High Level	SVOCs	MCP 14 Metals With Copper	EPH with PAH	PCB NOAA Congeners	TPH	TOC - Loyd Kahn	Conductivity	Reactivity	pH	Ignitability	Grain Size	ORP	TCLP LEAD	
1	3/31/20	12:30	Grab/Composite	Sediment	WALL-SED-1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	3/31/20	14:00	Grab/Composite	Sediment	WALL-SED-2		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	3/31/20	1230	grab/composite	sediment	WALL-SED-1 - AIR DRIED				X												
4	3/31/20	1400	grab/composite	sediment	WALL-SED-1 - AIR DRIED				X												
					ML - 4/10/20																

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other
 Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
 Number of Containers: 3 5

Laboratory Use Only
 Cooler Present:
 Seals Intact: NA
 Cooler Temperature: 0.8 °C ice temp: 0.8
 Sampled by: E-LARKIN
 Comments: Please specify "Other" preservative and containers types in this space
 VOC sample was grab; Run LL VOC if HL does not have sufficient reporting limits for 401 WQC / Saugus Aggregate, include Pyridine on SVOCs; run Hx Cr if total Cr >100 mg/kg; run TCLP if 20X rule is exceeded; Email CC to ghedman@tighebond.com; other: 2 DI Vials, 1 MeOH Vial

Relinquished by: (Signature, Date & Time) <u>GMM 2010</u> 3/31/20 14:30	Received By: (Signature, Date & Time) <u>JLR</u> 3/31/20 14:33	Relinquished By: (Signature, Date & Time) <u>JLR</u> 3/31/20 17:00	Received By: (Signature, Date & Time)
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time) <u>Amber Garcia</u> 03/31/20 17:17	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

ESS Laboratory

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 185 Frances Avenue, Cranston RI 02910
 Tel. (401) 461-7181 Fax (401) 461-4486
 www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 2000943

Turn Time: 5-Day Rush:

Reporting Limits 401 Water Quality Cert / RCS-1 / Saugus Aggregate

Regulatory State: Massachusetts

Is this project for any of the following?:
 MA-MCP CT-RCP RGP Remediation

Electronic Deliverables Limit Checker Excel
 Other (Please Specify) → EDD to Jill Libby

Company Name Tighe & Bond		Project # 22-1476-01475		Project Name MBTS - Sawmill Brook	
Contact Person Emma Larkin		Address 4 Barlows Landing			
City Pocasset		State MA	Zip Code 02559	PO #	
Telephone Number (508) 304-6355		FAX Number		Email Address elarkin@tighebond.com	

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VOCs - Low Level (HOLD)	VOCs - high Level	SVOCs	MCP 14 Metals With Copper	EPH with PAH	PCB NOAA Congeners	TPH	TOC - Loyd Kahn	Conductivity	Reactivity	pH	Ignitability	Grain Size	ORP
1	3/31/20	12:30	Grab/Composite	Sediment	WALL-SED-1		X	X	X	X	X	X	X	X	X	X	X	X	X
2	3/31/20	14:00	Grab/Composite	Sediment	WALL-SED-2		X	X	X	X	X	X	X	X	X	X	X	X	X

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other V AG

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* 11 1

Number of Containers: 3 5

Laboratory Use Only Cooler Present: <input checked="" type="checkbox"/> Seals Intact: <input checked="" type="checkbox"/> Cooler Temperature: °C ice temp: 0.8		Sampled by: E-LARKIN Comments: Please specify "Other" preservative and containers types in this space VOC sample was grab; Run LL VOC if HL does not have sufficient reporting limits for 401 WQC / Saugus Aggregate, include Pyridine on SVOCs; run Hx Cr if total Cr >100 mg/kg; run TCLP if 20X rule is exceeded; Email CC to ghedman@tighebond.com; other: 2 DI Vials, 1 MeOH Vial	
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
<i>GMM 2012</i> 3/31/20 14:30	<i>JLR</i> 3/31/20 14:33	<i>JLR</i> 3/31/20 17:00	
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
	<i>Amber Garcia</i> 03/31/20 17:17		

Tighe&Bond

APPENDIX H

CERTIFICATE OF THE SECRETARY OF ENERGY AND
ENVIRONMENTAL AFFAIRS ON THE ENVIRONMENTAL
NOTIFICATION FORM

EEA #16127



The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Charles D. Baker
GOVERNOR

Karyn E. Polito
LIEUTENANT GOVERNOR

Kathleen A. Theoharides
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1181
<http://www.mass.gov/eea>

January 10, 2020

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME : Central Street Bridge Reconstruction and Central Pond/
Sawmill Brook Restoration Project
PROJECT MUNICIPALITY : Manchester-by-the-Sea
PROJECT WATERSHED : North Coastal
EEA NUMBER : 16127
PROJECT PROPONENT : Town of Manchester-by-the-Sea
DATE NOTICED IN MONITOR : December 12, 2019

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **does not require** an Environmental Impact Report (EIR).

Project Description

The purpose of the project is to repair the Central Street Bridge, restore natural tidal flow and ecological conditions to Sawmill Brook and enhance the resiliency of Sawmill Brook from flooding under current and future conditions. As noted below, the project is the recipient of grant funding through the Municipal Vulnerability Preparedness program, through these bridge upgrades were identified as a top priority to promote resiliency in municipal infrastructure to prepare for climate change. As described in the ENF, the project includes the following components:

- Replacement of the existing Central Street Bridge with a new bridge with a 20-ft wide span;
- Reconstruction of the surface roadway over the bridge to accommodate two 11-ft travel lanes, two 1-ft wide shoulders, a 5.5-ft wide sidewalk on the north side of the bridge and a 5.5-ft to 11.5-ft wide sidewalk on the south side;

- Removal of the concrete tide gate structure and associated infrastructure on the south side of the bridge;
- Repair/reconstruction of stone walls along the east bank of the Sawmill Brook impoundment (Central Pond) upstream of the bridge; and,
- Restoration of the natural stream channel, vegetated bank and salt marsh in Sawmill Brook; if necessary, based on monitoring of natural restoration processes expected to occur with the removal of the tide gate and construction of a bridge with a wider span.

According to the ENF, removal of the tide gate and widening of the bridge span is not expected to cause a significant net of mobilization of sediment into or out of Sawmill Brook. An equilibrium is expected to be established by sediment moving into the brook under high tide conditions and out of the brook at low tides and periods of high stream flow. The tide gate has been left open for the last year to relieve hydraulic stress on the bridge. During this time, Sawmill Brook has been subject to daily tidal action and stream flows that would have transported fine sediments in a manner similar to that expected by the unrestricted tidal flows proposed as a result of the project.

Project Site

The 2.92-acre project site includes the bridge, the Central Pond/Sawmill Brook impoundment and land immediately adjacent to the bridge and impoundment. The bridge carries Central Street (Route 127) in an east-west direction over the mouth of Sawmill Brook where it meets Manchester Harbor. The bridge includes a 16-ft span mortared stone masonry circular arch with stone masonry wingwalls and headwalls. The bridge is built upon a ledge outcropping and is not constructed on pilings. According to the ENF, the condition of the bridge is deteriorating due to overtopping of the bridge during extreme storm events, seepage through the wingwalls and loss of backfill material. A concrete and iron tide gate is located at the south (downstream) side of the bridge. The tide gate does not enclose the entire bridge span and under high tide conditions, water from Manchester Harbor flows around and over the tide gate upstream through the bridge arch and into Sawmill Brook. The tide gate has been left open for the past year, allowing tidal exchange through the bridge arch under all tidal conditions; however, the narrow opening and bottom components of the tide gate structure serve to constrict flow into the harbor and maintain the impoundment.

Sawmill Brook enters the Central Pond impoundment from the north. Sawmill Brook and its tributaries receive drainage from approximately 75 percent of the land area of the Town of Manchester-by-the-Sea (Town). Central Pond is an approximately 1.5-acre impoundment of Sawmill Brook and is located north (upstream) of the bridge. According to the ENF, when the tide gate is closed, the depth of water in the pond ranges from 4.25 ft at low tide to 4.9 ft at high tide; when tide gate is open, the water depth in the impoundment ranges from 1.01 ft at low tide to 5.04 ft at high tide. At low tide, two large areas of mudflats are exposed within the impounded area. The eastern shoreline of the pond is comprised of a stone wall that has collapsed in places due to erosion of its foundation, overtopping of the wall under flood conditions and surface drainage. The western shoreline of the pond has a more gradual slope. Stream and tidal flows and stormwater discharges from outfalls on the west bank have caused both sediment deposition and erosion in sections of the shoreline.

As shown on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) (number 25009C0434G, effective date July 16, 2014), the project site is located within the 100-year floodplain (Zone AE) with a Base Flood Elevation (BFE) of 311 ft North American Vertical Datum of 1988 (NAVD 88). According to the Division of Marine Fisheries (DMF), Sawmill Brook includes habitat for migratory rainbow smelt (*Osmerus mordax*) and habitat for American eel (*Anguilla rostrata*).

Environmental Impacts and Mitigation

Potential environmental impacts associated with the project include alteration of 2,055 linear feet (lf) of Coastal Bank, 52,190 square feet (sf) of Riverfront Area, 50,635 sf of Land Subject to Coastal Storm Flowage (LSCSF) and 72,405 sf of Land Under the Ocean (LUO), including 7,600 sf that will be permanently impacted by the placement of riprap along the edge of the reconstructed seawall. Activities to restore ecological conditions in Sawmill Brook may include dredging to facilitate formation of a new channel, construction of instream rock grade-control structures, installation of a living shoreline to stabilize the bank on the west side of the pond and planting of salt marsh in intertidal areas. These activities would occur within areas that will be altered as a result of changing the impoundment to a tidal stream; however, the ENF did not provide detailed designs of these potential restoration measures and described potential impacts at a conceptual level.

As noted, the purpose of the project is to repair the Central Street Bridge, restore natural tidal flow and ecological conditions to Sawmill Brook and enhance the resiliency of Sawmill Brook from flooding under current and future conditions. Measures to minimize construction period impacts include using a temporary cofferdam or turbidity curtain during dredging; working at low tide to the extent feasible; implementing sedimentation and erosion controls for work in upland areas; and stabilizing work areas upon completion of construction.

The Town has also conceptually identified potential future measures that may be needed, including in-stream modifications, bank stabilization and salt marsh planting, in order to facilitate restoration of Sawmill Brook. Future restoration measures are not currently anticipated to meet or exceed mandatory thresholds for the preparation of an EIR, but the Town should consult with the MEPA Office to determine whether a Notice of Project Change (NPC) should be filed prior to the final design and construction of such future restoration measures. Implementation of additional restoration measures may require further MEPA review and/or additional permits in order to identify impacts and mitigation. Comments from the Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Office of Coastal Zone Management (CZM) support the reevaluation of restoration options based on monitoring of conditions after the bridge has been reconstructed and tide gate removed.

Permitting and Jurisdiction

This project is subject to MEPA review and preparation of an ENF pursuant to 301 CMR 11.03(3)(b)(1)(a) and 301 CMR 11.03(3)(b)(1)(f) because it requires State Agency Actions and, involves an alteration of a coastal bank and alteration of one half or more acres of any other wetlands (including Riverfront Area, LSCSF and LUO). The project requires a Chapter 91 (c. 91) License and 401 Water Quality Certification (WQC) from the Massachusetts Department of

Environmental Protection (MassDEP) and Chapter 85 Review from the Massachusetts Department of Transportation (MassDOT).

The project requires an Order of Conditions from the Manchester-by-the-Sea Conservation Commissions (or Superseding Orders of Conditions from MassDEP in the event the Order is appealed). The project requires the submittal of a Pre-Construction Notification pursuant to Army Corps of Engineers' (ACOE) General Permits for Massachusetts, a National Pollutant Discharge Elimination System Construction General Permit (NPDES CGP) from the Environmental Protection Agency (EPA), and may require review by the Massachusetts Historical Commission (MHC) acting as the State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The project has received State Financial Assistance through the Office of Coastal Zone Management (CZM) Coastal Resilience Grant program, the Massachusetts Environmental Trust, the Municipal Vulnerability Preparedness (MVP) grant program and the MassDOT Small Bridge Grant program. Therefore, MEPA jurisdiction is broad in scope and extends to all aspects of the project that may cause Damage to the Environment, as defined in the MEPA regulations.

Review of the ENF

The ENF included a description and plans of existing and proposed conditions and an alternatives analysis. It provided an analysis of the chemical and physical properties of sediment in the pond and a sediment transport analysis for existing and proposed conditions. The ENF identified the project's environmental impacts and proposed mitigation measures.

Alternatives Analysis

The ENF included an evaluation of alternatives for the replacement of the bridge and tide gate, techniques for stabilizing the banks of the impoundment and ecological restoration of Sawmill Brook.

Alternatives to address the condition of the bridge include No Action, Bridge Rehabilitation and Bridge Replacement with Wider Span (Preferred Alternative). The No Action alternative is not feasible due to the poor structural condition of the bridge and lack of pedestrian facilities on the roadway. The Bridge Rehabilitation alternative would include removal of the tide gate and repairing the existing bridge to minimize seepage and to add physical support to its structure. The Bridge Rehabilitation and Preferred Alternative would both impact approximately 15,195 sf of wetland resource areas, including Coastal Bank, LUO and Riverfront Area during the construction period. However, the Bridge Rehabilitation alternative would maintain the existing 16-ft span of the bridge span and would not restore full tidal flow to Sawmill Brook and facilitate its ecological restoration. The Preferred Alternative includes removing the existing tide gate, bridge and culvert and constructing a new bridge with a 20-ft wide span; in addition, the surface of the bridge would be slightly widened to provide sidewalks on both side of the bridge.

The ENF reviewed three alternatives for stabilizing the banks of Sawmill Brook upon replacement of the bridge: Living Shoreline, Segmental Block Wall and Green Gabions. The Living Shoreline alternative would include the use bioengineering techniques such as fiber rolls and plantings to stabilize the shoreline and minimize erosion. This alternative would minimize

structures that would interfere with public access to the shoreline, have the lowest cost and provide long-term habitat benefits, but would not protect the shoreline under severe storm conditions. The Segmental Block Wall alternative would provide limited access to the shoreline and is the costliest alternative, but would provide long-term stability of the shoreline under all storm conditions. It would impact approximately 1,925 lf of Coastal Bank and 39,000 sf of LSCSF. The Green Gabion alternative would involve the use of stone-filled gabions with vegetated faces to replace the existing stone wall on the east side of Central Pond. Compared to the Segmental Block Wall alternative, green gabions would provide a similar level of limited access to the shoreline, would cost less to construct and would have similar impacts to Coastal Bank and LSCSF, but would require greater maintenance to provide long-term stability to the bank. The Preferred Alternative includes the use of a Living Shoreline to stabilize the western shoreline and a Segmental Block Wall to match the existing condition of the eastern shoreline.

Alternatives for the final condition of Sawmill Brook north of the bridge include the maintenance of a Low-Level Impoundment, Creation of Low-Level Pools and Riffles and Restoration of Sawmill Brook to an Unrestricted Tidal Stream (Preferred Alternative). The Low-Level Impoundment alternative would maintain an impoundment similar to the existing Central Pond by constructing a cross-channel berm upstream of the bridge to maintain the water level in the impoundment. According to the ENF, this alternative would not provide the ecological benefits of restoring full tidal flow to the stream. The Low-Level Pools and Riffles alternative would include placement of low-level riffle structures in the stream channel upstream of the bridge to maintain areas of ponding and stream riffles. This alternative would restore fish passage and provide good habitat features, but would be costly to construct and difficult to maintain. The Preferred Alternative will restore the natural tidal stream condition to Sawmill Brook, provide fish passage to upstream sections of the brook and, if necessary, facilitate habitat restoration along the brook through native plantings. The Town intends to monitor conditions along Sawmill Brook after the bridge replacement and tide gate removal are completed to determine whether active restoration measures, such as plantings or a living shoreline are necessary. Comments from MassDEP, CZM and DMF include recommendations for habitat features, such as in-stream riffles, shoreline plantings and bank stabilization measures that the Town should consider implementing as part of its final restoration plan.

Wetlands and Water Quality

The bridge replacement/tide gate removal component of the project will temporarily impact 130 lf of Coastal Bank, 2,005 sf of LUO, 13,190 sf of Riverfront Area and 11,635 sf of LSCSF. These impacts are associated with removal of the existing structures and construction of the new bridge. The new bridge will have a similar footprint as the existing structure and will not cause new permanent impacts to wetlands resource areas. Removal of the tide gate will restore the natural ledge benthic condition that is present throughout the mouth of Sawmill Brook.

A new channel is anticipated to be formed naturally in Sawmill Brook upon removal of the tide gate and reconstruction of the bridge. The ENF included an analysis of the physical and chemical characteristics of sediment in the impoundment. The analysis was intended to provide a preliminary characterization of sediment that will be dredged to reconstruct the wall on the east side of the impoundment and that could be mobilized upon removal of the tide gate and reconstruction of the bridge. Approximately 5,350 cy of sediment is located in the

impoundment, ranging from one foot to six feet in depth. According to the analysis, sediments in the impoundment are generally fine-grained silt. Coarser cobble, sand and gravel form the substrate upstream of the impoundment and cobbles, boulders and gravel form the bottom between the impoundment and the bridge. With the exception of benzo(a)pyrene, concentrations of contaminants are below the MassDEP Reportable Concentration (RCS-1) standards applicable for upland reuse of sediment. According to the ENF, sediments in the impoundment, including those to be dredged in connection with the block wall are suitable for on-site reuse for establishing suitable substrate for salt marsh planting adjacent to Sawmill Brook. The Town will be required to collect additional sediment samples for its 401 WQC application and MassDEP will determine the suitability of sediments for reuse or disposal.

According to the ENF, the wall along the east bank of the impoundment is collapsing due to overtopping of the wall during flood conditions and drainage through the wall from adjacent upland areas. The ENF provided a conceptual design of a segmental block wall that would replace the existing wall on the east side of the impoundment. Based on the conceptual design, construction of the new wall would impact 1,925 lf of Coastal bank, 39,000 sf of Riverfront Area and 7,600 sf of LUO. Impacts to LUO include dredging of approximately 1,000 cubic yards (cy) of sediment from a 750 ft by 4 ft area (3,000 sf) to provide a base for the blocks and placement of riprap over an area of approximately 4,600 sf along the base of the wall for wall stabilization and scour protection. Dredging and construction of the wall will take place behind either a temporary cofferdam or turbidity curtain to minimize sedimentation of the water column during construction activities. The ENF did not identify measures that could be implemented to minimize potential erosion of the bank adjacent to the wall from upland drainage sources that could cause the wall to collapse. The final design of the wall replacement should include measures to manage stormwater and floodwater flows to minimize future erosion of the bank.

Climate Change

The Town is a participant in the Commonwealth's Municipal Vulnerability Preparedness (MVP) program. The MVP program is a community-driven process to define natural and climate-related hazards, identify existing and future vulnerabilities and strengths of infrastructure, environmental resources and vulnerable populations, and develop, prioritize and implement specific actions the Town can take to reduce risk and build resilience. The Town conducted Community Resilience Building Workshops in 2018 that identified the Central Street Bridge as vulnerable transportation infrastructure due to its poor structural condition and location in a flood-prone area and included the replacement of the bridge as a top recommendation for improving the Town's resilience. The ENF included a summary of a hydrologic and hydraulic (H&H) analysis of the proposed design of the new bridge under future storm events. During the review period, the Proponent provided supplemental information that clarified that the bridge was designed on the basis of a projected two-foot increase in sea level rise by the year 2100.¹ A two-foot increase in sea level was based on sea level rise projections by the Northeast Climate Science Center at the University of Massachusetts at Amherst, which indicate a 66 percent probability that sea level will rise between 2.0 and 4.0 feet by 2100 under a high greenhouse gas (GHG) emissions scenario and by 1.5 to 3.1 feet under a medium GHG emissions scenario.² This

¹ Email dated January 9, 2020 from Emily Tully of Tighe & Bond to Alex Strycky, MEPA Office.

² This data is available through the Climate Change Clearinghouse for the Commonwealth at www.resilientMA.org.

increase in sea level used to design the build exceeds the approximately one-foot increase recommended for use by MassDOT's Load and Resistance Factor Design (LRFD) Bridge Manual (2013). The enlarged bridge is not expected to be overtopped during storm events up to the 50-year design storm based on the mean higher high water elevation and higher sea levels. The proposed bridge design will reduce surface water elevations upstream of the bridge for the modeled storm events compared to the existing bridge structure, which will reduce the extent and duration of flooding along Sawmill Brook and its tributaries and make the bridge more resilient by reducing overtopping events and the potential for damage to the bridge from flood flows.

Waterways

According to ENF, the tide gate and bridge have been authorized by c. 91 Licenses No. 197 (issued in 1922) and No. 650 (issued in 1926). The project will require a new c. 91 license as a water-dependent use pursuant to the Waterways Regulations at 310 CMR 9.12(2). The Town should consult MassDEP's comment letter for guidance on information and analyses that must be submitted with the license application.

Construction Period

The Town will implement sedimentation and erosion control measures to minimize water quality impacts. Due to the proximity of the project site to residences and commercial uses, the project should include measures to prevent nuisance conditions such as dust, noise, and odors during construction and reduce emissions of air pollutants from construction equipment, including anti-idling measures in accordance with the Air Quality regulations (310 CMR 7.11). I encourage the Proponent to require that its contractors use construction equipment with engines manufactured to Tier 4 federal emission standards, or select project contractors that have installed retrofit emissions control devices or vehicles that use alternative fuels to reduce emissions of volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment. Off-road vehicles are required to use ultra-low sulfur diesel fuel (ULSD). All construction activities should be undertaken in compliance with the conditions of all State and local permits. I encourage the Proponent to reuse or recycle construction and demolition (C&D) debris to the maximum extent.

Conclusion

The ENF has adequately described and analyzed the project and its alternatives, and assessed its potential environmental impacts and mitigation measures. Based on review of the ENF and comments received on it, and in consultation with State Agencies, I have determined that an EIR is not required. Outstanding issues may be addressed during permitting.

January 10, 2020

Date



Kathleen A. Theoharides

Comments received:


- 12/30/2019 Office of Coastal Zone Management (CZM)
- 12/30/2019 Massachusetts Department of Environmental Protection (MassDEP)/Waterways Regulation Program (WRP)
- 12/30/2019 Division of Marine Fisheries (DMF)
- 12/31/2019 Massachusetts Department of Environmental Protection (MassDEP)/Northeast Regional Office (NERO)

KAT/AJS/ajs



MEMORANDUM

TO: Kathleen A. Theoharides, Secretary, EEA
ATTN: Alex Strycky, MEPA Office
FROM: Lisa Berry Engler, Director, CZM
DATE: December 30, 2019
RE: EEA-16128, Central Street Bridge Reconstruction and Central Pond/Sawmill Brook Restoration Project; Manchester-by-the-Sea



The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the above-referenced Environmental Notification Form (ENF), noticed in the *Environmental Monitor* dated December 11, 2019, and offers the following comments.

Project Description

The proposed project includes replacement of the Sawmill Brook/Route 127 bridge, removal of an existing tide gate structure on the ocean side of the bridge culvert, replacement of channel walls along Central Pond upstream of the bridge, and restoration activities for Sawmill Brook and Central Pond. Work on the tide gate removal will include demolition of the concrete tide gate structure, slide gate, cat walk, and associated tide gate infrastructure to reduce the existing tidal restriction. The existing bridge, with a span of 16 feet, will be demolished and replaced with a concrete arch culvert with a span of approximately 20 feet to further improve tidal flushing and reduce impacts of inland flooding events caused by the existing restriction. Existing deteriorated walls along the east bank of Central Pond will be repaired or replaced, and west bank areas experiencing erosion will be stabilized with a living shoreline. Restoration activities proposed for Central Pond include allowing the changing hydrologic processes to naturally create a new stream channel through the sediment deposits, adjusting the stream channel location if necessary to minimize shoreline impacts, and planting of vegetation where appropriate.

Project Comments

As stated in the ENF, much of the planning and design work for the proposed project has been supported through funding from numerous state grant programs, with the goals of improving resilience to flooding associated with inland storms, restoration of more natural hydrology, and ecological restoration for fish migration. CZM supports the goals of the proposed project and offers these recommendations and comments to ensure that these goals can be met while avoiding or minimizing impacts to existing coastal resources.

CZM notes that the resource area within Central Pond is identified as Land Under Water in the ENF. This area is tidally influenced and should therefore be delineated as Land Under Ocean (LUO) for areas below mean low water (MLW) in the channel bed or Coastal Beach (CB) for areas between MLW and mean high water (MHW). Impacts to each of these resource areas should be calculated and provided.



The ENF includes some information about bank stabilization alternatives, however more detail for the preferred alternative will be needed to assess whether the impacts are minimized by the chosen alternative. As described in the ENF and evident at the MEPA site visit, many areas of the existing retaining walls along the eastern bank of Central Pond are in disrepair, and in some areas are failing and collapsing into the intertidal area. The ENF proposes to repair these walls in place with either a segmental block wall or gabion baskets, with riprap to be installed in front of the wall. Discussion with the consultant at the MEPA site visit indicate that the segmental wall option is preferred, while noting that the plan details provided in the ENF are generic and intended as examples of the types of riprap and wall modification that are under consideration. Once the town has approved a preferred alternative, specific details on appropriately scaled plan views and cross-sections will be needed to assess the potential impacts to adjacent resource areas. These plans should include the proposed structures, details of any dredging, excavation or fill required within the coastal bank, riverfront, LUO or coastal beach resource areas, with these areas clearly delineated. The plans should also include MHW, MLW, and flood elevations. Details of how any excavated/dredged material will be disposed of or reused should also be included.

The ENF states that the preferred alternative for stabilization of eroding areas of the western shore of Central Pond is a living shoreline. The appropriate final design for these areas will be dependent on the physical environment of the pond resulting from changes that are likely to occur as a result of the tide gate structure removal and the bridge span replacement. As changes may occur to hydrology, scour characteristics, stream velocity, and water and soil salinity, CZM recommends that these designs not be completed until the system has had a chance to equilibrate after the bridge/tide gate project is complete. In addition, according to the ENF, most of the eastern bank of Central Pond is privately owned, therefore the town will need to work with the property owners of these parcels to ensure that these designs can be incorporated and maintained over time to ensure their success.

The restoration component of the project primarily focuses on adaptive management that allows the ecosystem to adapt over time and find equilibrium with the new hydrology afforded by the removal of the tide gate system and enlargement of the bridge span. CZM supports this approach. Currently, with the tide gate structure in place and the tide gate open, there has been some evidence of establishment of *Spartina alterniflora* on the mudflat (coastal beach) in Central Pond. It is possible that a portion of the fine sediments deposited in Central Pond, as a result of the historic tide gate installation and associated hydrologic impacts, will flush out toward Manchester Harbor once the tide gate structure has been removed and the existing partially obstructed span is increased to twenty feet, resulting in changes to both elevation and morphology of the Central Pond substrate. Additionally, the balance of freshwater discharge from the watershed and increased tidal flushing may change the salinity regime of this reach of the waterway. While the ENF describes a specific planting plan for certain locations within the project site based on existing conditions, CZM recommends that a final planting and restoration plan not be developed and approved until the changes in hydrology, salinity, elevation and morphology have had time to naturally equilibrate. Monitoring these parameters as well as vegetation during the transition will be helpful in determining the appropriate restoration and living shoreline approaches. Specific vegetation planting plans should be developed and proposed once these new conditions are well understood to ensure the success of the restoration.

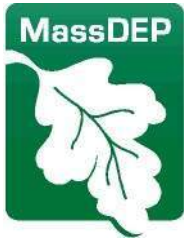
An evaluation of soil aggradation versus degradation in the Central Pond area is included in the ENF, comparing existing conditions with the tide gate open and closed to the proposed conditions. The evaluation concludes that deposition is likely to occur when a bankfull inland flooding event occurs under existing conditions when the tide gate is closed, or during a mean higher high water (MHHW) tide under existing (tide gate open) or proposed conditions, as the backwater slows the stream velocities in this area. The ENF concludes that soil mobilization (loss) is likely to occur similarly at mean lower low water (MLLW) tides under the existing (tide gate open) and proposed conditions. However, the existing tide gate structure is a solid concrete weir with a top of wall elevation just above MHHW, with a 6.5 by 5.5-foot cast iron slide gate. For most tides, the outlet is limited by this dimension even with the tide gate open, so while the full tidal flushing does occur, there is a lag in the timing of the outgoing (and incoming tide). With an unobstructed twenty-foot span at the bridge after the reconstruction, the hydrology is likely to result in changes to the deposition/mobilization rates and characteristics for fine sediments in Central Pond because the outflow velocities will not be reduced. The extent to which these sediments may be mobilized should be characterized before the project is undertaken, to understand the likelihood of sediments moving out toward Manchester Harbor. The ENF states that the sediment sampling activities conducted during the feasibility evaluation were limited in scope, and additional sediment sampling will be necessary to support a 301 Water Quality Certification permit application. The town should analyze the sediment in the pond to ensure that the receiving area in Manchester Harbor is not impacted by any possible contaminant concentrations from the released sediment.

Federal Consistency Review

The proposed project may be subject to CZM federal consistency review and if so must be found to be consistent with CZM's enforceable program policies. For further information on this process, please contact Robert Boeri, Project Review Coordinator, at 617-626-1050, or visit the CZM web site at www.mass.gov/czm.

LE/kg

cc: Kathryn Glenn, CZM
Chrissy Hopps, DEP Waterways
Rachel Freed, DEP NERO
Georgeann Keer, DER
Chris Bertoni, Manchester-by-the-Sea Conservation Administrator



Department of Environmental Protection

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Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

Memorandum

To: Alex Strysky, MEPA

From: Daniel Padien, Waterways Program Chief, MassDEP/Boston

Re: **Comments from the Chapter 91 Waterways Regulation Program** — EEA #16127
Environmental Notification Form – Central Street Bridge Reconstruction and Central Pond
/ Sawmill Brook Restoration Project, Manchester-by-the-Sea, Essex County

Date: December 30, 2019

Project Description

The Department of Environmental Protection Waterways Regulation Program (the “WRP” or the “Program”) has reviewed the referenced Environmental Notification Form (ENF) (EEA #16127), submitted by Tighe & Bond on behalf of the Town of Manchester-by-the-Sea (“Proponent”) for the proposed work within geographic areas subject to M.G.L. Chapter 91 and as further described in 310 CMR 9.04:

- Removal of the existing tide gate separating Sawmill Brook and Manchester Harbor;
- Demolition and removal of the 16-foot Central Street Bridge and replacement with a new 20± foot span;
- Repair, replacement and stabilization of existing stone retaining walls along Central Pond a former tidal inlet (Sawmill Brook), now a man-made impoundment, and
- Restoration of Central Pond / Sawmill Brook to an unrestricted tidal stream, planned to bio-stabilization of stream banks and salt marsh;

Water Dependency

Based on the WRP’s review of the ENF, descriptions and plans contained therein, and relevant licensing and cartographic records maintained by MassDEP, the Program understands the project

would be deemed water dependent under 310 CMR 9.12(2) because the work “*requires direct access to or location in tidal waters*”. Furthermore, upon confirmation that the project is determined by the Manchester By-the-Sea Conservation Commission (of MassDEP upon appeal) to meet the definition of “*Ecological Restoration Project*” as stipulated in 310 CMR 10.24(8) and 310 CMR 9.02, the project also meet the water dependency requirements stipulated in 310 CMR 9.12(a)15.

Chapter 91 Jurisdiction and Licensing Requirements

Based on a review of maps, aerial photographs, site photographs and plans accompanying the ENF as supplemented by licensing and cartographic records maintained by MassDEP, we conclude that the project includes activities subject to licensing and permitting as stipulated by 310 CMR 9.05(1) and (2). The existing tide gate and bridge appear to have been authorized by one or more prior waterways licenses.

While the ENF includes DRAFT 25% design plans, it does not include a description of the project’s compliance with applicable provisions of the Waterways Regulations. However, we note that the project appears to comply with the limitations stipulated at 310 CMR 9.32 – *Categorical Restrictions on Fill and Structures* - and 310 CMR 9.31(2) – *Proper Public Purpose Requirements* – and is eligible for licensing under Chapter 91.

WRP staff did not identify any substantive concerns related to the proposed project that would prevent issuance of a waterways license under Chapter 91. The WRP looks forward to receipt of a completed Waterways License Application which meets the minimum filing standards as set forth in 310 CMR 9.11(3) including the Secretary’s Certificate concluding the MEPA review process and the proof of the filing of a Notice of Intent under the Massachusetts Wetlands Protection Act.

If you have any questions regarding the WRP comments, please contact Daniel Padien at Daniel.Padien@mass.gov at (617) 292-5615.



Daniel J. McKiernan
Acting Director

Commonwealth of Massachusetts

Division of Marine Fisheries

251 Causeway Street, Suite 400
Boston, Massachusetts 02114

(617)626-1520
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Secretary
Ronald S. Amidon
Commissioner
Mary-Lee King
Deputy Commissioner

December 30, 2019

Kathleen Theoharides, Secretary
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, Alex Strycky
100 Cambridge Street, suite 900
Boston, MA 02114

RE: EEA# 16127 Environmental Notification Form

Dear Secretary Theoharides:

Division of Marine Fisheries (MA DMF) staff have reviewed the ENF for the Central Street Bridge Reconstruction and Central Pond and Sawmill Brook restoration project. MA DMF has been involved with the development of this project and we will continue to provide technical support where needed.

The Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordax*), and habitat for American eel (*Anguilla rostrata*) (Chase 2006). The proposed work may impact passage and a time of year restriction is recommended to avoid in-water and silt-producing work from March 1 to June 30 of any year (Evans et al. 2011). We recommend designing upstream substrate improvements to enhance smelt spawning riffles. Expanding the present spawning riffle to encompass a larger area upstream will be important if the tidal intrusion reaches further upstream with the removal of the tidegate. Overall, MA DMF expects this project will be a positive improvement to the ecology, stormwater management and resiliency of the Sawmill Brook.

Thank you for considering our comments. Please contact Tay Evans at 978-282-0308 x168 or tay.evans@state.ma.us if you have any questions about this review.

Sincerely,

Daniel J. McKiernan
Acting Director

cc. R. Lehan, DFG
K. Ford, DMF
B. Gahegan, DMF
E. Tully, Tighe&Bond
C. Bertoni, Manchester
B. Boeri, CZM
D. Wong, DEP

DM/TE/sd

References:

- Chase, BC (2006) Rainbow smelt (*Osmerus mordax*) spawning habitat on the Gulf of Maine coast of Massachusetts. Massachusetts Division of Marine Fisheries Technical Report, 2006. Tr-30: p. 1-173.
- Evans, NT, KH Ford, BC Chase and JJ Sheppard (2011) Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts Technical Report [DMF TR-47](#).



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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Commissioner

December 31, 2019

Kathleen A. Theoharides, Secretary
Executive Office of
Energy & Environmental Affairs
100 Cambridge Street
Boston MA, 02114

Attn: MEPA Unit

RE: Manchester-by-the-Sea
Central Street Bridge Reconstruction and
Central Pond/Sawmill Brook Restoration
Project
Central Street, east of Elm Street
EEA # 16127

Dear Secretary Theoharides:

The Massachusetts Department of Environmental Protection Northeast Regional Office (MassDEP-NERO) has reviewed the Environmental Notification Form (ENF) submitted by Tighe & Bond, Inc. on behalf of Town of Manchester-by-the-Sea for the proposed replacement of the Sawmill Brook Bridge, removal of the tide gate structure, repair and replacement of channel walls along Central Pond, and restoration of Sawmill Brook located in Manchester-by-the-Sea. DEP provides the following comments.

Project Description

The proposed project includes replacement of the Sawmill Brook/Route 127 bridge, removal of an existing tide gate structure on the ocean side of the bridge culvert, replacement of channel walls along Central Pond upstream of the bridge, and restoration activities for Sawmill Brook and Central Pond. Work on the tide gate removal will include demolition of the concrete tide gate structure, slide gate, cat walk, and associated tide gate infrastructure to reduce the existing tidal restriction. The existing bridge, with a span of 16 feet, will be demolished and replaced with a concrete arch culvert with a span of approximately 20 feet to further improve tidal flushing and reduce impacts of inland flooding events caused by the existing restriction. Existing deteriorated walls along the east bank of Central Pond will be repaired or replaced, and west bank areas experiencing erosion will be stabilized with a living shoreline. Restoration activities proposed for Central Pond include allowing

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-5751.

TTY# MassRelay Service 1-800-439-2370

MassDEP Website: www.mass.gov/dep

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the changing hydrologic processes to naturally create a new stream channel through the sediment deposits, adjusting the stream channel location, if necessary, to minimize shoreline impacts, and planting of vegetation where appropriate.

Project Comments

The ENF notes that there is approximately 400 feet of existing wall along Central Pond/Sawmill Brook that is need of extensive repair. It is proposed that this wall, located on the east bank, be repaired and that installation of a living shoreline be used for stabilization along the west bank. There should be more information provided on the causes of bank instability. Page 4-7 notes that poor wall drainage is likely one of the factors contributing to the failure of the existing wall and that improved drainage features will be included in the selected alternative. Does overland sheet flow also contribute to failure of the existing wall? Would increasing the vegetated buffer along the eastern bank reduce overland flow and increase the life of the wall?

Section 2.5 of the Technical Memorandum, Streambank Survey, notes that sections along the western shore could be improved to prevent continued soil erosion and could benefit from soft erosion solutions including establishing vegetation, controlling public access and potential stormwater outfall improvements. Though the living shoreline proposal is discussed within the ENF, controlling public access and potential stormwater outfall improvements are not; these options should be explored more fully in future filings. In addition, consideration should be given to increasing the vegetated buffer along the western bank as part of the living shoreline proposal.

Section 3 of the Technical Memorandum, Sediment Transport, notes that the existing system is in disequilibrium and that degradation of the existing fine-grained sediments are anticipated. The existing fine-grained sediments and organic muck are certainly susceptible to stream channel incision once the tide-gate is removed and this process should be anticipated. Section 4, Sediment Management for Restoration, notes that in-stream modifications may include dredging, rock veins or other forms of flow augmentation. It is unclear without careful monitoring of sediment transport whether flow augmentation is necessary. Dredging would certainly increase incision of the stream channel so it is unclear why this is a consideration. Ineffective sediment transport would be better addressed by adjusting stream channel dimensions to that appropriate for a stream with a 5.4 square-mile watershed. A carefully-designed rock cross-vane may be effective for grade control within a stream channel.

As there is an existing smelt run in the Central Pond/Sawmill Brook system, there should be consideration given to the construction of riffle areas within the stream channel to introduce stream bed diversity and smelt spawning habitat.

Future filings should include an invasive species control and management program.

The MassDEP appreciates the opportunity to comment on this proposed project. Please contact Rachel.Freed@mass.gov at (978) 694-3258 for further information on wetland issues. If you have any general questions regarding these comments, please contact me at John.D.Viola@mass.gov or at (978) 694-3304.

Sincerely,

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

John D. Viola
Deputy Regional Director

cc: Brona Simon, Massachusetts Historical Commission
Eric Worrall, Rachel Freed, MassDEP-NERO

ORDER OF CONDITIONS
DEP FILE # 039-0832



MANCHESTER-BY-THE-SEA

CONSERVATION COMMISSION • TOWN HALL
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 526-4397 FAX (978) 526-2001

18 November 2020

Gregory Federspiel, Town Administrator
Town Hall / 10 Central Street
Manchester, MA 01944

HAND DELIVERY

Re: Order of Conditions Central & Elm St DEP File #039-0832

Dear Greg:

Enclosed is the Order of Conditions for the Central Street Bridge Replacement Project including removal of tide gate and replacing the existing Central Street Culvert within Coastal Bank, Coastal Beach, Riverfront Area, Land Under Ocean, Land Subject to Coastal Storm Flowage 100-foot, 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers, which was approved by the Manchester Conservation Commission on 11/3/20.

Before any work may begin, you must wait 10 business days (the appeal period) after which the Order must be recorded at the Registry of Deeds in its entirety. Once the Order is recorded, please submit proof of recording to me prior to the commencement of work.

Please review the Order carefully as it will govern how the work must be performed in order to be in compliance with the Massachusetts Wetlands Protection Act and the Manchester Wetlands By-Law. Please note that this order includes several pre-construction conditions, **including a pre-construction meeting between your contractors and me prior to the commencement of work** (see Standard and Special Conditions, Section B).

The Order is valid for three years from the original issuance date, except where otherwise specified. Requests for extensions must be received at least 30 days prior to the expiration date. Also note that ANY deviation from the plans contained or required in the Order of Conditions will require a *de minimis* change request, an amendment to the order(s) or submittal of a new application. As always, any other applicable permits required from any other Board or Department (state or local) will have to be obtained prior to commencement of work..

Please be advised that once work has been completed and the plantings have been monitored for two growing seasons, you should promptly seek a Certificate of Compliance from this office. Recording the Certificate of Compliance will clear the title for this property from the Order.

Please let me know if you have any questions or if I may be of further assistance.

Sincerely,

Chris Bertoni
Manchester Conservation Administrator

cc: Richard Canavan, Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
Filed eDEP on 11/18/20; Transaction #1239502
/file

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 5 - Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:039-0832
eDEP Transaction #:1239502
City/Town:MANCHESTER

and Manchester Gen. Wetlands Bylaw

A. General Information

1. Conservation Commission MANCHESTER
2. Issuance a. OOC b. Amended OOC

3. Applicant Details

- a. First Name GREGORY b. Last Name FEDERSPIEL
c. Organization TOWN OF MANCHESTER
d. Mailing Address 10 CENTRAL STREET
e. City/Town MANCHESTER BY THE SEA f. State MA g. Zip Code 01944

4. Property Owner

- a. First Name b. Last Name
c. Organization
d. Mailing Address
e. City/Town f. State g. Zip Code

5. Project Location

- a. Street Address CENTRAL STREET AND ELM STREET
b. City/Town MANCHESTER c. Zip Code 01944
d. Assessors Map/Plat# 45 e. Parcel/Lot# 23
f. Latitude 42.57526N g. Longitude 70.77501W

6. Property recorded at the Registry of Deed for:

- | a. County | b. Certificate | c. Book | d. Page |
|----------------|----------------|---------|---------|
| SOUTHERN ESSEX | | 881 | 173 |

7. Dates

- a. Date NOI Filed : 9/15/2020 b. Date Public Hearing Closed: 11/3/2020 c. Date Of Issuance: 11/18/2020

8. Final Approved Plans and Other Documents

- a. Plan Title: b. Plan Prepared by: c. Plan Signed/Stamped by: d. Revised Final Date: e. Scale:
SEE ATTACHED
DOCUMENT
CENTRAL &
ELM_STANDARD
AND SPECIAL
CONDS_039-0832

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

- | | | |
|---|--|---|
| a. <input type="checkbox"/> Public Water Supply | b. <input checked="" type="checkbox"/> Land Containing Shellfish | c. <input type="checkbox"/> Prevention of Pollution |
|---|--|---|

Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
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 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
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d. <input type="checkbox"/> Private Water Supply	e. <input checked="" type="checkbox"/> Fisheries	f. <input checked="" type="checkbox"/> Protection of Wildlife Habitat
g. <input type="checkbox"/> Ground Water Supply	h. <input checked="" type="checkbox"/> Storm Damage Prevention	i. <input checked="" type="checkbox"/> Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b. The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a).
a. linear feet

Inland Resource Area Impacts:(For Approvals Only):				
Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	<u> </u> a. linear feet	<u> </u> b. linear feet	<u> </u> c. linear feet	<u> </u> d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
6. <input type="checkbox"/> Land under Waterbodies and Waterways	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
	<u> </u> e. c/y dredged	<u> </u> f. c/y dredged		
7. <input type="checkbox"/> Bordering Land Subject to Flooding	<u> </u> a. square feet	<u> </u> b. square feet	<u> </u> c. square feet	<u> </u> d. square feet
Cubic Feet Flood Storage	<u> </u> e. cubic feet	<u> </u> f. cubic feet	<u> </u> g. cubic feet	<u> </u> h. cubic feet
8. <input type="checkbox"/> Isolated Land Subject to Flooding	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Massachusetts Department of Environmental Protection

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	a. square feet	b. square feet		
Cubic Feet Flood Storage				
	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	4414	4414		
	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	4414	4414	0	0
	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	0	0	0	0
	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts:

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input checked="" type="checkbox"/> Land Under the Ocean	0	353		
	a. square feet	b. square feet		
	0			
	c. c/y dredged	d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches				
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
14. <input type="checkbox"/> Coastal Dunes				
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
15. <input checked="" type="checkbox"/> Coastal Banks	90	90		
	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores				
	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes				
	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds				
	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish				
	a. square feet	b. square feet	c. square feet	d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	c. c/y dredged	d. c/y dredged		

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21. Land Subject to Coastal Storm Flowage 6058 6058
a. square feet b. square feet

22.

Restoration/Enhancement (For Approvals Only)

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c & d or B.17.c & d above, please entered the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

23.

Streams Crossing(s)

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

a. number of new stream crossings

1
b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects

- 1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
a. the work is a maintenance dredging project as provided for in the Act; or
b. the time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order.
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not exceed the issuance date of the original Final Order of Conditions.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered

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land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..

10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"
[or 'MassDEP']
File Number : "039-0832"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

19. The work associated with this Order (the "Project") is (1) is not (2) subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;
- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i.* all construction period BMPs have been

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removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv.* all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v.* any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: *i.*) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and *ii.*) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.
- g) The responsible party shall:
 - 1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 - 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 - 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

**Massachusetts Department of Environmental
Protection**

Bureau of Resource Protection - Wetlands

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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

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-
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
 - i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
 - j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
 - k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
 - l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions:

SEE ATTACHED DOCUMENT CENTRAL & ELM_STANDARD AND SPECIAL CONDS_039-0832

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No

2. The Conservation Commission hereby (check one that applies):

a. DENIES the proposed work which cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order or Conditions is issued. Which are necessary to comply with a municipal ordinance or bylaw:

b. APPROVES the proposed work, subject to the following additional conditions.

1. Municipal Ordinance or Bylaw _____
MANCHESTER
GENERAL
WETLANDS BY-
LAW _____

2. Citation XVII _____

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:
SEE ATTACHED DOCUMENT CENTRAL & ELM_STANDARD AND SPECIAL CONDS_039-0832

Manchester Conservation Commission

**Central Street (MA-127) & Elm Street Standard and Special Conditions
Order of Conditions (DEP File #039-0832)**

Massachusetts Wetlands Protection Act M.G.L. C. 131 §40 and the Manchester General Wetlands By-Law

DEP File:	#39-0832
Applicant/Owner:	Gregory Federspiel / Town of Manchester-by-the-Sea
Project Location:	Central Street (MA-127) and Elm Street Map: 45 Lot: 23
Project Description:	Central Street Bridge Replacement Project including removal of tide gate and replacing the existing Central Street Culvert within Coastal Bank, Coastal Beach, Riverfront Area, Land Under Ocean, Land Subject to Coastal Storm Flowage 100-foot, 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers
Summary of Permitted Activities:	<ul style="list-style-type: none"> • Removal of tide gate (demolition of concrete structure, slide gate, catwalk, and associated infrastructure) as described in the NOI narrative and shown on the Approved Plans • Replacement of Central Street Bridge (demolish an existing concrete beam span section downstream and upstream stone arch culvert, and replace with a concrete arch culvert with a span of about 20 feet) • Central Street roadway improvements (Roadway portion of this project is an isolated bridge construction and not part of the larger corridor improvement. Overall footprint has been minimized to limit impact and reduce cost.) • Proposed roadway section matches the objectives of the Town objectives and includes elements of “complete streets” approach to downtown. • Utilization of existing access on Church Street and final location of staging & material handling to be further defined during later stages of design development. • Installation / removal of a coffer dam as described in the NOI narrative • Project includes replacing one existing stream crossing
Approved Plans and Documents	<ul style="list-style-type: none"> • “Central Street Bridge Reconstruction [Plans]”; prepared for Town of Manchester-by-the-Sea DPW & BOS by Tighe & Bond; 9/9/20; digitally signed and stamped by David L. Loring, PE; scale 1” = 10’ and others; Permit Set 23 Sheets. • “Checklist for Stormwater Report and Regulatory Compliance including Illicit Discharge Compliance Statement and Long-Term Pollution Prevention Plan”; included in the NOI prepared for Town of Manchester-by-the-Sea DPW & BOS by Tighe & Bond, September 2020. • “Notice of Intent Application”, prepared for Town of Manchester-by-the-Sea DPW & BOS by Tighe & Bond, September 2020. • Document: “Email from Tay Evans, Marine Scientist and Environmental Reviewer to Chris Bertoni, Conservation Administrator”, dated 10/13/20 with comments from MA Division of Marine Fisheries

Findings

1. The Manchester Conservation Commission (MCC) finds that the site on which the work is proposed contains resource areas subject to the Massachusetts Wetlands Protection Act, M.G.L. c. 131, sec. 40 (the Act) and its Regulations, 310 CMR 10.00 and the Manchester General Wetlands By-Law which are significant to the protection of interests identified in the Act and the By-Law, specifically:
 - a. Riverfront Area (total of 4,414 square feet temporary alteration)
 - b. Land Under Ocean (353 square feet proposed replacement/restoration)
 - c. Coastal Bank (90 linear feet)
 - d. Coastal Beach (900 square feet temporary alteration)
 - e. Land Subject to Coastal Storm Flowage (6,058 square feet)
 - f. 100-foot Buffer to Coastal Bank and Coastal Beach
 - g. 30 foot No Disturbance Zone (NDZ) as protected under the By-Law
 - h. 50 foot No Build Zone (NBZ) as protected under the By-Law

The project is not known to be within or adjacent to Estimated Habitat of rare or endangered species.

2. The wetland depiction appearing on the Approved Plan(s) is confirmed for this project only and shall be reconfirmed and/or re-delineated for subsequent filings.
3. The project as permitted allows for a temporary alteration of 4,414 sf within Riverfront Area.
4. The project as permitted allows an alteration of up to 353 sf of restoration in Land Under Ocean.
5. The project as permitted allows 6,056 sf alteration in Land Subject to Coastal Storm Flowage.
6. The project as permitted allows for a temporary alteration of 900 sf to Coastal Beach.
7. The project as permitted allows for an alteration of up to 90 lf to Coastal Bank.
8. The MCC finds that the BVW and its Buffer Zone are significant to the protection of the following interests as defined in the Act and its Regulations and the Manchester General Wetlands By-Law:
 - a. Flood control
 - b. Storm Damage Prevention
 - c. Fisheries
 - d. Land Containing Shellfish
 - e. Protection of Wildlife Habitat

Specific Findings under the Manchester General Wetlands By-Law and its regulations

1. In addition to those interests protected under the Act and its Regulations, the MCC finds that the resource areas and their buffer zones are significant to the protection of the following interests:
 - a. Water quality
 - b. Erosion and sedimentation control
2. The MCC grants a waiver as requested in the "Section 4 Regulatory Compliance of the NOI Application" prepared by Merlin Associates, Inc., dated February 20, 2014 and as shown on the Approved Plans for the Permitted Activities listed above.

The MCC grants the waiver under the by-law for the following reasons:

- a. The applicant has satisfied the requirement of demonstrating, by clear and convincing evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity

which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Disturb Zone. The applicant has also satisfied the requirement of demonstrating, by a preponderance of credible evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Build Zone.

- b. The project involves the replacement of an existing (and failing) downtown Manchester municipal bridge. The replacement bridge will be located within the footprint of the old bridge – no new additional structure is proposed.
- c. The replacement bridge will have an increase in hydraulic capacity so will improve the in-stream resource conditions (tidal flow flushing). The anticipated design life of the replacement bridge is approximately 75 years.
- d. Due to proximity of existing buildings and existing stream ecology, no other methods of bank stabilization are feasible – replacement of the Coastal Bank in-kind is not anticipated to have any adverse impact on Coastal Beach or other resource areas.
- e. The only practical alternative to address the current condition of the infrastructure is to replace the current bridge. In addition, the removal of the tide gate will improve conditions within the Sawmill Brook, a perennial stream.
- f. 30-ft NDZ, 50-ft NBZ – Due to location of the existing infrastructure, it is not possible to move the project outside either zone to avoid impacts to these local buffers. Temporary disturbances will be minimized and restored to pre-construction conditions. In addition, temporary erosion control, dewatering sediment control necessary to protect the on-site resources will be temporarily installed in these zones.

General and Special Conditions

A. General Conditions

1. The term “Applicant” as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The MCC shall be notified in writing within 30 days of all transfers of title of any portion of property that take place prior to the issuance of the Certificate of Compliance.
2. With respect to all conditions the MCC designates the Conservation Administrator as its agent with full powers to act on its behalf in administering and enforcing this Order.
3. This document shall be included by reference in all contracts, plans and specifications dealing with the activity that is the subject of this Order, and that are created or modified after the issuance date of this Order, along with a statement that this Order shall supersede any conflicting contractual arrangements, plans or specifications.
4. It is the responsibility of the applicant to complete any review required by all agencies with jurisdiction over the activity that is the subject of this Order, and to procure all required permits or approvals. These reviews, permits and approvals may include but are not limited to the following:
 - a. Review by the U.S. Army Corps of Engineers for any Category 2 or Individual Permit Activity, and procurement of any permits or approvals identified by the Corps.
 - b. Review by the DEP and procurement of any permits or approvals identified by the DEP.
 - c. Review by the Massachusetts Natural Heritage and Endangered Species Program for any projects within estimated and/or priority habitat and any permits or approvals identified by the Program.
 - d. Review by local Planning Boards, Boards of Health, Zoning Boards, and Building Inspectors,

and procurement of any permits or approvals required by these boards or agencies.

5. The MCC shall be informed of all changes that may be made to the Plan(s) of Record by any other Board, Commission or Authority or as a result of changes by the Applicant. All changes shall require additional approvals from the MCC.
6. The MCC reserves the right to impose additional conditions on this project, including but not limited to, additional or modified erosion/siltation controls during the project, if it deems that site conditions warrant such measures to mitigate potential impacts.
7. Members and agents of the MCC shall have the right to enter and inspect the property to evaluate compliance with this Order, the Wetlands Protection Act, Wetlands Protection Bylaw, and to require submittal of any data deemed necessary by the MCC for that evaluation.
8. The site engineer or contractor shall have a copy of this Order of Conditions and the final approved plans at the site and available for inspection during all phases of construction. It is the applicants' responsibility to provide the contractors with a set of the approved documents, plans, and this Order, and to ensure that the contractors are aware of the Order's provisions, and that they follow them. If the conditions of the Order are not clear, the MCC or its Administrator shall be asked to clarify them.
9. **Any change in the plans approved under this Order, including those due to review by other boards or resulting from the aforementioned conditions, must be submitted to the MCC in writing for approval prior to implementation.** The MCC will then decide whether the change is substantial enough to require a new Notice of Intent filing or a request for an amendment to this Order of Conditions. Any errors found in the plans or information submitted by the applicant shall be considered as changes.
10. If any changes are made in the above-described plan(s) which may or will alter an area subject to protection under the Wetlands Protection Act, 310 CMR 10.00 or the Manchester Wetlands By-Law, the applicant shall inquire from the MCC or its Administrator, prior to implementing the change in the field, whether the change is significant enough to require the filing of a new Notice of Intent. Any errors in the plans or information submitted by the applicant shall be considered changes and the above procedures shall be followed.

B. Pre-Construction Requirements

11. This Order shall be recorded at the Registry of Deeds in its entirety. The form provided at the end of WPA Form 5 shall be completed and stamped at the Registry of Deeds after the expiration of the 10-day appeal period and within 30 days of the issuance if no request for appeal has been filed with the Department of Environmental Protection. This form shall be returned to the MCC within 21 days of recording **and prior to commencement of any activities subject to the Order of Conditions.**
12. Prior to the commencement of work:
 - a) Erosion controls (filter sock) shall be installed per the Approved Plan. The filter sock shall consist of biodegradable materials only.
 - b) The applicant or owner shall provide the name, address, and phone number of a contact person responsible for compliance with this Order.
 - c) A Storm Preparedness Plan shall be prepared and submitted to the Conservation Administrator for review (See condition #21)
 - d) Should a chemical expansion method be chosen, a plan, materials and details preventing chemicals from entering the resource shall be submitted to the Conservation Administrator for review. (See Condition #22)
 - c) Applicant shall provide engineering plans for diverting water from work area and these plans shall come before the Conservation Commission for review. (See condition #23)
 - d) The Applicant or his designee shall install a sign no less than 2 square feet or more than 3 square feet, visible from the street reading "MA DEP File #39-0832", and not placed on a living tree.

13. Once all the above pre-construction requirements stated in Conditions #11 and #12 have been fulfilled, the Conservation Administrator shall be contacted at least 48 hours prior to the start of work in order to schedule a pre-construction meeting at the site. The Administrator may be contacted by email at: bertonic@manchester.ma.us or by phone at [978-526-4397](tel:978-526-4397).

C. Special Conditions

14. Site access shall be as shown on the Approved Plan Set and as described in section 3.3 of the Notice of Intent Application (NOI).
15. The Commission Administrator shall be notified if there are any significant changes to the anticipated Construction Sequence (NOI 3.4).
16. Construction Best Management Practices as described in the NOI (3.5, 3.5.1-7) and shown on the Approved Plan set shall be implemented and followed.
17. The Conservation Administrator shall be notified as to the Responsible Parties.
18. All aspects of the Long-Term Pollution Prevention Plan as described in the NOI shall be implemented and followed.
19. A Time-of-Year restriction of no in-water silt-producing work from March 1 to June 31 shall be implemented and followed. (DMF comments 11/13/20).
20. Post-construction monitoring shall be designed and implemented to assess the effects of tide-gate removal and bridge replacement on Central Pond, particularly on salinity improvements that would support saltmarsh plantings potentially as part of the pond restoration portion of the entire project. (DMF comments 11/13/20).
21. In case of a major storm event, the site shall be secured beforehand in such a way to protect Sawmill Brook and other resources, including covering of any stockpiles of soil; installation of erosion control mats over areas of exposed soil; and removal of any debris, equipment, materials, etc. that could potentially enter the brook and other resources. A Storm Preparedness Plan shall be prepared and submitted to the Conservation Administrator for review.
22. Should a chemical expansion method be chosen, a plan, materials and details preventing chemicals from entering the resource shall be submitted to the Conservation Administrator for review.
23. Applicant shall provide engineering plans for diverting water from work area and these plans shall come before the Conservation Commission for review and discussion at a public meeting.
24. This Order of Conditions shall be included in all bid proposals, contracts, and documents.

D. Project Period

25. The erosion control devices shall function throughout the project to prevent erosion and sedimentation. They shall be inspected and maintained routinely by the applicant or his contractor throughout the duration of the project and after every storm event of 1/2 inch of precipitation or more. Breaks in the line shall be immediately repaired to prevent siltation into the wetlands. Additional erosion controls shall be available on site for such repairs.
26. If soils are to be disturbed for longer than two months, a temporary cover of rye or other grass (conservation mix) shall be established to prevent erosion. Once final grading is completed, loaming and seeding of each area shall be completed promptly. Vegetative cover, either temporary or permanent, shall be established prior to winter. If the season is not appropriate for plant growth, exposed soils shall be stabilized with jute netting, staked mulches, or other U. S. Natural Resource Conservation Service methods.

27. The limit of work shall be the erosion control devices beyond which no work may occur. The MCC reserves the right to require additional erosion controls and storm damage prevention measures at any time if it deems necessary.
28. The contractor or responsible party shall have an appropriately sized spill containment kit on site whenever vehicles or mechanized equipment is operating or present. The kit shall be sized to accommodate the total volume of fluids in the largest piece of equipment present. Appropriately trained personnel shall also be present and have access to this material. The contractor or responsible party shall be required to have additional absorbent materials (pads) and additional length of boom on site.
29. Equipment fuel storage and refueling and lubrication operations shall be situated least 100 feet from any wetland resource area.
30. Heavy equipment shall be stored in an upland area at least 100 feet from any wetland resource area when not in use or overnight.
31. Absolutely no washing of trucks or other equipment shall take place within 100 feet of the resource areas.
32. Only clean fill may be used in connection with this project. Any fill used in connection with this project shall not contain trash, refuse, rubbish, or debris, including but not limited to lumber, brick, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
33. Any excavated materials resulting from the work shall be moved outside the 100-foot buffer zone at the end of each day.
34. Stockpiled earth and other materials or debris shall be located outside of the 100-foot buffer zone of the resource areas(s).
35. All stumps, brush, and debris shall be removed from the site, including existing and construction debris. This material shall be disposed of promptly and properly at an off-site facility licensed to receive the material. Records as to the destination of all materials including stumps, brush, and excess fill shall be kept and supplied to the Commission if requested.
36. Any refuse material generated through the project construction will be removed to an approved landfill, and in no case will these materials be allowed to be buried or disposed of on site or on abutting property. **REMOVAL MUST BE DONE WEEKLY DURING THE CONSTRUCTION PHASE OF THE PROJECT. REFUSE MUST NOT BE ALLOWED TO ENTER ANY WETLAND AREAS.**
37. No blasting shall be permitted under this Order of Conditions. If it is discovered during the course of work that blasting will be necessary, the applicant shall file for an Amended Order of Conditions with plans and evidence describing the blasting activities.
38. If weather conditions cause the terrain to be excessively soft, the MCC may halt work until dry conditions permit work to continue without excessive churning of the soil.

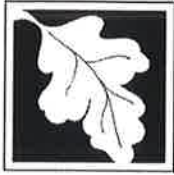
E. Post Project

39. After the completion of construction, the applicant shall submit the following to the MCC:
 - a. A completed Request for a Certificate of Compliance – WPA form 8A.
 - b. A letter from a Registered Professional Engineer certifying compliance of the project with this Order of Conditions and detailing any deviations that exist and their potential effect on the project. **A statement that the work is in “substantial compliance” with no detailing of the deviations shall not be accepted.**
 - c. An “As-Built” plans stamped and signed by a Registered Professional Engineer or Land Surveyor showing post-construction conditions. This plan shall note any deviations from the Approved Plans and include at a minimum:

1. All wetland resource area boundaries with associated buffer zones and regulatory setback areas taken from the plan(s) approved in this Order of Conditions;
 2. Locations and elevations of all stormwater management conveyances, structures and best management designs, including foundation drains, constructed under this Order within any wetland resource area or buffer zone;
 3. Distances from any structures constructed under this Order to wetland resource areas - "structures" include, but are not limited to, all buildings, septic system components, wells, utility lines, fences, retaining walls, and roads/driveways; and
 4. Wetland resource replication areas constructed under this order.
- d. Post construction photographs demonstrating compliance with this Order, including established vegetation where required.
 - e. The required post-construction monitoring shall be implemented and installed that assess the effects of tide-gate removal and bridge replacement on Central Pond.

F. Perpetual Conditions The following conditions shall run with the land and be binding in perpetuity on all successors in title and assigns of the applicant; they are ongoing and do not end upon completion of this project or the issuance of a Certificate of Compliance; they shall be the responsibility of the owner of record of this property.

40. **Additional Alteration Prohibited:** There shall be no additional alterations of the jurisdictional buffers and resource areas without the express permission from the MCC through a Request of Determination of Applicability or a Notice of Intent application. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
41. Use of toxic substances for lawn and garden maintenance presents a hazard to groundwater and resource areas. Use of pesticides and herbicides is therefore permanently prohibited at this site within 100 feet of the resource area. Only organic fertilizers shall be used on the site. Fertilizers shall not contain pesticides or herbicides, shall only contain slow release nitrogen, and shall not contain more than 3% phosphorous. To mitigate runoff, do not fertilize immediately preceding a rainstorm and use fertilizer sparingly.
42. The use of de-icing chemicals (such as sodium chloride, potassium chloride or any other chemicals) is to be limited to the amount necessary to maintain public safety. The Applicant shall assume the responsibility of informing any snow removal contractors working on the property of this requirement.
43. Long term maintenance and pollution prevention shall adhere to the "Long-Term Prevention Pollution Plan" listed under the Approved Plans and Documents above.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0832
 MassDEP File #
 1239502
 eDEP Transaction #
 MANCHESTER
 City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

11/18/2020

1. Date of Issuance

Please indicate the number of members who will sign this form.


6

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

By Vote on 5/5/20, the individuals listed below have authorized the Conservation Administrator to sign on their behalf pursuant to the signature authorization recorded with the Southern Essex Registry of Deeds in Book 38501 Page 530. They also intend for their typed names below to serve as their electronic signatures for any entity (MassDEP) that accepts electronic signatures.

Signatures: /Sarah Oseasohn/
/Stephen Gang/ /Henry Oettinger/
/Olga Hayes/ /David Lumsden/

 Christine Bertoni, Conservation Administrator,
 duly authorized (Book 38501, Page 530) /John Judge/

by hand delivery on
11/18/20
 Date

by certified mail, return receipt requested, on
 Date



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0832
 MassDEP File #
 1239502
 eDEP Transaction #
 MANCHESTER
 City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0832
 MassDEP File #
 1239502
 eDEP Transaction #
 MANCHESTER
 City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location

MassDEP File Number

Has been recorded at the Registry of Deeds of:

County

Book

Page

for:

Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
Request for Departmental Action Fee
Transmittal Form

DEP File Number: _____

Provided by DEP _____

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address _____

b. City/Town, Zip _____

c. Check number _____

d. Fee amount _____

2. Person or party making request (if appropriate, name the citizen group's representative):

Name _____

Mailing Address _____

City/Town _____

State _____

Zip Code _____

Phone Number _____

Fax Number (if applicable) _____

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name _____

Mailing Address _____

City/Town _____

State _____

Zip Code _____

Phone Number _____

Fax Number (if applicable) _____

4. DEP File Number:

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number:

Request for Departmental Action Fee
Transmittal Form

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

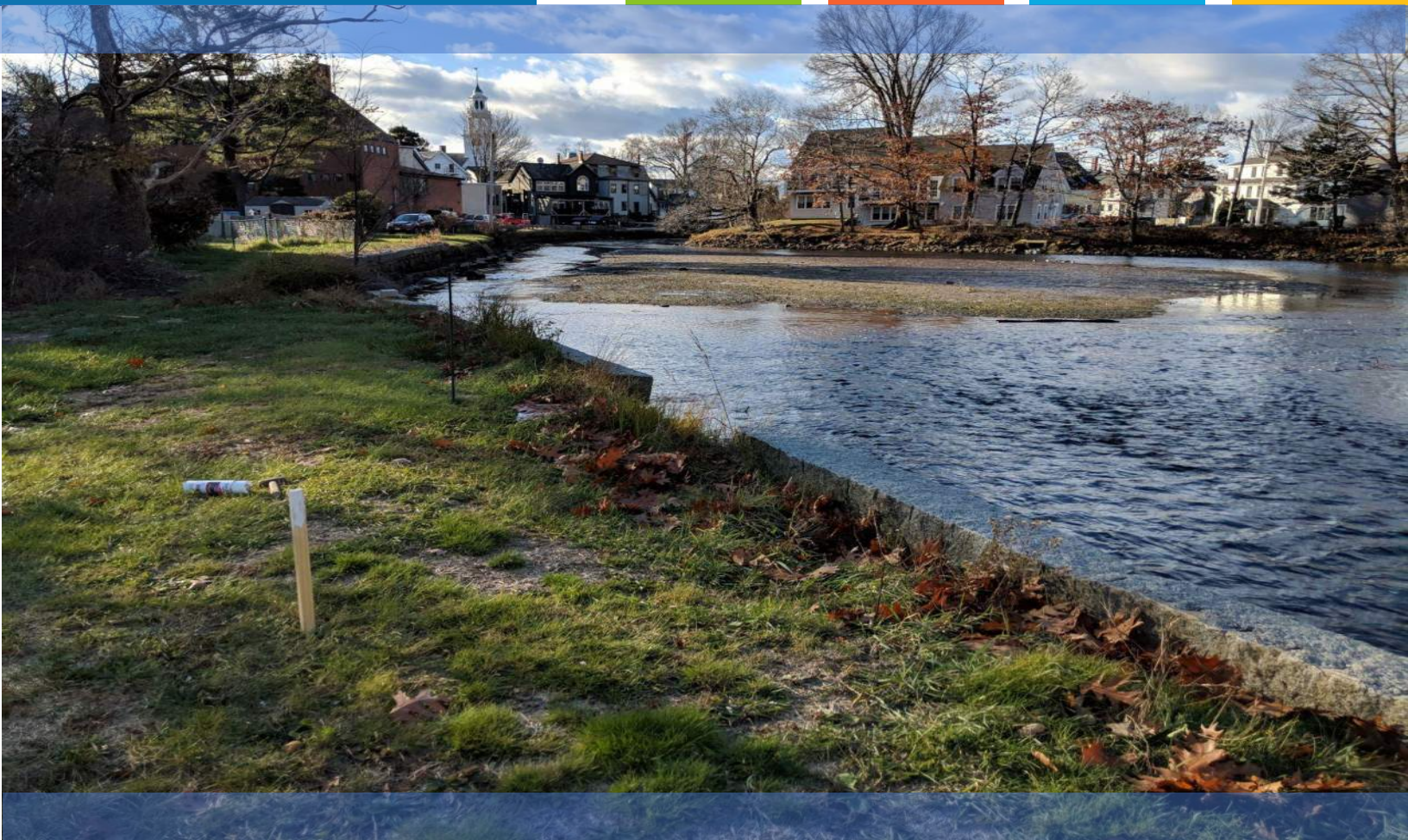
Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Tighe&Bond

APPENDIX I



Central Pond/Sawmill Brook Restoration Project
Central Street, Manchester-by-the-Sea

WETLAND MONITORING & RESTORATION MAINTENANCE PLAN

Town of Manchester-by-the-Sea
10 Central Street
Manchester-by-the-Sea, Massachusetts

May 2021

Tighe&Bond

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Section 1

Introduction

This *Wetland Enhancement and Restoration Plan* design has been developed by Tighe & Bond on behalf of the Town of Manchester-by-the-Sea (Town) for the proposed ecological restoration at Sawmill Brook and Central Pond in Manchester by the Sea. The Town is seeking to rehabilitate and/or replace the existing retaining wall sections on Central Pond and Sawmill Brook, construct a living shoreline in other areas of the Pond for slope protection and ecological enhancement, place structural elements in the Pond to improve stability, habitat, and to promote natural stream geomorphologic processes, and plantings to promote the establishment of native tidal wetland plants. This work is part of a larger tidal restoration project that also includes the replacement of the Central Street Bridge and removal of the tide gate structure at that bridge. All Waters of the United States (WotUS) within the project area limits will be targeted for restoration and/or enhancement, as described in the following sections of this report. In addition, this report includes a monitoring and operational plan to ensure the long-term success of this project.

1.1 Central Pond Restoration Project DEP File # 039-0824 - Order of Conditions Monitoring Requirements

The Central Pond Restoration Order of Conditions (OOC) preconstruction requirements and special conditions requires a monitoring plan, among other documents. The full OCC is included in Appendix B. Following are numbered items from the OCC that are addressed within this restoration planning document. This wetland restoration plan extends the monitoring plan to five years based on the requirements from the US Army Corps of Engineers Section 404 permit, found in Attachment C.

Manchester Conservation Commission General and Special Conditions:

B. Pre-Construction Requirements:

12. c) Apex Jam Structures. Construction details for the Apex Jam Structures similar to those provided for “Bank Treatment A- Rootwad detail’ and Bank Treatment C – Encapsulated Soil Lift” shall be provided by the applicant and shall include anchoring details if the structures are to be anchored. In addition, a Monitoring Plan specific to the Apex Jam Structures shall be provided detailing bank/ access protection during construction, who is responsible for monitoring effectiveness of the Structures, and who is responsible for removing woody debris that collects on the apex jams.

- Section 4.3.2 details the maintenance of the apex jams in perpetuity. Section 5 addresses the initial monitoring of the apexes and the effectiveness of the structures. Section 5.2 details the quantitative measurements that will be used to evaluate the effectiveness.

12. e) Monitoring. The applicant shall establish fixed photographic monitoring locations and submit photo-documentation of existing conditions. The fixed

locations shall be used to photo-document construction, final project conditions and restoration of disturbed areas.

- Section 5 within the plan discusses the monitoring of the area following the completion of construction. It describes the qualitative (Section 5.1) and quantitative (Section 5.2) methods of monitoring. Section 5.1 details the photo documentation, stating that a benchmark will be set on each stream bank approximately every 500 feet through the reach providing monumentation for fixed position coordinates which comparison photo documentation can occur.

C. Special Conditions

14. Western bank living shoreline plantings and those mitigation plantings installed into the 30-foot No Disturb Zone shall be monitored for two growing seasons to guarantee at least an 85% survivorship. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plan monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five(5) years following the issuance of a Certificate of Compliance.

- Section 4.2.2 details out the shrub replacement for the western bank living shoreline. Section 5 within the plan discusses the monitoring of the area following the completion of construction and ensuring the 85% survivorship of the plantings within the western bank living shoreline.

15. Western bank streambank stabilization components including root wads and apex jams shall be monitored for erosion and scour for two years. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plan monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.

- Section 5 within the plan discusses the monitoring of the area following the completion of construction. It describes the qualitative (Section 5.1) and quantitative (Section 5.2) methods of monitoring.

16. A monitoring plan for invasive species management shall be submitted to the Conservation Administrator for approval. The monitoring plan shall include details for removing invasive species if found in the planting area. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.

- Section 4.2.1 details out the invasive species management within the project area. Invasive species will be removed via mechanical means, unless permission is obtained from the Town to apply herbicides.

Section 2

Evaluation of Existing Conditions

2.1 General

The project is located within Sawmill Brook/Central Pond in Manchester-by-the-Sea, Massachusetts. Sawmill Brook and associated tributaries have a watershed area of approximately five square miles which drains much of the central portion of Manchester-by-the-Sea. The mouth of Sawmill Brook drains through a narrow small bridge and tide gate under Central Street. The tide gate has been open since February 27, 2018. The main area known as Central Pond extends upstream from Central Street Bridge to Knights Circle.

The Pond is relatively flat, with a shallow gradient from ranging from three feet (NAVD88) where Sawmill Brook enters Central Pond to 0.2 feet at the Central Street bridge inlet. Two main "islands" are present at low tide; one triangular feature at the entrance to the pond and one kidney shaped feature in approximately the center.

Sediment accumulation has been noted along the shoreline on the western bank of the pond and to the north of the pond, and eroded banks have been observed predominantly along the eastern bank of the pond, due to collapse of retaining walls. Wall types found around Central Pond include granite block, poured concrete, brick, field stone and shale revetment and combinations of the above. The eastern shoreline is cut sharply into the Pond, with the wall defining the eastern bank boundary. The eastern shoreline is completely lined with wall structures ranging from three to five feet in height, with the tallest walls adjacent to Central Street along the channel that parallels Elm Street. These walls support the fill slopes that contain residential and commercial properties.

The western shoreline has a more gradual slope, and includes several shoals formed from finer sediments deposited as Sawmill Brook flows under low water flow, gathering in pockets along the shore. Aggradation has formed of a central bar from the center to the eastern third of the pond and propagation of saltwater cordgrass (*Spartina alterniflora*) has occurred since the removal of the flap on the tide gate structure. Three stormwater discharge outfalls along the western shore are also sources of sediment from street runoff. Walls along the western shoreline vary from loose cobbles and revetment to low fieldstone.

2.2 Waters of the United States

Waters of the United States (WotUS) were delineated by Tighe & Bond on April 18 and 19, 2018. Resource areas were delineated in accordance with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0, USACE, January 2012).

WotUS identified at the site were limited to the Mean High Water (MHW) marks associated with this segment of Sawmill Brook, a navigable waterway subject to tidal action. Note that the Sawmill Brook and Central Pond are both in transition from inland wetland resource areas to coastal resource areas and that as the restoration of tidal influence

improves with removal of the tide gate, areas that may have previously been inland resource areas are now being characterized as coastal resource areas.

The National Wetlands Inventory (NWI) Map classifies the wetlands (using the Cowardin et al. (1979) system for wetlands and deep-water habitats) within the project area include:

- E1UBL, Estuarine Subtidal Unconsolidated Bottom, Tidal Salt
- R5UBH, Riverine Unknown Perennial Unconsolidated Bottom, Permanently Flooded

The majority of the project area within the limits of Central Pond is identified on the NWI map as E1UBL. The Sawmill Brook is identified on the NWI map as R5UBH.

2.3 Hydrology

The Sawmill Brook is shown as a perennial stream on the USGS topographic map (Marblehead North, Massachusetts; 1985). The project area is within a tidal portion of Sawmill Brook as the mouth of coastal rivers mapping indicates that the tide gate and bridge at Central Street is the mouth of the coastal river.

The mean high water (MHW) mark was determined following a review of available tide charts, tidal datum, and hydraulic modeling. The MHW marks on the project plans are approximately elevation 4.33 feet (NAVD88). Mean Higher-High Water (MHHW) is approximately 4.77 feet (NAVD 88). Mean Lower-Low Water (MLLW) in the bay is estimated to be approximately -5.51 feet (NAVD88) based on the NOAA long-term tide water level monitoring station for Boston, MA (ID 8443970). With the tide gate open the upstream bridge invert would become the control, so MLLW would need to be greater than the elevation of the upstream bridge invert, -0.2 feet for current tide elevations to have affect in the stream further upstream. Tighe & Bond used data loggers upstream of Central Street from November 27, 2017 to May 4, 2018 to monitor water levels. Based on available data when the tide gate was open, MLW would be at approximately 1.5 feet within the pond.

Tighe & Bond observed areas below the MHW during low tide conditions. Observations during these low tide conditions included the establishment of cordgrass (*Spartina alterniflora*) within the tidal flats. No shellfish or other submergent aquatic vegetation were observed. The land below the MHW associated with Central Pond consists of a mixture of fine-grained sandy sediment and organic muck. The land below MHW within Sawmill Brook, south of Central Pond, consist of primarily rock, gravel, and cobble with limited deposits of coarse sand.

2.4 Soil Survey

According to the USDA NRCS [online] Soil Survey of Essex County (MA606), Massachusetts, the project as area is mapped as Water (1), Boxford silt loam (220B), and Merrimac fine sandy loam (254B). Brief descriptions of these soil units follow. The current sediment and soil profile in the Central Pond are a blend of accretion of sediments from tides and aggradation from terrestrial flows that has taken decades to produce.

Boxford Silt Loam (220B) consists of areas where the slope is three to eight percent that are moderately well drained. The parent materials are soft silty and clayey lacustrine deposits or marine deposits over lacustrine deposits. The most extensive areas of this map unit are found along the western shoreline of Central Pond/Sawmill Brook. A water table may be present in the within two to three feet. Minor soils and included areas comprise about 10 percent of the unit.

Merrimac fine sandy loam (254B) This map unit consists of moderate slopes (3 to 8 percent) of excessively drained. Parent material consists of loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and glaciofluvial deposits. This unit is most extensively mapped on the eastern shoreline of Central Pond/Sawmill Brook. Minor soils comprise about 10 percent of this unit.

2.5 Functions and Values

Alterations of the hydrology and banks at Central Pond/Sawmill Brook in the project area limit the wetlands functions and values of the current system. Based the Corps' *"The Highway Methodology Workbook Supplement: Wetlands Functions and Values,"* the WotUS within the project area provide a number of functions and values, including:

- Groundwater Recharge/Discharge
- Floodflow Alteration
- Sediment/Toxicant Retention
- Nutrient Removal/Retention/Transformation
- Sediment/Shoreline Stabilization
- Wildlife Habitat
- Visual Quality/Aesthetics

The goals of the restoration seek to improve many of these functions and values particularly shoreline stabilization. In addition, the restoration includes the removal of a tide gate which currently inhibits fish passage. The restoration will significantly improve fish habitat by improving fish passage conditions at this transition from Sawmill Brook to Manchester Harbor.

Section 3 Enhancement & Restoration Area Design

A primary purpose of the Central Pond Restoration project is the ecological enhancement of wetland areas currently impacted by erosion, slope failure, and sediment/debris fill and to improve stability, habitat, and to promote natural stream geomorphologic processes within Central Pond. Wetland enhancement and restoration will be completed concurrently with the proposed shoreline stabilization work. While areas of Central Pond will need to be impacted to implement the shoreline stabilization, this provides a unique opportunity to restore and/or otherwise enhance this wetland system to provide increased functions and values through added habitat complexity.

Enhancement and restoration efforts are comprised of several elements:

- restoration of the channel and associated in-stream habitat
- improvement of Central Pond bank stability
- installation of an apex jam for habitat complexity and stability
- planting with native species to restore and enhance habitat
- creation of a living shoreline adding complexity and habitat at the edge of the project area

3.1 Enhancement and Restoration Details

Enhancement will involve the installation of a woody apex jam and of rootwads, coir logs and/or coir-wrapped soils lifts to stabilize undercut or dissipate energy in high-energy sections and the in areas below OHW. Mudflat areas will be enhanced with native plantings with coir logs and/or blankets in some areas to improve the habitat structure in the intertidal area and stabilize sediments in the portions of the Central Pond outside of the create a diverse wetland complex with a native vegetative community structure that is designed to provide improved habitat.

Appropriate structures are necessary to allow time for riparian and marsh vegetation to establish, prevent later channel movement, dissipate flow energy, and provide instream and overhead cover for fish. Toe wood uses appropriately sized wood to stabilize streambanks at high velocity-high shear locations on outer bends. The structure will dissipate the anticipated high bank shear once the stream planform stabilizes with the pools anticipated to develop along the outer bank. Toe wood design uses embedded large wood as structure to dissipate bank stresses. Wood is often found in systems that have deposited themselves from upper watershed riparian recruitment. These structures add flow resistance to prevent streambank erosion and contains native planted vegetation on the upper part of the bank. The logs are buried deep and counter-buttressed with fill and vegetation to avoid the buoyancy factor ensuring that the wood remains intact throughout the various flow regimes.

Bank stabilization along the western shoreline of Central Pond will be achieved through the placement of rootwads, coir logs and/or coir wrapped soil lifts to stabilize undercut or dissipate energy in high-energy sections of the stream channel. Native plants appropriate for the planting zones (tidal elevations) will be inserted into these logs and/or soil lifts. Planting zones will be established based on the ability of the plant to thrive in the brackish zone at the toe upward through the upland zone of the upper bank. The proposed plantings include plantings at the top of the slope, at elevations above MHHW, to reduce the existing top of bank erosion.

Habitat complexity will be encouraged through rootwads to help create deep scour pools and near bank shear dissipation. Large rootwads will extend into the channel on an outside bend of the western shoreline. Rootwads are placed roughly thirty-five degrees from bank facing upstream to the channel atop the toe, or inserting a key log placed longitudinally in the channel toe (rootwad facing upward). The bank will require some excavation to bury the trees using buried rock ballast and native backfill.

The bank will then be regraded and planted with native woody plants installed to encourage riparian vegetation. The coir logs will be secured and then top-dressed with loam and planted with plugs. The loam will be covered with coir blankets and then overseeded and planted as shown on the planting plans. Appropriate structures are necessary to allow time for riparian and marsh vegetation to establish, prevent later channel movement, dissipate flow energy, and provide instream and overhead cover for fish. Planting in the living shoreline areas will occur during construction of those elements as a critical component of those structures.

Planting on the tidal flats will include smaller areas of initial planting (test plots) with follow up monitoring to determine if the elevation of the tidal flat is high enough to allow for *Spartina alterniflora* to survive the high tide inundation periods. Smaller planting areas can also be used to determine if the addition of plants helps retain sediment in Central Pond. Typical species that will be used for the plantings are listed below in Section 3.6.

3.2 Waters of the U.S. Impact Calculations

There will be a total impact area of 26,522 sf within land below MHW for this project as a result of the living shoreline and restoration of the tidal wetland. Of this total impact area, a portion of the land below MHW will be converted to a tidal wetland (approximately 11,300 sf depending on vegetation growth). There is a conversion of land below MHW to a tidal wetland as a result of this project due to the stream restoration, native plantings, and living shoreline installation. Table 3-1 presents an overview of net gains and losses in WotUS at the site.

TABLE 3-1
Waters of the U.S. Impacts, Creation, and Net Loss/Gain

WotUS Type	Existing Areas to be Impacted		Proposed Area Post-Construction	Net Loss (-)/Gain (+)
	Temporary	Permanent		
Tidal Wetland	0 sf	0 sf	11,300 sf	+ 11,300 sf
Land Below MHW	10,997 sf	15,525 sf	15,222 sf	- 11,300 sf
Bank	95 lf	1,430 lf	1,525 lf	

3.3 Wetland & Channel Area Hydrology

The hydrology of the proposed enhancement and restoration area has been designed to guide the system towards pre-tide gate conditions to the extent practicable. The hydrology is driven both by inputs from the tidal flow, and by stream flows. The system is influenced both by the tidal cycle and the variations in freshwater flows from Sawmill Brook. The proposed approach of adding large wood structures and plantings will allow some channel migration towards the center of the relic pond area for the channel to establish natural equilibrium. This area will also provide floodplain area for higher storm and tidal events. It is expected that any channel migration will likely be slow and over long periods of time. Therefore, riparian and tidal planting, at appropriate elevations, in these areas will provide root mass, depth, and density creating soil stability through the use of native vegetation and enhance habitat creation.

3.4 Hydric Soil and Sediment Structure

The existing soils within the footprint of the impacted jurisdictional areas consist of a blend of accretion of sediments from tides and aggradation from terrestrial flows that has taken decades to produce. No amendments are proposed to the existing soil in the pond area and excavated materials (dredge) required for construction and installation of material such as root wads are proposed to be reused onsite to the extent practicable.

3.5 Wetland Area Community Type

The Estuarine Subtidal Unconsolidated Bottom (E1UBL) is proposed to be vegetated and converted to an Estuarine Intertidal Emergent (EIEM1) wetland. As there is no existing wetland vegetation of value, stockpiling and transplanting is not proposed. This area will be planted with plugs as described in Section 3.6. A list of live planting species proposed is provided in the herbaceous species section in Table 3-2 below.

3.6 Proposed Wetland Plant Community

The proposed plantings for the impacted wetland areas consist of a mix of woody and herbaceous plant species. Live plantings are summarized in Table 3-2. The planting locations are shown on the planting plans.

TABLE 3-2

List of Proposed Native Plantings by Community Type

	Common Name	Scientific Name	Indicator Status ¹
Tidal Marsh	Smooth cordgrass	<i>Spartina alterniflora</i>	OBL
	Three-square club-bulrush	<i>Schoenoplectus pungens</i>	OBL
Higher Wetland Elevations to Wetland Boundary	Switch panicgrass	<i>Panicum virgatum</i>	FAC
	Seaside goldenrod	<i>Solidago sempervirens</i>	FACW
	Maritime marsh-elder	<i>Iva frutescens</i>	FACW
	Coastal sweet pepperbush	<i>Clethra alnifolia</i>	FAC
	Swamp rose-mallow	<i>Hibiscus mosheutos</i>	OBL
	Eastern false willow	<i>Baccharis halimifolia</i>	FACW

¹Lichvar, R.W. 2013. *The National Wetland Plant List: 2018 wetland ratings*. Phytoneuron 2013-49: 1-241. Northcentral and Northeast subregion.

3.7 Functions and Values

Successful enhancement and restoration of the altered areas is anticipated to provide improved and additional functions and values, including:

- Groundwater Recharge/Discharge
- Floodflow Alteration
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention

- Nutrient Removal/Retention/Transformation
- Wildlife Habitat
- Shoreline Stabilization
- Recreation
- Educational/Scientific Value
- Visual Quality/Aesthetics

The restoration seeks improve many of these functions and values as detailed in Sections 3.3, 3.4, 3.6, and 3.8. In addition, the proposed project includes a new staircase to allow public access to Central Pond and improve recreation and educational opportunities within the area.

3.8 Goals and Criteria for Enhancement and Restoration Success

A number of goals and supporting criteria will be considered to evaluate the relative of success of the enhancement and restoration areas. These factors will be the focus of post-construction monitoring events and will serve to inform the degree of permit compliance and/or need to implement contingencies or other adaptive management measures. Project goals are summarized below in bold, as well as the general supporting criteria that will be used to evaluate achievement of each goal. Sections 4 and 5 provide additional detail on the success criteria and associated construction oversight, monitoring, and reporting.

- **Provide Bank Stability**
 - As-built drawings and post-construction photos will document completion of this goal demonstrating that grading, coir logs, fiber blanketing, seeding, and live staking were installed as depicted on project plans.
 - Photo-documentation over the 5-year monitoring period of the restored banks will provide additional proof of meeting this objective. Signs of erosion, undercutting, slumping, or scouring will be the focus of monitoring to document channel stability.
- **Restore Channel**
 - As-built drawings, specifically cross-sections and channel profiles, will demonstrate the stream channel conditions via post-construction elevations.
 - Measure the width/depth ratio of the channel over the 5-year monitoring period.
 - Measure the bank erosion through the bank height ratio and floodplain connectivity under low tide over the 5-year monitoring period.
- **Restoration of Aquatic In-Stream Habitat**
 - As-built drawings, specifically cross-sections and channel profiles, will demonstrate the restoration of in-stream habitat.
 - Permanent photo plots will be established within various reaches of the channel to document in-stream habitat over the 5-year monitoring period.

- Signs of wildlife use or in-stream plant establishment will also be documented and reported over the 5-year monitoring period.
- Measure the pool/riffle ratio within Sawmill Brook.
- Aerial photographs will also be utilized, as available, to document potential indicators of hydrology within the restored channel associated with the in-stream habitat.
- **Vegetation Monitoring**
 - Post-construction (Year 0) monitoring by a wetland scientist will verify that all plantings have been installed as proposed on the planting plan.
 - The 5-year monitoring plan outlined in Section 5 will quantitatively and qualitatively document establishment of native vegetation within the wetland enhancement areas.
 - Replace western bank living shoreline plantings below an 85% survival rate and if there is more than 10 lf along the bank of no active growth for shrub and tree plantings for five growing seasons.
 - Additional colonization/recruitment of native plants will also serve as a metric of success, should that be documented during monitoring.
- **Management of Invasive Plant Species**
 - Maintain control of invasive plants over the monitoring period with 5% cover or less over the restoration area.
 - The 5-year monitoring plan outlined in Section 5 will quantitatively and qualitatively document invasive vegetation within the wetland enhancement areas.
 - Remove any invasive species within the project boundaries during the monitoring period.
- **Creation of Diverse Habitat**
 - As built-drawings will document establishment of channel habitat, scrub-shrub/emergent marsh wetland areas, and upland riparian areas.
 - Post-construction (Year 0) observations will verify native plantings installed as proposed on project plans to create varying vegetation communities.
 - The 5-year monitoring plan will document improvements in habitat structure.

Section 4 Plan Implementation

4.1 Construction-Phase

A designated wetlands specialist will monitor enhancement and restoration area construction activities in the field. At a minimum, the wetland specialist (*i.e.*, Environmental Monitor) shall have a minimum of five (5) years of experience with wetlands enhancement and restoration. If scheduling allows, it is recommended this plan be implemented during either the early or late growing season, depending on the construction schedule in order to avoid seasonal high temperatures and/or low precipitation rates that might adversely affect the viability of seed germination.

4.1.1 Construction Sequence

The following steps represent the anticipated sequence of actions necessary to complete the wetland enhancement and channel restoration in accordance with this plan. Minor variations may be necessary to adjust to field conditions such as weather.

1. Install erosion and sedimentation controls and establish work areas
2. Schedule and conduct site walks with pertinent regulatory agencies to inspect construction-phase BMPs
3. Complete site preparation on east and west sides of the pond prior to initiating in-pond work, including temporary and permanent access routes
4. Install apex jam, utilizing approved temporary matting for construction access
5. Install coffer dams and turbidity curtain or other water control elements
6. Perform grading and install bank habitat features as shown in the plans while removing the existing upstream bank
7. Construct wood structures in main channel as shown in plans
8. Restore and rebuild the wall in segments
9. Remove coffer dam, temporary stream access points and in-channel BMPs
10. Restore disturbed areas in-kind and revegetate areas with plantings as described above and depicted on the plantings plan
11. Remove erosion and sedimentation controls pending approval from the Manchester-by-the-Sea Conservation Commission
12. Manual planting of tidal marsh grasses on tidal flat beginning with test plots

4.2 Maintenance & Contingencies

While the vegetation becomes established, maintenance may be required. Typical maintenance activities could include providing irrigation (e.g., watering in) woody and herbaceous species or, over time, the hand-removal of non-native and/or invasive species.

4.2.1 Invasive Species Control

As with any recently disturbed soil surface, there is the potential for colonization by non-native and/or invasive plant species. Monitoring of this area will be required following completion of construction, and the environmental monitor will search for and document establishment of any invasive plants (*i.e.* Phragmites and Japanese knotweed) and make recommendations for their removal and any other corrective actions, as needed. Invasive species will be removed via mechanical means, unless permission is obtained from the Town to apply herbicides.

In addition, construction period invasive species control measures will be implemented. Construction vehicles and equipment are recommended to be clean and free of any plant or soil debris prior to entering the project site, and are recommended to be cleaned prior to leaving the site to prevent the introduction or off-site transport of invasive plant fragments or seed. In addition, items such as boots or other personal equipment are also recommended to be cleaned prior entering or leaving the site.

4.2.2 Shrub Replacement

Should any shrubs appear to be dead or dying, recommendations for their replacement will be made by the Environmental Monitor. It is recommended plant materials are replaced within two to three weeks of the recommendation for their replacement, so that they are planted during the active growing season and have increased chances of becoming established. Timely shrub replacement will also serve to offset any temporal loss in habitat value that would otherwise occur from retaining dead or dying shrubs on site.

4.2.3 Apex Jam

The apex jam will be monitored and maintained by the Town of Manchester-by-the-Sea following the completion of construction. The apex jam will be monitored on an annual basis, with inspections occurring after major flood events and as needed. Urban and woody debris that collects within the apex jams will be removed during low tide utilizing best management practices to limit the impact on nearby areas.

4.2.4 Gravity Retaining Walls

The retaining walls will be monitored and maintained by the Town of Manchester-by-the-Sea following the completing of construction. The retaining walls will be monitored on an annual basis, with inspections occurring at low tide after major precipitation events or as needed. Any erosion in front of the wall or subsidence behind the wall will be noted.

Section 5 Monitoring

The Sawmill Brook/Central Pond plan will include both physical and biological response components. The physical habitat section will focus on the interaction of alluvial sediment, flow and wood, while the biological component will focus on the relationships between wood habitats and non-wood habitats as well as succession of vegetation planted or seeded post construction. Physical and biological monitoring parameters used for engineered logjam effectiveness. The structures focus primarily on two types, bar apex jams (BAJs) and meander bank or deflector jams (DJs). These concepts of engineered logjams (ELJs) are based on the design for natural logjams. The jams are intended to be stable and capable of influencing channel morphology, stream habitat and riparian conditions. The stability is attributed to the presence of one or more pieces of large "key" pieces of wood. An ELJ monitoring plan is suggested as part of the quantitative data monitoring with the goal of understanding both stability and effectiveness of the ELJ techniques as a restoration component. Physical and biological parameters, methodology and frequency of measurements are summarized in Table 5-1. Greater detail is provided for both physical and biological methods and metrics in Table 5-2 in the Quantitative section.

Baseline morphology, hydraulic summary and biological parameters will be recorded for pre-existing condition, design, as-built baseline and compared to data taken during the monitoring period.

TABLE 5-1 Monitoring Parameters, Methodology and Frequency Table

Type	Parameter	Methodology	Frequency
Physical	<i>Topography/Sediment Storage</i>	Survey/LiDAR/air photo analysis, meander progression	Annually spot upstream & downstream of reach
	<i>Substrate</i>	Wolman Pebble Counts	~Biennial
	<i>Habitat</i>	Classify & Survey Scour Pool, Woody Vegetation on Structure	~Biennial
	<i>ELJs</i>	Snag/Jam Enumeration & Location (GIS)	~Annual
	<i>Hydrology Events</i>	Rainfall Data and Runoff	~Biennial
Biological	<i>Primary Productivity</i>	Artificial Substrate/Direct Sampling Techniques	~Annual Growing Season
	<i>Vegetation Development</i>	Low Flow Survey	~Annual Growing Season
	<i>Flotsam on Structures</i>	Low Flow Survey & Decay	~Annual
	<i>Macroinvertebrates</i>	IBI Scoring	~Biennial

Monitoring will be required at the end of the growing season following construction (Year 0) and then for four full growing seasons following completion of construction (Years 1 through 4). The timing of the proposed monitoring events will allow for documentation of conditions within this area at the beginning and end of the growing season each year. Monitoring will be conducted by a qualified wetland scientist. A report will be prepared following each monitoring event and submitted to the Corps for their review, as well as the local Conservation Commission, and will include a quantitative and qualitative assessment of vegetation cover and species present within these areas. The qualitative vegetation assessment will document if the required 85% cover of native plant species is being achieved. Vegetation cover goals in the intertidal area will be reassessed pending the results of test plot plantings.

Prior to the start of construction, permanent photo plots will be established and GPS-located at several locations within this area. Photos will be taken at each plot from a consistent direction during construction and monitoring visits to provide visual documentation of the vegetation establishment over time. These photos will be included as part of the monitoring report.

Should any plants be observed to be dead or dying during monitoring, recommendations for their replacement will be made. Should areas of exposed soil become identified, recommendations for additional applications of seed and/or biodegradable matting will be made. The monitor will also survey for and document the presence of any invasive plant species and make recommendations for their removal, to prevent establishment of invasive plants within either area.

5.1 Qualitative Methods

These protocols for consideration of this project are those that are used typically for stream (restoration) projects. Specific checklists would include Revegetation Treatments (RT), Vegetation Control and Removal (VC), and Land Use Treatments (LU). RT include components that are in conjunction with instream and bank changes including bioengineering bank stabilization monitoring. A benchmark will be set on each stream bank approximately every 500 feet through the reach providing monumentation for fixed position coordinates which comparison photo documentation can occur during qualitative monitoring.

5.2 Quantitative Methods

These protocols involve attributes that are appropriate indicators of change in site conditions as a result of vegetation succession or revegetation efforts. Goals might include increase of native woody cover on the targeted areas.

Documenting changes in site conditions is critical in determining whether a project is at risk of increasing changes that require remediation or restoration. In addition to documenting beneficial effects, systematic monitoring may also highlight inadvertent effects that require more attention. The information obtained through monitoring provides critical feedback to project stakeholders and potential need to grantors.

The following table (Table 5-2) depicts the function based metrics considered for quantitative monitoring through a minimum period of five (5) years. This is a minimum suggestion considering the site and that geomorphic change is likely to continue for longer.

TABLE 5-2 Monitoring Metrics Table

Functional Category	Function-Based Parameters	Metrics (Units)
Hydrology	Reach Runoff	Land Use Coefficient (Dimensionless)
		BMP Outfall protection Rainfall Gage Data producing terrestrial bankfull and larger events
Hydraulics	Floodplain Connectivity	Bank Height Ratio (ft/ft)
		Bankfull Depth (ft) Entrenchment Ratio (ft/ft) Width/Depth Ratio (ft/ft)
Geomorphology	Large Woody Debris (BAJ/BJ)	LWD Index (Dimensionless)
		# Pieces (# Pieces per jam) Dominant BEHI/NBS
	Lateral Migration	Percent Streambank Erosion (%)
		Percent Armoring (%)
	Bed Material Characterization	Size Class Pebble Count Analyzer D50
		Pool Spacing Ratio (ft/ft) Pool Depth Ratio (ft/ft)
	Profile and Bed Form Diversity Pattern	Aggradation Ratio (ft/ft)
		Channel Beltwidth Radius of Curvature Meander/Width Ration (ft/ft)
		Water Surface Slope
	Riparian Vegetation	Effective Vegetated Riparian Area (%)
Canopy Cover (%)		
Herbaceous Vegetation Cover (%) Woody Stem Basal Area (sqm/hectare)		

5.3 Monitoring Schedule – Construction & Post-Construction Phases

The environmental monitor will be present on-site to perform or observe the following tasks:

- Observe grading, planting, and seeding of the restoration/enhancement area.
- Observations will include the proper test plots of the tidal wetland vegetation and installation of woody plants as outlined in Section 3 of this Plan.

- Post-Construction Monitoring - Observe restoration/enhancement areas at the end of the construction year growing season (Year 0) to determine vegetation development and to collect data for annual documentation and reporting (see following sections) relative to regulatory compliance.

Observations and data collected during this site inspection will be documented on the approved monitoring form, as well as in color photographs of each area. These materials will support the second annual monitoring report provided to the Corps and the Town Conservation Commission (see Sections 5.2 and 5.3 for details).

- Observe the restoration/enhancement area over five full growing season following project completion to determine vegetation development and to collect data for annual documentation and reporting (see following sections) relative to regulatory compliance (*i.e.*, Year 1, 2, 3, 4, and 5).

Observations and data collected during these site inspections will be documented on the approved monitoring form, as well as in color photographs of each area. These materials will support the annual monitoring reports provided to the Corps (see Sections 5.2 and 5.3 for details). These observations will be made two (2) times during the growing season each year. The first will be conducted during the early-to-mid growing season (e.g. June/July) and the second during the mid-to-late growing season (e.g. September/October).

TABLE 5-3 Monitoring Table

Attribute Monitored	Quantitative Method Suggested: Years 1,3, and 5	Qualitative Methods Suggested: Years 2 and 4
Terrestrial Tree or Shrub Cover	Transects, floodplain forest composition	Pictures take from monumented location(s) of study plot(s)
Wetland Herbaceous cover	Transects, gap intercept	Pictures take from monumented location(s) of study plot(s)
Stream Channel Morphology	Bankfull width, cross-section, longitudinal profile, aggradation, degradation	Sediment probing to refusal depth, Pictures capturing movement of slide islands
Bank Stability	Transects, cross-section, loss of soil, lack of native vegetation	Pictures taken from monumented location to track erosion or bank recession both upland and river bank
Woody Debris	Increasing, decreasing, movement in channel	Pictures capturing movement of slide islands

Riffle and Pool dimensions	Pool depth and location, longitudinal profile	Sediment probing to refusal depth, bankfull width changes at transects
Water Quantity	Stream flow, bankfull, groundwater, surface storm runoff from pipe discharge	Erosion captured from two storm outfalls, surface changes due to runoff
Invasive vegetation	Transects of non-vegetated areas being seeded by knotweed and phragmites both prevalent in reach	Pictures of transects capturing succession
Habitat Use	Birds, benthic	Pictures of use evolution

5.4 Documentation

Monitoring reports will include, at a minimum, the following information:

- Narrative description of activities performed to date and observations of the restoration/enhancement area (e.g., rate of vegetation growth, relative cover, presence/absence of non-native and/or invasive species), as well as recommended corrective actions, if necessary.
- Copies of monitoring forms (see Appendix A of this Plan for a sample form).
- Detailed evaluation of vegetation cover, soils and hydrology for two (2) reference plots within the restoration/enhancement area.
- Qualitative assessment and documentation of entire restoration and enhancement area outside of the detailed reference plots (i.e., photographs, species observed, and average planting survival rates).
- Digital color photographs of each reference plot as well as the overall restoration/enhancement area.
- Assessment of field findings relative to success criteria.

5.5 Reporting

Annual reports will be submitted to the Corps and the local Conservation Commission no later than December 15th of each calendar year for a period of five years. The first annual report will document the implementation of this Plan. The subsequent reports will document the relative success of the restoration/enhancement areas over current and previous full growing seasons.

\\Tighebond.com\data\Data\Projects\M\M1476 Manchester MA Hydro Study\014-Sawmill_Central PondPermit\Task 2- Living Shoreline\Monitoring Plan\Sawmill Brook Monitoring Plan Report_Final 5.6.21.docx

Tighe&Bond

APPENDIX A

File #: _____

Project Name: _____

Permittee Name: _____

Permittee Address: _____

Person Completing Form: _____

Date of Monitoring Event: _____

Purpose of Monitoring Event: _____

Weather Conditions: _____

Wetland Resoration Area ID: _____

VEGETATION & COVER¹: **Hydrophytic/Non-Hydrophytic**

% Cover Herbaceous Vegetation _____

% Cover Shrubs _____

% Cover Trees _____

% Cover Vines _____

% Cover Native Vegetation _____

% Cover Non-Native Vegetation^{1,2} _____

HYDROLOGY¹:

Bank Height Ratio (ft/ft) _____

Bankfull Depth (ft) _____

Entrenchment Ratio (ft/ft) _____

SOILS¹:

OTHER OBSERVATIONS:

Large Woody Debris (BAJ/BJ) _____

% Streambank Erosion _____

% Armoring _____

¹ Refer to attached floristic inventory

² Refer to attached Replacement Area site sketch (below) for location of vegetation cover types



Tighe&Bond

APPENDIX B



MANCHESTER-BY-THE-SEA

CONSERVATION COMMISSION • TOWN HALL
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 526-4397 FAX (978) 526-2001

4 June 2020

Greg Federspiel, Town Administrator
Town Hall
10 Central Street
Manchester, MA 01944

HAND DELIVERY

Re: Order of Conditions Central Pond Restoration Project DEP File #039-0824

Dear Greg:

Enclosed is the Order of Conditions for restoration of tidal flows to Central Pond to stabilize the shore with retaining wall repair/replacement, and to construct a living shoreline to improve ecological conditions and coastal resiliency within Riverfront, Land Under Ocean, Coastal Beach, Coastal Bank, Land Subject to Coastal Storm Flowage, and the 50-foot No Build Zone, and 30-foot No Disturb Zone Buffers at 0 Elm Street (map 53, lot 28) which was approved by the Manchester Conservation Commission on 5/5/2020.

Before any work may begin, you must wait 10 business days (the appeal period) after which the Order must be recorded at the Registry of Deeds in its entirety. Once the Order is recorded, please submit proof of recording to me prior to the commencement of work.

Please review the Order carefully as it will govern how the work must be performed in order to be in compliance with the Massachusetts Wetlands Protection Act and the Manchester Wetlands By-Law. Please note that this order includes several pre-construction conditions, **including a pre-construction meeting between your contractors and me prior to the commencement of work** (see Standard and Special Conditions, Section B).

The Order is valid for three years from the original issuance date, except where otherwise specified. Requests for extensions must be received at least 30 days prior to the expiration date. Also note that ANY deviation from the plans contained or required in the Order of Conditions will require a *de minimis* change request, an amendment to the order(s) or submittal of a new application. As always, any other applicable permits required from any other Board or Department (state or local) will have to be obtained prior to commencement of work..

Please be advised that once work has been completed and the plantings have been monitored for two growing seasons, you should promptly seek a Certificate of Compliance from this office. Recording the Certificate of Compliance will clear the title for this property from the Order.

Please let me know if you have any questions or if I may be of further assistance.

Sincerely,



Chris Bertoni
Manchester Conservation Administrator

cc: Richard Canavan, Tighe & Bond, Inc., 120 Front Street, Suite 7, Worcester, MA 01608
DEP Northeast Regional Office (electronic copy only - filed eDEP)
/file

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 - Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
and Manchester Gen. Wetlands Bylaw

Provided by MassDEP:
MassDEP File #:039-0824
eDEP Transaction #:1200120
City/Town:MANCHESTER

A. General Information

1. Conservation Commission MANCHESTER
2. Issuance a. OOC b. Amended OOC

3. Applicant Details

- a. First Name GREGORY b. Last Name FEDERSPIEL
c. Organization TOWN OF MANCHESTER
d. Mailing Address 10 CENTRAL STREET
e. City/Town MANCHESTER f. State MA g. Zip Code 01944

4. Property Owner

- a. First Name b. Last Name
c. Organization
d. Mailing Address
e. City/Town f. State g. Zip Code

5. Project Location

- a. Street Address CENTRAL STREET, EAST OF ELM STREET
b. City/Town MANCHESTER c. Zip Code 01944
d. Assessors 53 e. Parcel/Lot# 28
Map/Plat#
f. Latitude 42.57532N g. Longitude 70.73622W

6. Property recorded at the Registry of Deed for:

- a. County b. Certificate c. Book d. Page
SOUTHERN ESSEX 881 173

7. Dates

- a. Date NOI Filed : 4/13/2020 b. Date Public Hearing Closed: 5/5/2020 c. Date Of Issuance: 6/4/2020

8. Final Approved Plans and Other Documents

- a. Plan Title: b. Plan Prepared by: c. Plan Signed/Stamped by: d. Revised Final Date: e. Scale:

SEE ATTACHED
DOCUMENT CENTRAL
POND
RESTORATION_STANDARD
AND SPECIAL
CONDS_039-0824

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act

Following the review of the the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act.

Check all that apply:

Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

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a. <input type="checkbox"/> Public Water Supply	b. <input checked="" type="checkbox"/> Land Containing Shellfish	c. <input checked="" type="checkbox"/> Prevention of Pollution
d. <input type="checkbox"/> Private Water Supply	e. <input checked="" type="checkbox"/> Fisheries	f. <input checked="" type="checkbox"/> Protection of Wildlife Habitat
g. <input checked="" type="checkbox"/> Ground Water Supply	h. <input checked="" type="checkbox"/> Storm Damage Prevention	i. <input checked="" type="checkbox"/> Flood Control

2. Commission hereby finds the project, as proposed, is:

Approved subject to:

a. The following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b. The proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. The information submitted by the applicant is not sufficient to describe the site, the work or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310CMR10.02(1)(a).

_____ a. linear feet

Inland Resource Area Impacts:(For Approvals Only):

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	_____ a. linear feet	_____ b. linear feet	_____ c. linear feet	_____ d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
6. <input type="checkbox"/> Land under Waterbodies and Waterways	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
	_____ e. c/y dredged	_____ f. c/y dredged		
7. <input type="checkbox"/> Bordering Land Subject to Flooding	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
Cubic Feet Flood Storage	_____ e. cubic feet	_____ f. cubic feet	_____ g. cubic feet	_____ h. cubic feet

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<input type="checkbox"/> Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	25062	25062		
	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	23594	23594		
	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	1468	1468		
	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts:

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
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10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input checked="" type="checkbox"/> Land Under the Ocean	2030	2030		
	a. square feet	b. square feet		
	3046	3046		
	c. c/y dredged	d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input checked="" type="checkbox"/> Coastal Beaches	24492	24492	0	
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
14. <input type="checkbox"/> Coastal Dunes				
	a. square feet	b. square feet	c. c/y nourishment	d. c/y nourishment
15. <input checked="" type="checkbox"/> Coastal Banks	1525	1525		
	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores				
	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes				
	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds				
	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish				
	a. square feet	b. square feet	c. square feet	d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	c. c/y dredged	d. c/y dredged		

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which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work..

10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

" Massachusetts Department of Environmental Protection"
[or "MassDEP"]
File Number : "039-0824"

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before Mass DEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.
17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

NOTICE OF STORMWATER CONTROL AND MAINTENANCE REQUIREMENTS

19. The work associated with this Order(the "Project") is (1) is not (2) subject to the Massachusetts Stormwater Standards. If the work is subject to Stormwater Standards, then the project is subject to the following conditions;
- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Construction General Permit as required by Stormwater Standard 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that: *i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period

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- BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures; *ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized; *iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10; *iv.* all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition; *v.* any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 19(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following: *i.*) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and *ii.*) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollutant Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 19(f) through 19(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 19(f) through 19(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.
- g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with

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all applicable federal, state, and local laws and regulations.

- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions:

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No

2. The Conservation Commission hereby (check one that applies):

a. DENIES the proposed work which cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order or Conditions is issued. Which are necessary to comply with a municipal ordinance or bylaw:

b. APPROVES the proposed work, subject to the following additional conditions.

I. Municipal Ordinance or Bylaw	MANCHESTER GENERAL WETLANDS BY- LAW	2. Citation XVII
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3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows:
SEE ATTACHED DOCUMENT CENTRAL POND RESTORATION_STANDARD AND SPECIAL CONDS_039-0824

Findings

1. The Manchester Conservation Commission (MCC) finds that the site on which the work is proposed contains resource areas subject to the Massachusetts Wetlands Protection Act, M.G.L. c. 131, sec. 40 (the Act) and its Regulations, 310 CMR 10.00 and the Manchester General Wetlands By-Law which are significant to the protection of interests identified in the Act and the By-Law, specifically:
 - a. Riverfront Area (total of 314,437 sf; proposed alteration of 25,062 sf)
 - b. Land Under Ocean (1,280 sf permanent, 750 sf temporary, 3,046 cubic yards dredged)
 - c. Coastal Beach (14,245 sf permanent, 10,247 temporary)
 - d. Coastal Bank (1,525 linear feet)
 - e. Land Subject to Coastal Storm Flowage (39,000 sf temporary)
 - f. 30 foot No Disturbance Zone as protected under the By-Law (8,317 sf, including temporary impacts for safe construction access for seawall replacement and as a result of the proposed bioengineering)
 - g. 50 foot No Build Zone as protected under the By-Law (temporary impact of 2,086 sf for the gravel access construction road)

The project is not known to be within or adjacent to Estimated Habitat of rare or endangered species.

2. The wetland depictions appearing on the Approved Plan(s) is confirmed for this project only and shall be reconfirmed and/or re-delineated for subsequent filings.
3. The project as permitted is an Ecological Restoration Limited Project. The project is for the purposes of restoring or enhancing a wetland resource area in addition to the square footage listed above. The project proposes salt marsh plantings; however, the total area in square feet of Salt Marsh is pending trial plantings.
4. The project as permitted allows an alteration in Riverfront Area of 25,062 square feet (23,594 sf within 100 feet; 1,468 sf between 100 feet and 200 feet).
5. The project as permitted allows an alteration of up to 1,280 square feet of permanent alteration and 750 square feet of temporary alteration in Land Under Ocean; and 3,046 cubic yards of dredging to install footers for the wall replacement in Land Under Ocean.
6. The project as permitted allows an alteration of up to 14,245 square feet of permanent alteration and 10,247 square feet of temporary alteration in Coastal Beach.
7. The project as permitted allows an alteration of up to 1,525 linear feet of Coastal Bank.
8. The project as permitted allows a temporary alteration of 39,000 in Land Subject to Coastal Storm Flowage.
9. The MCC finds that the resources listed above are significant to the protection of the following interests as defined in the Act and its Regulations and the Manchester General Wetlands By-Law :
 - a. Groundwater supply
 - b. Flood control
 - c. Storm Damage Prevention
 - d. Prevention of Pollution
 - e. Fisheries
 - f. Land Containing Shellfish
 - g. Protection of Wildlife Habitat

Specific Findings under the Manchester General Wetlands By-Law and its regulations

1. In addition to those interests protected under the Act and its Regulations, the MCC finds that the resource areas and their buffer zones are significant to the protection of the following interests:
 - a. Water quality

- b. Erosion and sedimentation control
2. The MCC grants a waiver as requested in the “Notice of Intent” prepared for the Town of Manchester-by-the-Sea by Tighe & Bond Engineers; dated March 20, 2020, sections 5.3.2.1 and 5.3.3.1, and as shown on the Approved Plans for the following:
 - a. Installation of a temporary safe construction access for the wall replacement in the 30-foot No Disturb Zone;
 - b. Bioengineering associated with the installation of the living shoreline in the 30-foot No Disturb Zone; and
 - c. Construction of the temporary gravel access road in the 50-foot No Build Zone as needed on each side of the pond. No other structures are proposed for the 50-foot No Build Zone.

The MCC grants the waiver under the by-law for the following reasons:

- a. The applicant has satisfied the requirement of demonstrating, by clear and convincing evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Disturb Zone. The applicant has also satisfied the requirement of demonstrating, by a preponderance of credible evidence as set forth in the Alternatives Analysis, that there is no Practicable Alternative to the proposed activity which would have a materially less Significant Immediate or Cumulative Adverse Impact to the Resource Area in the No Build Zone.
- b. The project on the whole (Preferred Alternative, Section 4.1.6 of the NOI) will provide free-flowing water in a continuous stream, will replace a failing seawall along the east bank, will provide for spot treatment of areas susceptible to erosion along the west bank with toe protection and living shoreline components.
- c. The project overall will increase habitat diversity and restored naturalized landscape with the establishment of the living shoreline and salt marsh plantings.
- d. The project overall will provide improved bank stabilization for the Town of Manchester and abutters to the project area.
- e. The proposed impacts to the 30-foot No Disturb Zone and 50-foot No Build Zone are temporary disturbance for construction access. After construction, the 50-foot No Build Zone will be restored to the existing conditions; the 30- No Disturb Zone will be planted with native vegetation through the top of the living shoreline.

General and Special Conditions

A. General Conditions

1. The term “Applicant” as used in this Order of Conditions shall refer to the owner, any successor in interest or successor in control of the property referenced in the Notice of Intent, supporting documents and this Order of Conditions. The MCC shall be notified in writing within 30 days of all transfers of title of any portion of property that take place prior to the issuance of the Certificate of Compliance.
2. With respect to all conditions the MCC designates the Conservation Administrator as its agent with full powers to act on its behalf in administering and enforcing this Order.
3. This document shall be included by reference in all contracts, plans and specifications dealing with the activity that is the subject of this Order, and that are created or modified after the issuance date of this Order, along with a statement that this Order shall supersede any conflicting contractual arrangements, plans or specifications.

4. It is the responsibility of the applicant to complete any review required by all agencies with jurisdiction over the activity that is the subject of this Order, and to procure all required permits or approvals. These reviews, permits and approvals may include but are not limited to the following:
 - a. Review by the U.S. Army Corps of Engineers for any Category 2 or Individual Permit Activity, and procurement of any permits or approvals identified by the Corps including but not limited to a Section 404/10 Pre-Construction Notification.
 - b. Review by the DEP and procurement of any permits or approvals identified by the DEP, including but not limited to 401 Water Quality Certification for dredging more than 100 cubic yards of Land Under Water, Chapter 91 License.
 - c. Review by the Massachusetts Natural Heritage and Endangered Species Program for any projects within estimated and/or priority habitat and any permits or approvals identified by the Program.
 - d. Review by Massachusetts Office of Coastal Zone Management for a Federal Consistency Review.
 - e. Review by local Planning Boards, Boards of Health, Zoning Boards, and Building Inspectors, and procurement of any permits or approvals required by these boards or agencies.
5. The MCC shall be informed of all changes that may be made to the Plan(s) of Record by any other Board, Commission or Authority or as a result of changes by the Applicant. All changes shall require additional approvals from the MCC.
6. The MCC reserves the right to impose additional conditions on this project, including but not limited to, additional or modified erosion/siltation controls during the project, if it deems that site conditions warrant such measures to mitigate potential impacts.
7. Members and agents of the MCC shall have the right to enter and inspect the property to evaluate compliance with this Order, the Wetlands Protection Act, Wetlands Protection Bylaw, and to require submittal of any data deemed necessary by the MCC for that evaluation.
8. The site engineer or contractor shall have a copy of this Order of Conditions and the final approved plans at the site and available for inspection during all phases of construction. It is the applicants' responsibility to provide the contractors with a set of the approved documents, plans, and this Order, and to ensure that the contractors are aware of the Order's provisions, and that they follow them. If the conditions of the Order are not clear, the MCC or its Administrator shall be asked to clarify them.
9. **Any change in the plans approved under this Order, including those due to review by other boards or resulting from the aforementioned conditions, must be submitted to the MCC in writing for approval prior to implementation.** The MCC will then decide whether the change is substantial enough to require a new Notice of Intent filing or a request for an amendment to this Order of Conditions. Any errors found in the plans or information submitted by the applicant shall be considered as changes.
10. If any changes are made in the above-described plan(s) which may or will alter an area subject to protection under the Wetlands Protection Act, 310 CMR 10.00 or the Manchester Wetlands By-Law, the applicant shall inquire from the MCC or its Administrator, prior to implementing the change in the field, whether the change is significant enough to require the filing of a new Notice of Intent. Any errors in the plans or information submitted by the applicant shall be considered changes and the above procedures shall be followed.

B. Pre-Construction Requirements

11. This Order shall be recorded at the Registry of Deeds in its entirety. The form provided at the end of WPA Form 5 shall be completed and stamped at the Registry of Deeds after the expiration of the 10-day appeal period and within 30 days of the issuance if no request for appeal has been filed with the Department of Environmental Protection. This form shall be returned to the MCC within 21 days of recording **and prior to commencement of any activities subject to the Order of Conditions.**

12. Prior to the commencement of work on each specific Approved Activity of this project (western shoreline, eastern shoreline, tidal marsh plantings):
 - a) Erosion controls (filter sock) shall be installed per the Approved Plan. The filter sock shall consist of biodegradable materials only.
 - b) The applicant or owner shall provide the name, address, and phone number of a contact person responsible for compliance with this Order.
 - c) Apex Jam Structures. Construction details for the Apex Jam Structures similar to those provided for 'Bank Treatment A – Rootwad detail' and 'Bank Treatment C – Encapsulated Soil Lift' shall be provided by the applicant and shall include anchoring details if the structures are to be anchored. In addition, a Monitoring Plan specific to the Apex Jam Structures shall be provided detailing bank /access protection during construction, who is responsible for monitoring effectiveness of the Structures, and who is responsible for removing woody debris that collects on the apex jams.
 - d) Cofferdams. Construction details, choice of material shall not be left up to the discretion of the contractor. Construction details and choice of material shall be provided by the applicant prior to construction and approved by MCC.
 - e) Monitoring. The applicant shall establish fixed photographic monitoring locations and submit photodocumentation of existing conditions. The fixed locations shall be used to photo-document construction, final project conditions and restoration of disturbed areas.
 - f) The Applicant or his designee shall install a sign no less than 2 square feet or more than 3 square feet, visible from the street reading “**MA DEP File #39-0824**”, and not placed on a living tree.
13. Once all of the above pre-construction requirements stated in Conditions #11 and #12 have been fulfilled, the Conservation Administrator shall be contacted at least 48 hours prior to the start of work on each specific Approved Activity of this project in order to schedule a pre-construction meeting at the site. The Administrator may be contacted by email at: bertonic@manchester.ma.us or by phone at [978-526-4397](tel:978-526-4397).

C. Special Conditions

14. Western bank living shoreline plantings and those mitigation plantings installed in the 30-foot No Disturb Zone shall be monitored for two growing seasons to guarantee at least an 85% survivorship. A monitoring plan shall be submitted to the Conservation Administrator for approval. Plant monitoring reports shall be submitted after the first growing season and again after the second growing season. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.
15. Western bank streambank stabilization components including root wads and apex jams shall be monitored for erosion and scour for two years. A monitoring plan shall be submitted to the Conservation Administrator for approval. Monitoring reports shall be submitted after the first year and again after the second year. Issuance of a final Certificate of Compliance shall occur only after this condition has been met. Monitoring this dynamic living shoreline shall be an ongoing condition for a minimum of five (5) years following the issuance of a Certificate of Compliance.
16. A monitoring plan for invasive species shall be submitted to the Conservation Administrator for approval and include monitoring of invasive species for at least two years. The monitoring plan shall include details for removing invasive species if found in the planting area. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
17. Prior to any construction that is not on property owned by the Town of Manchester, permission for access shall be obtained, this Order made part of the permission, and kept on file with the Manchester Department of Public Works.

18. **Time-of-Year Restriction.** Sawmill Brook, including Central Pond, is migratory habitat for rainbow smelt (*Osmerus mordox*), and habitat for American eel (*Anguila rostrata*). The proposed work may impact passage. In-water work and silt-producing work shall be avoided from March 1 to June 30 of any year.
19. The MCC shall receive monitoring reports and sediment test results as shall be required by the 401 Water Quality permitting process.
20. The contractor selected for this restoration project shall be familiar with the principles and installation of large woody debris for use in restoration and stabilization projects.
21. Bioengineering structures / living shoreline implementation / tide marsh plantings installation shall be overseen by a qualified Environmental Monitor or equivalent with design knowledge and experience with bank restoration and stabilization projects.
22. In case of a major storm event, the site shall be secured beforehand in such a way to protect Sawmill Brook, including covering of any stockpiles of soil; installation of erosion control mats over areas of exposed soil; and removal of any debris, equipment, materials, etc. that could potentially enter the brook.
23. These special conditions shall survive in perpetuity beyond the issuance of a Certificate of Compliance: 16.

D. Project Period

24. The erosion control devices shall function throughout the project to prevent erosion and sedimentation. They shall be inspected and maintained routinely by the applicant or his contractor throughout the duration of the project and after every storm event of 1/2 inch of precipitation or more. Breaks in the line shall be immediately repaired to prevent siltation into the wetlands. Additional erosion controls shall be available on site for such repairs.
25. If soils are to be disturbed for longer than two months, a temporary cover of rye or other grass (conservation mix) shall be established to prevent erosion. Once final grading is completed, loaming and seeding of each area shall be completed promptly. Vegetative cover, either temporary or permanent, shall be established prior to winter. If the season is not appropriate for plant growth, exposed soils shall be stabilized with jute netting, staked mulches, or other U. S. Natural Resource Conservation Service methods.
26. The limit of work shall be the erosion control devices beyond which no work may occur. The MCC reserves the right to require additional erosion controls and storm damage prevention measures at any time if it deems necessary.
27. The contractor or responsible party shall have an appropriately sized spill containment kit on site whenever vehicles or mechanized equipment is operating or present. The kit shall be sized to accommodate the total volume of fluids in the largest piece of equipment present. Appropriately trained personnel shall also be present and have access to this material. The contractor or responsible party shall be required to have additional absorbent materials (pads) and additional length of boom on site.
28. Equipment fuel storage and refueling and lubrication operations shall be situated least 100 feet from any wetland resource area.
29. Heavy equipment shall be stored in an upland area at least 100 feet from any wetland resource area when not in use or overnight.
30. Absolutely no washing of trucks or other equipment shall take place within 100 feet of the resource areas.
31. Only clean fill may be used in connection with this project. Any fill used in connection with this project shall not contain trash, refuse, rubbish, or debris, including but not limited to lumber, brick, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.
32. Any excavated materials resulting from the work shall be moved outside the 100-foot buffer zone at the end of each day.

33. Stockpiled earth and other materials or debris shall be located outside of the 100-foot buffer zone of the resource areas(s).
34. All stumps, brush, and debris shall be removed from the site, including existing and construction debris. This material shall be disposed of promptly and properly at an off-site facility licensed to receive the material. Records as to the destination of all materials including stumps, brush, and excess fill shall be kept and supplied to the Commission if requested.
35. Any refuse material generated through the project construction will be removed to an approved landfill, and in no case will these materials be allowed to be buried or disposed of on site or on abutting property.
**REMOVAL MUST BE DONE WEEKLY DURING THE CONSTRUCTION PHASE OF THE PROJECT.
REFUSE MUST NOT BE ALLOWED TO ENTER ANY WETLAND AREAS.**
36. No blasting shall be permitted under this Order of Conditions. If it is discovered during the course of work that blasting will be necessary, the applicant shall file for an Amended Order of Conditions with plans and evidence describing the blasting activities.
37. If weather conditions cause the terrain to be excessively soft, the MCC may halt work until dry conditions permit work to continue without excessive churning of the soil.
38. The construction-period coffer dam shall be removed properly upon completion of construction.

E. Post Project

39. After the completion of construction, the applicant shall submit the following to the MCC:
 - a. A completed Request for a Certificate of Compliance – WPA form 8A.
 - b. A letter from a Registered Professional Engineer certifying compliance of the project with this Order of Conditions, and detailing any deviations that exist and their potential effect on the project. **A statement that the work is in “substantial compliance” with no detailing of the deviations shall not be accepted.**
 - c. An “As-Built” plans stamped and signed by a Registered Professional Engineer or Land Surveyor showing post-construction conditions. This plan shall note any deviations from the Approved Plans and include at a minimum:
 1. All wetland resource area boundaries with associated buffer zones and regulatory setback areas taken from the plan(s) approved in this Order of Conditions;
 2. Locations and elevations of all stormwater management conveyances, structures and best management designs, including foundation drains, constructed under this Order within any wetland resource area or buffer zone;
 3. Distances from any structures constructed under this Order to wetland resource areas - “structures” include, but are not limited to, all buildings, septic system components, wells, utility lines, fences, retaining walls, and roads/driveways;
 4. Wetland resource replication areas constructed under this order.
 - d. Pre-construction, during construction and post-construction photographs demonstrating compliance with this Order, including established vegetation where required, shall be submitted to the MCC.

F. Perpetual Conditions The following conditions shall run with the land and be binding in perpetuity on all successors in title and assigns of the applicant; they are ongoing and do not end upon completion of this project or the issuance of a Certificate of Compliance; they shall be the responsibility of the owner of record of this property.

40. **Additional Alteration Prohibited:** There shall be no additional alterations of the jurisdictional buffers and resource areas without the express permission from the MCC through a Request of

Determination of Applicability or a Notice of Intent application. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.

41. The applicant is required to maintain the Bank Restoration on the western and eastern banks. Should maintenance in the future require a design change to accommodate unforeseen changes in the stream regime and/or bank stability, the applicant shall file with MCC for this change. This condition shall survive the expiration of this Order and shall be included as a continuing condition in perpetuity on the Certificate of Compliance.
42. There shall be no alteration within the restoration and mitigation areas, except as may be required to maintain the area in its restored or mitigated condition.
43. Use of toxic substances for lawn and garden maintenance presents a hazard to groundwater and resource areas. Use of pesticides and herbicides is therefore permanently prohibited at this site within 100 feet of the resource area.
44. The use of de-icing chemicals (such as sodium chloride, potassium chloride or any other chemicals) is to be limited to the amount necessary to maintain public safety. The Applicant shall assume the responsibility of informing any snow removal contractors working on the property of this requirement.
45. Any hazardous materials (e.g., gasoline, lubricants, etc.) shall be stored securely above the 100-year flood elevation.
46. In areas of restoration planting, the 30-foot No Disturb Zone shall be allowed to grow naturally and shall not be mowed or altered in any way without express permission from the MCC through a Request for Determination of Applicability or a Notice of Intent application.
47. Only organic, slow-release, water-insoluble fertilizers shall be used within 50 feet of the resource areas.
48. In addition to these perpetual conditions, these special conditions shall survive in perpetuity beyond the issuance of a Certificate of Compliance: 16.

[Remainder of page left intentionally blank.]



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0824
 MassDEP File #
 1200120
 eDEP Transaction #
 MANCHESTER
 City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

6/4/2020
 1. Date of Issuance

Please indicate the number of members who will sign this form.

6

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

By Vote on 5/5/20, the individuals listed below have authorized the Conservation Administrator to sign on their behalf pursuant to the signature authorization recorded with the Southern Essex Registry of Deeds in Book 38501 Page 530. They also intend for their typed names below to serve as their electronic signatures for any entity (MassDEP) that accepts electronic signatures.

Signatures:

/Sarah Oseasohn/

/Stephen Gang/

/Joseph Puopolo/

/Olga Hayes/

/Henry Oettinger/

/David Lumsden/

Christine Bertoni, Conservation Administrator,
 duly authorized (Book 38501, Page 530)

by hand delivery on

by certified mail, return receipt requested, on

6/4/2020
 Date

 Date



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
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 MANCHESTER
 City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
 and Manchester-by-the-Sea General Wetlands Bylaw

Provided by MassDEP:
 039-0824
 MassDEP File #
 1200120
 eDEP Transaction #
 MANCHESTER
 City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

 Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

 Conservation Commission

Please be advised that the Order of Conditions for the Project at:

 Project Location

 MassDEP File Number

Has been recorded at the Registry of Deeds of:

 County

 Book

 Page

for: _____
 Property Owner

and has been noted in the chain of title of the affected property in:

 Book

 Page

In accordance with the Order of Conditions issued on:

 Date

If recorded land, the instrument number identifying this transaction is:

 Instrument Number

If registered land, the document number identifying this transaction is:

 Document Number

 Signature of Applicant



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number:

Request for Departmental Action Fee Transmittal Form

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address	b. City/Town, Zip
c. Check number	d. Fee amount

2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

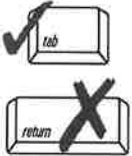
Name

Mailing Address

City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

4. DEP File Number:

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
**Request for Departmental Action Fee
Transmittal Form**

DEP File Number:

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211


2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Tighe&Bond

APPENDIX C

Army Corps authorization to be added upon receipt



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www.tighebond.com

APPENDIX G2

PNF Response to Comments

Daniel L. Murphy

From: Brien, Ruthann CIV USARMY CENAE (USA) <Ruthann.A.Brien@usace.army.mil>
Sent: Tuesday, October 26, 2021 10:40 AM
To: Emily R. Tully
Cc: Gabrielle C. Belfit; Daniel L. Murphy; Richard W. Canavan
Subject: NAE-2019-02827 Manchester-by-the-Sea Update

[Caution - External Sender]

Hi Emily:

I wanted to follow up on this project and to give you updated information on the CZM consistency.

First, I want to make sure that the HTL plan set and impact calculations haven't been submitted yet and that I missed them somehow. The last email I received to my knowledge is the one below from July 19, 2021.

Secondly, Bob Boeri at CZM has indicated that an individual federal consistency determination will be required for this project. Therefore, you will need to apply to his office directly for the individual federal consistency determination. This process can take several months so you will want to initiate it as soon as possible. Here is a link to MA CZM's consistency information: <https://www.mass.gov/how-to/apply-for-federal-consistency-review> Also, you can contact Bob Boeri directly at robert.boeri@mass.gov Please copy me on all documentation.

Thank you,

Ruthann

Ruthann Brien
Regulatory Project Manager
USACE New England District
696 Virginia Road
Concord, MA 01742
(office) 978-318-8054
(cell) 978-505-3750
Email: ruthann.a.brien@usace.army.mil

From: Emily R. Tully <ETully@tighebond.com>
Sent: Monday, July 19, 2021 10:19 AM
To: Brien, Ruthann CIV USARMY CENAE (USA) <Ruthann.A.Brien@usace.army.mil>
Cc: Gabrielle C. Belfit <GCBelfit@tigheBond.com>; Daniel L. Murphy <DLMurphy@TigheBond.com>; Richard W. Canavan <RCanavan@tighebond.com>
Subject: [Non-DoD Source] Manchester-by-the-Sea Amendment to PCN NAE-2019-02827 - Historical Documentation

Good morning, Ruthann – thank you for your time last week discussing the Town of Manchester-by-the-Sea's Central Street Bridge / Central Pond Restoration Project application NAE-2019-02827. We are currently working on adding HTL to the plan set and adjusting impact calculations accordingly, and anticipate getting those to you in the near future. In the meantime, as discussed, please find attached historical documentation of the existence of the wall on the east side

of the pond prior to 1968. The first document is an archive map from 1884 showing the whole bank along the east side as modified per present-day conditions. The second and third documents are clips of the historic aerials from 1938 and 1955 respectively, in which the wall on the east side is visible. The remaining documents are registered historic plans from the 1950s documenting the wall's existence.

Please let us know if you have any questions or require any additional documentation regarding the historic existence of the wall. Thanks very much!

Best regards,
Emily

Emily R. Tully | Project Manager

Tighe & Bond | 53 Southampton Road | Westfield, MA 01085 | 413.875.1622 | 802.829.0341 (cell)

APPENDIX G3

Revised Plan Set adding High Tide Line

TOWN OF MANCHESTER-BY-THE-SEA, MASSACHUSETTS

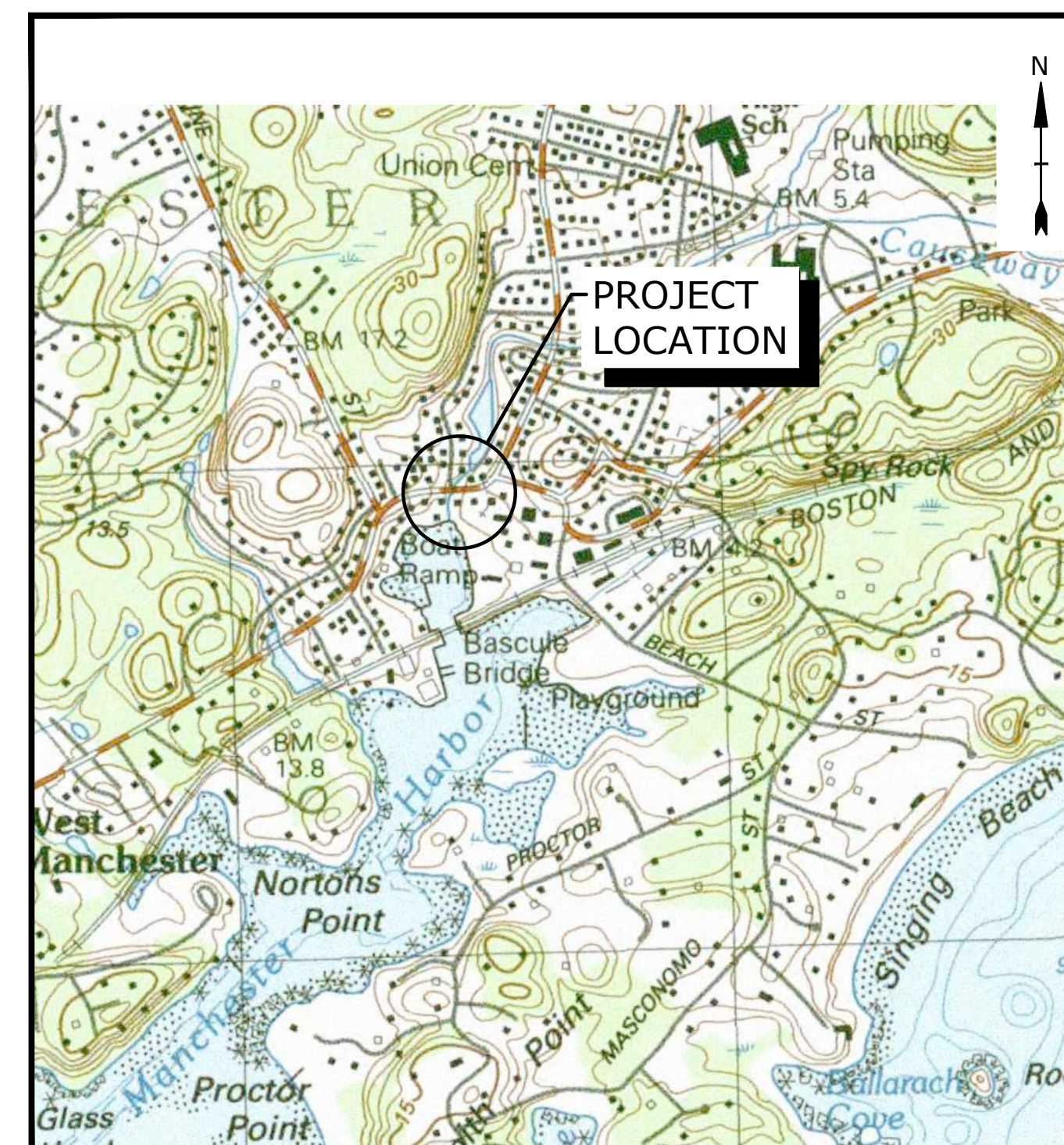
CENTRAL STREET BRIDGE

RECONSTRUCTION

PROJECT NO: M1476-011

NOVEMBER 2021

LIST OF DRAWINGS	
SHEET NO.	SHEET TITLE
	COVER
G-001	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
C-001	CENTRAL STREET SURVEY 1 OF 4
C-002	CENTRAL STREET SURVEY 2 OF 4
C-003	CENTRAL STREET SURVEY 3 OF 4
C-004	CENTRAL STREET SURVEY 4 OF 4
C-005	DEMOLITION PLAN & SITE PREPARATION PLAN
C-101	SITE PLAN AND PROFILE
C-102	GRADING AND ALIGNMENT PLAN
C-103	UTILITY PLAN
C-104	TEMPORARY ROADWAY PLAN
C-105 TO C-106	UTILITY/WORK STAGING PLAN
C-501 TO C-502	CONSTRUCTION DETAILS
C-503	COASTAL BANK PLAN
C-504 TO C-505	CONTROL OF WATER NOTES AND DETAILS
C-701	TEMPORARY TRAFFIC CONTROL PLAN - GENERAL
C-702	TEMPORARY TRAFFIC CONTROL PLAN - DETOUR
S-001 TO S-103	BRIDGE DRAWINGS
S-104 TO S-105	BRIDGE SECTIONS & DETAILS
R-101	S3-TL4 BARRIER DETAILS
R-102	PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS



LOCATION MAP
SCALE: 1" = 2000'

PREPARED FOR:

TOWN OF MANCHESTER-BY-THE-SEA
DEPARTMENT OF PUBLIC WORKS
CHARLES DAM, PE, DIRECTOR
NATHAN DESROSIERS, PE, TOWN ENGINEER

BOARD OF SELECTMEN

JEFFERY BODMER-TURNER, CHAIR
BECKY JAQUES, VICE CHAIR
ANN HARRISON
JOHN ROUND
ELI BOLING

PREPARED BY:

Tighe & Bond
Engineers | Environmental Specialists

**90% DRAWINGS
NOT FOR CONSTRUCTION**

COMPLETE SET 30 SHEETS

GENERAL NOTES

1. BASE PLAN ENTITLED "MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PLAN OF TOPOGRAPHIC SURVEY OF CENTRAL STREET, MANCHESTER BY THE SEA" PREPARED BY DOUCET SURVEY INC. ON NOVEMBER 9, 2018.
2. THE HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAV88).
3. BOLD TEXT AND LINES INDICATES PROPOSED WORK. LIGHT TEXT AND LINES INDICATES APPROXIMATE EXISTING CONDITIONS.
4. WETLAND RESOURCE AREAS WERE DELINEATED BY TIGHE & BOND ON APRIL 18, 2018.
5. SOIL BORINGS WERE PERFORMED BY NEW ENGLAND BORING CONTRACTORS ON AUGUST 9, 2018.
6. NOTIFY "DIGSAFE" AT 1-888-344-7233 TO ARRANGE FOR MARKING OUT EXISTING UNDERGROUND UTILITIES AT LEAST 72 HOURS (EXCLUDING SATURDAYS, SUNDAYS, AND HOLIDAYS) PRIOR TO BEGINNING EXCAVATION AT ANY GIVEN LOCATION. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR BE ALLOWED TO START ANY KIND OF EXCAVATION WORK PRIOR TO OBTAINING ALL THE NECESSARY INFORMATION REGARDING THE LOCATION OF UNDERGROUND UTILITIES AT THE SITE. ACCOMPLISH ALL EXCAVATION SO THAT UNDERGROUND UTILITIES OR STRUCTURES ARE NOT DAMAGED. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED DURING EXCAVATION OPERATIONS. REPAIR ANY EXISTING PIPE OR UTILITY DAMAGED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
7. THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR THE LOCATION OF EXISTING UTILITIES. THE ENGINEER AND OWNER MAKE NO GUARANTEE AS TO THE UNDERGROUND CONDITIONS THAT MAY BE ENCOUNTERED.
8. FIELD MEASURE TO VERIFY EXISTING AND CONTRACT INTERFACE DIMENSIONS, LOCATIONS, AND OTHER CONDITIONS.
9. TEST PITS TO LOCATE EXISTING UTILITIES ARE STRONGLY ENCOURAGED AND MAY BE ORDERED BY THE ENGINEER.
10. IF CHANGES TO THE DESIGN ARE PROPOSED, THE CHANGES SHALL BE SUBMITTED TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
11. MAKE NECESSARY ARRANGEMENTS TO PERFORM ANY WORK NEAR THE OVERHEAD UTILITIES PRIOR TO THE START OF CONSTRUCTION.
12. EXISTING UTILITY POLES IN CLOSE PROXIMITY TO CONSTRUCTION MAY REQUIRE TEMPORARY SUPPORT BY THE UTILITY COMPANY. INCLUDE COST UNDER THE PRICES BID FOR THE VARIOUS ITEMS OF WORK.
13. NO OPEN TRENCHES WILL BE ALLOWED OVERNIGHT. THE USE OF ROAD PLATES TO PROTECT THE EXCAVATION WILL BE CONSIDERED UPON REQUEST, BUT BACKFILLING IS PREFERRED.
14. STORE FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS IN A SECONDARY CONTAINER AND REMOVE FROM THE SITE TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
15. IMMEDIATELY REPORT SPILLS OF OIL AND/OR HAZARDOUS MATERIALS (OHM) TO THE MASSDEP.
16. PROVIDE A SUFFICIENT SUPPLY OF ABSORBENT SPILL RESPONSE MATERIALS, SUCH AS BOOMS OR BLANKETS, AT THE CONSTRUCTION SITE AT ALL TIMES TO CLEAN UP POTENTIAL SPILLS OF HAZARDOUS MATERIALS.
17. FURNISH AND INSTALL TRAFFIC CONTROL/SAFETY DEVICES TO ENSURE SAFE VEHICULAR TRAFFIC THROUGH THE WORK AREA OR FOR SAFELY IMPLEMENTING DETOURS AROUND THE WORK AREA.

LEGEND

EXISTING	NEW
	IRON PIPE FOUND
	UTILITY POLE
	BURIED DRAIN PIPE
	OVERHEAD UTILITY WIRES
	FENCE (SIZE AND TYPE NOTED)
	GUARDRAIL
	APPROXIMATE PROPERTY LINE
	SIGN AND POST
	TREE LINE
	INDEX CONTOUR
	INTERMEDIATE CONTOUR
	STONEWALL
	BORING
	PROFILE ELEVATIONS
	WETLAND FLAGS
	WETLAND SYMBOL
	LAND SUBJECT TO COASTAL STORM FLOWAGE
	100-FOOT BUFFER ZONE
	200-FOOT RIVERFRONT AREA
	30-FOOT NO DISTURBANCE ZONE
	50-FOOT NO BUILD ZONE
	COASTAL BANK
	TEMPORARY COFFER DAM
	EROSION CONTROL BARRIERS
	SURVEYED EDGE OF WATER (APRIL 2018)

ABBREVIATIONS

GENERAL		UTILITIES	
ABAN	ABANDON	AC	ASBESTOS CEMENT PIPE
ADJ	ADJUST	ACCOMP	ASPHALT COATED CORRUGATED METAL PIPE
APPROX	APPROXIMATE	CAP	CORRUGATED ALUMINUM PIPE
ASTM	AMERICAN SOCIETY OF TESTING MATERIALS	CB	CATCH BASIN
BIT	BITUMINOUS	CI	CAST IRON PIPE
BOS	BOTTOM OF SLOPE	CIT	CHANGE IN TYPE
BVW	BORDERING VEGETATIVE WETLANDS	CMP	CORRUGATED METAL PIPE
CC	CONCRETE CURB	CNO	COULD NOT OPEN
CCW	CEMENT CONCRETE WALK	COND	CONDUIT
CEM	CEMENT	CPP	CORRUGATED PLASTIC PIPE
CLF	CHAIN LINK FENCE	CS	CURB STOP
CMP	CORRUGATED METAL PIPE	DIA	DIAMETER
CONC	CONCRETE	DI	DUCTILE IRON PIPE
CS	CUT SPIKE	DMH	DRAIN MANHOLE
CW	CONCRETE WALK	EMH	ELECTRIC MANHOLE
DIM	DIMENSION	F&C	FRAME AND COVER
DPW	DEPARTMENT OF PUBLIC WORKS	F&G	FRAME AND GRATE
EOP	EDGE OF PAVEMENT	GSO	GAS SHUT OFF
EXIST	EXISTING	HH	HANDHOLE
'	FEET/FOOT	HYD	HYDRANT
FDN	FOUNDATION	INV	INVERT ELEVATION
FND	FOUND	MJ	MECHANICAL JOINT
GC	GRANITE CURB	MW	MONITORING WELL
GE	GRANITE EDGING	PVC	POLYVINYLCHLORIDE PIPE
GRAN	GRANITE	RCP	REINFORCED CONCRETE PIPE
HMA	HOT MIX ASPHALT	RP	RECORD PLAN
"	INCH	SC	STORM WATER TREATMENT UNIT
IFO	IN FRONT OF	SD	STORM DRAIN LINE
IP	IRON PIN	SMH	SEWER MANHOLE
LSCSF	LAND SUBJECT TO COASTAL STORM FLOWAGE	TSV&B	TAPPING SLEEVE, VALVE AND BOX
MASSDEP	MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION	UP	UTILITY POLE
MAX	MAXIMUM	WG	WATER GATE
MIN	MINIMUM	WSO	WATER SHUT OFF
MHD	MASSACHUSETTS HIGHWAY DEPARTMENT		
M	MHD MATERIAL REFERENCE	ALIGNMENT/PROFILE	
MISC	MISCELLANEOUS	AD	ALGEBRAIC DIFFERENCE
N/F	NOW/FORMERLY	BL	CONSTRUCTION BASELINE
NTS	NOT TO SCALE	CC	CENTER OF CURVE
PREF	PREFERRED	E	EAST
PROP	PROPOSED	EL/ELEV	ELEVATION
PSF	POUNDS PER SQUARE FOOT	GB	GRANITE BOUND
PSI	POUNDS PER SQUARE INCH	K	RATE OF VERTICAL CURVATURE
PVMT	PAVEMENT	L	LENGTH
QTY	QUANTITY	LT	LEFT
REMOD	REMODEL	N	NORTH
REM	REMOVE	OC	ON CENTER
REQD	REQUIRED	PC	POINT OF CURVE
RET	RETAIN	PCC	POINT OF COMPOUND CURVE
R&D	REMOVE AND DISPOSE	PK/SPIKE	SURVEY NAIL
R&R	REMOVE AND RESET	PL	PROPERTY LINE
R&S	REMOVE AND STACK	PRC	POINT OF REVERSE CURVE
SB	STONE BOUND	PT	POINT OF TANGENT
SF	SQUARE FEET	PVC	POINT OF VERTICAL CURVE
SPKS	SURVEY SPIKE	PVI	POINT OF VERTICAL INTERSECTION
TOS	TOP OF SLOPE	PVCC	POINT OF VERTICAL COMPOUND CURVE
TYP	TYPICAL	PVRC	POINT OF VERTICAL REVERSE CURVE
VGC	VERTICAL GRANITE CURB	PVT	POINT OF VERTICAL TANGENT
WCR	WHEELCHAIR RAMP	R	RADIUS
YD	YARD	ROW	RIGHT OF WAY
		RT	RIGHT
		S	SOUTH
		STA	STATION
		VC	VERTICAL CURVE
		W	WEST

SURFACE RESTORATION NOTES

1. RESTORE ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE LIMITS OF WORK TO ORIGINAL CONDITIONS AT NO ADDITIONAL COST TO THE OWNER.
2. ALL PAVEMENT DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. PROTECT SURFACE FEATURES (E.G., WALLS, FENCES, MAIL BOXES, SIGNS, SIDEWALKS, CURBING, STAIRS, WALKWAYS, TREES, ECT.) FROM DAMAGE DURING CONSTRUCTION, INCLUDING PROVIDING TEMPORARY SUPPORTS, WHEN APPROPRIATE.
4. IF REMOVAL OF SURFACE FEATURES IS REQUIRED IN ORDER TO PERFORM THE PROPOSED WORK, REMOVE THOSE SITE FEATURES ONLY UPON APPROVAL OF ENGINEER. REPLACE ALL REMOVED SITE FEATURES; NEW ITEMS SHALL BE EQUAL OR BETTER IN QUALITY AND CONDITION TO THE ITEMS REMOVED.
5. EXISTING SURVEY MONUMENTS DISTURBED BY THE CONTRACTOR SHALL BE REPLACED BY A LAND SURVEYOR LICENSED IN THE STATE IN WHICH THE WORK IS PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
6. REPAIR DISTURBED PAVED SURFACES AT THE END OF EACH WORK WEEK, UNLESS OTHERWISE APPROVED/REQUIRED BY THE OWNER.

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO: M1476-011		
DATE: NOVEMBER 2021		
FILE: M1476-011-G-001.dwg		
DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

LEGEND, ABBREVIATIONS, AND
GENERAL NOTES

SCALE: NO SCALE

G-001

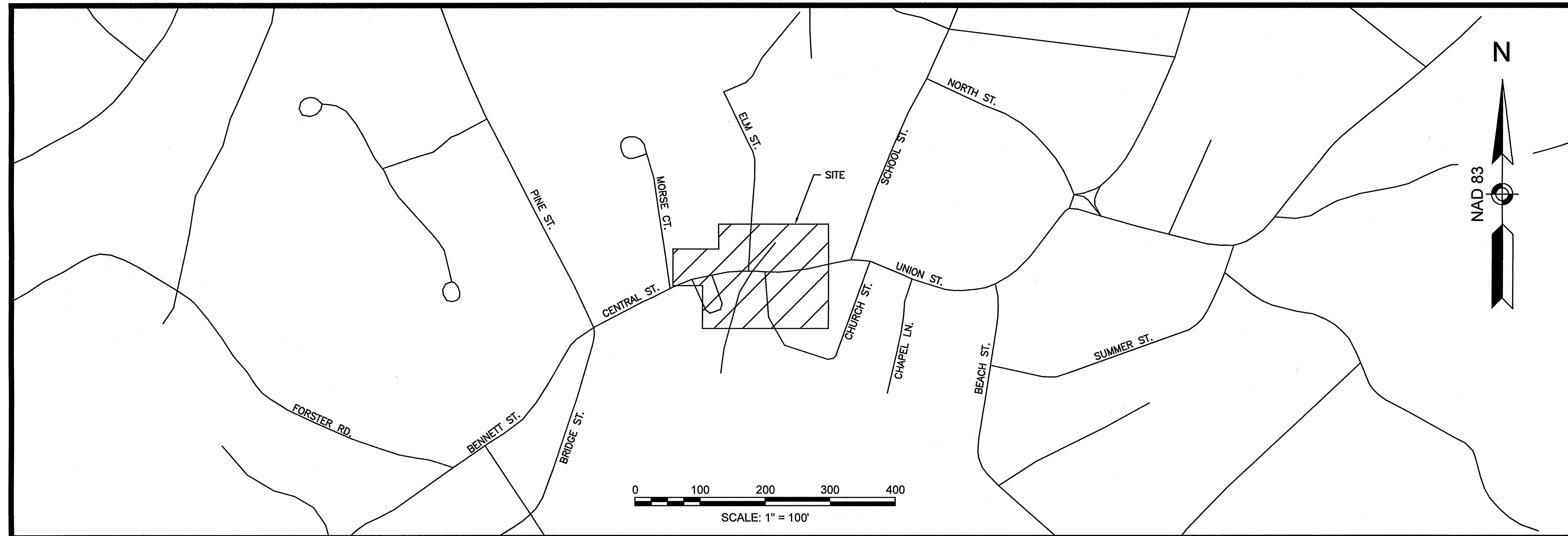
CITY/TOWN
STREET/ROUTE # OR NAME

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO. XXXXXX			

TITLE SHEET, LEGEND & ABBREVIATIONS

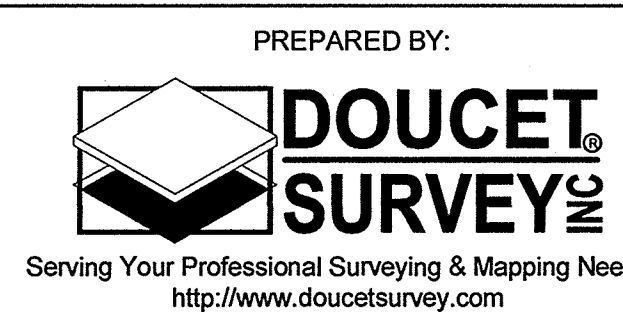
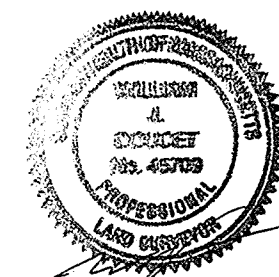
LEGEND

	APPROX. ABUTTERS LOT LINE (SEE NOTE 9)
	GAS LINE
	SEWER LINE
	TELEPHONE LINE
	WATER LINE
	UNDERGROUND ELECTRIC LINE
	SHRUB LINE
	OVERHEAD WIRE
	CHAIN-LINK FENCE
	HAND RAIL
	OTHER FENCE
	MAJOR CONTOUR LINE
	MINOR CONTOUR LINE
	RIVER BED MAJOR CONTOUR LINE (SEE NOTE 10)
	RIVER BED MINOR CONTOUR LINE (SEE NOTE 10)
	BRICK
	CONCRETE
	CRUSHED STONE
	LANDSCAPED AREA
	CATCH BASIN - SQUARE
	CLEANOUT
	DISK (CAV, USC&GS, LAND COURT, ETC.)
	DRAIN MANHOLE
	ELECTRIC HANDHOLE
	ELECTRIC MANHOLE
	ELECTRIC METER
	FLAG POLE
	GAS GATE
	GAS METER
	GAS SHUTOFF VALVE
	FIRE HYDRANT
	LIGHT POLE
	OTHER MANHOLE
	SQUARE POST
	SEWER MANHOLE
	TELEPHONE MANHOLE
	TREE
	SIGN
	UTILITY POLE
	WATER GATE
	WATER SHUTOFF
BB	BITUMINOUS BERM
CIP	CAST IRON PIPE
CONC	CONCRETE
CS	COBBLESTONE
DBYL	DOUBLE YELLOW LINE
DMH	DRAIN MANHOLE
DS	DOWN SPOUT
DSK	DISK
EL	ELEVATION
EP	EDGE OF PAVEMENT
ETW	EDGE OF TRAVELED WAY
FF	FINISHED FLOOR
GRAN	GRANITE
HDW	HEADWALL
PLUG	LEAD PLUG WITH ESCUTCHEON PIN
RET	RETAINING
SWL	SOLID WHITE LINE
TYP	TYPICAL
VGC	VERTICAL GRANITE CURB



NOTES:

- REFERENCE: TOWN OF MANCHESTER-BY-THE-SEA. CENTRAL STREET BRIDGE OVER SAWMILL BROOK.
- FIELD SURVEY PERFORMED BY B.T. & T.M.M. DURING AUGUST 2018 USING A TRIMBLE S6 TOTAL STATION WITH A TRIMBLE TSC3 DATA COLLECTOR AND A SOKKIA B21 AUTO LEVEL. TRAVERSE ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS. ADDITIONAL FIELD SURVEY PERFORMED BY M.J.C. IN AUGUST 2018 USING A LEICA P40 HDS SCANNER. REGISTRATION ADJUSTMENT BASED ON LEAST SQUARE ANALYSIS.
- THIS MAP WAS PREPARED FROM RECORD RESEARCH, OTHER MAPS, LIMITED FIELD MEASUREMENTS AND OTHER SOURCES. IT IS NOT TO BE CONSTRUED AS A PROPERTY / BOUNDARY SURVEY AND IS SUBJECT TO SUCH FACTS AS SAID SURVEYS MAY DISCLOSE.
- HORIZONTAL DATUM BASED ON MASSACHUSETTS MAINLAND ZONE NAD83(2011) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK.
- VERTICAL DATUM IS BASED ON NAVD88 DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING THE KEYNET GPS VRS NETWORK AND CALIBRATED TO THREE MASSDOT GEODETIC CONTROL STATIONS (REF. DSI PROJECT 4536).
- PROPER FIELD PROCEDURES WERE FOLLOWED IN ORDER TO GENERATE CONTOURS AT (1') INTERVALS. ANY MODIFICATION OF THIS INTERVAL WILL DIMINISH THE INTEGRITY OF THE DATA, AND DOUCET SURVEY, INC. WILL NOT BE RESPONSIBLE FOR ANY SUCH ALTERATION PERFORMED BY THE USER.
- THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES/TYPES IS SUBJECT TO NUMEROUS FIELD CONDITIONS, INCLUDING; THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS, MANHOLE CONFIGURATION, ETC.
- ALL ELECTRIC, GAS, TEL. WATER, SEWER AND DRAIN SERVICES ARE SHOWN IN SCHEMATIC FASHION, THEIR LOCATIONS ARE NOT PRECISE OR NECESSARILY ACCURATE. NO WORK WHATSOEVER SHALL BE UNDERTAKEN ON THIS SITE USING THIS PLAN TO LOCATE THE ABOVE SERVICES. CONSULT WITH THE PROPER AUTHORITIES CONCERNED WITH THE SUBJECT SERVICE LOCATIONS FOR INFORMATION REGARDING SUCH. CALL DIG-SAFE AT 1-888-DIG-SAFE.
- ABUTTER AND RIGHT OF WAY LINES SHOWN HEREON ARE FROM MASS.GOV OFFICE OF GEOGRAPHIC INFORMATION (MASSGIS) ONLY.THE REFERENCE PLANS LISTED HEREON ARE PROVIDED AS A COURTESY ONLY; THE SCOPE OF THIS TOPOGRAPHIC SURVEY DID NOT INCLUDE BOUNDARY ANALYSIS OR FIELD SURVEY EFFORTS TO UNCOVER RECORD MONUMENTS.
- ELEVATIONS AND LOCATIONS SHOWN DEPICTING SPRING LINE ARE BASED ON DATA FROM LASER SCAN POINT CLOUD OF STONE ARCH CULVERT.
- VISIBLE UTILITTY STRUCTURES (MANHOLES, CATCH BASINS, GAS & WATER VALVES, ETC.) WERE LOCATED BY INSTRUMENT SURVEY BY THIS OFFICE. THE CORRESPONDING STORMWATER DRAIN & SANITARY SEWER INVERT SIZE & ELEVATION IS PER SURVEY DONE BY THIS OFFICE. THE LOCATIONS OF THE REMAINING UNDERGROUND UTILITIES ARE BASED ON THE LOCATIONS OF S.U.E. PAINT MARKS (BY OTHERS - UNKNOWN) OBSERVED ON SITE AT THE TIME OF OUR SURVEY.



REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

SCALE: 10 FEET TO THE INCH

FILE NAME: 5521A_SV
FIELD BOOK NO: XXXX
DRAWN BY: W.D.C. CHECKED BY: W.J.D.
FIELD CHIEF: XXX PARS. NO: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET

(BRIDGE NO. X-XX-XXX)
IN THE (TIC) OF

MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	

TITLE SHEET, LEGEND & ABBREVIATIONS

REFERENCE PLANS:

- "PLAN OF A PORTION OF THE MAIN ROAD IN MANCHESTER SHOWING THE PROPOSED WIDENINGS" DONE BY CHARLES A. PUTNAM, DATED NOVEMBER 23, 1871. COUNTY OF ESSEX RECORD #1230.
- "PLAN OF A PORTION OF CENTRAL STREET AT THE JUNCTION OF SCHOOL STREET AND UNION STREET IN THE TOWN OF MANCHESTER AS ALTERED" DONE BY CLINTON C. BARKER COUNTY ENGINEER DATED SEPTEMBER 1947. S.E.D.R.D. PLAN #76-35.
- "PLAN OF A PORTION OF CENTRAL STREET FROM ELM STREET TO SCHOOL STREET IN THE TOWN OF MANCHESTER AS ALTERED" BY JOHN O. MARMAALA COUNTY ENGINEER DATED SEPTEMBER 1953. S.E.D.R.D. PLAN #84-8.
- "PLAN OF LAND IN MANCHESTER, MASS FOR JEAN E. GRELET" DATED MARCH 20, 1959 BY DANA F. PERKINS & SONS, INC. S.E.D.R.D. PLAN #92-74.
- "PLAN OF A PORTION OF ELM STREET FROM CENTRAL STREET 700 FEET NORTHERLY IN THE TOWN OF MANCHESTER AS LAID OUT" BY EARL H. PAGE DATED OCTOBER 25, 1966. S.E.D.R.D. PLAN #107-91.
- "PLAN OF LAND IN MANCHESTER, MASSACHUSETTS COUNTY OF ESSEX FOR ANN N. KILEY & DOROTHY B. KILEY" DATED FEBRUARY 14, 1985. DONE BY W. C. CAMMETT ENGINEERING, INC. S.E.D.R.D. PLAN #233-32.
- "SITE PLAN 27 CENTRAL ST. CONDOMINIUMS" DONE BY W. C. CAMMETT ENGINEERING, INC. DATED FEBRUARY 1985. S.E.D.R.D. PLAN #233-33.
- "PLAN OF LAND BELONGING TO SAMUEL KNIGHT SONS CO." DATED SEPTEMBER 27, 1946 BY RICHARD A. WIRLING. S.E.D.R.D. PLAN #1946-824.
- "PLAN OF LAND IN MANCHESTER TO BE CONVEYED FROM F. J. MERRILL TO THE CRICKET PRESS, INC." FEBRUARY 15, 1923. BY RAYMOND C. ALLEN. S.E.D.R.D. PLAN #2549-181.
- "LAND OF JOHN W. MARSHALL HEIRS" DATED OCTOBER 28, 1944 BY WARREN A. CROMBIE. S.E.D.R.D. PLAN #3465-1.
- "PLAN OF LAND BELONGING TO SAMUEL KNIGHT SONS, CO." DATED DECEMBER 10, 1946 BY RICHARD A. WIRLING. S.E.D.R.D. PLAN #3521-600.
- "PROPERTY OF JEAN E. GRELET, CENTRAL ST, MANCHESTER MASS" DATED NOVEMBER 8, 1952 S.E.D.R.D. PLAN #3925-1.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF SEA ROCK ESTATE, INC." DATED DECEMBER 18, 1970. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5765-800.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF SEA ROCK ESTATE, INC." DATED MAY 3, 1971 BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5835-1.
- "PLAN OF LAND IN MANCHESTER PEELE HOUSE SQUARE" FOR SEA ROCK ESTATE, INC. DATED JULY 11, 1972 BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #5961-297.
- "PLAN OF LAND IN MANCHESTER PEELE HOUSE SQUARE" FOR SEA ROCK ESTATE, INC. DATED MAY 8, 1973. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #6025-1.
- "PLAN OF LAND IN MANCHESTER PROPERTY OF ARTHUR A. & MARJOIRE SECHER" DATED JUNE 11, 1984. BY ESSEX SURVEY SERVICE, INC. S.E.D.R.D. PLAN #7688-133.
- "PLAN TO ACCOMPANY PETITION OF THE TOWN OF MANCHESTER. TO CONSTRUCT A RETAINING WALL AND FILL SOLID MANCHESTER HARBOR" DATED NOVEMBER 3, 1921. BY RAYMOND C. ALLEN. S.E.D.R.D. PLAN #36-31.
- PLAN TITLED "MANCHESTER-BY-THE-SEA DOWNTOWN ATLAS, MANCHESTER-BY-THE-SEA, MASSACHUSETTS, ESSEX COUNTY" PREPARED BY DGT SURVEY GROUP DATED 6-10-2015.

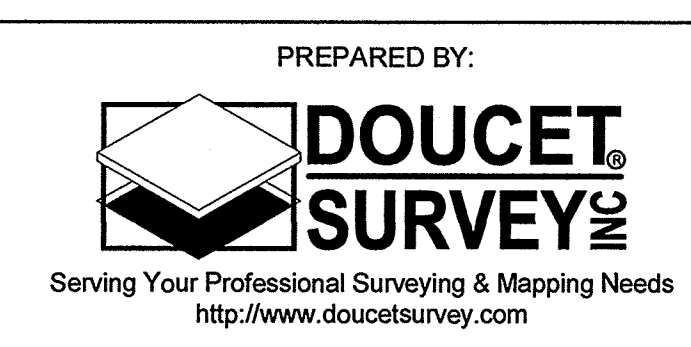
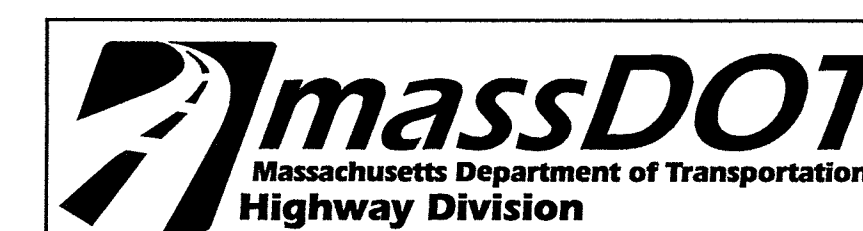
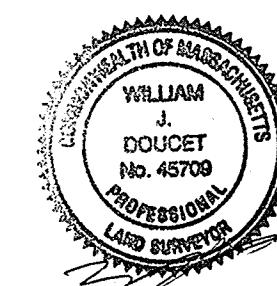
DRAINAGE STRUCTURES	
CB 1104	RIM ELEV.=14.2'
(A) 4" CIP INV.=12.1' (4" METAL**)	
(B) 10" CMP INV.=10.5' (8"**)	
CB 1153	RIM ELEV.=10.1'
SUMP ELEV.=7.8'	
CONC. CHANNEL TO OUTFALL	
CB 1196	RIM ELEV.=9.2'
(OUTFALL) 12" CLAY INV.=5.3' (10" CONC**)	
(A) 12" CLAY INV.=5.2' (12"**)	
CB 1215	RIM ELEV.=9.2'
(1226) 15" CMP INV.=2.6'	
(A) 8" METAL INV.=1.6'	
(B) 8" METAL INV.=1.5'	
DMH 1228	RIM ELEV.=10.1'
(1245) 10" CLAY INV.=6.4' (10" CLAY**)	
(1215) 15" CMP INV.=5.5'	
DMH 1245	RIM ELEV.=11.5'
(1215) 12" PVC INV.=9.3' (12" PVC**)	
(A) VERY RECESSED (12" CLAY FROM CB 1246**)	
WATER ELEV.=9.3'	
SUMP ELEV.=8.3'	
CB 1246	RIM ELEV.=11.2'
(A) 12" UNKN INV.=9.6'	
(10" OR 12" CLAY TO DMH 1245**)	

**INDICATES PIPE SIZE/DIA. INFO.
IS PER REF. PLAN 19

SEWER STRUCTURES	
SMH 1081	RIM ELEV.=12.4'
CC=-1.1'	
(1155) UNKN BC=-1.2' (12" PIPE**)	
(1109) UNKN BC=-1.3' (15" PIPE**)	
SMH 1109	RIM ELEV.=14.6'
(1081) 15" UNKN INV.=-2.1' (15" PIPE**)	
(A) 15" UNKN INV.=-2.6'	
(B) 15" UNKN INV.=-2.7' (18" PIPE**)	
SMH 1155	RIM ELEV.=10.2'
(A) 4" PVC INV.=4.7'	
(B) 4" PVC INV.=0'	
(C) UNKN INV.=-0.3' (6" PIPE**)	
(1248) UNKN INV.=-0.6' (15" PIPE**)	
(1081) UNKN INV.=-0.6' (12" PIPE**)	
CC=-0.6'	
SMH 1248	RIM ELEV.=13.7'
(A) 8" UNKN INV.=6.7'	
(B) 8" UNKN INV.=0.1'	
(1155) 12" UNKN INV.=-0.3' (15" PIPE**)	
(C) 12" UNKN INV.=-0.4' (12" PIPE**)	
(D) 12" UNKN INV.=-0.4'	

**INDICATES PIPE SIZE/DIA. INFO.
IS PER REF. PLAN 19

OTHER STRUCTURES	
MH 1063	RIM ELEV.=11.5'
SUMP ELEV.=6.8'	
DRY NO PIPES W/ WATER SHUT OFF	
MH 1550	RIM ELEV.=13.8'
SUMP ELEV.=9.9'	
DRY NO PIPES W/ ELECTRIC METER AND CHANNEL TO FOUNTAIN	

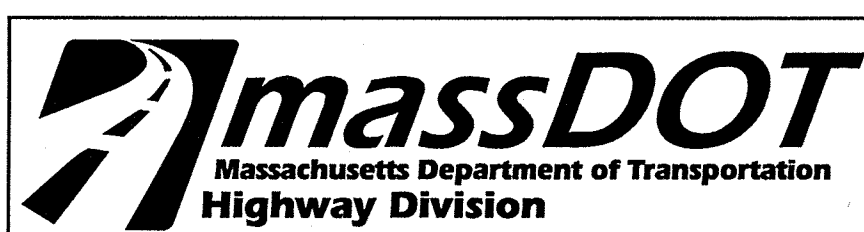
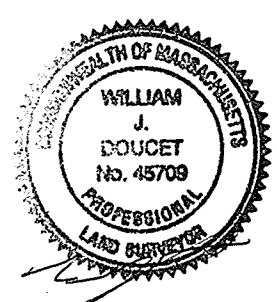
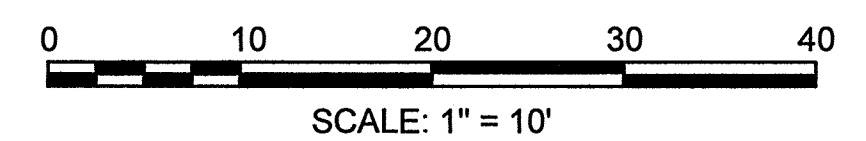
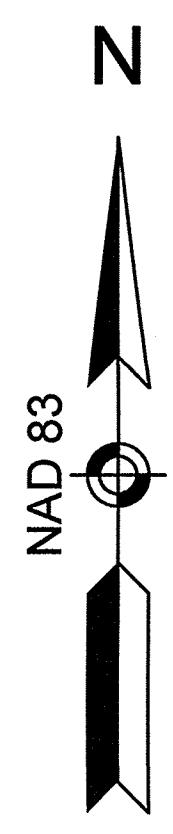
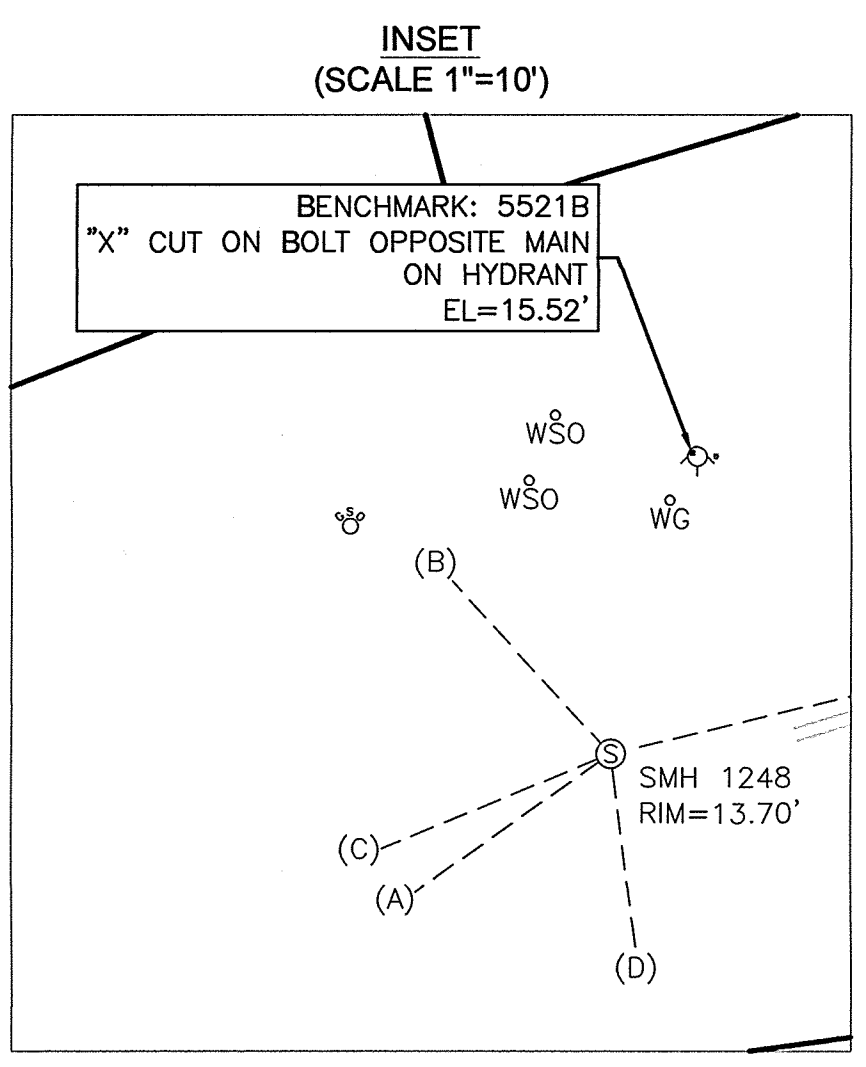
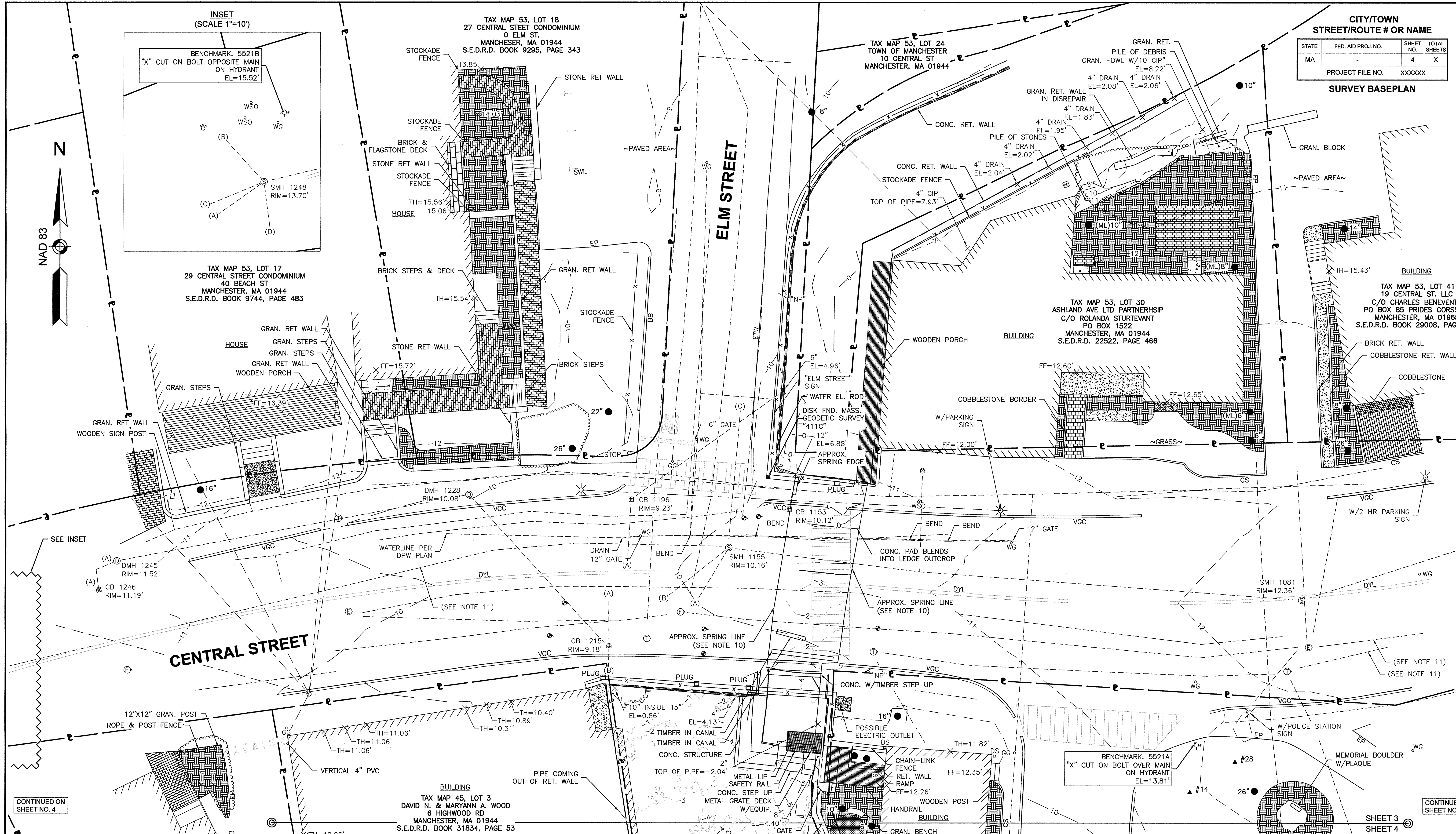


REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

SCALE: 10 FEET TO THE INCH	
FILE NAME: 5521A_SV	
FIELD BOOK NO: XXXX	
DRAWN BY: W.D.C.	CHECKED BY: W.J.D.
FIELD CHIEF: XXX	PARS. NO: XXXXXX

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF
MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO.		XXXXXX	
SURVEY BASEPLAN			



PREPARED BY:
DOUCET SURVEY
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<http://www.doucetsurvey.com>

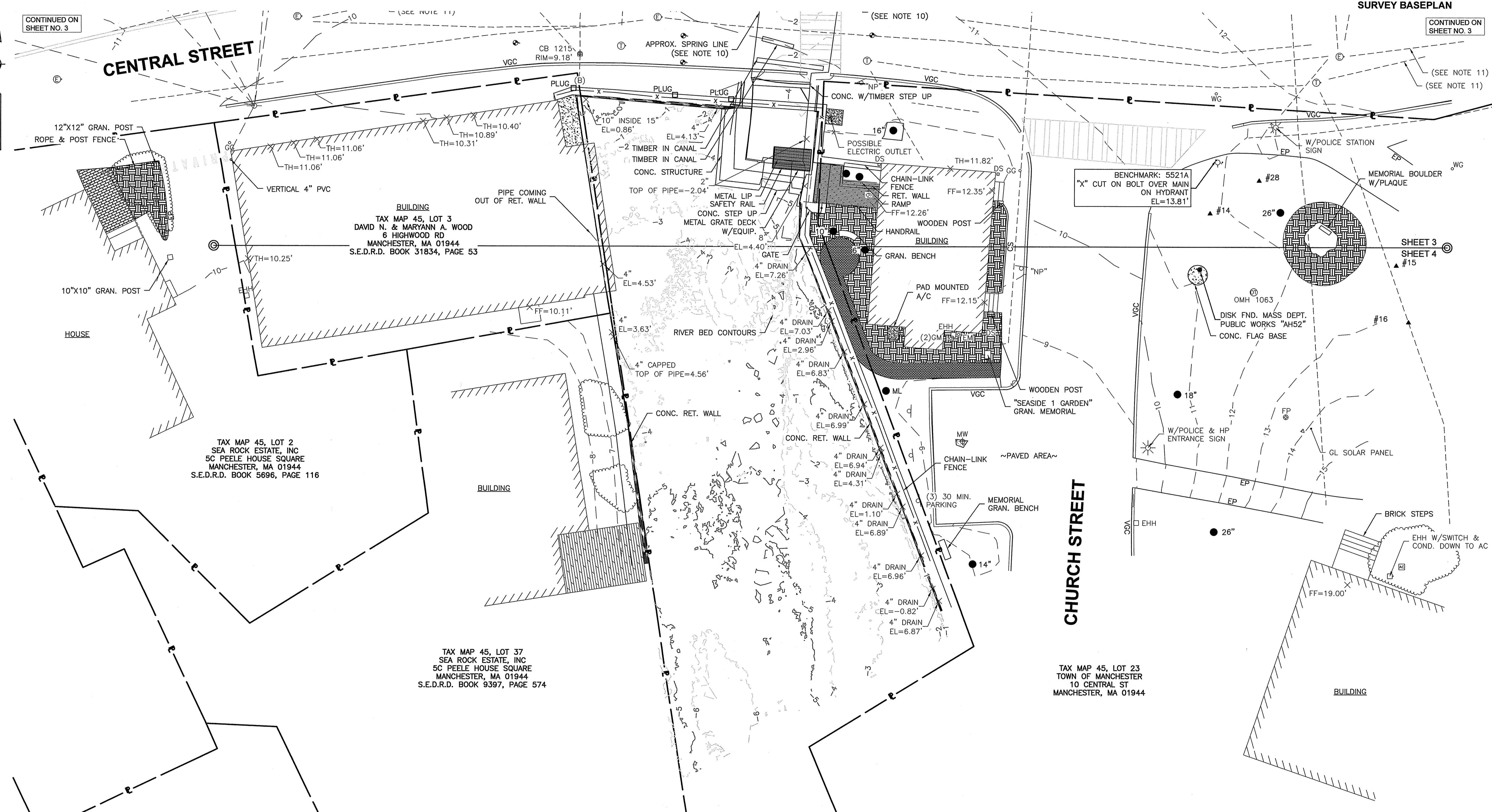
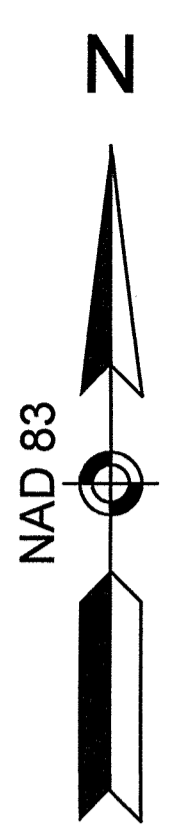
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
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SCALE: 10 FEET TO THE INCH	
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MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
 PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
 (BRIDGE NO. X-XX-XXX)
 IN THE (T/C) OF

MANCHESTER BY THE SEA
 AS ORDERED BY
 THE MASSACHUSETTS DEPARTMENT OF
 TRANSPORTATION, HIGHWAY DIVISION

CITY/TOWN STREET/ROUTE # OR NAME			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	4	X
PROJECT FILE NO. XXXXX			
SURVEY BASEPLAN			

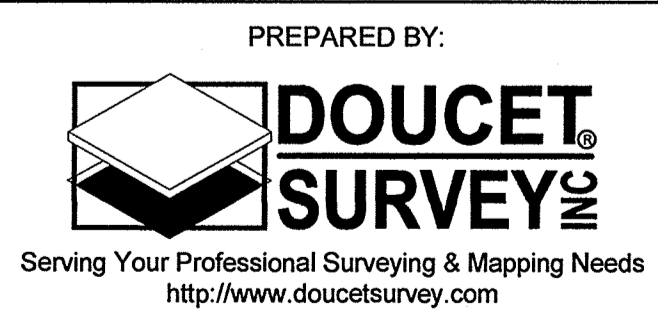
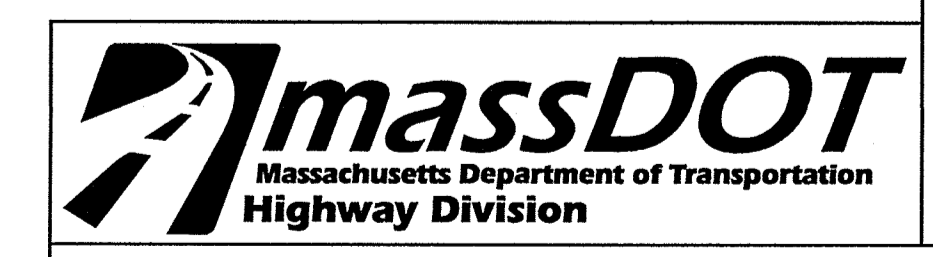
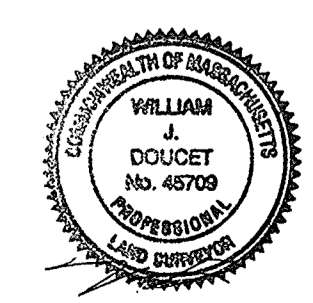
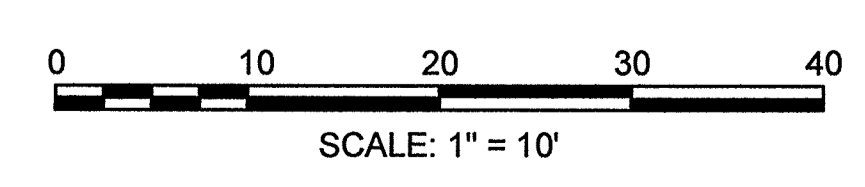


TAX MAP 45, LOT 2
SEA ROCK ESTATE, INC
5C PEELE HOUSE SQUARE
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 5696, PAGE 116

BUILDING
TAX MAP 45, LOT 3
DAVID N. & MARYANN A. WOOD
6 HIGHWOOD RD
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 31834, PAGE 53

TAX MAP 45, LOT 37
SEA ROCK ESTATE, INC
5C PEELE HOUSE SQUARE
MANCHESTER, MA 01944
S.E.D.R.D. BOOK 9397, PAGE 574

TAX MAP 45, LOT 23
TOWN OF MANCHESTER
10 CENTRAL ST
MANCHESTER, MA 01944

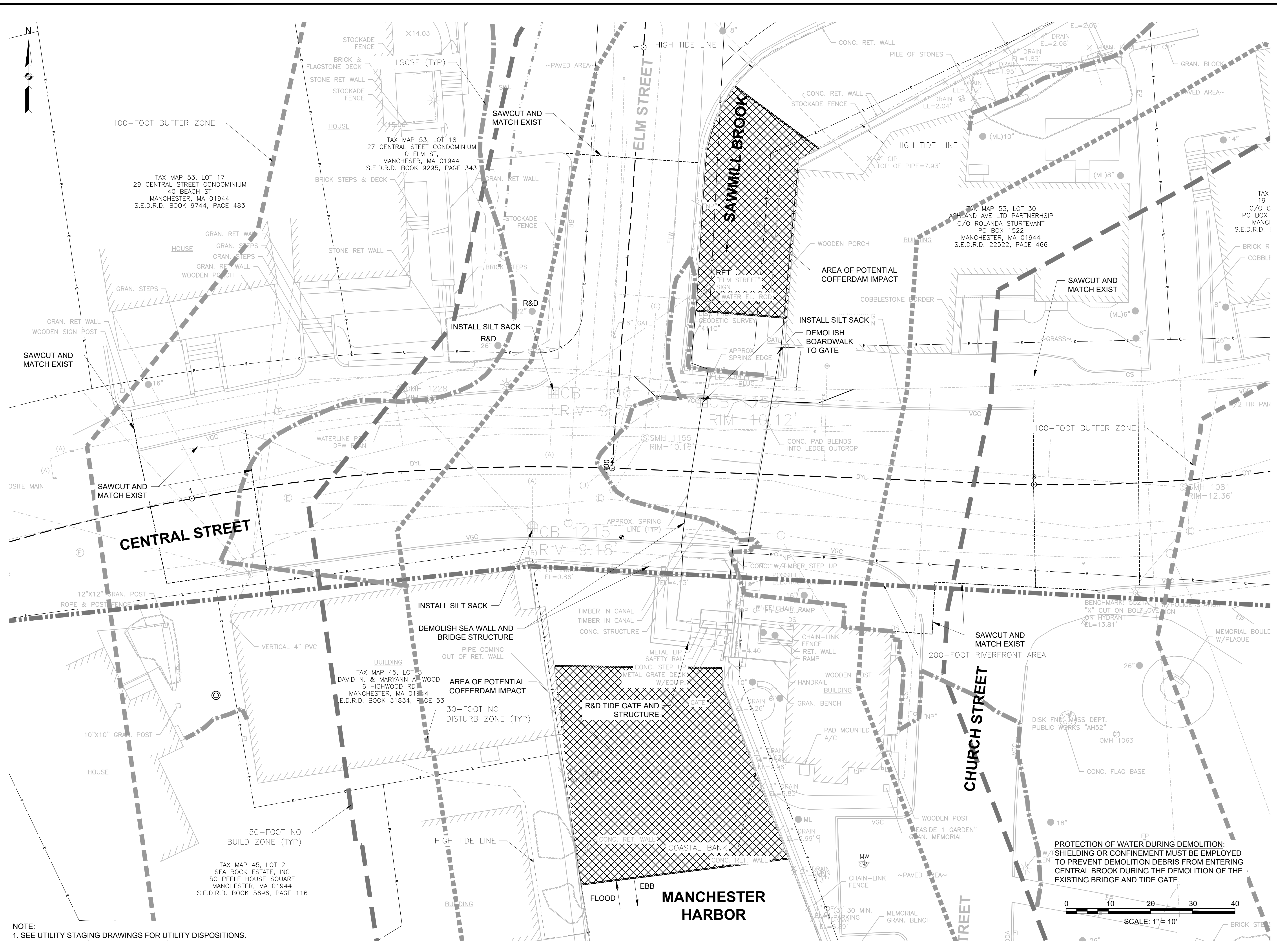


REVISIONS		
REV.	COMMENTS	DATE
01	SMH INVERTS, ADD MISC. FEATURES	10/18/18
02	ADD REF. PLAN 19, MISC. UPDATES	11/09/18

SCALE: 10 FEET TO THE INCH	
FILE NAME: 5521A_SV	CHECKED BY: W.J.D.
FIELD BOOK NO: XXXX	PARS. NO: XXXXXX
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FIELD CHIEF: XXX	

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
PLAN OF TOPOGRAPHIC SURVEY OF
CENTRAL STREET
(BRIDGE NO. X-XX-XXX)
IN THE (T/C) OF
MANCHESTER BY THE SEA
AS ORDERED BY
THE MASSACHUSETTS DEPARTMENT OF
TRANSPORTATION, HIGHWAY DIVISION

SHEET 4 OF 4



90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476-011	
DATE:	NOVEMBER 2021	
FILE:	M1476-011-C-005.dwg	
DRAWN BY:	AGB	
CHECKED BY:	BRB	
APPROVED BY:	DLM	

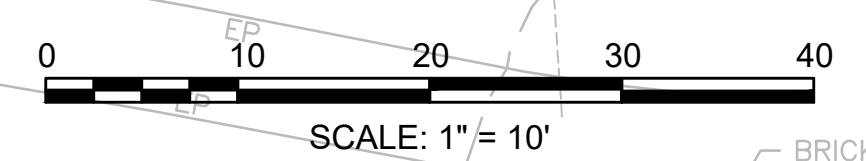
DEMOLITION AND SITE PREPARATION PLAN

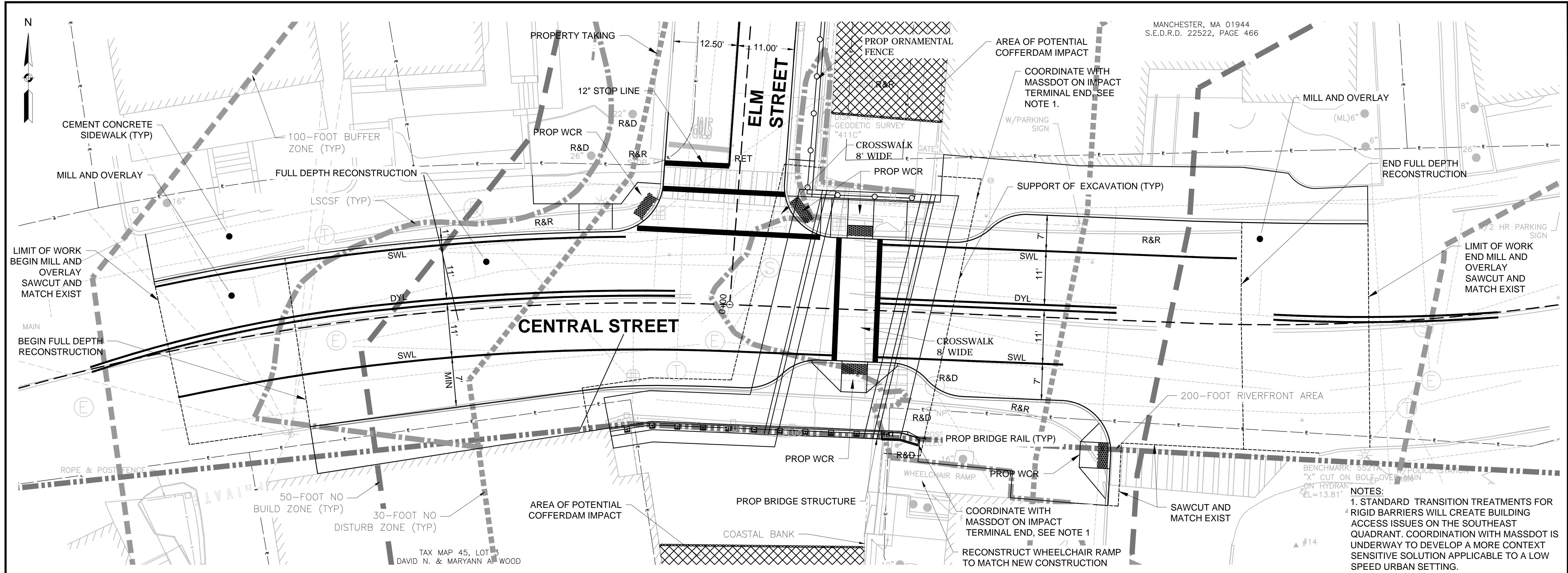
SCALE: 1" = 10'

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NOTE:
1. SEE UTILITY STAGING DRAWINGS FOR UTILITY DISPOSITIONS.

PROTECTION OF WATER DURING DEMOLITION:
SHIELDING OR CONFINEMENT MUST BE EMPLOYED TO PREVENT DEMOLITION DEBRIS FROM ENTERING CENTRAL BROOK DURING THE DEMOLITION OF THE EXISTING BRIDGE AND TIDE GATE.





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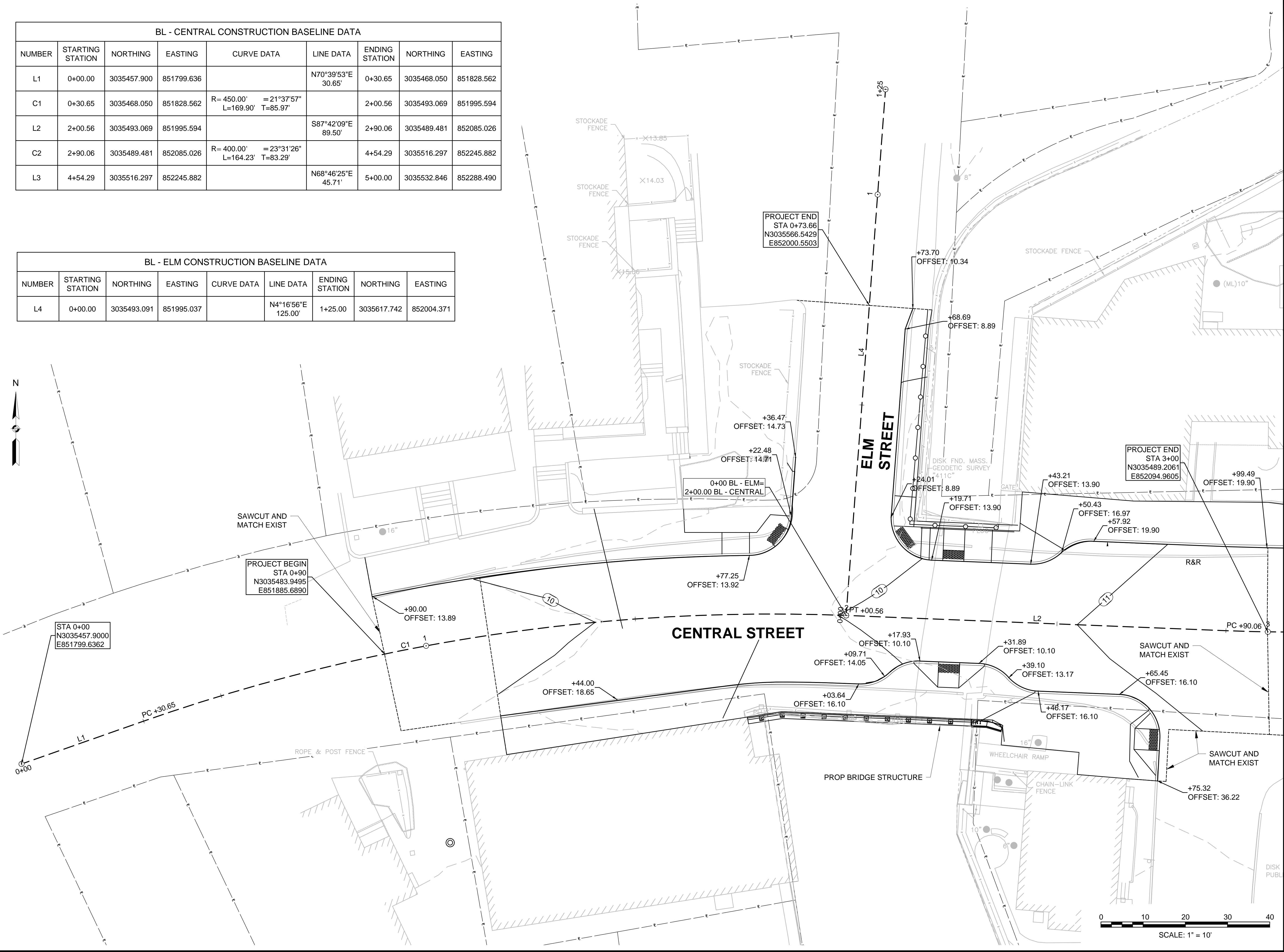
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DATE:	NOVEMBER 2021	
FILE:	M1476-011-C-101.dwg	
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SITE PLAN AND PROFILE
SCALE: 1" = 10' HORIZ, 1" = 4' VERT

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BL - CENTRAL CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	0+00.00	3035457.900	851799.636		N70°39'53"E 30.65'	0+30.65	3035468.050	851828.562
C1	0+30.65	3035468.050	851828.562	R= 450.00' = 21°37'57" L=169.90' T=85.97'		2+00.56	3035493.069	851995.594
L2	2+00.56	3035493.069	851995.594		S87°42'09"E 89.50'	2+90.06	3035489.481	852085.026
C2	2+90.06	3035489.481	852085.026	R= 400.00' = 23°31'26" L=164.23' T=83.29'		4+54.29	3035516.297	852245.882
L3	4+54.29	3035516.297	852245.882		N68°46'25"E 45.71'	5+00.00	3035532.846	852288.490

BL - ELM CONSTRUCTION BASELINE DATA								
NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L4	0+00.00	3035493.091	851995.037		N4°16'56"E 125.00'	1+25.00	3035617.742	852004.371



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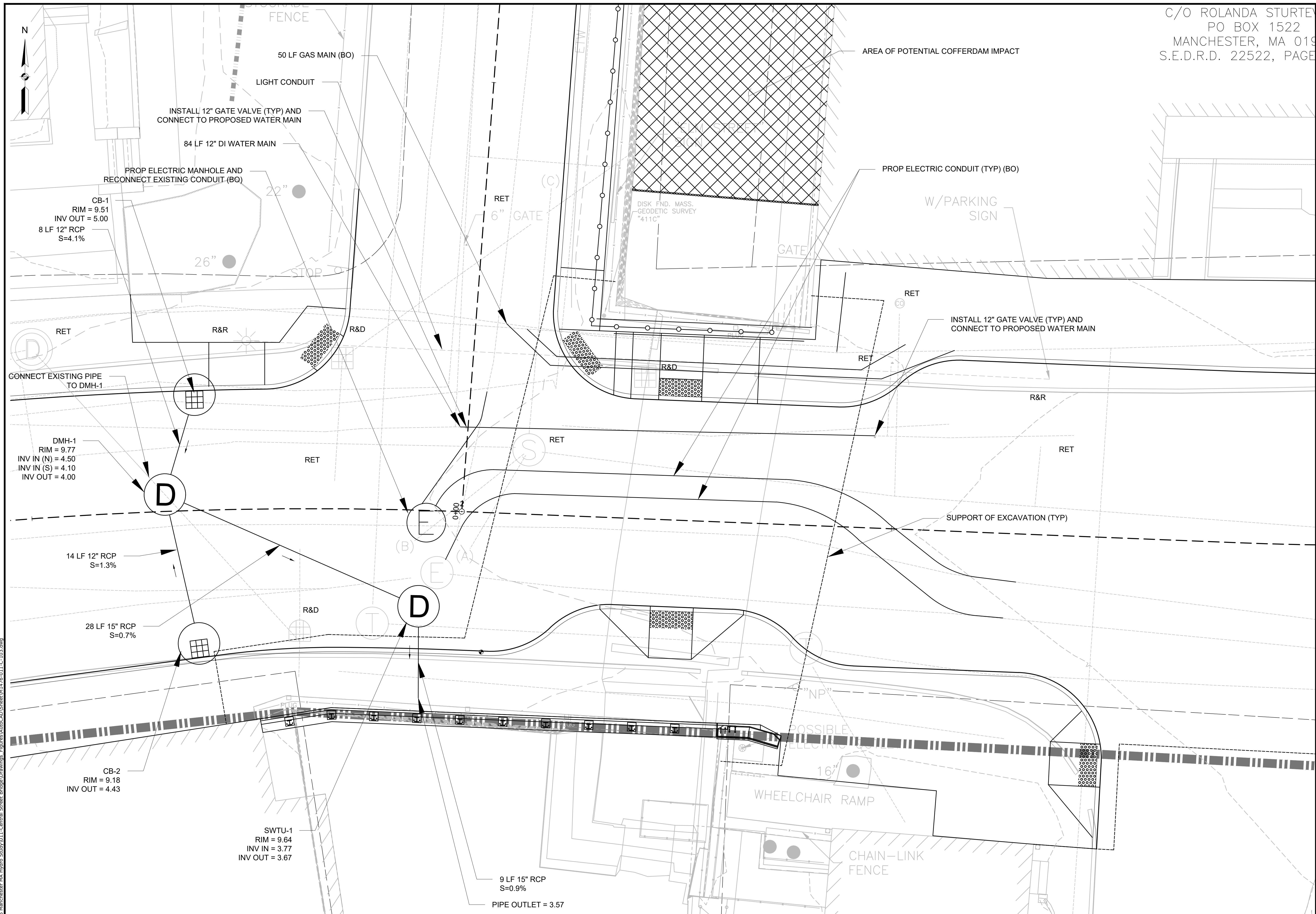
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The-Sea,
Massachusetts

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DATE:	NOVEMBER 2021	
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APPROVED:	DLM	

GRADING AND ALIGNMENT PLAN

SCALE: 1" = 10' HORIZ, 1" = 4' VERT

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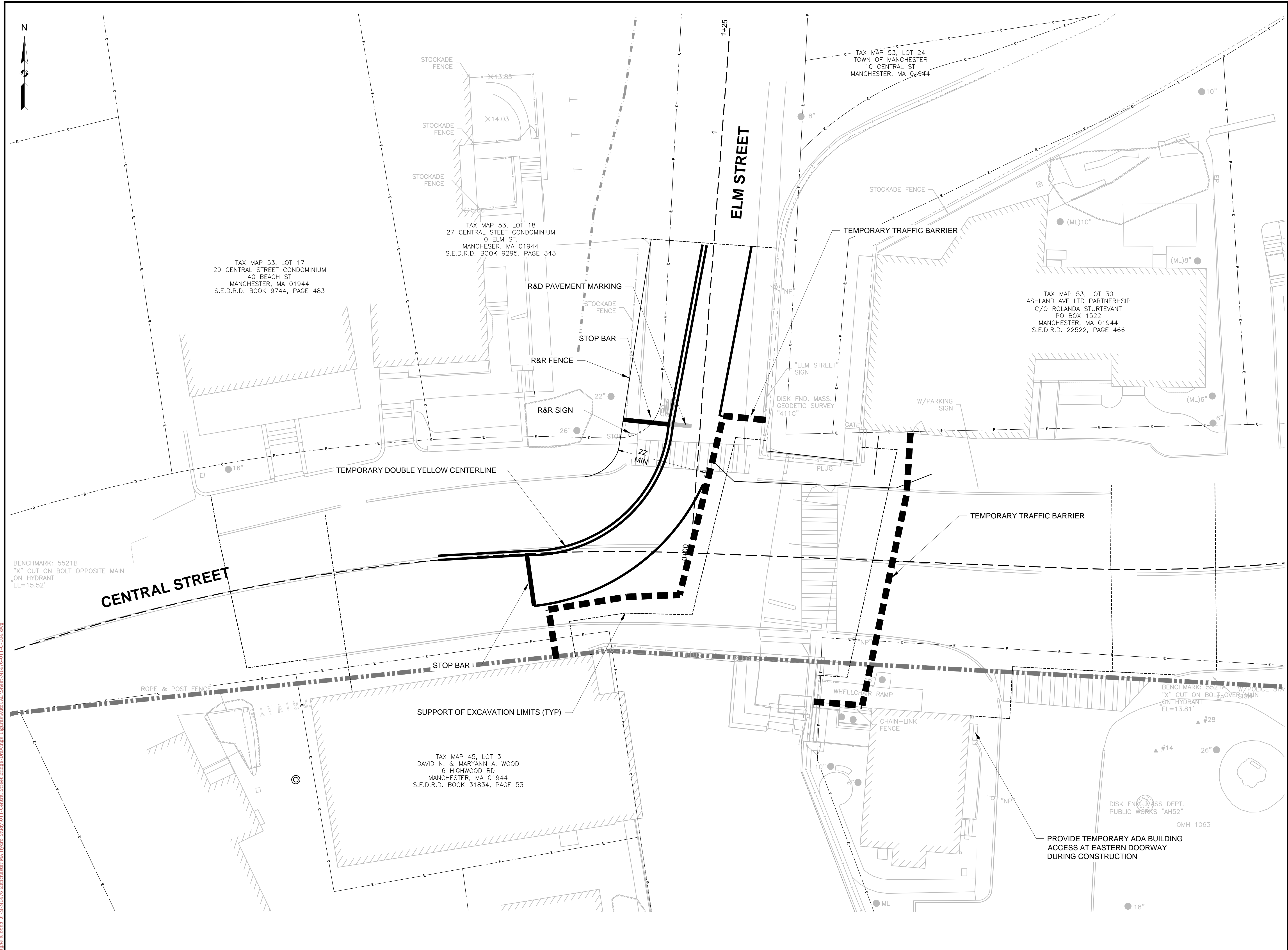
UTILITY PLAN



SCALE: 1" = 10'

C-103

NOTE:
 1. PROPOSED UTILITY LAYOUT SUBJECT TO DESIGN BY UTILITY COMPANIES.
 EXISTING UTILITIES SHOWN BASED ON LIMITED INFORMATION AVAILABLE FROM
 SURVEY AND UTILITY RECORDS. CONTRACTOR TO CONFIRM LOCATION.



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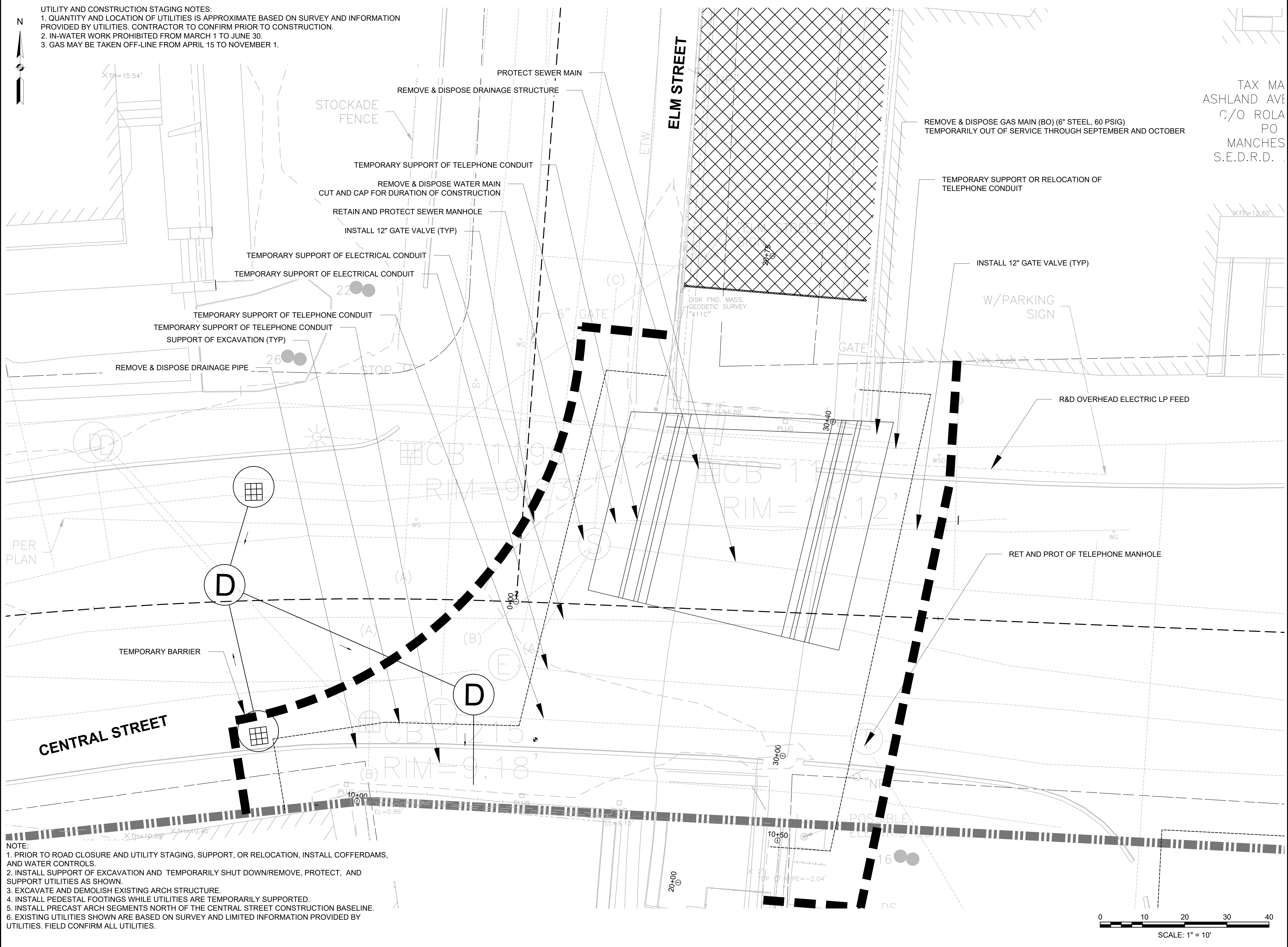
TEMPORARY ROADWAY PLAN

SCALE: 1" = 10'

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TAX MA
ASHLAND AVE
C/O ROLA
PO
MANCHES
S.E.D.R.D.

UTILITY AND CONSTRUCTION STAGING NOTES:
 1. QUANTITY AND LOCATION OF UTILITIES IS APPROXIMATE BASED ON SURVEY AND INFORMATION PROVIDED BY UTILITIES. CONTRACTOR TO CONFIRM PRIOR TO CONSTRUCTION.
 2. IN-WATER WORK PROHIBITED FROM MARCH 1 TO JUNE 30.
 3. GAS MAY BE TAKEN OFF-LINE FROM APRIL 15 TO NOVEMBER 1.



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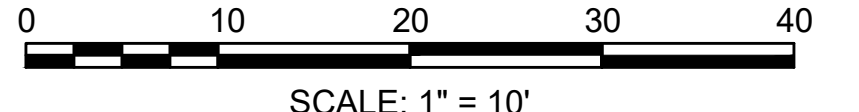
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FILE:	M1476-011-C-105_106 Utility Staging.dwg	
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UTILITY/WORK
STAGING PLAN - PHASE 1

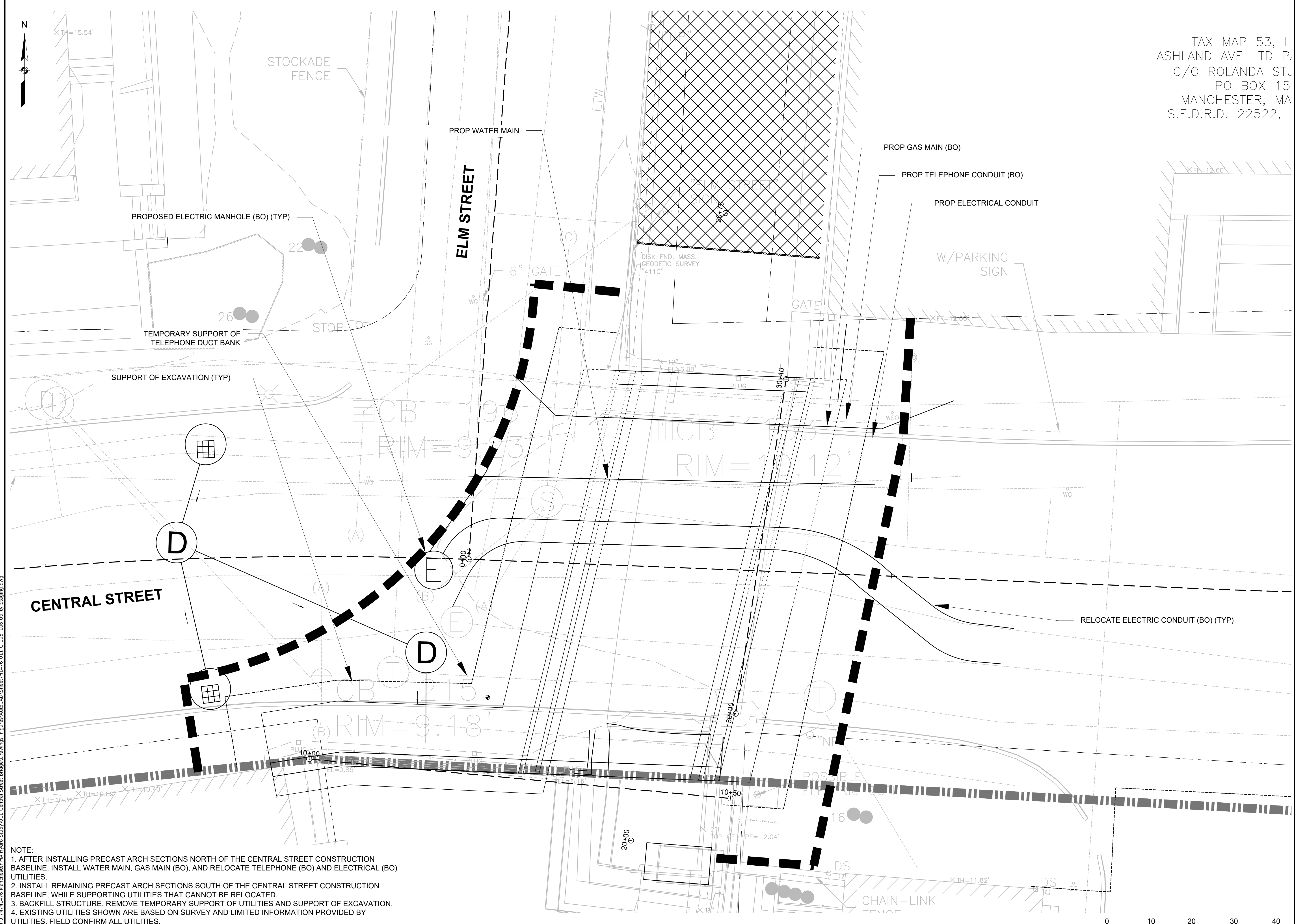


SCALE: 1" = 10'

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NOTE:
 1. PRIOR TO ROAD CLOSURE AND UTILITY STAGING, SUPPORT, OR RELOCATION, INSTALL COFFERDAMS, AND WATER CONTROLS.
 2. INSTALL SUPPORT OF EXCAVATION AND TEMPORARILY SHUT DOWN/REMOVE, PROTECT, AND SUPPORT UTILITIES AS SHOWN.
 3. EXCAVATE AND DEMOLISH EXISTING ARCH STRUCTURE.
 4. INSTALL PEDESTAL FOOTINGS WHILE UTILITIES ARE TEMPORARILY SUPPORTED.
 5. INSTALL PRECAST ARCH SEGMENTS NORTH OF THE CENTRAL STREET CONSTRUCTION BASELINE.
 6. EXISTING UTILITIES SHOWN ARE BASED ON SURVEY AND LIMITED INFORMATION PROVIDED BY UTILITIES. FIELD CONFIRM ALL UTILITIES.

TAX MAP 53, L
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C/O ROLANDA STU
PO BOX 15
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S.E.D.R.D. 22522,



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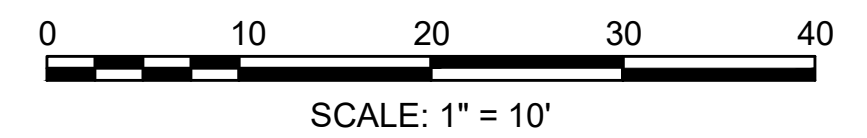
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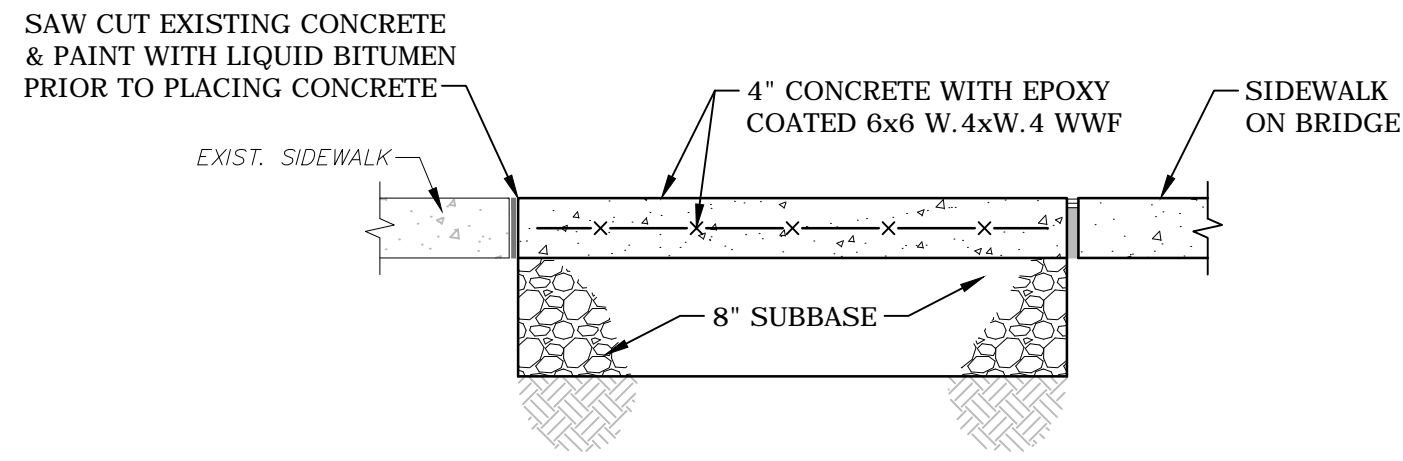
UTILITY/WORK
STAGING PLAN - PHASE 2

SCALE: 1" = 10'

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- NOTE:**
1. AFTER INSTALLING PRECAST ARCH SECTIONS NORTH OF THE CENTRAL STREET CONSTRUCTION BASELINE, INSTALL WATER MAIN, GAS MAIN (BO), AND RELOCATE TELEPHONE (BO) AND ELECTRICAL (BO) UTILITIES.
 2. INSTALL REMAINING PRECAST ARCH SECTIONS SOUTH OF THE CENTRAL STREET CONSTRUCTION BASELINE, WHILE SUPPORTING UTILITIES THAT CANNOT BE RELOCATED.
 3. BACKFILL STRUCTURE, REMOVE TEMPORARY SUPPORT OF UTILITIES AND SUPPORT OF EXCAVATION.
 4. EXISTING UTILITIES SHOWN ARE BASED ON SURVEY AND LIMITED INFORMATION PROVIDED BY UTILITIES. FIELD CONFIRM ALL UTILITIES.

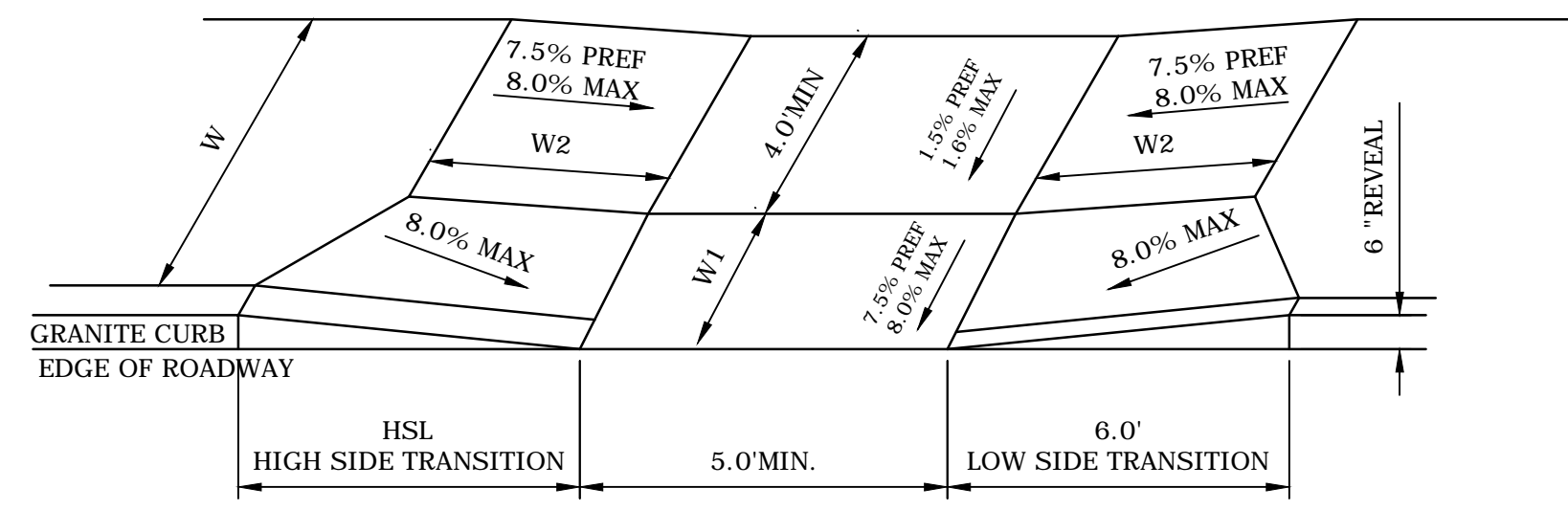




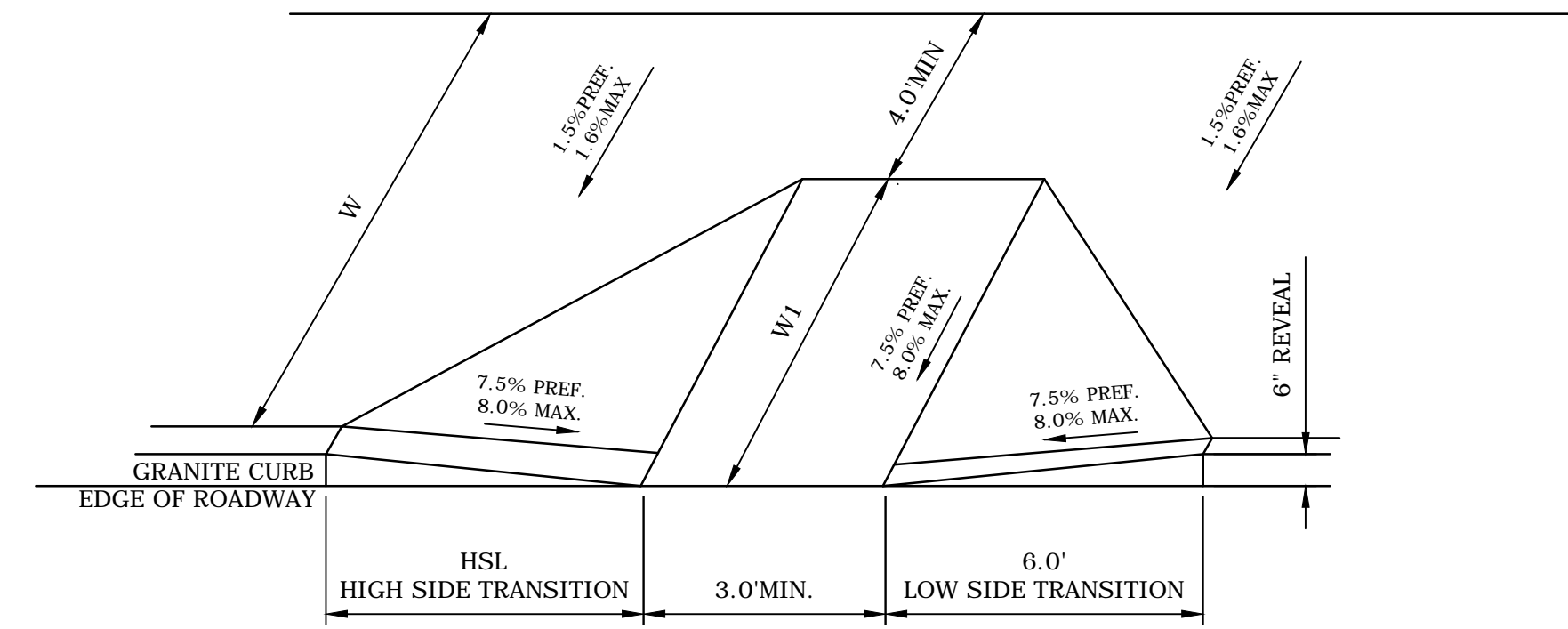
NOTES:

1. ALL CONCRETE, AGGREGATE, STABILIZED COURSE, SUBBASE AND LIQUID BITUMEN SHALL CONFORM TO THE MATERIALS EQUIPMENT AND CONSTRUCTION REQUIREMENTS AS PER STATE SPECIFICATIONS.
2. PROVIDE A 1" CONSTRUCTION JOINT BETWEEN BRIDGE AND APPROACH SIDEWALK. FILL JOINT WITH COMPRESSIBLE FILLER MATERIAL AND SEAL WITH 1" WIDE x 1/2" DEEP SILICONE JOINT SEALANT.
3. MATCH FINISH GRADE AND WIDTH OF EXISTING SIDEWALK.

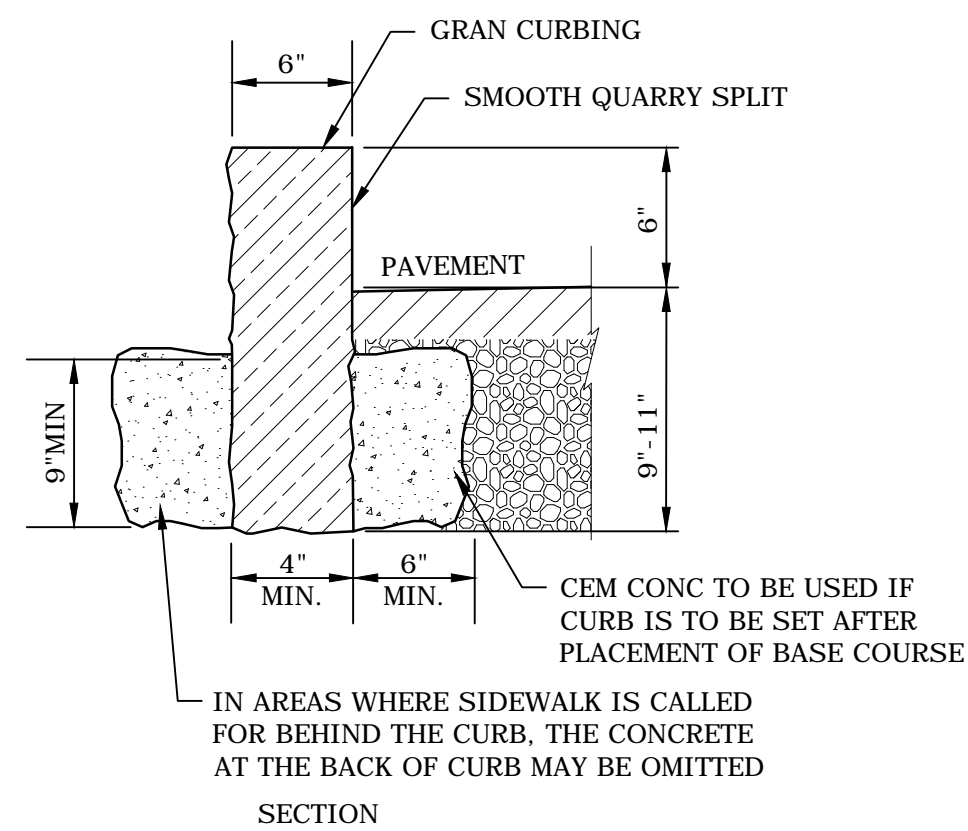
APPROACH SIDEWALK
NO SCALE



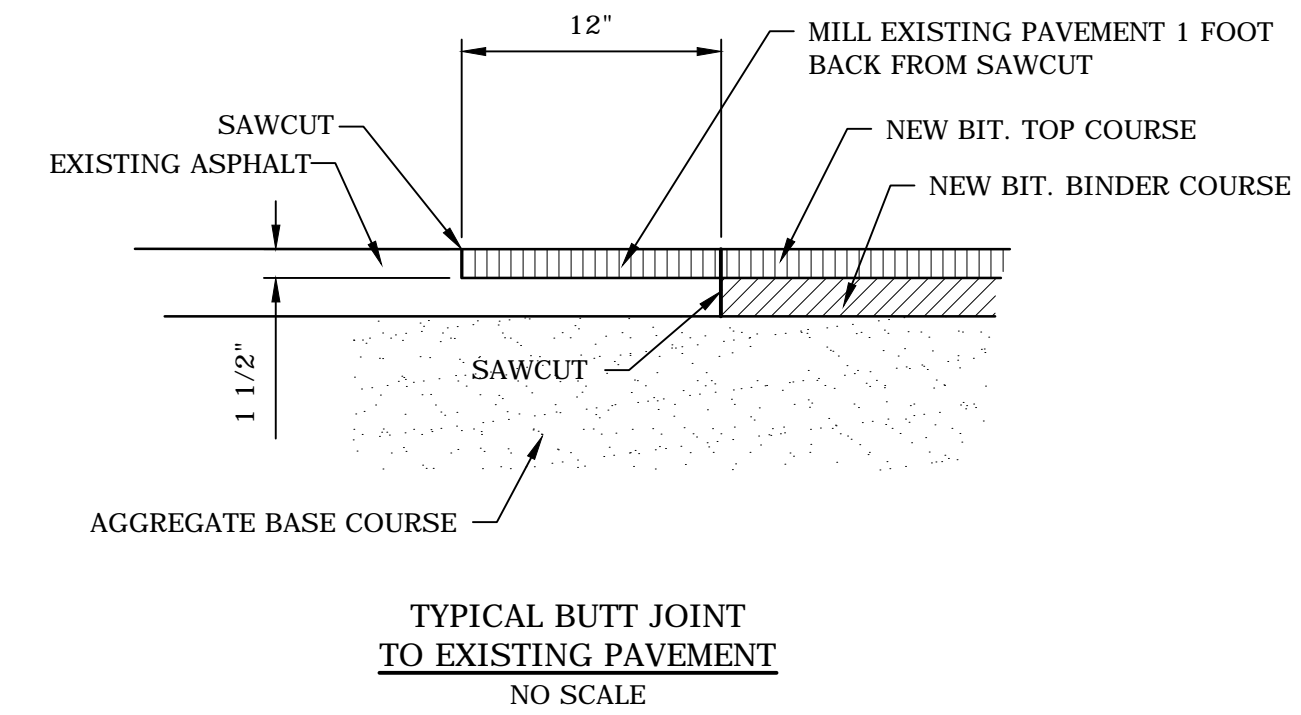
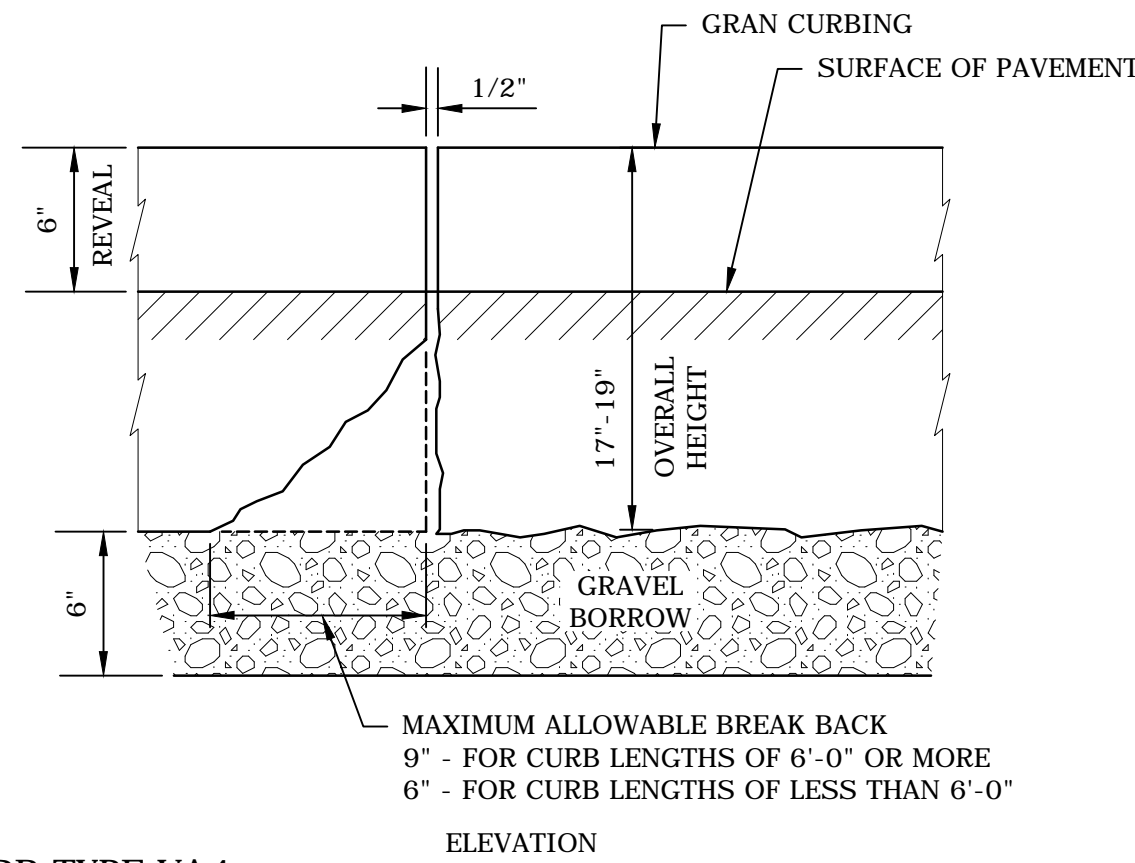
HANDICAP RAMP FOR LESS THAN 11.5' SIDEWALK
NO SCALE



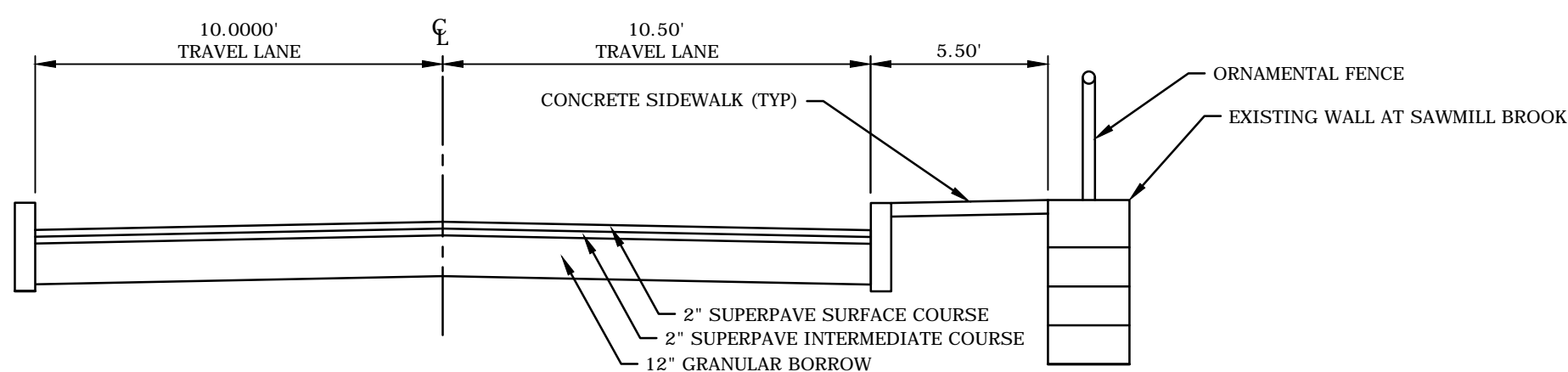
HANDICAP RAMP FOR WIDER THAN 11.5' SIDEWALK
NO SCALE



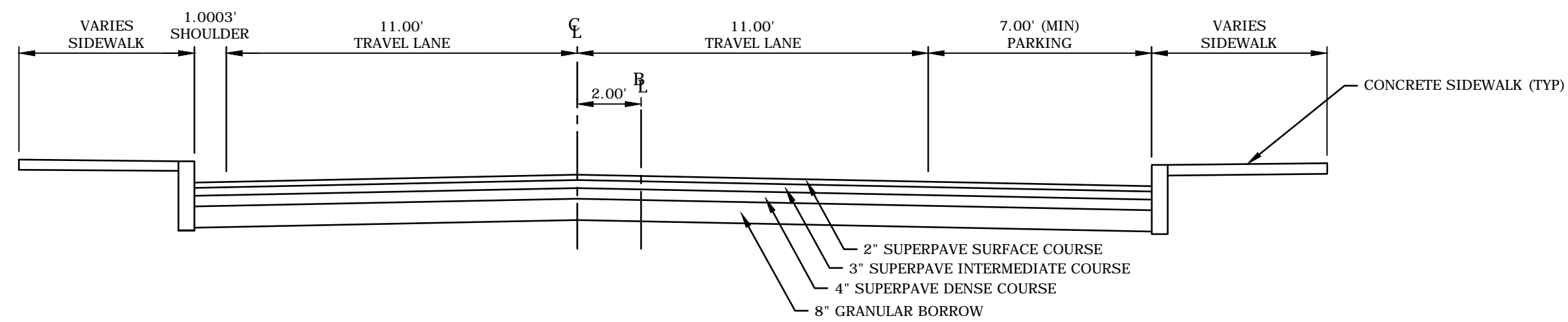
GRANITE CURB TYPE VA4
NO SCALE



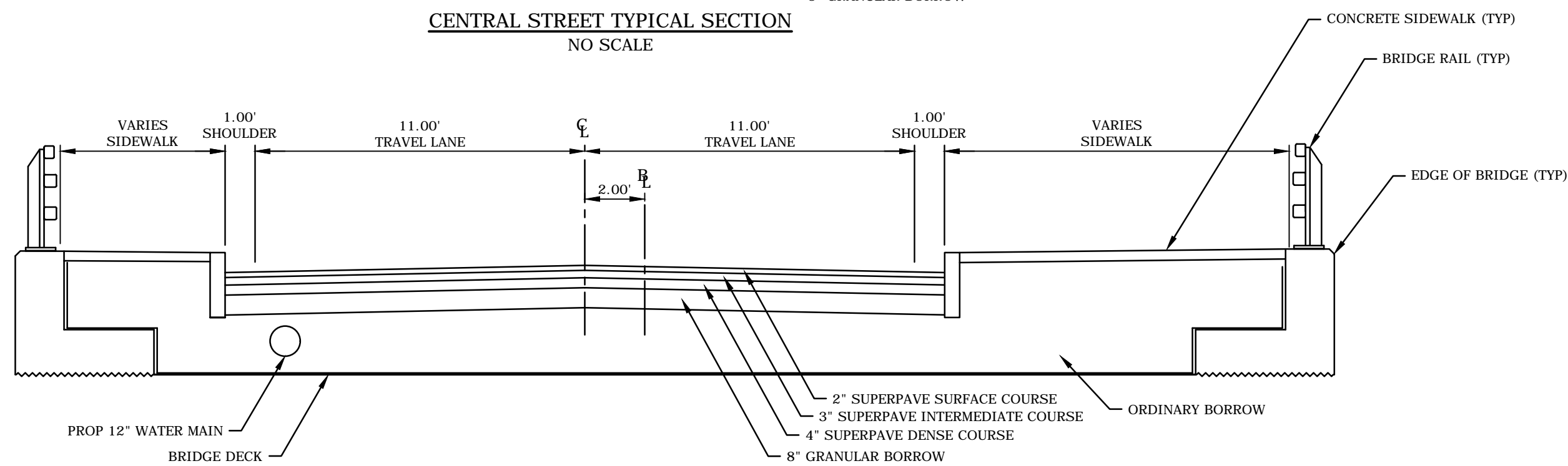
TYPICAL BUTT JOINT TO EXISTING PAVEMENT
NO SCALE



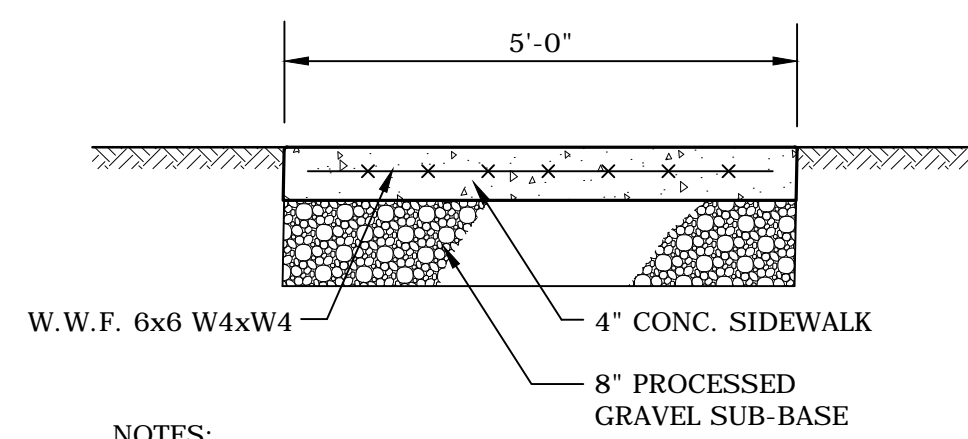
ELM STREET TYPICAL SECTION
NO SCALE



CENTRAL STREET TYPICAL SECTION
NO SCALE



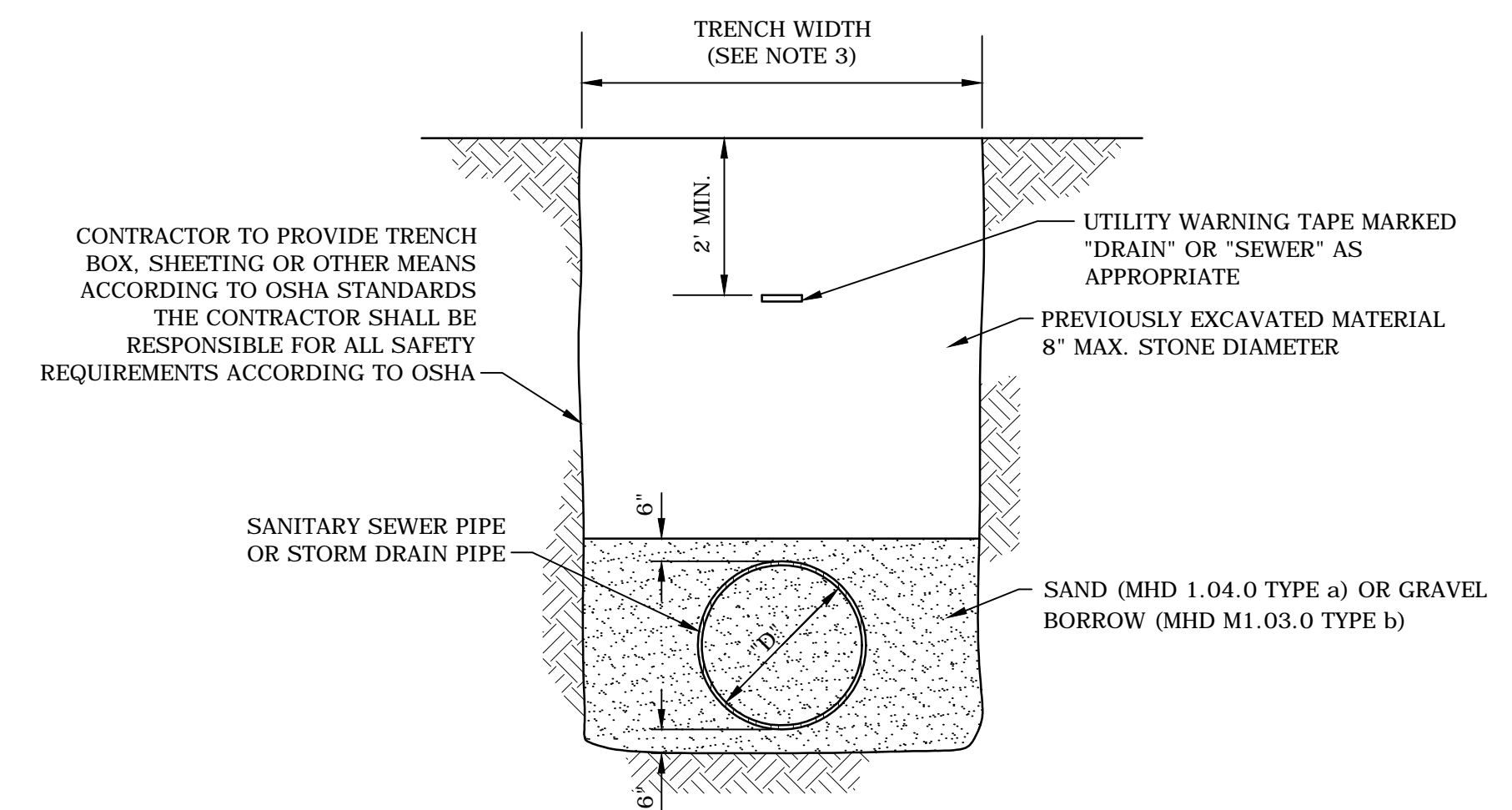
CENTRAL STREET BRIDGE TYPICAL SECTION
NO SCALE



NOTES:

1. WALK TO HAVE 1/4" RADIUS TOOLED DUMMY JOINT 1/4 OF THE THICKNESS OF THE SIDEWALK IN DEPTH EVERY 5 L.F. OF WALK.
2. WALK TO HAVE 1/2" WIDE NON-EXTRUDING PREFORMED EXPANSION JOINT EVERY 20 L.F. OF WALK.

CONCRETE SIDEWALK
NO SCALE



TYPICAL DRAIN LINE AND SEWER TRENCH SECTION
NO SCALE

NOTES:

1. COMPACT ALL BACKFILL MATERIAL WITH VIBRATORY PLATE EQUIPMENT (MINIMUM TWO PASSES) TO A MINIMUM DENSITY OF 95 PERCENT OF THE STANDARD PROCTOR DENSITY AS DETERMINED BY ASTM D698.
2. PLACE BACKFILL MATERIAL IN MAXIMUM ONE FOOT LIFTS.
3. FOR PIPES LESS THAN 24" IN DIAMETER THE TRENCH WIDTH SHALL BE 5.0'. FOR PIPES 24" IN DIAMETER AND GREATER, TRENCH WIDTH SHALL BE THE PIPE DIAMETER PLUS 3.0'.

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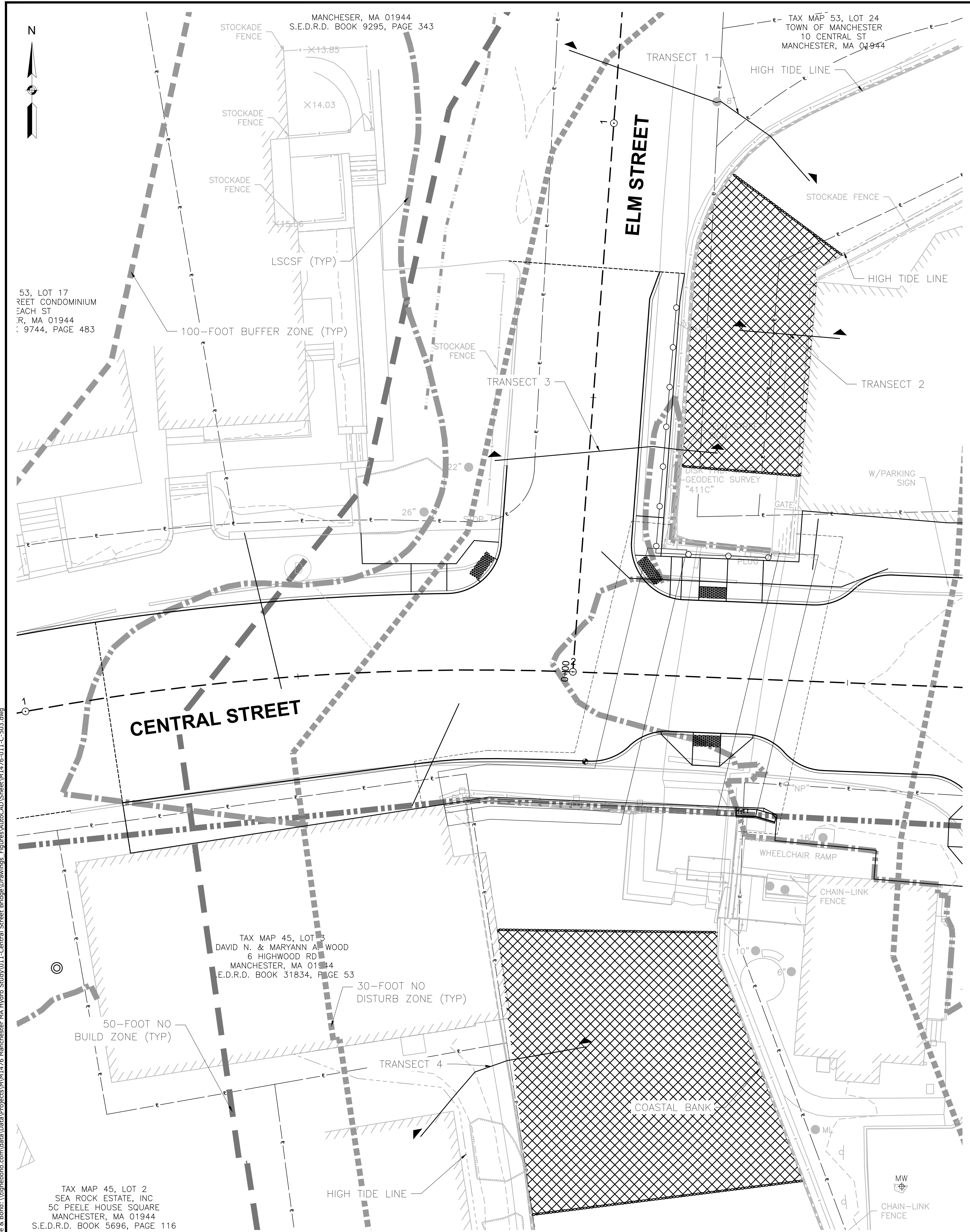
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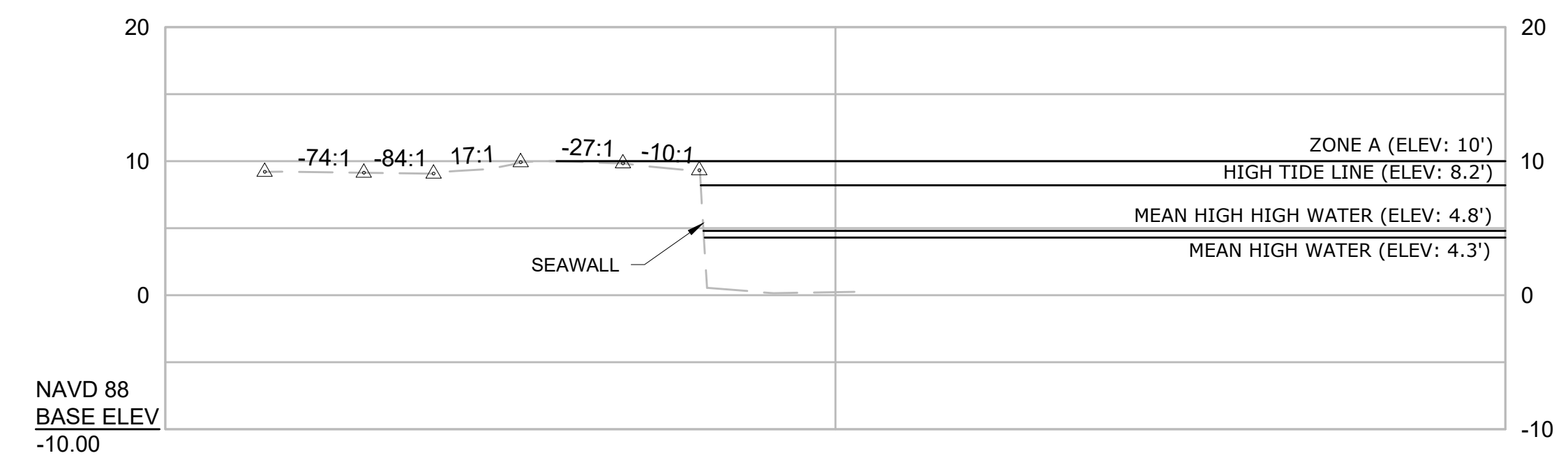
CONSTRUCTION DETAILS

SCALE: AS NOTED

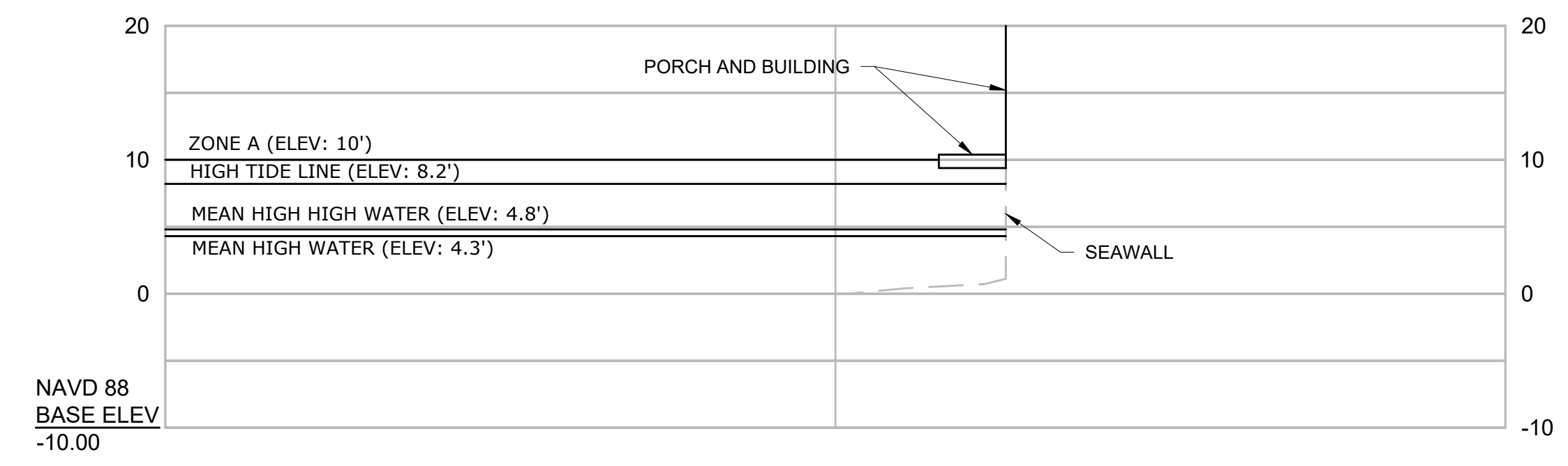
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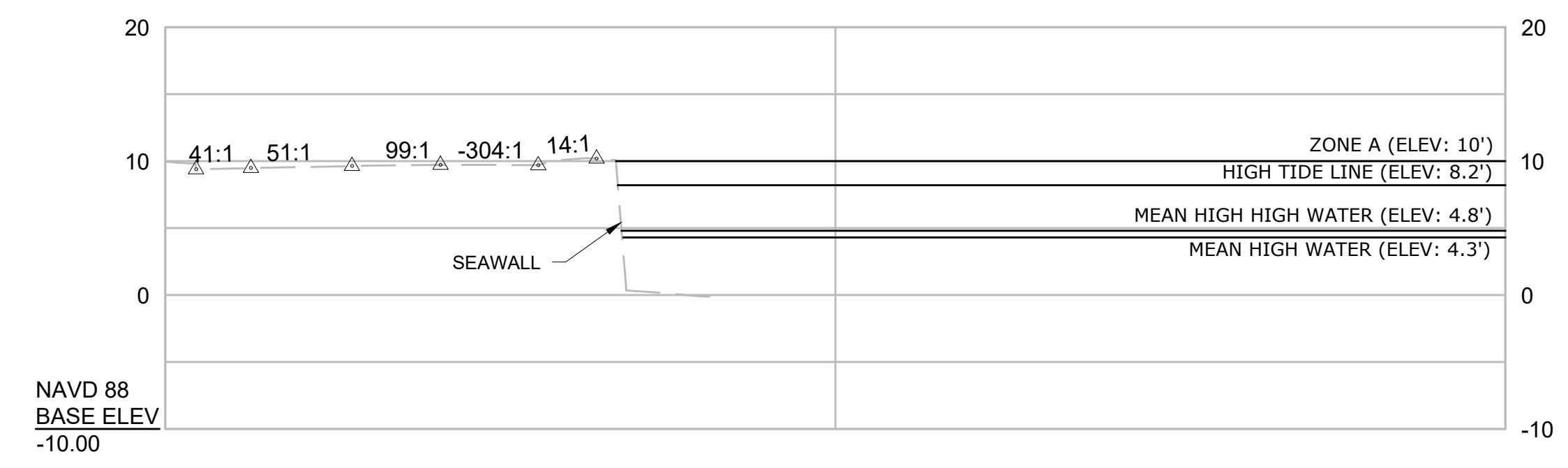
TRANSECT 1



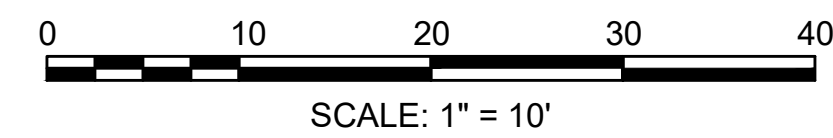
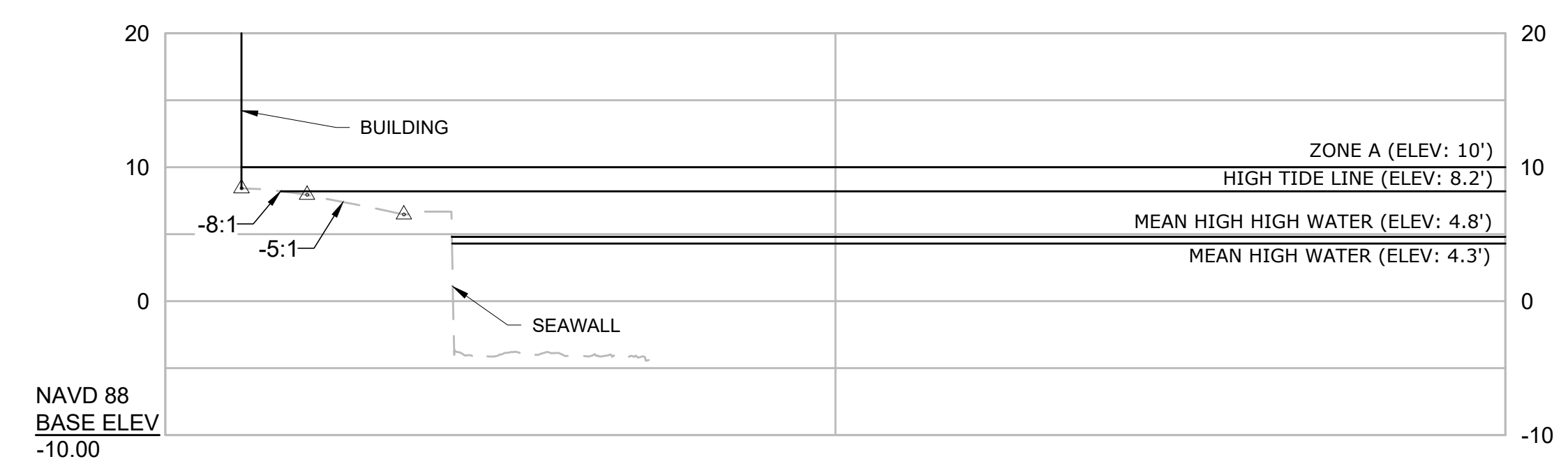
TRANSECT 2



TRANSECT 3



TRANSECT 4



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COASTAL BANK PLAN

SCALE: HORIZ, VERT: 1" = 10'

C-503

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BEST MANAGEMENT PRACTICES

INSPECTION AND MAINTENANCE

- SEDIMENT, EROSION CONTROLS, AND BEST MANAGEMENT PRACTICES (BMPS) SHALL BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION AT THE SITE. NO WORK WHICH SHALL DISTURB THE SITE OR CREATE THE POTENTIAL FOR SEDIMENT RELEASE SHALL COMMENCE UNTIL THE SEDIMENT AND EROSION CONTROLS HAVE BEEN INSPECTED AND APPROVED BY THE OWNER, ENGINEER, AND REGULATORY AGENCIES. ALL CONTROLS AND BMPS SHALL BE SUBJECT TO INSPECTION BY THE OWNER, HIS REPRESENTATIVE, AND REGULATORY AGENCIES AT ANYTIME THEREAFTER.
- PERIODIC INSPECTION, MAINTENANCE, AND CLEANING OF TEMPORARY EROSION OF SEDIMENT CONTROL MEASURES AND BMPS SHALL BE REQUIRED. ALL CONTROLS AND BMPS SHALL BE INSPECTED EVERY 7 DAYS AND WITHIN 24 HOURS OF RAINFALL EVENTS OF 0.25 INCHES OR GREATER. ROUTINE INSPECTION AND MAINTENANCE WILL REDUCE THE CHANCE OF POLLUTING STORMWATER BY FINDING AND CORRECTING PROBLEMS BEFORE THE NEXT RAIN EVENT. THE FOCUS OF THE INSPECTION WILL BE TO DETERMINE:
 1. WHETHER OR NOT THE MEASURE WAS INSTALLED / PERFORMED CORRECTLY;
 2. WHETHER OR NOT THERE HAS BEEN ANY DAMAGE TO THE MEASURE SINCE IT WAS INSTALLED OR PERFORMED; AND
 3. WHAT SHOULD BE DONE TO CORRECT ANY PROBLEMS WITH THE MEASURE. EACH MEASURE IS TO BE OBSERVED TO DETERMINE IF IT IS STILL EFFECTIVE.
 IN SOME CASES, SPECIFIC MEASUREMENTS MAY BE TAKEN TO DETERMINE IF MAINTENANCE OF THE MEASURES IS REQUIRED.

SITE MANAGER

- PRIOR TO CONSTRUCTION, A SITE MANAGER WILL BE DESIGNATED BY THE CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION, MONITORING, INSPECTION, AND CORRECTION OF EROSION AND SEDIMENT CONTROL MEASURES.

CONSTRUCTION SITE ENTRANCE

- TO REDUCE THE TRACKING OF SEDIMENT FROM THE CONSTRUCTION SITE ONTO OTHER AREAS OF THE PROPERTY AND/OR PUBLIC ROADS, AS WELL AS THE PRODUCTION OF AIRBORNE DUST, A STABILIZED CONSTRUCTION ENTRANCE IS TO BE ESTABLISHED AT ANY PERMANENT CONSTRUCTION STAGING AREA. THE ENTRANCE IS TO CONSIST OF A 6-INCH THICK PAD OF CRUSHED STONE UNDERLAIN WITH FILTER FABRIC OR A BITUMINOUS CONCRETE APRON. IT IS TO BE REMOVED AND THE AREA RESTORED FOLLOWING CONSTRUCTION.

SITE CLEARING

- DURING SITE CLEARING, EXISTING VEGETATION WITHIN THE OVERALL LIMITS OF CLEARING AND GRUBBING SHALL BE REMOVED, EXCEPT AS OTHERWISE DIRECTED. PRIOR TO ANY SITE CLEARING ACTIVITIES, SEDIMENT CONTROL BARRIERS SHALL BE PLACED ALONG THE OUTER LIMIT OF DISTURBANCE. CLEARING IS TO BE LIMITED TO THOSE AREAS OF PROPOSED WORK. DISTURBED AREAS ARE TO BE KEPT TO A MINIMUM. NO TREE WITH A BREAST HEIGHT DIAMETER OF GREATER THAN 6 INCHES SHALL BE CLEARED FROM AREAS OUTSIDE THE LIMITS OF CLEARING AND GRUBBING WITHOUT PRIOR APPROVAL FROM THE OWNER.

DUST CONTROL

- STANDARD DUST CONTROL MEASURES, INCLUDING SPRAYING AND MISTING SHALL BE USED AS NECESSARY. CALCIUM CHLORIDE SHALL NOT BE ALLOWED ON THIS PROJECT.

STAGING AREAS

- THE CONTRACTOR SHALL COORDINATE LAYDOWN STAGING AREAS FOR STORING EQUIPMENT AND MATERIALS WITH THE OWNER.
- STAGING AREAS SHALL BE SURROUNDED WITH COMPOST FILTER TUBE EROSION BARRIERS ON THE DOWNHILL SIDE.
- DURING AND AFTER CONSTRUCTION, ALL PAVED ROAD AND DRIVEWAY SURFACES ARE TO BE SCRAPED AND BROOMED FREE OF EXCAVATED MATERIALS ON A DAILY BASIS, UNLESS APPROVED BY THE OWNER.

STOCKPILED MATERIALS

- STOCKPILES OF SOIL CREATED DURING CONSTRUCTION ACTIVITIES ARE TO BE SURROUNDED WITH AN EROSION CONTROL BARRIER AROUND THE PERIMETER OF THE STOCKPILE. STOCKPILES OF ERODIBLE MATERIAL ARE TO BE COVERED PRIOR TO INCLEMENT WEATHER WITH A MINIMUM OF 20 MIL POLYETHYLENE SHEETING. STOCKPILES LEFT UNDISTURBED LONGER THAN 14 DAYS SHALL BE SEEDED OR COVERED.

EQUIPMENT FUELING

- EQUIPMENT FUELING AND OTHER ACTIVITIES INVOLVING PETROLEUM, OIL, OR OTHER POTENTIALLY HAZARDOUS SUBSTANCES ARE TO BE PERFORMED AT PRE-APPROVED, DESIGNATED AREAS WITH APPROPRIATE SPILL PREVENTION AND CONTROL MEASURES. PORTABLE SECONDARY CONTAINMENT IS TO BE USED, AND SORBENT MATERIALS ARE TO BE PLACED AROUND THE PERIMETER OF THE FUELING AREA.

CONSTRUCTION DEWATERING

- CONSTRUCTION DEWATERING SHALL BE REQUIRED DURING PORTIONS OF CONSTRUCTION WHICH REQUIRE EXCAVATION OR OTHER ACTIVITIES WHERE GROUNDWATER MAY INTERFERE WITH THE WORK.
- CONSTRUCTION DEWATERING DISCHARGES SHALL BE PRE-TREATED FOR SEDIMENT REMOVAL BY PASSING THROUGH AN APPROPRIATELY SIZED FILTER SOCK, SILT BAG, FRACTIONATION / SEDIMENTATION TANK, OR SEDIMENT TRAP PRIOR TO DISCHARGE, AS NECESSARY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DEWATERING TECHNIQUES AND MAINTAINING DEWATERING PROCEDURES THROUGHOUT THE DURATION OF THE PROJECT.

OUTLET PROTECTION

- APPROPRIATE OUTLET PROTECTION, CONSISTING OF RIPRAP CHANNEL LINING, A LEVEL SPREADER, OR OTHER SUCH MEASURE SHALL BE PROVIDED AT THE OUTLET OF ANY DEWATERING CONDUIT OR STORMWATER CULVERT OR CHANNEL OUTFALL TO REDUCE VELOCITIES AND ENHANCE SEDIMENTATION PRIOR TO DISCHARGE.

LIMITS OF WORK

- THE CONTRACTOR SHALL LINE THE UPGRADIENT BOUNDARY OF WORK AREAS WITH ORANGE SAFETY FENCING BEFORE THE START OF SITE CLEARING ACTIVITIES EXCEPT WHERE CHAIN-LINK FENCING IS NEEDED TO RESTRICT PUBLIC ACCESS.

SURFACE WATER CONTROL

- THE CONTRACTOR MUST MAINTAIN THE SITE FLOWAGE OF SURFACE WATER THROUGH THE WORK AREA IN ACCORDANCE WITH THE SPECIFICATIONS. ALL COFFERDAMS SHALL CONSIST OF NON-ERODIBLE MATERIAL. THE CONTRACTOR SHALL SUBMIT A WATER CONTROL PLAN THAT WILL ADDRESS EMERGENCY MEASURES TO IMPLEMENT IN THE EVENT A STORM OCCURS DURING CONSTRUCTION.

TURBIDITY MONITORING AND CONTROL

- TURBIDITY SHALL BE MONITORED AND CONTROLLED BY THE CONTRACTOR. A TURBIDITY CURTAIN SHALL BE INSTALLED SURROUNDING AREAS OF EXCAVATION AT AND BELOW THE IMPOUNDMENT WATER LINE.
- IF TURBIDITY LEVELS ARE UNACCEPTABLE AS JUDGED BY THE OWNER, ENGINEER, OR REGULATORY AGENCY, ADDITIONAL MEASURES SHALL BE IMPLEMENTED AT NO EXPENSE TO THE OWNER.

TEMPORARY STABILIZATION

- WHEN NECESSARY, TEMPORARY SLOPE PROTECTION SHALL BE PROVIDED BY INSTALLING SEDIMENT TRAP BARRIERS AT THE TOE OF FILLS OR CUT SLOPES. IF ADDITIONAL STABILIZATION IS NEEDED, THEN THE CONTRACTOR SHALL INSTALL MULCH LOGS, MATTING, SUCH AS STRAW, JUTE, WOOD FIBER, OR BIODEGRADABLE MESH. A TACKIFIER SHALL BE USED ON LOOSE MATERIALS USED FOR TEMPORARY EROSION CONTROL.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN TWO WEEKS, THE AREAS SHALL BE MULCHED WITH STRAW AT A RATE OF 100 LBS. PER 1,000 S.F. TO HELP CONTROL EROSION. 100% BIODEGRADABLE EROSION CONTROL BLANKETS OR TWO INCHES OF WOOD CHIP MULCH MAY ALSO BE USED AS TEMPORARY COVER.
- IN THE EVENT THAT DISTURBED AREAS AT THE SITE ARE TO BE LEFT UN-WORKED FOR MORE THAN ONE MONTH, THE AREAS SHALL BE TOPSOILED AND SEEDED AS PER THE SPECIFICATIONS AND AT NO ADDITIONAL COST TO THE OWNER.
- LEAVE THE SURFACE OF ALL EXCAVATIONS AND FILLS IN A FIRM AND STABLE CONDITION AT THE END OF EACH DAY. ROLL OR OTHERWISE TREAT THE SURFACE AS NEEDED.

SITE RESTORATION

- STABILIZATION OF DISTURBED AREAS OR NEW SOIL FILLS SHALL BE IMPLEMENTED WITHIN 14 DAYS AFTER GRADING OR CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED. APPROPRIATE VEGETATIVE SOIL STABILIZATION IS TO BE USED TO MINIMIZE EROSION. TEMPORARY AND PERMANENT VEGETATIVE COVER IS TO BE ESTABLISHED IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORATION OF PREVIOUSLY VEGETATED UPLAND AREAS DISTURBED BY CONSTRUCTION ACTIVITIES. RESTORATION OF UPLAND AREAS CONSIST OF REPLACEMENT OF TOPSOIL OR PLACEMENT OF IMPORTED LOAM AS NEEDED SUCH THAT A MINIMUM OF 4 INCHES OF SUITABLE MATERIAL IS PRESENT AND APPROPRIATELY LIMED, FERTILIZED, GRADED, AND SCARIFIED. FIELDS DISTURBED OR COMPACTED BY CONSTRUCTION ACTIVITIES SHALL BE PLOWED TO LOOSEN THE SOIL, HARROWED TO PROVIDE AN EVEN SURFACE, AND APPROPRIATELY PREPARED FOR PLANTING.
- DISTURBED UPLAND AREAS SHALL THEN BE HYDROSEEDED WITH AN APPROVED SEED MIX AT THE RATE RECOMMENDED BY THE MANUFACTURER. SEEDING RATE SHALL BE DOUBLED FOR DORMANT SEEDING. SEED MIX SHALL BE DRY SITE RESTORATION SEED MIX UNLESS OTHERWISE NOTED OR AS APPROVED BY THE ENGINEER.
- 100% BIODEGRADABLE EROSION CONTROL BLANKETS MUST BE USED FOR STABILIZATION OF SLOPES IN EXCESS OF 3H: 1V AND MAY BE USED IN LIEU OF HYDROSEEDED AT THE CONTRACTOR'S DISCRETION TO PROVIDE ADDITIONAL EROSION PROTECTION.
- FINAL STABILIZATION SHALL BE CONSIDERED COMPLETE WHEN ALL SOIL-DISTURBING ACTIVITIES HAVE BEEN COMPLETED AND A UNIFORM, PERENNIAL VEGETATIVE COVER WITH A DENSITY OF EIGHTY PERCENT HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES (SUCH AS THE USE OF MULCHES OR EROSION CONTROL MATTING) HAVE BEEN EMPLOYED ON ALL UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ALL VEGETATED SURFACES, INCLUDING WATERING, FERTILIZING, REPAIRING EROSION, INVASIVE PLANT REMOVAL, AND RE-SEEDING UNTIL ESTABLISHMENT CONDITIONS ARE MET AND UNTIL THE END OF THE CONTRACTUAL MAINTENANCE PERIOD.

EROSION CONTROL NOTES:

1. CONTRACTOR MUST FINALIZE AND IMPLEMENT THE EROSION AND SEDIMENT CONTROL PLAN (ESCP).
2. THE ESCP SHALL BE UPDATED AS CONSTRUCTION PROGRESSES. IT SHOULD REFLECT CURRENT OWNERSHIP, RESPONSIBILITIES, OPERATIONS AND FINDINGS. THE PLAN SHALL BE REVISED NO LATER THAN 7 DAYS AFTER THE INSPECTION. IF HAZARDOUS CONDITIONS OCCUR THE PLAN NEEDS TO BE MODIFIED BEFORE PROCEEDING WITH WORK. STEPS TO PREVENT THE REOCCURRENCE OF SUCH RELEASES WILL BE IDENTIFIED IN A PLAN REVISION AND IMPLEMENTED.
3. MAINTAIN AN ADDITIONAL SUPPLY OF EROSION CONTROL MEASURES THROUGHOUT THE CONSTRUCTION PERIOD.
4. MAINTAIN ALL EROSION CONTROL MEASURES IN GOOD WORKING CONDITION. THIS MAY REQUIRE CLEANING, REPAIRING, REPLACEMENT, AND SEDIMENT DISPOSAL. MAINTENANCE SHALL BE INITIATED WITHIN 24 HOURS OF IDENTIFICATION. SEDIMENT BARRIERS SHOULD HAVE SEDIMENT CLEANED OUT WHEN THE BARRIER IS 50% OF CAPACITY. SOIL AND DEBRIS ON ADJOINING PROPERTIES OR STREETS SHALL BE MINIMIZED. HAZARDOUS MATERIAL SPILLS SHOULD BE REMOVED IMMEDIATELY AND REMEDIAL ACTIONS FOR PREVENTION MUST BE TAKEN. HAZARDOUS MATERIALS SHALL BE CLEANED UP BY REMOVING AND DISPOSING OF CONTAMINATED MATERIALS PROPERLY.
5. SILT TRAPPED AT BARRIERS SHALL BE REMOVED AND DISPOSED OF IN UPLAND AREAS OUTSIDE BUFFER ZONES. MATERIALS DEPOSITED IN ANY TEMPORARY SETTLING BASIN SHALL BE REMOVED AT THE COMPLETION OF THE PROJECT. ALL DISTURBED AREAS SHALL BE RESTORED.
6. THE ESCP MEASURES SHOWN ON THIS PLAN ARE THE BASE REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, UPGRADE THESE MEASURES AS NEEDED TO COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL EROSION AND SEDIMENT CONTROL REGULATIONS.
7. EROSION AND SEDIMENT CONTROL MEASURES INCLUDING PERIMETER SEDIMENT CONTROL MUST BE IN PLACE BEFORE VEGETATION IS DISTURBED AND MUST REMAIN IN PLACE AND BE MAINTAINED, CLEANED, REPAIRED OR REPLACED, AND PROMPTLY IMPLEMENTED FOLLOWING PROCEDURES ESTABLISHED FOR THE DURATION OF CONSTRUCTION, INCLUDING PROTECTION FOR ACTIVE STORM DRAIN INLETS AND CATCH BASINS AND APPROPRIATE NON-STORMWATER POLLUTION CONTROLS.
8. PHASE CLEARING AND GRADING TO THE MAXIMUM EXTENT PRACTICAL TO PREVENT EXPOSED INACTIVE AREAS FROM BECOMING A SOURCE OF EROSION. CONSTRUCTION ACTIVITIES MUST AVOID OR MINIMIZE UNSTABILIZED EXCAVATION AND CREATION OF BARE GROUND DURING WET WEATHER.
9. PROTECT NEW WORK FROM FLOODING. PROPERLY SLOPE GRADING IN THE AREAS SURROUNDING ALL EXCAVATIONS TO PREVENT WATER FROM RUNNING INTO THE EXCAVATED AREA OR TO ADJACENT PROPERTIES. UPON COMPLETION OF THE WORK, RESTORE ALL AREAS IN A SATISFACTORY MANNER.
10. IDENTIFY, MARK, AND PROTECT (BY FENCING OFF OR OTHER MEANS) CRITICAL RIPARIAN AREAS AND VEGETATION INCLUDING ALL TREES AND ASSOCIATED ROOTING ZONES, AND VEGETATION AREAS NOT SPECIFICALLY IDENTIFIED FOR REMOVAL. MARK IN THE FIELD VEGETATIVE BUFFER ZONES BETWEEN THE SITE AND SENSITIVE AREAS (E.G., WETLANDS), AND OTHER AREAS TO BE PRESERVED, ESPECIALLY IN PERIMETER AREAS.
11. THE INTENTIONAL WASHING OF SEDIMENT INTO SAWMILL BROOK MUST NOT OCCUR. VACUUMING OR DRY SWEEPING AND MATERIAL PICKUP MUST BE USED TO CLEANUP SEDIMENTS.
12. STABILIZE THE AREAS OF CONSTRUCTION ACTIVITIES AT THE CLOSE OF EACH CONSTRUCTION DAY. CHECK EROSION CONTROLS AT THIS TIME AND MAINTAIN OR REINFORCE IF NECESSARY.
13. APPLY TEMPORARY AND/OR PERMANENT SOIL STABILIZATION MEASURES ON ALL DISTURBED AREAS AS GRADING PROGRESSES AND FOR ALL ROADWAYS INCLUDING GRAVEL ROADWAYS.
14. ESTABLISH CONCRETE TRUCK AND OTHER CONCRETE EQUIPMENT CONTAINED WASHOUT AREAS BEFORE BEGINNING CONCRETE WORK. CONCRETE WASHOUT MUST BE CONTAINED AWAY FROM DRAINAGE AREAS. IT MUST BE CLEARLY MARKED AND ACCESSIBLE.
15. ESTABLISH MATERIAL AND WASTE STORAGE AREAS, AND OTHER NON-STORMWATER CONTROLS. DISPOSAL OF MATERIALS AND WASTE SHALL COMPLY WITH STATE AND LOCAL WASTE DISPOSAL. SANITARY WASTE AND OTHER HAZARDOUS WASTE SHALL BE DISPOSED OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
16. DEWATER AS NECESSARY TO KEEP CONSTRUCTION AREAS FREE OF WATER, DISCHARGE WATER FROM DEWATERING TO THE APPROPRIATE LOCATION AND WITHOUT SEDIMENT.
17. ALL SILT-LADEN WATER MUST BE SETTLED OR FILTERED TO REMOVE ALL SEDIMENTS IN A SEDIMENTATION BASIN OR FILTER BAG LOCATED DOWNSTREAM, PRIOR TO RELEASE TO A WATERWAY OR EXISTING DRAINAGE SYSTEM.
18. PREVENT TRACKING OF SEDIMENT OUTSIDE OF PROJECT LIMITS USING BMPS SUCH AS: GRAVELED (OR PAVED) EXITS AND PARKING AREAS, GRAVEL ALL UNPAVED ROADS LOCATED ONSITE, OR USE AN EXIT TIRE WASH. THESE BMPS MUST BE IN PLACE PRIOR TO LAND-DISTURBING ACTIVITIES. AT THE END OF EACH WORK DAY, ANY SEDIMENTS TRACKED ONTO PUBLIC RIGHT-OF-WAYS BEYOND THE PROJECT LIMITS SHALL BE SWEEP AWAY.
19. WHEN TRUCKING SATURATED SOILS FROM THE SITE, EITHER USE WATER-TIGHT TRUCKS OR DEWATER LOADS ON SITE.
20. BMP'S SHOULD BE IMPLEMENTED AND MONITORED THROUGHOUT THE PROJECT. USE BMPS TO PREVENT OR MINIMIZE STORMWATER EXPOSURE TO POLLUTANTS FROM SPILLS, VEHICLE AND EQUIPMENT FUELING, MAINTENANCE, AND STORAGE; OTHER CLEANING AND MAINTENANCE ACTIVITIES; AND WASTE HANDLING ACTIVITIES. THESE POLLUTANTS INCLUDE FUEL, HYDRAULIC FLUID, AND OTHER OILS FROM VEHICLES AND MACHINERY, AS WELL AS DEBRIS, LEFTOVER PAINTS, SOLVENTS, AND GLUES FROM CONSTRUCTION OPERATIONS.
21. WRITTEN SPILL PREVENTION AND RESPONSE PROCEDURES, EMPLOYEE TRAINING ON SPILL PREVENTION AND PROPER DISPOSAL PROCEDURES, SPILL KITS IN ALL VEHICLES, REGULAR MAINTENANCE SCHEDULE FOR VEHICLES AND MACHINERY, MATERIAL DELIVERY AND STORAGE CONTROLS, TRAINING AND SIGNAGE, AND COVERED STORAGE AREAS FOR WASTE AND SUPPLIES. HAZARDOUS MATERIALS SHOULD BE STORED AWAY FROM THE STREAM TO ELIMINATE CHANCES FOR ACCIDENTAL SPILL SHALL BE IMPLEMENTED.
22. IF A TREATMENT (FOR EXAMPLE, ELECTRO-COAGULATION, FLOCCULATION, FILTRATION, ETC.) FOR SEDIMENT OR OTHER POLLUTANT REMOVAL IS EMPLOYED, SUBMIT AN OPERATION AND MAINTENANCE PLAN (INCLUDING SYSTEM SCHEMATIC, LOCATION OF SYSTEM, LOCATION OF INLET, LOCATION OF DISCHARGE, DISCHARGE DISPERSION DEVICE DESIGN, AND A SAMPLING PLAN AND FREQUENCY) BEFORE OPERATING THE TREATMENT SYSTEM. OBTAIN ENGINEER'S PLAN REVIEW BEFORE OPERATING THE TREATMENT SYSTEM. OPERATE AND MAINTAIN THE TREATMENT SYSTEM ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
23. TEMPORARILY STABILIZE SOILS AT THE END OF THE SHIFT BEFORE HOLIDAYS AND WEEKENDS. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT SOILS ARE STABLE DURING EVENTS AT ANY TIME.
24. STABILIZING PRACTICES : SEEDING WITH MULCH AND ROLLED EROSION CONTROL MATTING. ANY AREAS NOT SUBJECT TO CONSTRUCTION ACTIVITY FOR 14 DAYS MUST BE STABILIZED IMMEDIATELY. PRESERVE EXISTING VEGETATION IN AREAS NOT DISTURBED DURING CONSTRUCTION. ANY ON SITE STOCK PILES SHALL BE STABILIZED WITHIN 14 DAYS AFTER CONSTRUCTION ACTIVITY HAS CEASED WITH SEDIMENT BARRIERS INSTALLED.
25. FINAL STABILIZATION: MEANS THAT ALL SOIL DISTURBING ACTIVITIES AT THE SITE HAVE BEEN COMPLETED AND THAT A UNIFORM PERENNIAL VEGETATIVE COVER WITH A DENSITY OF 70% FOR THE AREA HAS BEEN ESTABLISHED OR EQUIVALENT STABILIZATION MEASURES HAVE BEEN EMPLOYED.

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

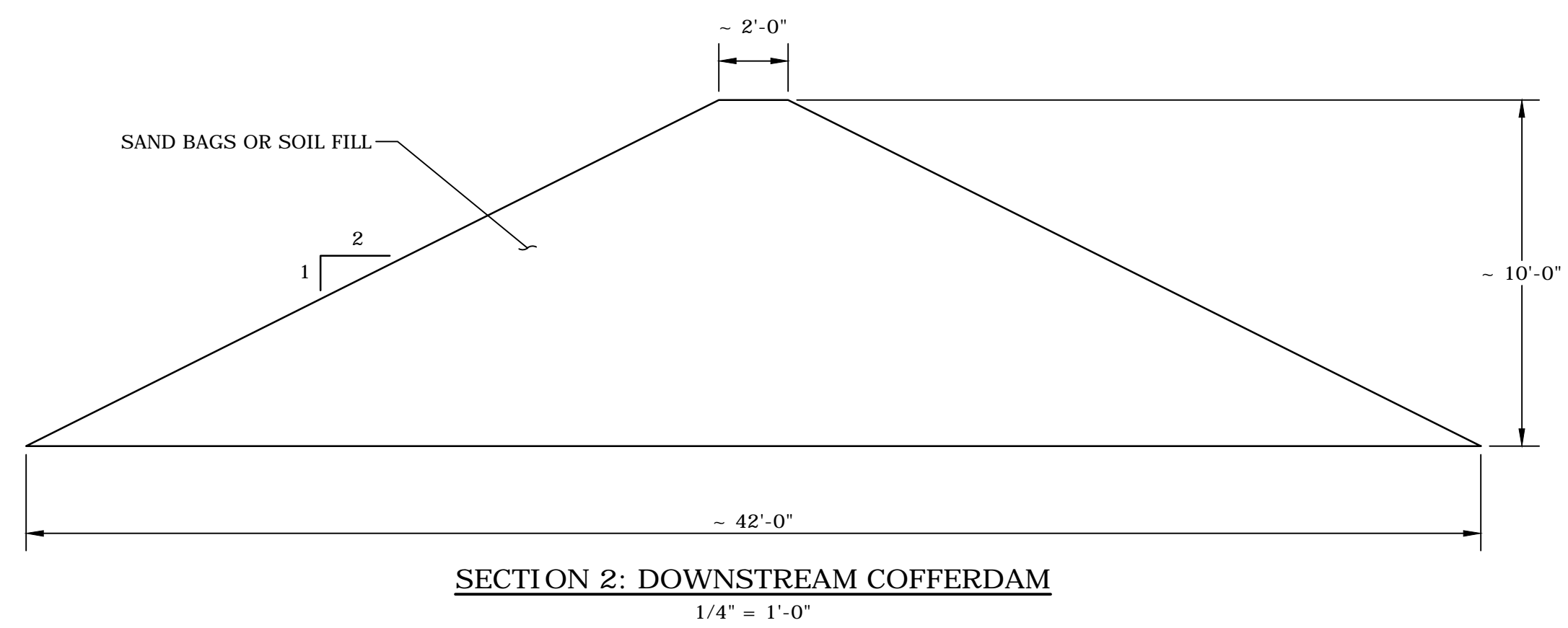
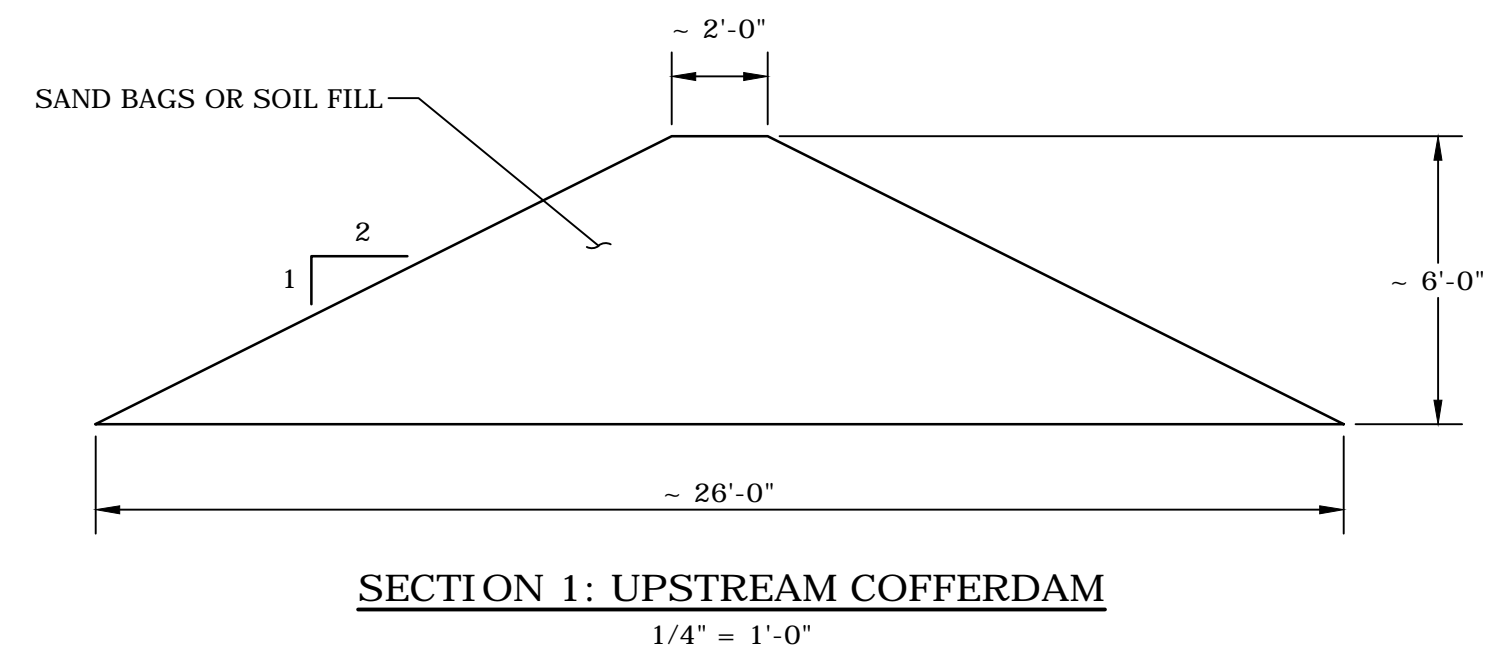
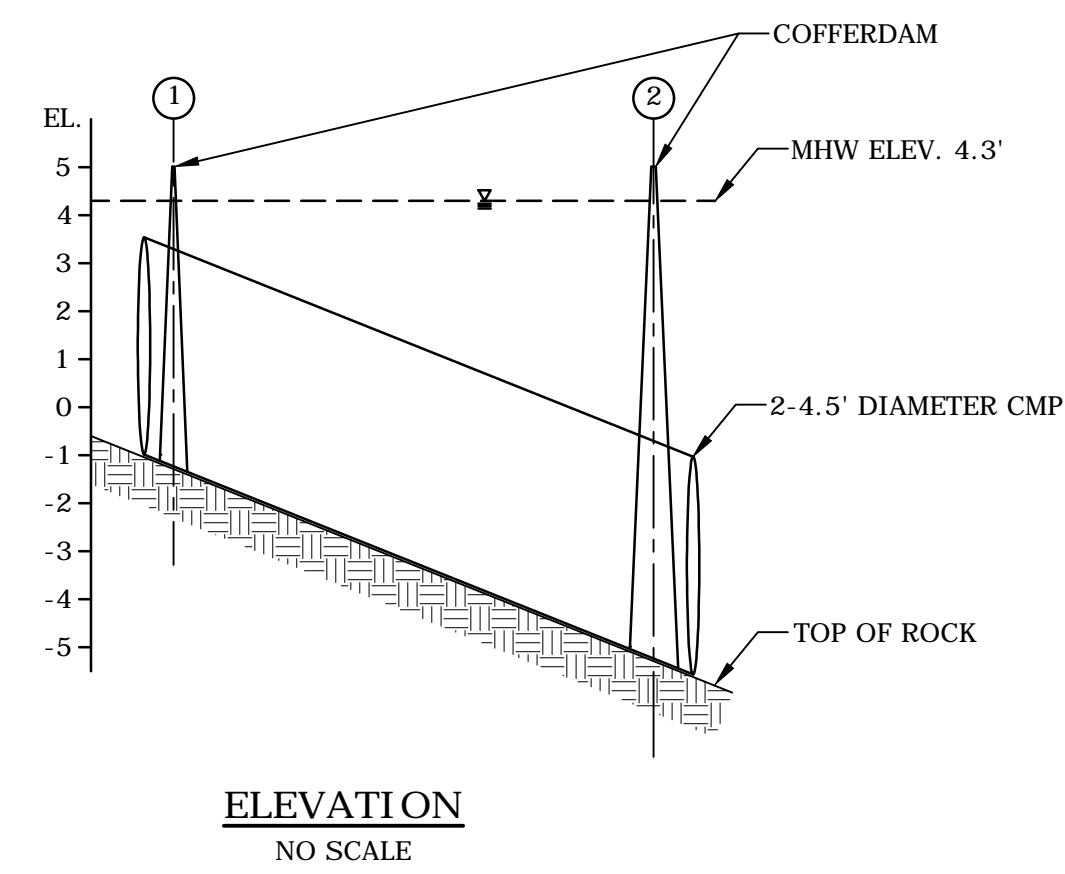
Town of
Manchester-By-
The-Sea,
Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	NOVEMBER 2021	
FILE:	M1476-011-C-501.dwg	
DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

CONTROL OF WATER NOTES

SCALE: AS NOTED

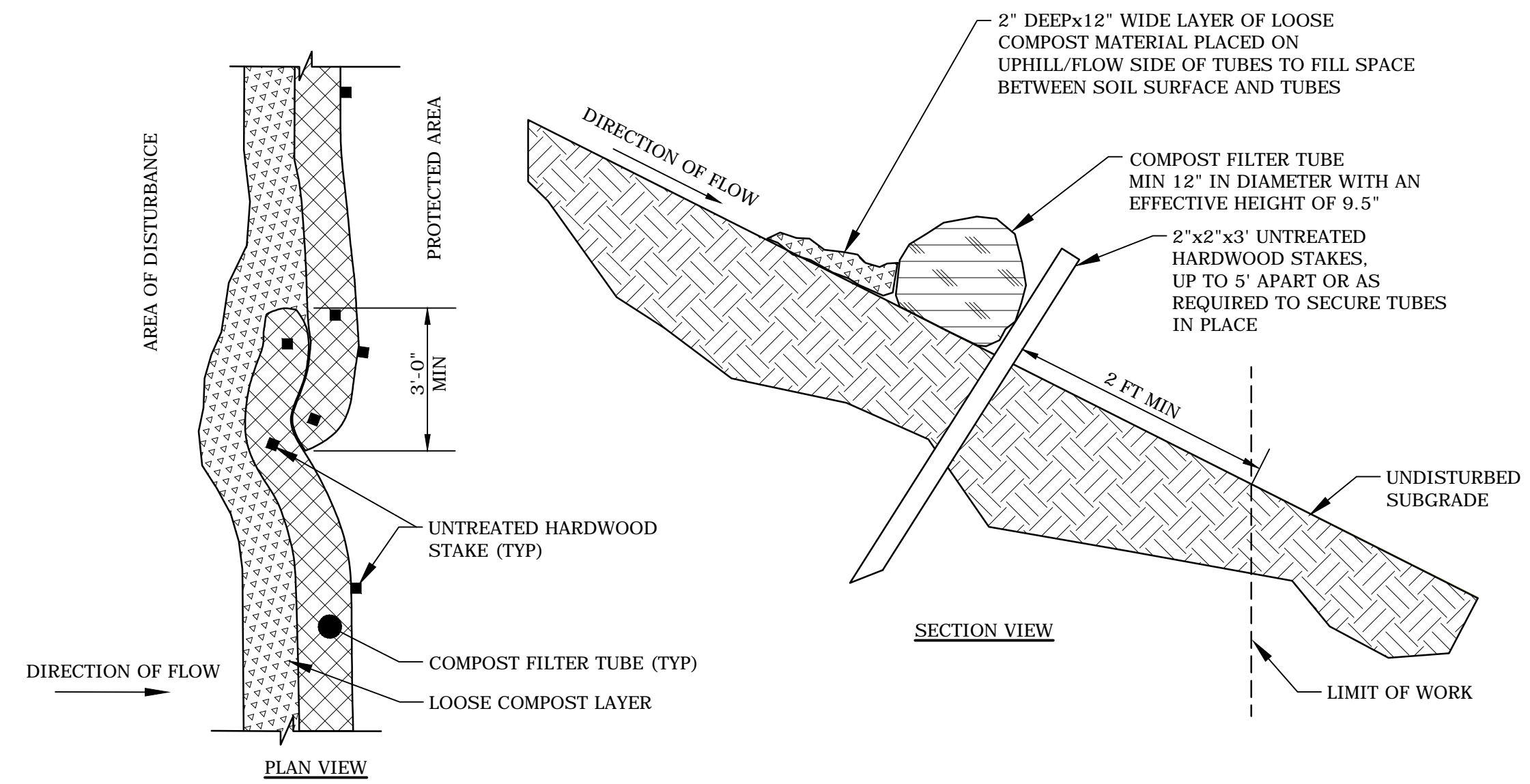
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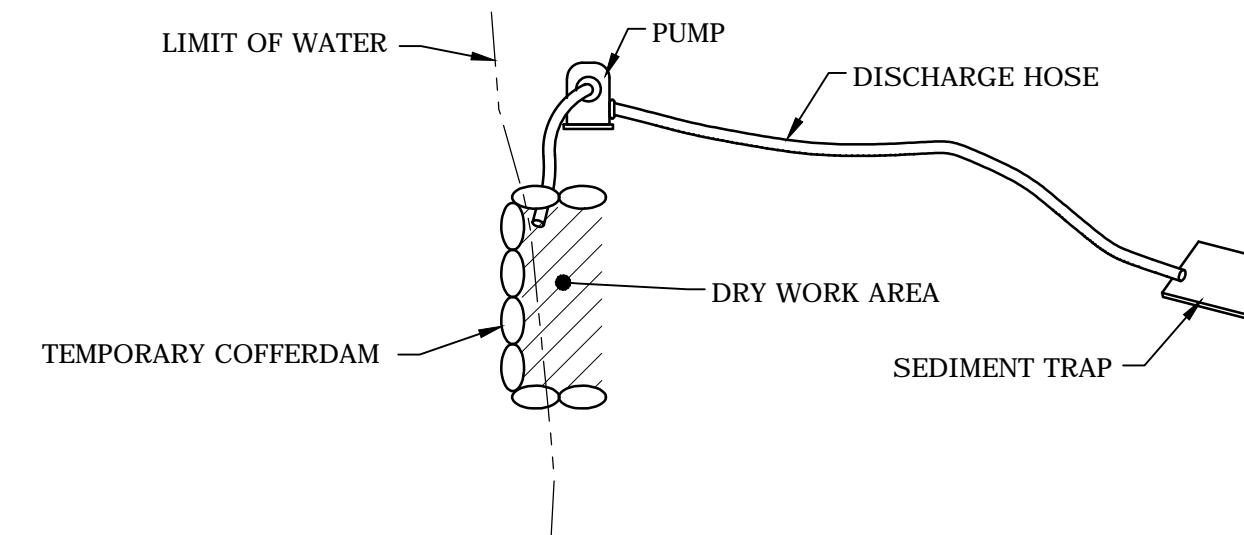
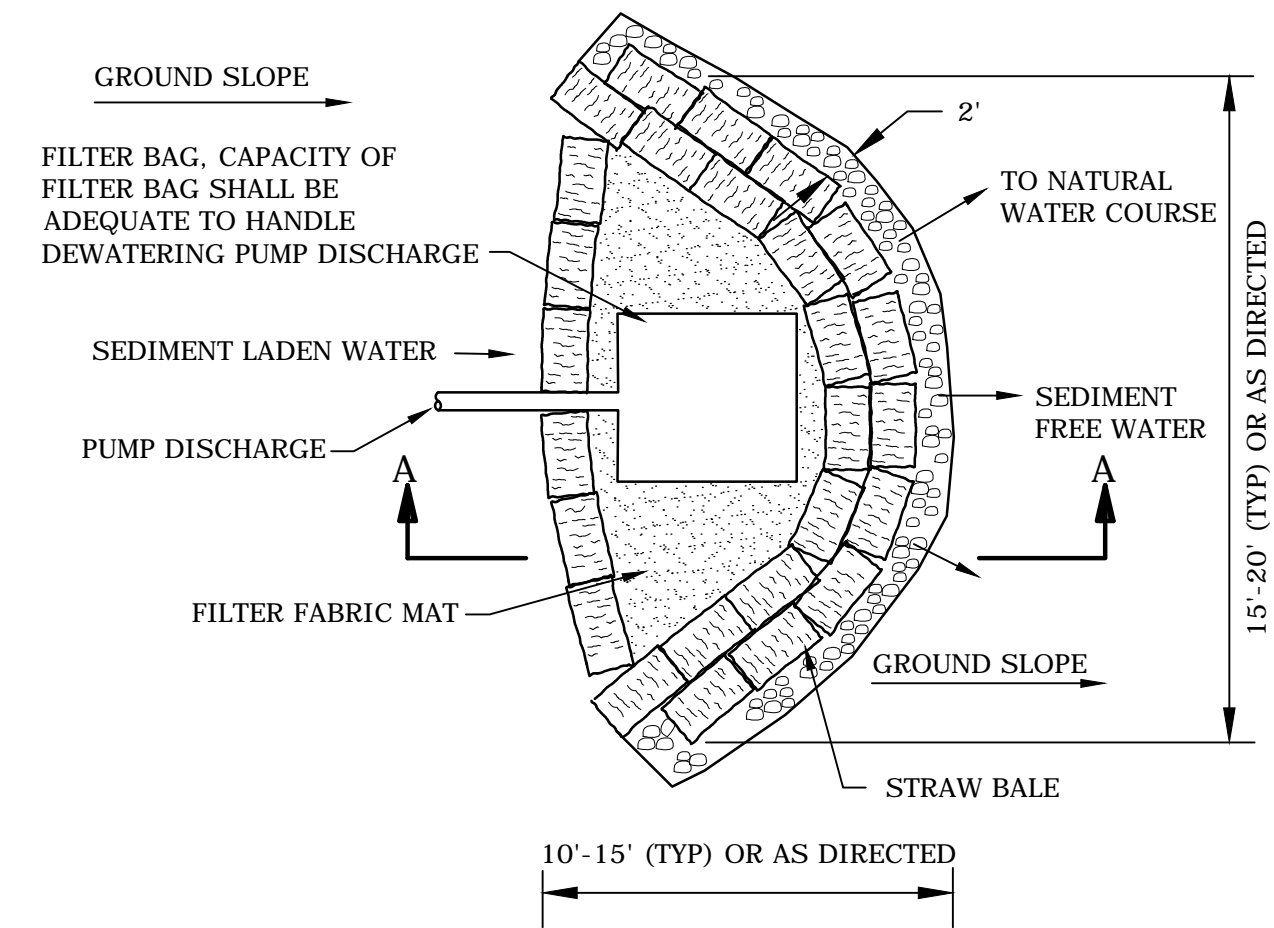
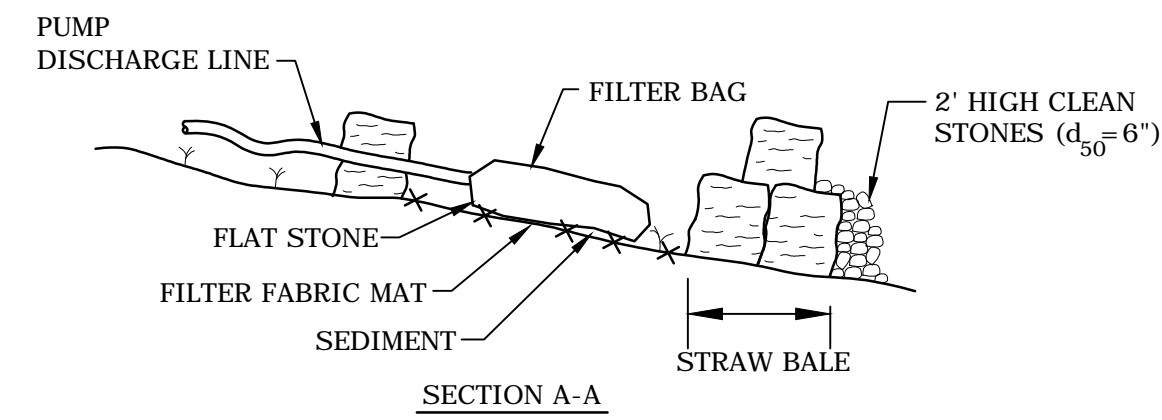
COFFERDAMS, PUMPING, DEWATERING, AND STREAM BYPASS NOTES:

- THE DETAILS SHOWN ON THIS SHEET ARE AN EXAMPLE OF ACCEPTABLE METHODS TO USE DURING CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND SUBMITTING A COFFERDAM PLAN, PUMPING AND DEWATERING PLAN FOR REVIEW AND APPROVAL BY THE CONTRACTING AGENCY OR ENGINEER. THE PLAN SHALL INCLUDE SUFFICIENT DETAIL OF MEANS AND METHODS TO SATISFY THE PROJECT SPECIFICATIONS AND PERMIT REQUIREMENTS. IF APPROVED, OTHER METHODS MAY BE USED SUCH AS UTILIZING INFLATABLE BLADDERS, PLATES, OR BARRIERS OF VARIOUS MATERIALS. COFFERDAMS SHALL INCLUDE PLASTIC LINER OR FINE MESH SILT FENCE TO REDUCE TURBIDITY AND FINES FROM ENTERING THE FREE FLOWING PORTION OF LIVE WATER.
- THE CONTRACTING AGENCY IS RESPONSIBLE FOR MEASURING TURBIDITY HOWEVER THE CONTRACTOR SHALL ADHERE TO THE SPECIAL PROCEDURES REGARDING IN-STREAM WORK, TURBIDITY, AND DEWATERING IN THE DESIGN DRAWINGS.
- CONSERVATION MEASURES ARE SUMMARIZED IN THE PLANS AND SHALL BE STRICTLY ADHERED TO.
- THE CONTRACTOR SHALL NOTIFY THE OWNER AND CONTRACTING OFFICER AT LEAST 5 DAYS BEFORE EACH COFFERDAM INSTALLATION DATE. ANTICIPATED COFFERDAM LOCATIONS ARE SHOWN IN THE PLANS.
- FILL MATERIAL FOR BULK BAGS FOR "SUPER SACKS", IF USED, SHALL BE CLEAN, WASHED, AND ROUNDED MATERIAL MEETING STANDARD SPECIFICATIONS FOR DRAIN ROCK, STREAMBED AGGREGATES, STREAMBED SEDIMENTS, OR STREAMBED COBBLES. MATERIAL USED TO FILL BULK BAGS SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PERMITS. IF PERMITS ALLOW, MATERIAL MAY BE DISPOSED OF IN UPLAND AREAS AS DIRECTED BY THE CONTRACTING OFFICER.
- DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
- EXCAVATIONS ASSOCIATED WITH CHANNEL, FLOODPLAIN, AND STRUCTURES SHALL BE DEWATERED.
- WATER SHALL BE PUMPED AND DISCHARGED AWAY FROM THE WORK AREAS TO SEDIMENT TRAPS.
- DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
- ALL PUMP INTAKES SHALL BE SCREENED FOR FISH PROTECTION AS REQUIRED BY NOAA.
- ALL EARTHWORK ACTIVITIES AND STRUCTURE CONSTRUCTION WITHIN THE ORDINARY HIGH WATER CHANNEL SHALL CONFORM TO THE WATER QUALITY STANDARDS ESTABLISHED BY REGULATORY AGENCY PERMITS FOR THIS PROJECT.

DATUMS FOR 8443970, BOSTON MA (NAVD88)	
MHHW	4.77
MHW	4.33
MSL	-0.30
MLW	-5.16
MLLW	-5.51



COMPOST FILTER TUBE
NO SCALE



- NOTES:**
- DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS AND SHALL DISCHARGE OUTSIDE OF THE WETLAND BOUNDARY AS SHOWN ON SHEET C-001.
 - DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION.

SEDIMENT TRAP AND DEWATERING
NO SCALE

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

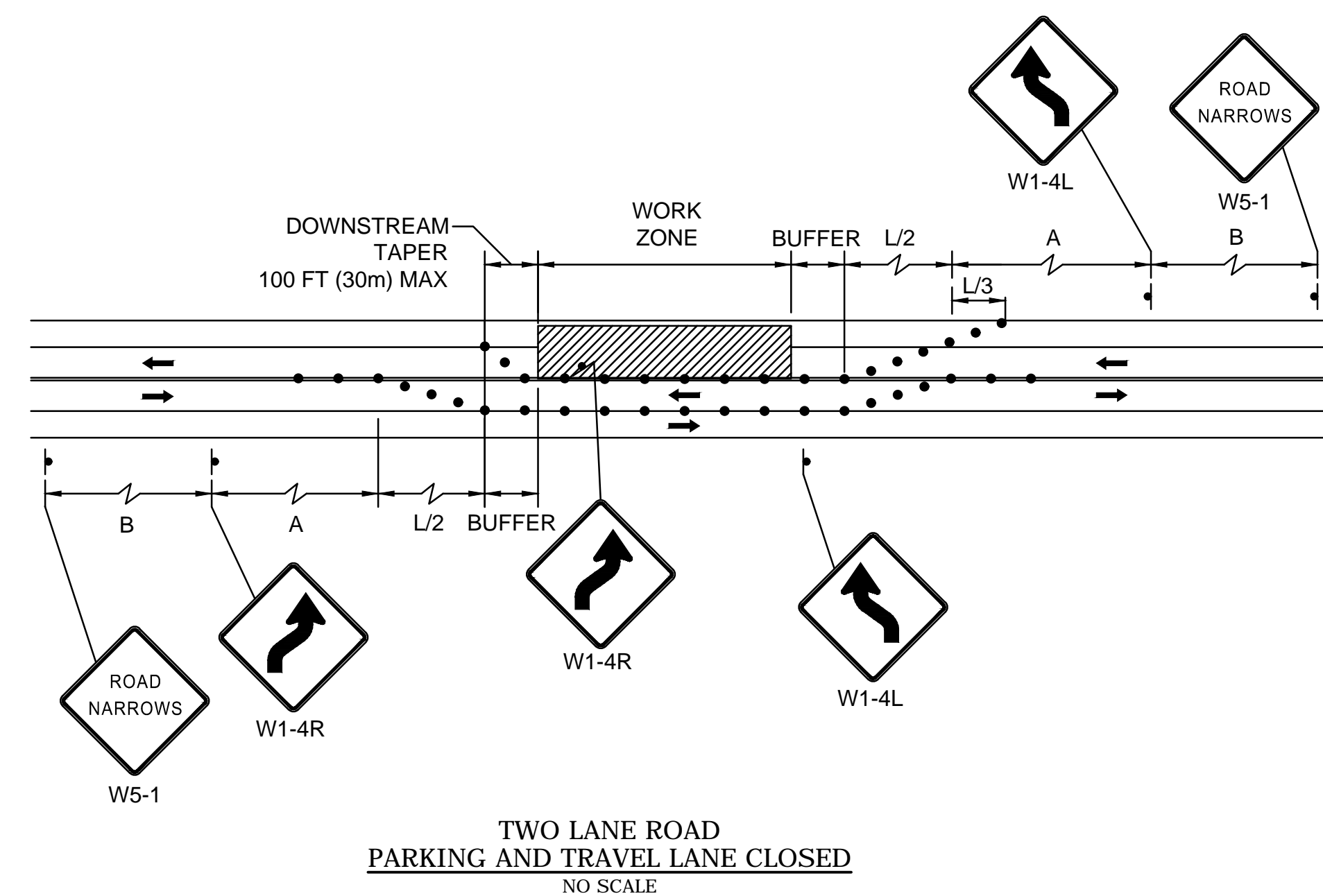
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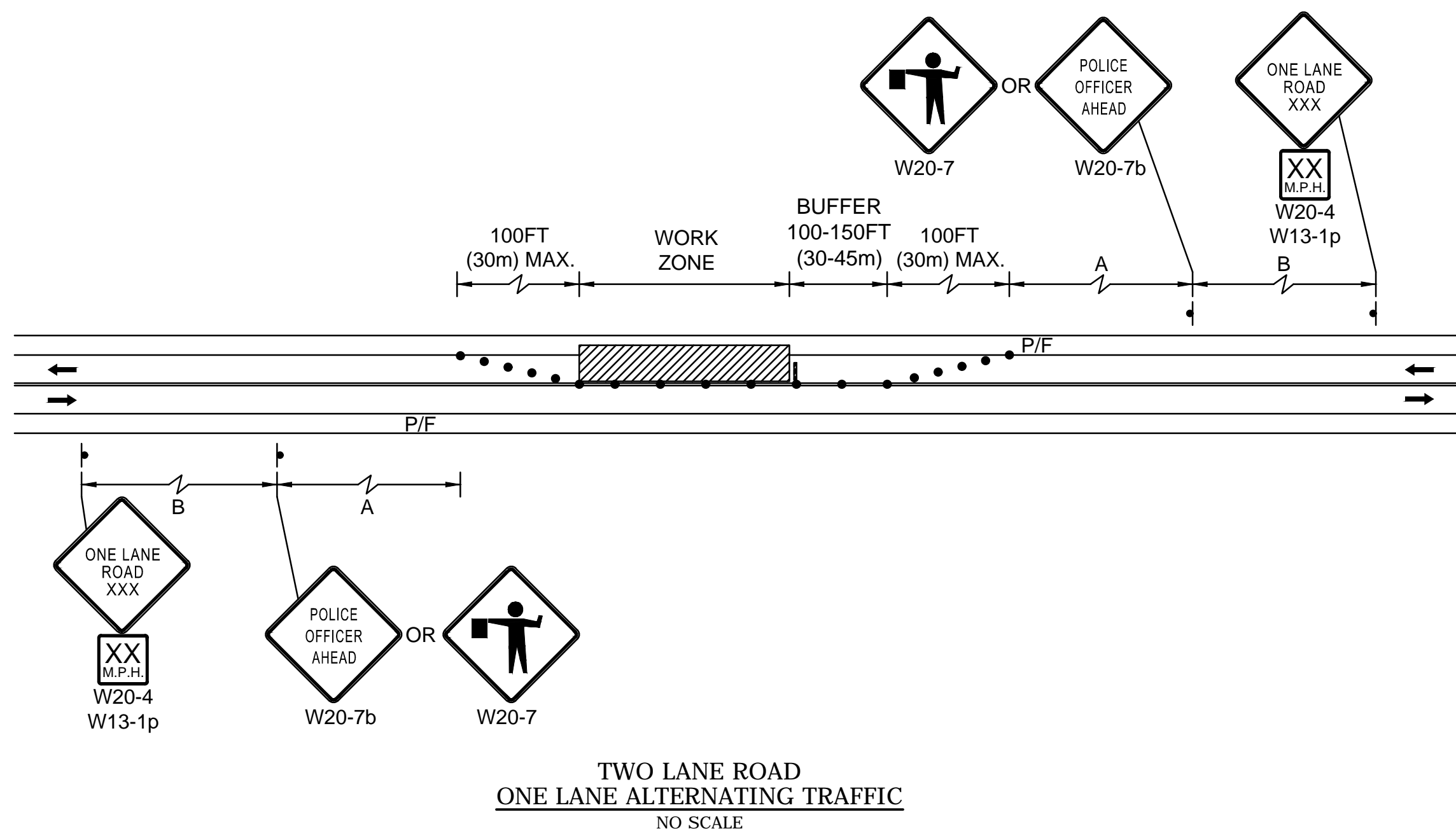
CONTROL OF WATER DETAILS

SCALE: AS NOTED

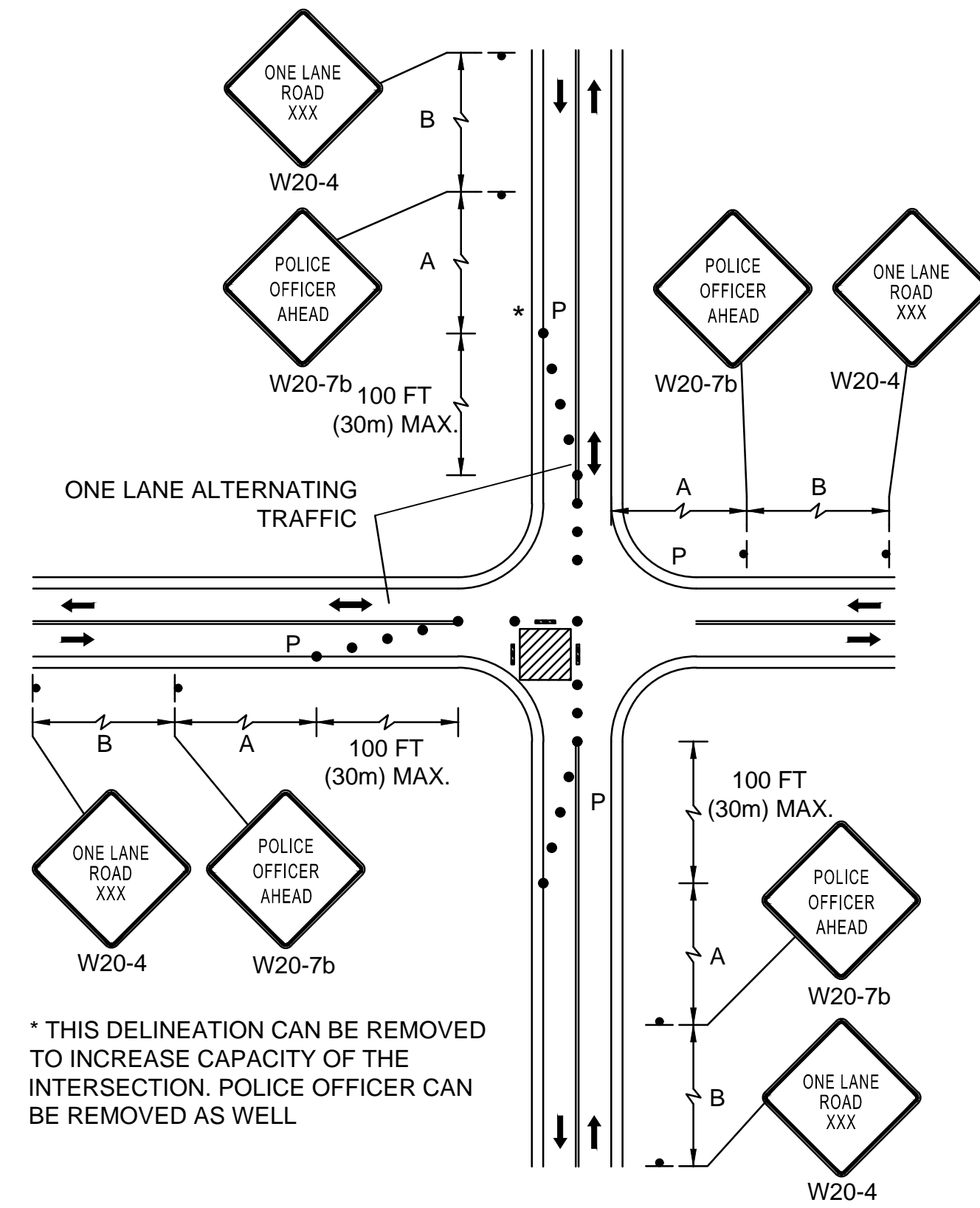
C-505



TWO LANE ROAD PARKING AND TRAVEL LANE CLOSED
NO SCALE

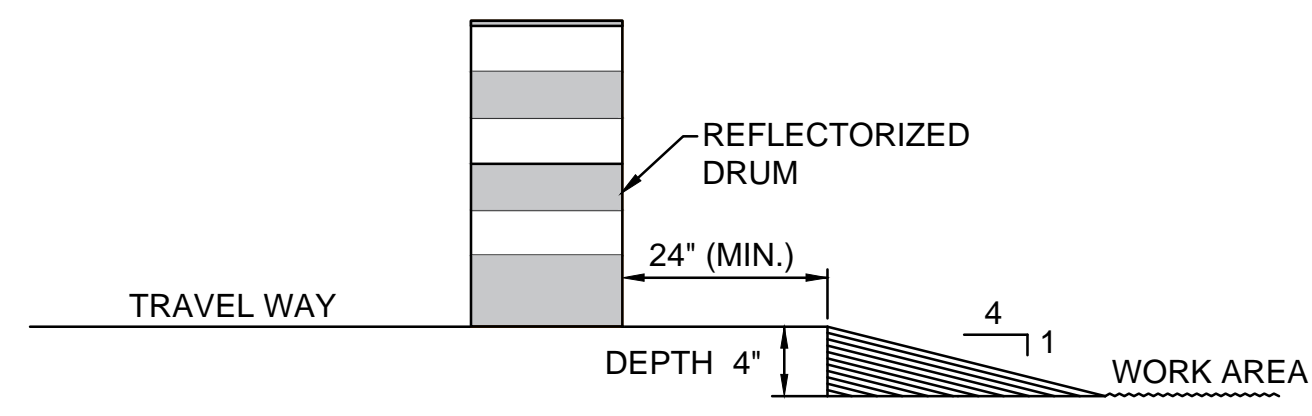


TWO LANE ROAD ONE LANE ALTERNATING TRAFFIC
NO SCALE



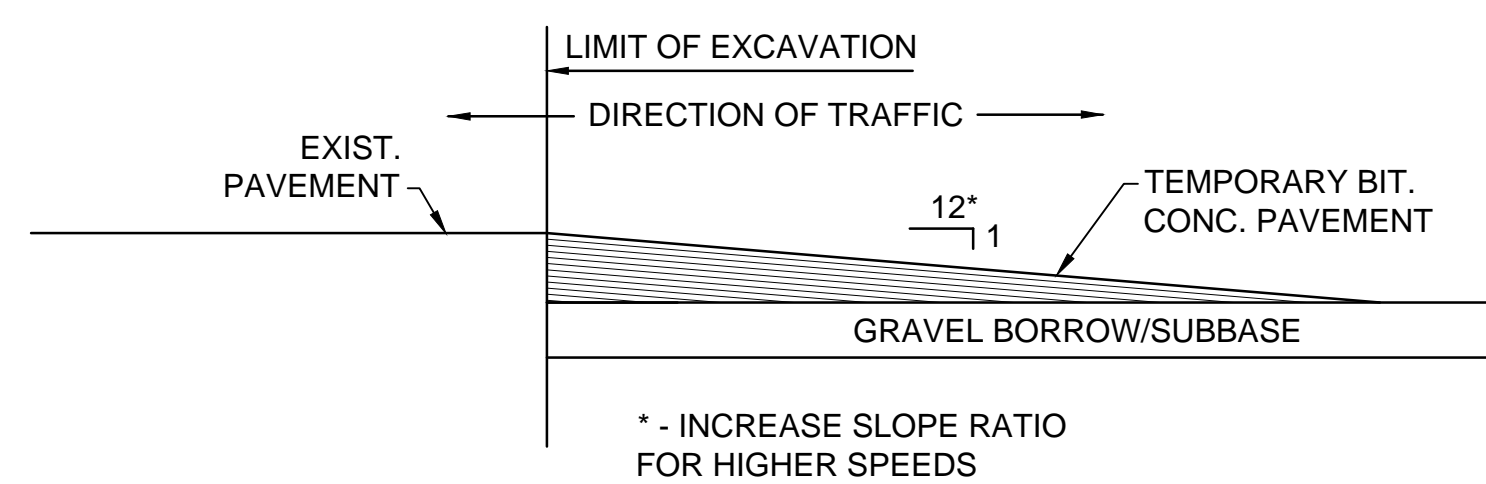
* THIS DELINEATION CAN BE REMOVED TO INCREASE CAPACITY OF THE INTERSECTION. POLICE OFFICER CAN BE REMOVED AS WELL

SINGLE LANE APPROACH ONE QUADRANT CLOSURE
NO SCALE



IF "D" IS GREATER THAN 4" THE CONTRACTOR SHALL PLACE FILL MATERIAL AT A 4:1 SLOPE AT THE EDGE OF THE EXCAVATED AREA. SUPPLYING, PLACING AND REMOVING THIS FILL MATERIAL SHALL BE INCIDENTAL TO THE PROJECT AND NOT SEPARATELY MEASURED OR PAID FOR.

LATERAL DROP-OFF DETAIL
NO SCALE



LONGITUDINAL DROP-OFF DETAIL
NO SCALE

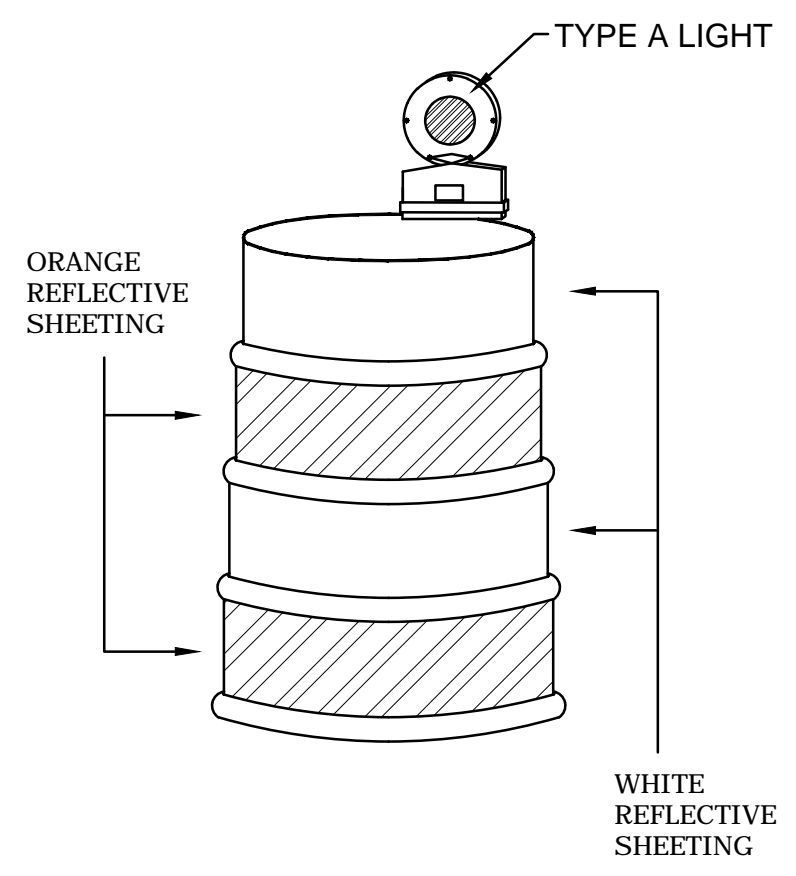
FORMULAS FOR DETERMINING TAPER LENGTHS

SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

WHERE:
L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH

NOTES:

- ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
- ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
- TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
- TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
- SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
- NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
- THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
- DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
- MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
- MINIMUM LANE WIDTH IS TO BE 11 FEET UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
- ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.
- TEMPORARY PEDESTRIAN WALKWAY LOCATION TO BE DETERMINED IN THE FIELD. CONTRACTOR AND ENGINEER TO DETERMINE TREE REMOVAL ALONG DETOUR PATH.
- TEMPORARY PEDESTRIAN WALKWAY TO CONFORM WITH ADA STANDARDS.
- TEMPORARY PEDESTRIAN WALKWAY TO BE RETURNED TO PRECONSTRUCTION CONDITIONS. REPLACE TREES IN KIND.
- CURB RAMPS SHALL BE 60 IN. MINIMUM WIDTH WITH A FIRM, STABLE AND NON-SLIP SURFACE.
- PROTECTIVE EDGING WITH A 2 IN. MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6 IN. OR GREATER OR HAS A SIDE APRON SLOP STEEPER THAN 1:3 (33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3 IN. OR MORE.
- DETECTABLE EDGING WITH 6 IN. MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
- CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS-SLOPE.
- CLEAR SPACE OF 48x48 IN. MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
- THE CURB RAMP WALKWAY EDGE SHALL BE MARKED WITH A CONTRASTING COLOR 2 TO 4 IN. WIDE MARKING. THE MARKING IS OPTIONAL WHERE COLOR CONTRASTING EDGING IS USED.
- WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
- LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5 IN. WIDTH.
- CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5 IN. LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25 IN. HIGH, AND BEVELED AT 1:2 BETWEEN 0.25 IN. AND 0.5 IN. HEIGHT.



- NOTES:**
- DRUM DESIGN AND APPLICATION SHALL BE AS PER THE CURRENT EDITION OF THE MUTCD.
 - DRUMS SHALL BE APPROXIMATELY 36" IN HEIGHT, HAVING A MINIMUM WALL THICKNESS OF 3/32" AND A MINIMUM DIAMETER OF 18" REGARDLESS OF ORIENTATION.
 - DRUM MATERIAL MUST BE APPROVED UV RESISTANT, LOW DENSITY, IMPACT RESISTANT, LINEAR POLYETHYLENE (OR APPROVED EQUIVALENT).
 - SHEETING SHALL BE APPROVED ORANGE AND WHITE TYPE IV REFLECTORIZED SHEETING CONFORMING TO M9.30.0.
 - ALL DRUMS SHALL BE WELL MAINTAINED INCLUDING REMOVAL OF DUST OR ROAD FILM, SO AS NOT TO REDUCE REFLECTIVE EFFICIENCY. WHEN A DRUM LOSTS TARGET VALUE IT SHALL BE REPLACED.
 - STORE UNUSED DRUMS IN ONE LOCATION, AWAY FROM ALL TRAFFIC, OR REMOVE FROM SITE ENTIRELY.

PLASTIC DRUMS

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
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APPROVED:	DLM	

TEMPORARY TRAFFIC CONTROL PLAN - GENERAL

SCALE: AS NOTED

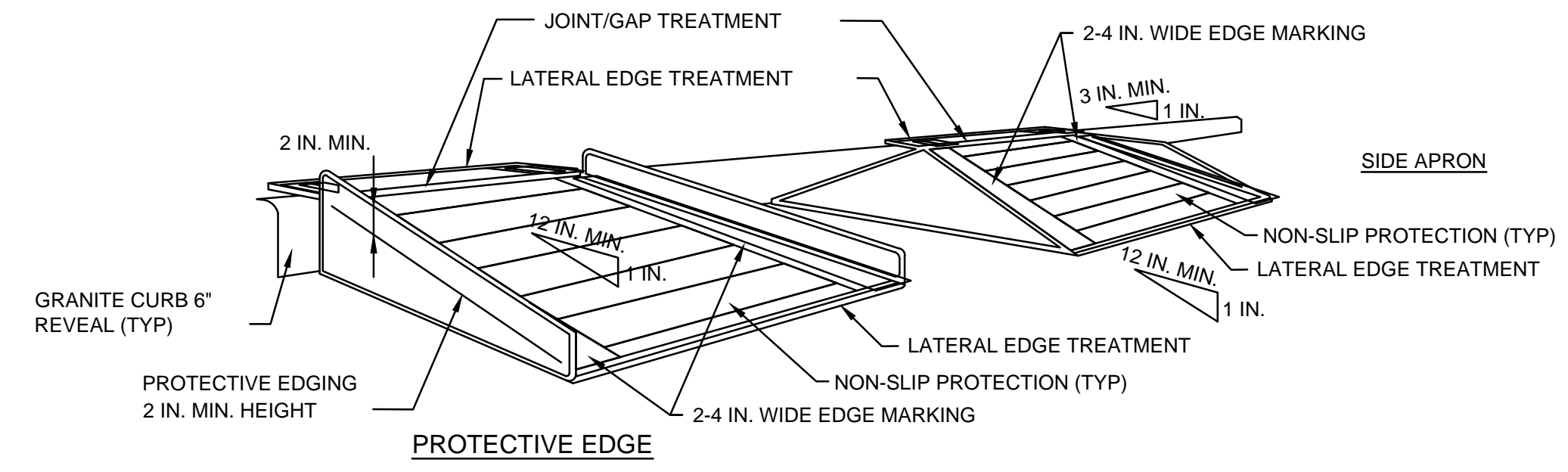


W20-1-a
DETOUR PLAN
SCALE 1"=500'

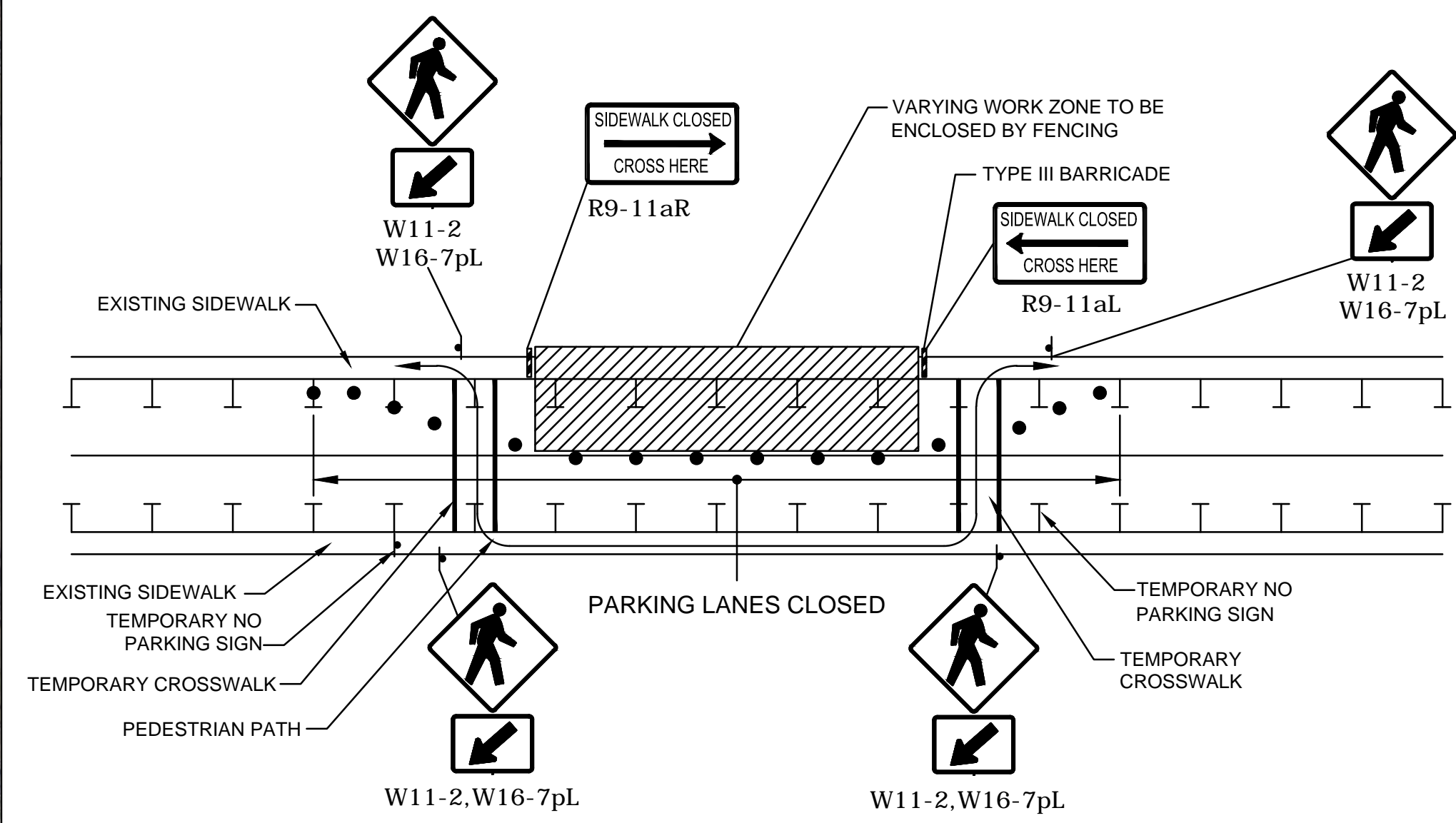
LEGEND

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- ▨ WORK ZONE
- DIRECTION OF TRAFFIC
- ▩ TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- ▲ SIGN

SIGN LEGEND					
CODE	DESCRIPTION	SIZE	AREA	NO.	TOTAL AREA
W20-1-a	ROAD WORK AHEAD	36"x36"	9 SF	2	18 SF
W20-3	ROAD CLOSED AHEAD	36"x36"	9 SF	2	18 SF
R11-2	ROAD CLOSED	48"x30"	10 SF	2	20 SF
R11-4	ROAD CLOSED TO THRU TRAFFIC	60"x30"	12.5 SF	2	25 SF
M4-10L	DETOUR	48"x18"	6 SF	1	6 SF
M4-10R	DETOUR	48"x18"	6 SF	1	6 SF
M4-9L	DETOUR	30"x24"	5 SF	5	25 SF
M4-9R	DETOUR	30"x24"	5 SF	5	25 SF
M4-8a	END DETOUR	30"x24"	5 SF	2	10 SF
TOTAL					= 153 SF



PEDESTRIAN DETOUR RAMPS
SCALE 1"=200'



- NOTES**
- ADDITIONAL ADVANCE WARNING MAY BE NECESSARY.
 - CONTROLS ONLY FOR PEDESTRIAN TRAFFIC ARE SHOWN. VEHICULAR TRAFFIC SHOULD BE HANDLED AS SHOWN ELSEWHERE.
 - STREET LIGHTING SHOULD BE CONSIDERED WHEN LOCATING CONTROL DEVICES.
 - TEMPORARY CROSSWALKS WITH APPROPRIATE SIGNS SHOULD BE INSTALLED TO CROSS PEDESTRIANS TO THE OPPOSITE SIDE OF THE STREET AS SHOWN IN PEDESTRIAN BYPASS, AND AS DIRECTED BY THE ENGINEER. TEMPORARY CURB RAMPS WILL BE REQUIRED AT ALL TEMPORARY CROSSWALK LOCATIONS.
 - BYPASS IS TO BE USED IN CONJUNCTION WITH THE PROPOSED LANE CLOSURE DETAILS AND DURING CONSTRUCTION STAGING, AS DIRECTED BY THE ENGINEER.
 - THE TEMPORARY SIDEWALK SHOULD BE A MINIMUM OF 4 FEET WIDE. IF THIS WALKWAY EXCEEDS 200 FEET THEN A 5 FOOT X 5 FOOT PASSING ZONE. (FOR SHORT TERM SETUPS < 10 HOURS, THIS CONDITION MAY BE WAIVED. A NOTE WOULD NEED TO BE INCLUDED IN THE TTCP THAT STATES HOW THE CONTRACTOR SHOULD ADDRESS THIS ISSUE.)

PEDESTRIAN DETOUR
NO SCALE

90%
Drawings
Not For
Construction

Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

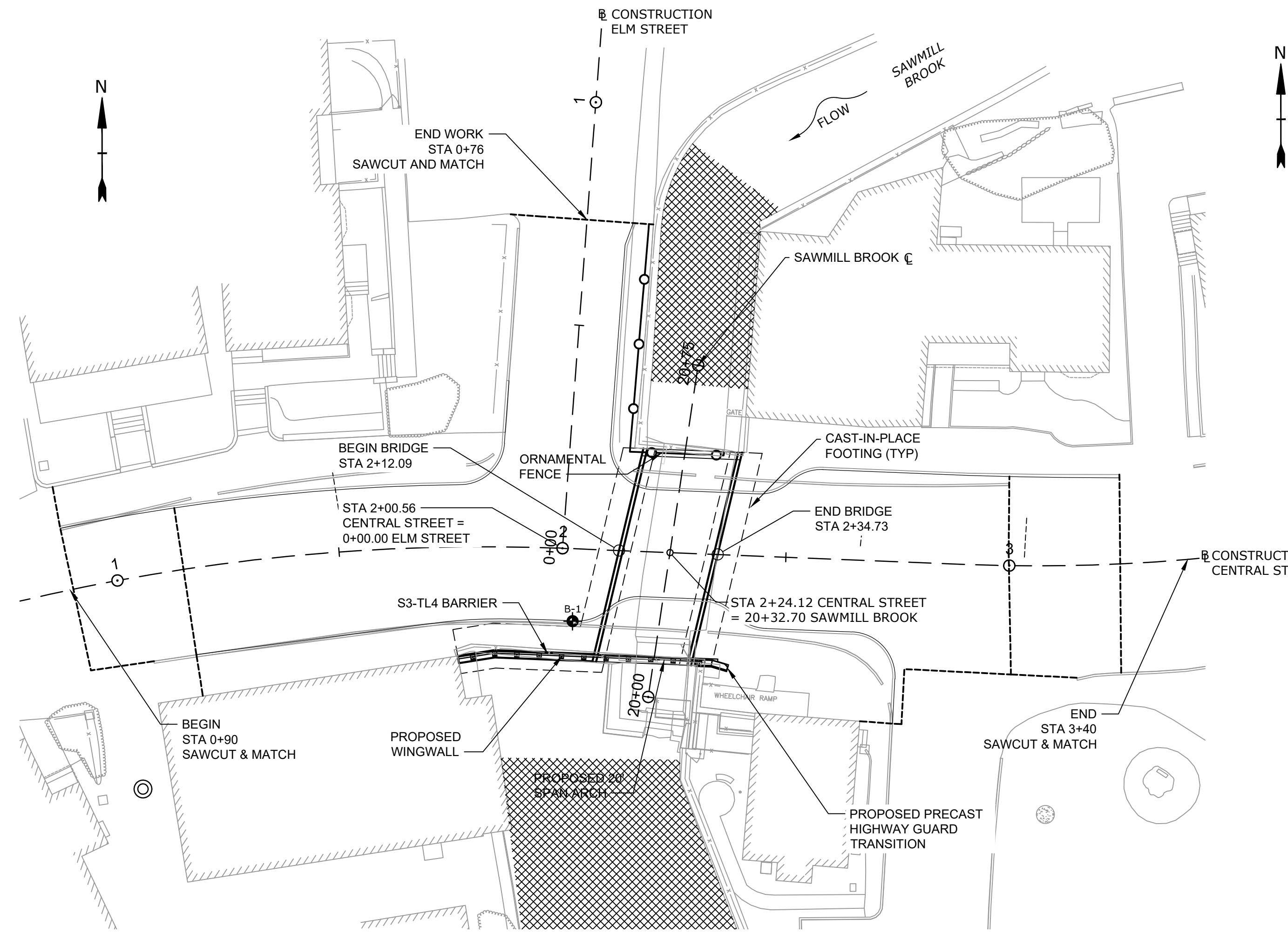
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DATE:	NOVEMBER 2021	
FILE:	M1476-011-C-702.dwg	
DRAWN BY:	AGB	
CHECKED:	BRB	
APPROVED:	DLM	

TEMPORARY TRAFFIC CONTROL
PLAN - DETOUR

SCALE: AS NOTED

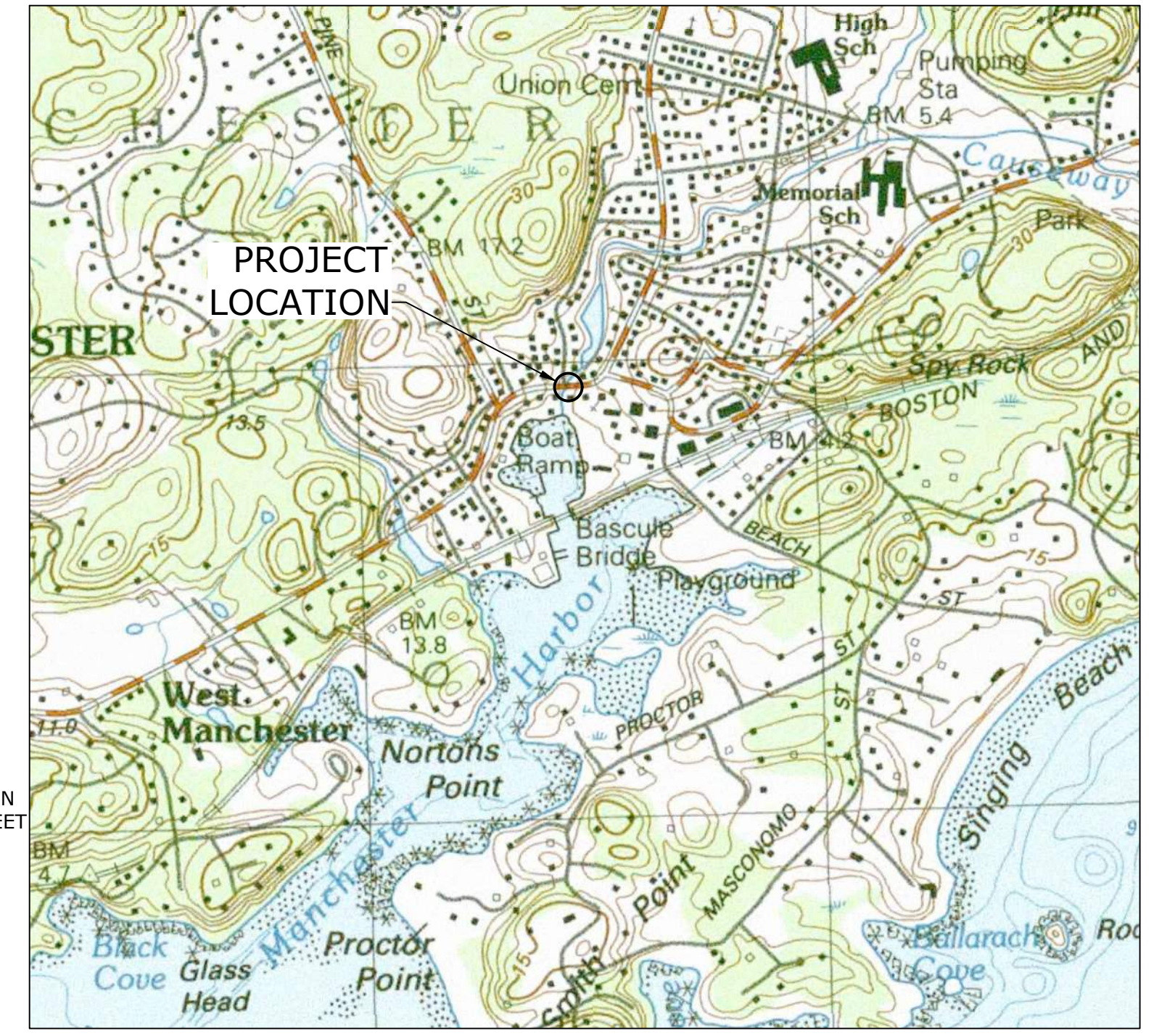
C-702

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KEY PLAN
SCALE: 1" = 20'

NOTES:
1. EXISTING AND PROPOSED UTILITIES NOT SHOWN FOR CLARITY. SEE SHEET C-XXX FOR APPROXIMATE LOCATIONS.



LOCUS PLAN
SCALE: 1" = 1000'

- BRIDGE DRAWING INDEX**
- S-001 BRIDGE KEY PLAN, PROFILES, LOCUS, AND INDEX
 - S-002 BRIDGE NOTES
 - S-003 BORING LOGS & BORING NOTES
 - S-101 GENERAL BRIDGE PLAN AND ELEVATION
 - S-102 ABUTMENT PLAN & DETAILS
 - S-103 BRIDGE FRAMING AND LAYOUT PLAN
 - S-104 BRIDGE SECTION & DETAILS

- REFERENCE DRAWING INDEX**
- R-101 S3-TL4 BARRIER DETAILS
 - R-102 PRECAST HIGHWAY GUARDRAIL TRANSITION AND S3-TL4 BARRIER DETAILS
 - R-103 TOP OF PRECAST HIGHWAY GUARDRAIL TRANSITION FOR S3-TL4
 - R-104 GUARDRAIL TRANSITION TO BRIDGE RAIL (BACK OF SIDEWALK)

HYDRAULIC DATA	
DRAINAGE AREA	5.0 SQ. MILES
WATER CONTROL FLOOD DISCHARGE (2 YR)	254 CFS
DESIGN FLOOD DISCHARGE (25 YR)	1,363 CFS
DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	4% (25-YEARS)
DESIGN FLOOD VELOCITY (25 YR)	7.5 FPS
DESIGN FLOOD ELEVATION (25 YR)	5.7 FEET
HIGH TIDE LINE	8.2 FEET
MEAN HIGHER HIGH WATER ELEVATION (MHHW)	4.8 FEET
MEAN HIGH WATER ELEVATION (MHW)	3.1 FEET
MEAN LOW WATER ELEVATION (MLW)	-1.5 FEET
MEAN LOWER LOW WATER ELEVATION (MLLW)	-5.5 FEET
BASE (100-YR) FLOOD DATA	
BASE FLOOD DISCHARGE (100 YR)	2,267 CFS
BASE FLOOD ELEVATION (100 YR)	*7.7 FEET
DESIGN AND CHECK SCOUR DATA	
SCOUR DESIGN FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	2% (50-YEARS)
DESIGN FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
SCOUR CHECK FLOOD ANNUAL CHANCE (RETURN FREQUENCY)	1% (100-YEARS)
CHECK FLOOD ABUTMENT SCOUR DEPTH	LEFT: 2 FT RIGHT: 2 FT
FLOOD OF RECORD	
DISCHARGE	UNKNOWN
FREQUENCY (IF KNOWN)	N/A
MAXIMUM ELEVATION	N/A
DATE	N/A
HISTORY OF ICE FLOES	UNKNOWN
EVIDENCE OF SCOUR AND EROSION	UNKNOWN

* THE 7.7' ELEVATION IS THE MODELED 100-YEAR PRECIPITATION EVENT DISCHARGE ELEVATION AT THE BRIDGE

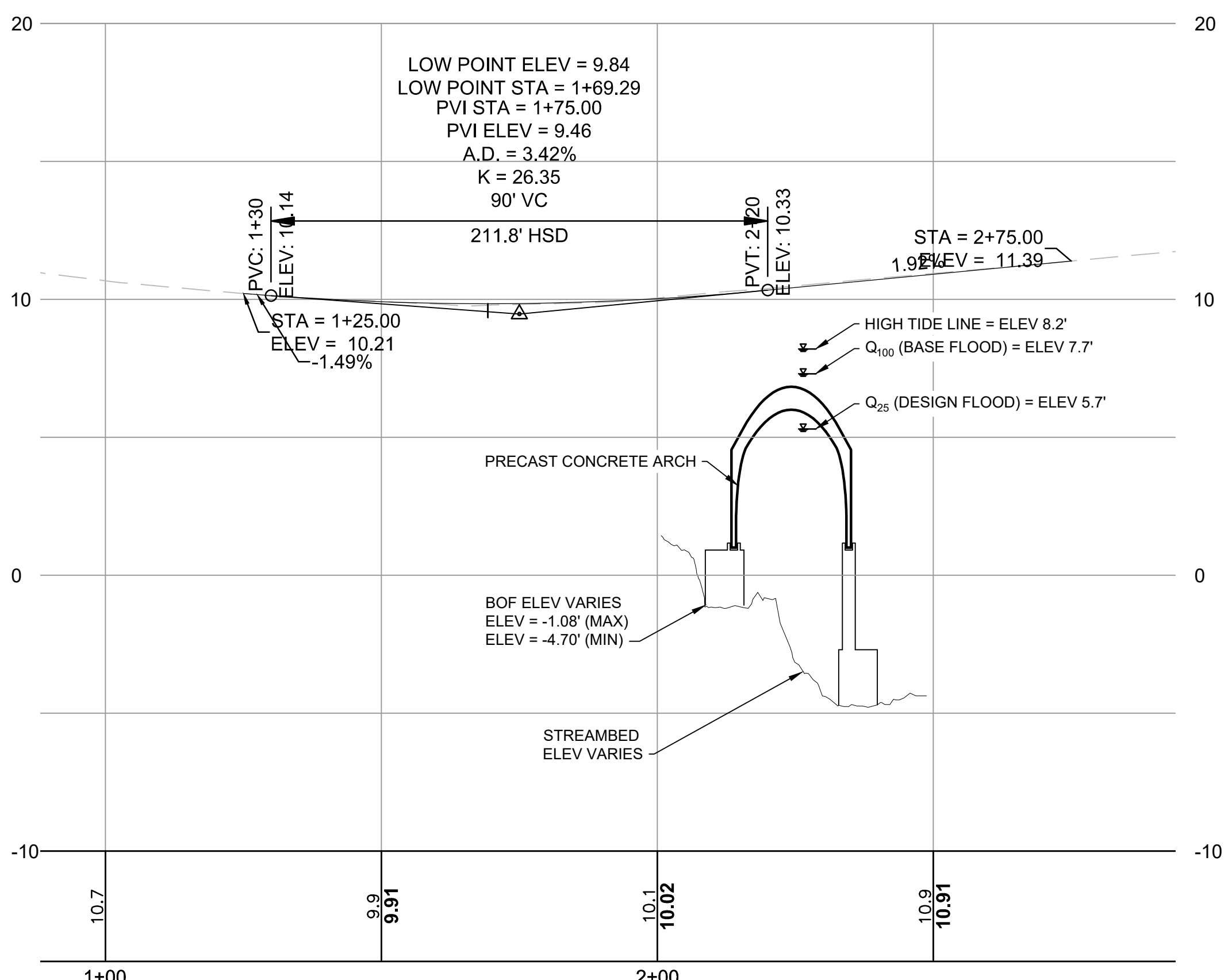
90% Drawings Not For Construction

Central Street Bridge Replacement

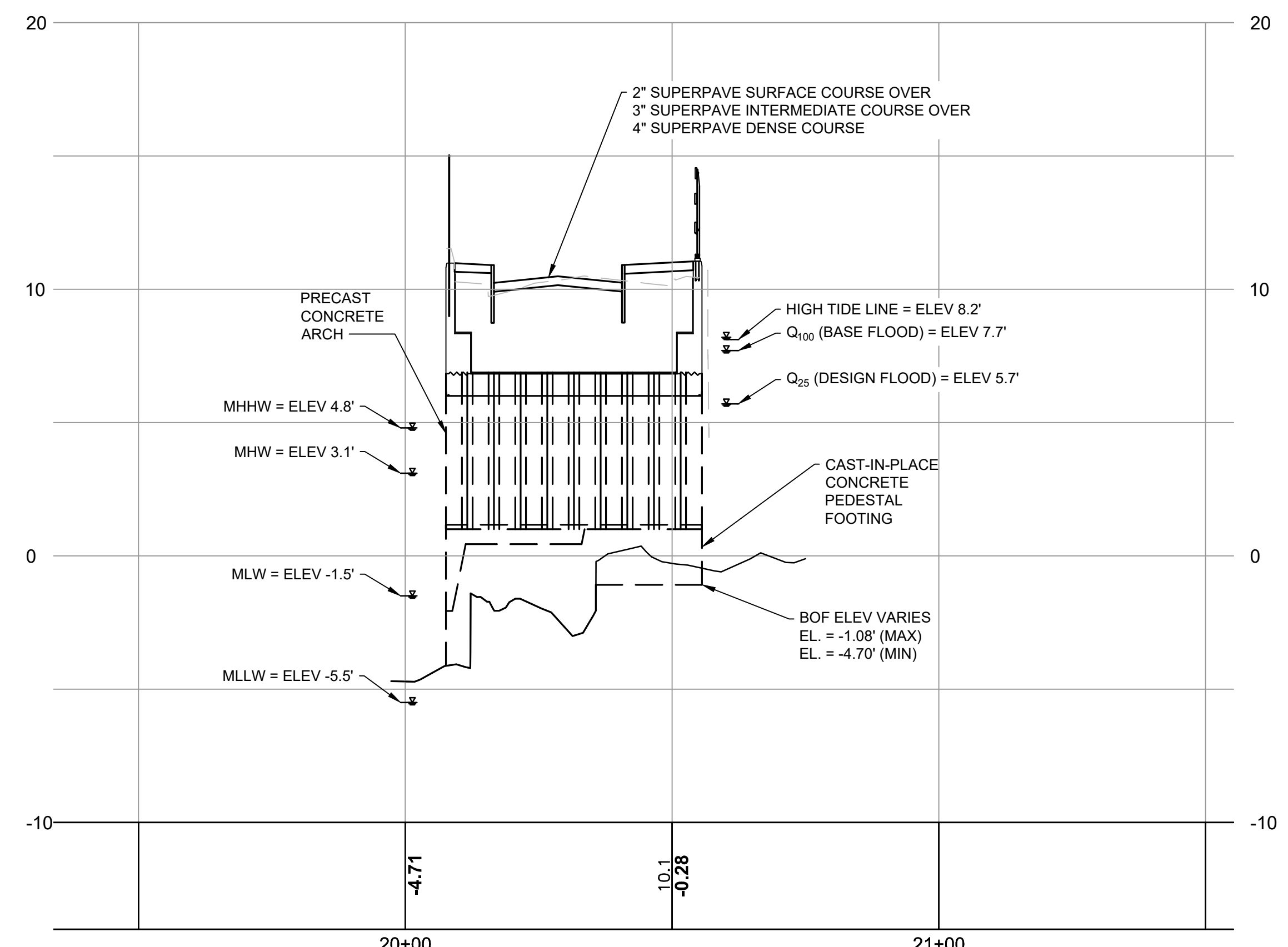
Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts



PROFILE - CENTRAL STREET
SCALE: 1" = 20'H, 1" = 8'V



PROFILE - SAWMILL BROOK
SCALE: 1" = 20'H, 1" = 4'V

CHAPTER 85 SECTION 35 REVIEW AND APPROVAL NOTES:

- IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS AND DESIGN CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

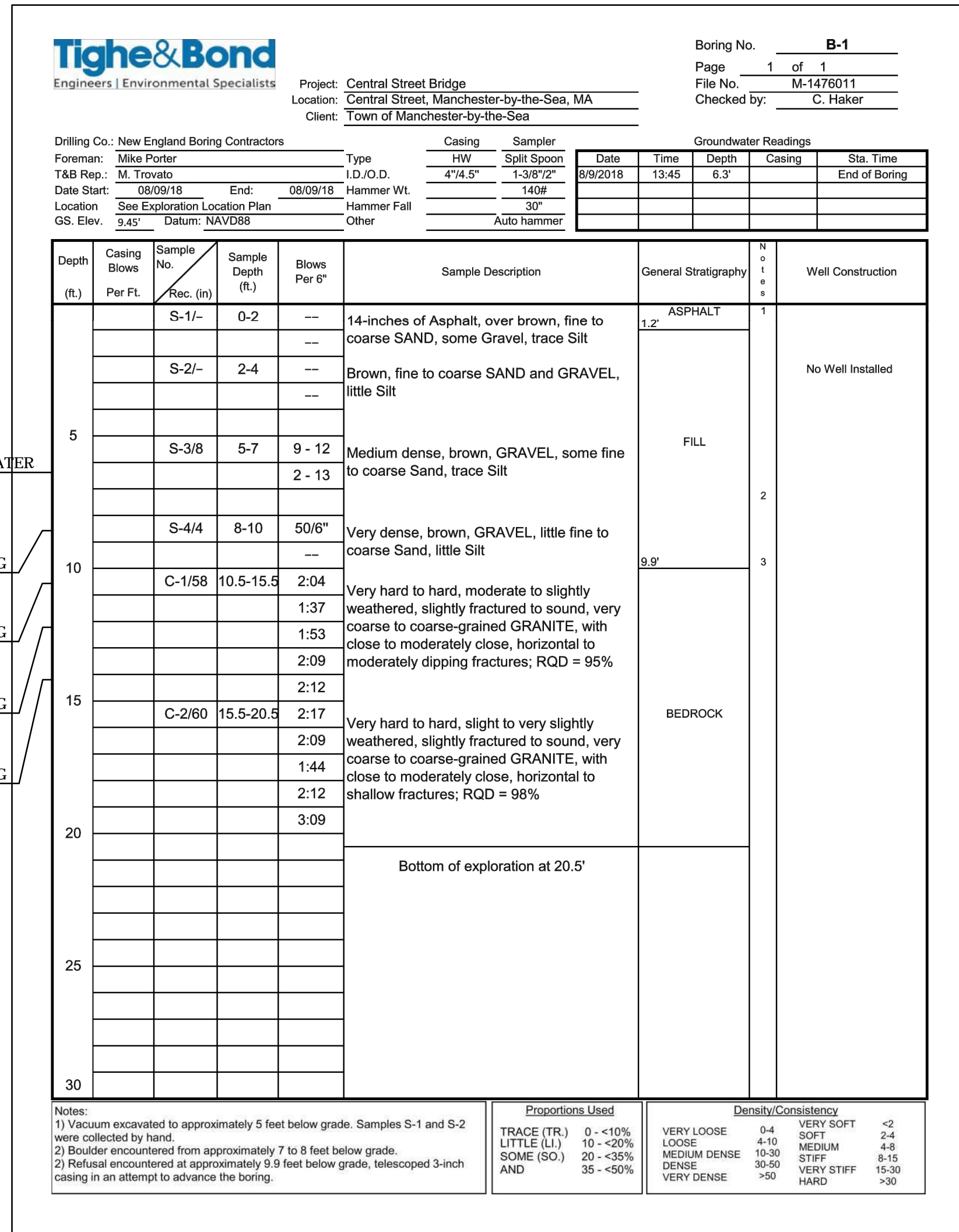
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PROJECT NO: M1476-011		
DATE: NOVEMBER 2021		
FILE: M1476-011-S-001.dwg		
DRAWN BY: D.BISHOP		
CHECKED: EAO		
APPROVED: DLL		

BRIDGE KEY PLAN, PROFILES, LOCUS AND INDEX

SCALE: AS NOTED

S-001

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BORING LOG B-1

BORING	STATION	OFFSET
B-1	0+52.3	RT. 16.2'

BORING NOTES:

- LOCATION OF BORINGS SHOWN ON SHEET S-001 THUS:
- BORINGS WERE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 1/2" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT TIGHE & BOND'S OFFICE, 53 SOUTHAMPTON ROAD, WESTFIELD, MA 01085. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE DESIGN ENGINEER.
- ALL BORINGS WERE MADE IN SEPTEMBER 2018.
- BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTORS OF DERRY, NEW HAMPSHIRE.
- THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
- THE WATER LEVELS RECORDED IN THE TABLE ARE THOSE MEASURED ON THE DATES GIVEN AND DO NOT NECESSARILY REPRESENT GROUND WATER LEVEL AT TIME OF CONSTRUCTION. IT SHOULD BE NOTED THAT GROUNDWATER LEVELS CAN FLUCTUATE WITH TIDE, SEASON, PRECIPITATION, AND NEARBY CONSTRUCTION OR OTHER BELOW GRADE ACTIVITIES, SUCH AS EXCAVATION, DEWATERING, WELLS, INFILTRATION BASINS, ETC.
- SEE SHEET S-002 FOR GEOTECHNICAL DESIGN PARAMETERS.
- ENGINEERING JUDGEMENT WAS EXERCISED IN PREPARING THE SUBSURFACE INFORMATION PRESENTED HEREIN. ANALYSIS AND INTERPRETATION OF SUBSURFACE DATA WAS PERFORMED FOR DESIGN AND ESTIMATING PURPOSES. PRESENTATION OF THE INFORMATION IN THE CONTRACT IS INTENDED TO PROVIDE THE CONTRACTOR ACCESS TO THE SAME DATA AVAILABLE TO THE OWNER. THE SUBSURFACE INFORMATION IS PRESENTED IN GOOD FAITH AND IS NOT INTENDED AS A SUBSTITUTE FOR PERSONAL INVESTIGATION, INDEPENDENT INTERPRETATION, INDEPENDENT ANALYSIS OR JUDGEMENT BY THE CONTRACTOR.

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

0	11/05/2021	90% Drawings
MARK	DATE	DESCRIPTION

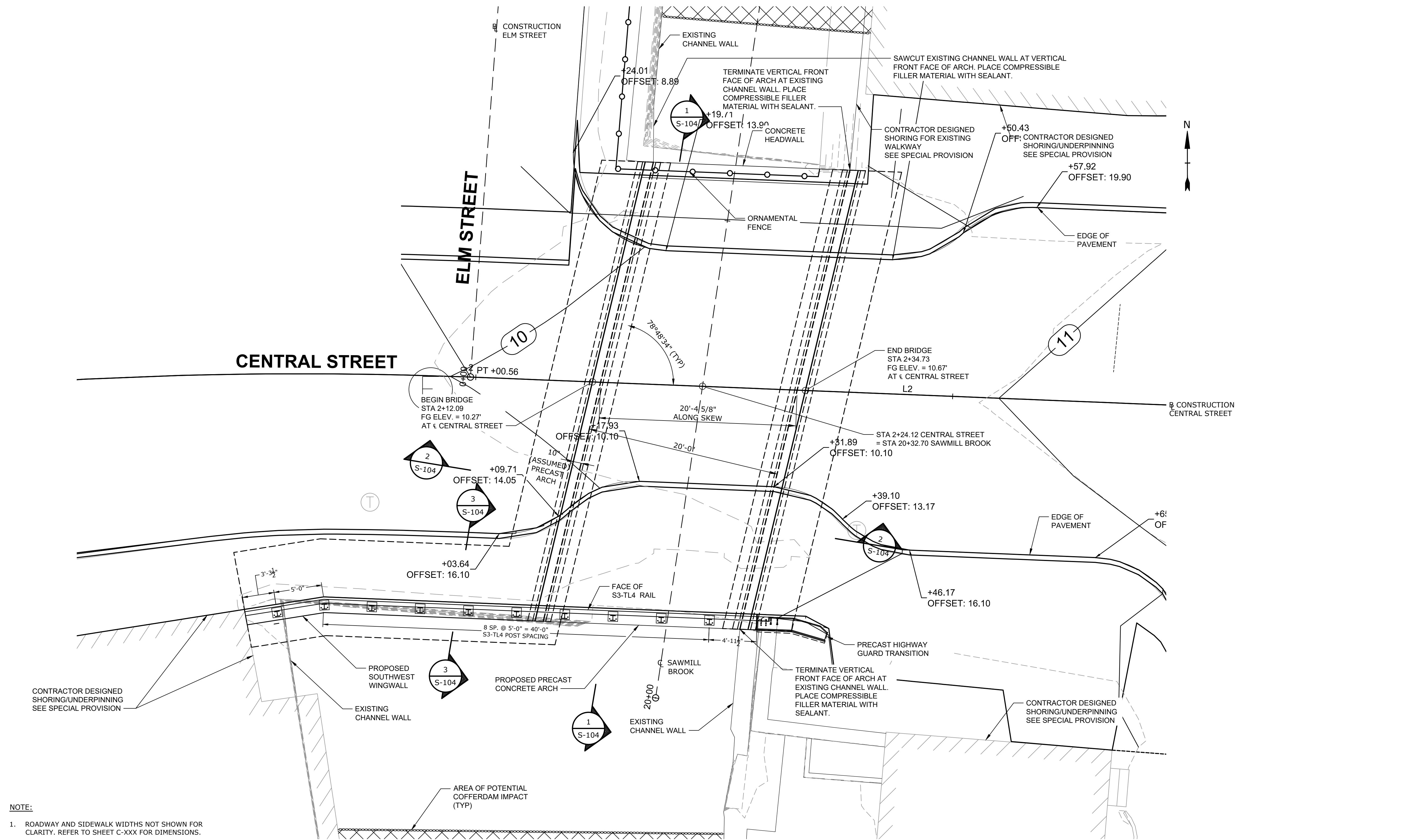
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DRAWN BY:	D BISHOP
CHECKED:	EAO
APPROVED:	DLL

BORING LOGS AND BORING NOTES

SCALE: AS NOTED

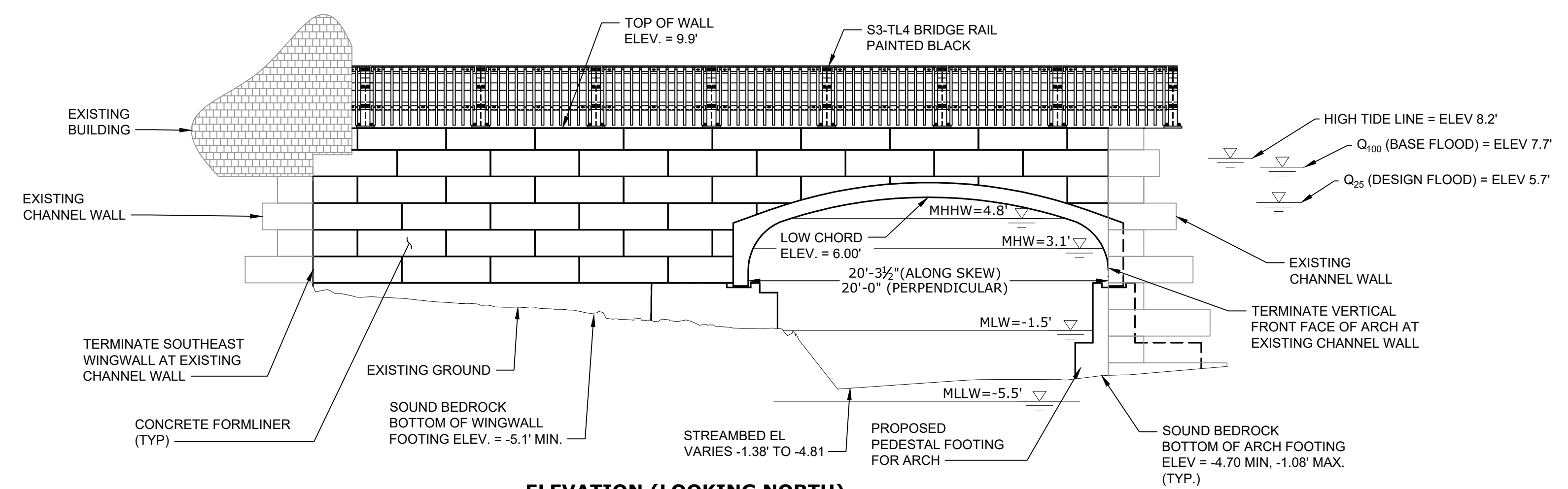
S-003

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 4 BRIDGE ENGINEER _____ DATE _____



NOTE:
 1. ROADWAY AND SIDEWALK WIDTHS NOT SHOWN FOR CLARITY. REFER TO SHEET C-XXX FOR DIMENSIONS.

GENERAL BRIDGE PLAN
 3/16" = 1'-0"



ELEVATION (LOOKING NORTH)
 3/16" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
 MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
 TO MASSDOT FOR CONTRACTING**
 DISTRICT 4 BRIDGE ENGINEER DATE

**90%
 Drawings
 Not For
 Construction**

**Central Street
 Bridge
 Replacement**

Department of
 Public Works

MassDOT Bridge No.
 M-02-001, BIN 8AM

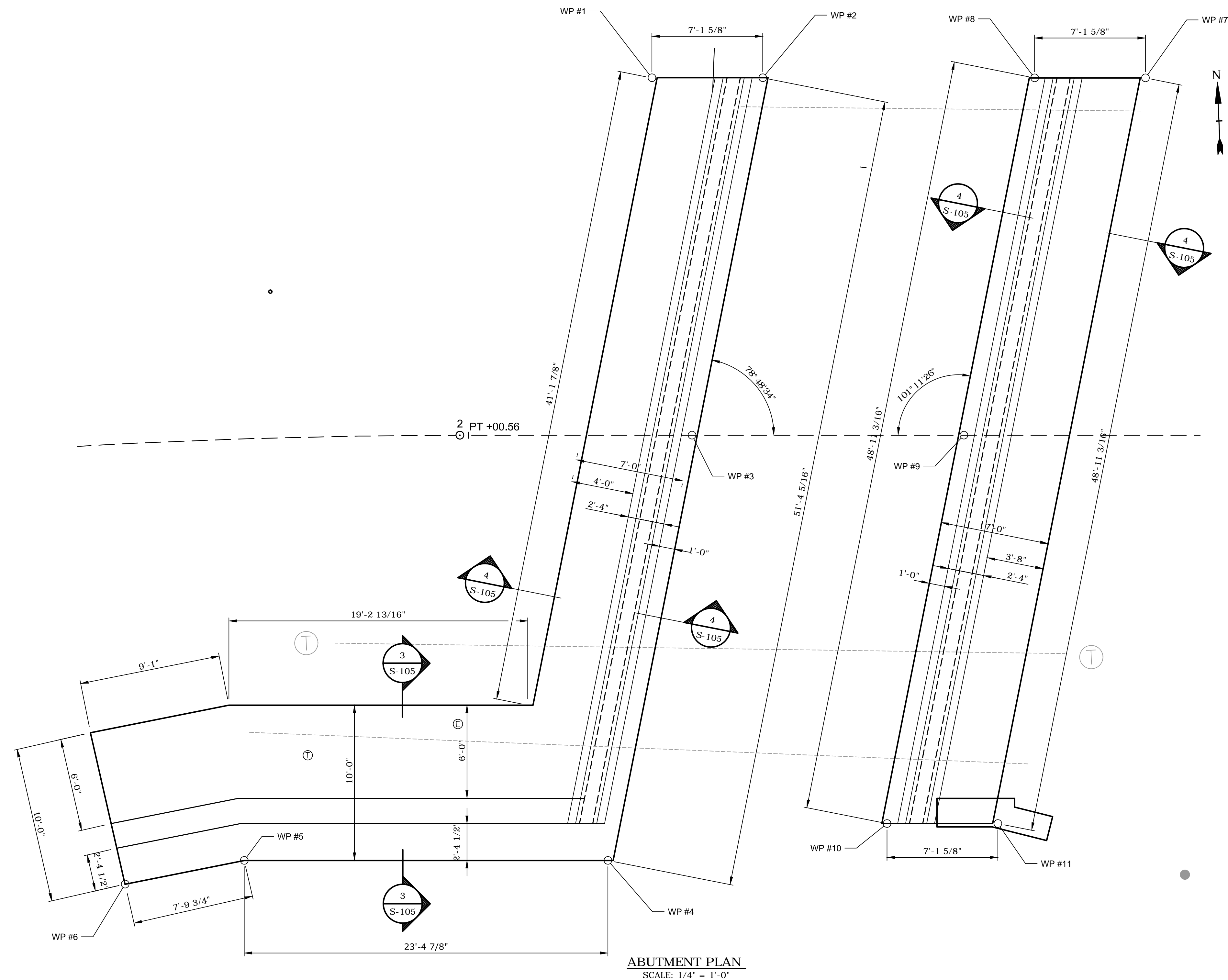
Town of
 Manchester-By-
 The-Sea,
 Massachusetts

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DATE: NOVEMBER 2021		
FILE: M1476-011-S-101_103.dwg		
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CHECKED BY: EAO		
APPROVED BY: DLL		

GENERAL BRIDGE PLAN
 AND ELEVATION

SCALE: AS NOTED

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ABUTMENT PLAN
SCALE: 1/4" = 1'-0"

WORKING POINT	STATION	OFFSET	NORTHING	EASTING
WP #1	2+12.36	LT 23.01	3,035,515.59	852,008.30
WP #2	2+19.49	LT 23.01	3,035,515.30	852,015.43
WP #3	2+14.94	-	3,035,492.49	852,009.96
WP #4	2+09.52	RT 27.37	3,035,465.36	852,003.46
WP #5	1+85.19	RT 27.13	3,035,466.29	851,980.07
WP #6	1+76.96	RT 28.32	3,035,465.08	851,972.35
WP #7	2+44.12	LT 23.00	3,035,514.30	852,040.05
WP #8	2+36.99	LT 23.00	3,035,514.59	852,032.92
WP #9	2+32.44	-	3,035,491.79	852,027.45
WP #10	2+27.49	RT 25.00	3,035,467.01	852,021.51
WP #11	2+34.63	RT 25.00	3,035,466.72	852,028.63

90%
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Central Street
Bridge
Replacement

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

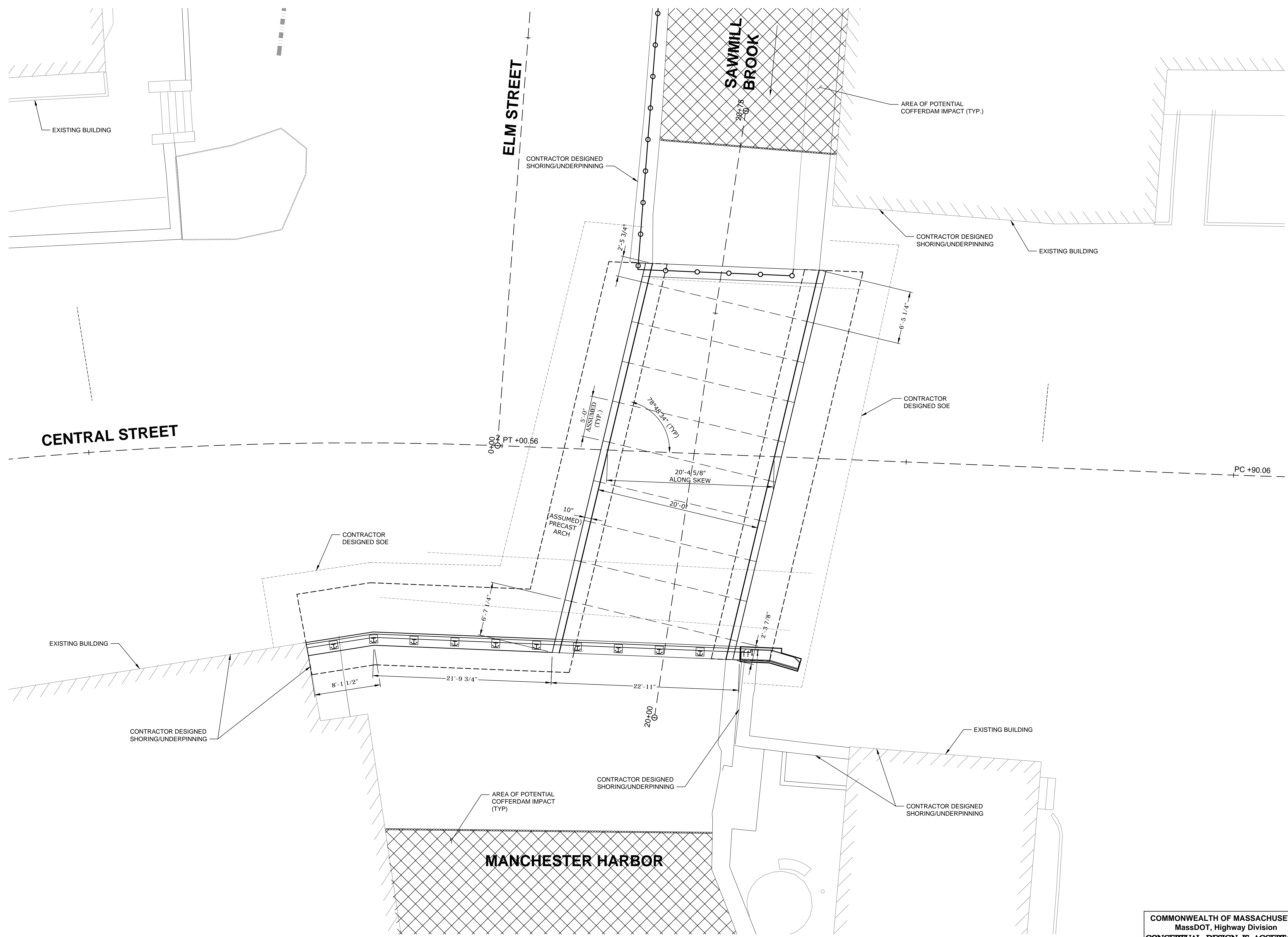
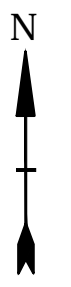
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COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**
DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

ABUTMENT PLAN & DETAILS

SCALE: AS NOTED

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DRAWN BY: D BISHOP		
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COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
**CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**

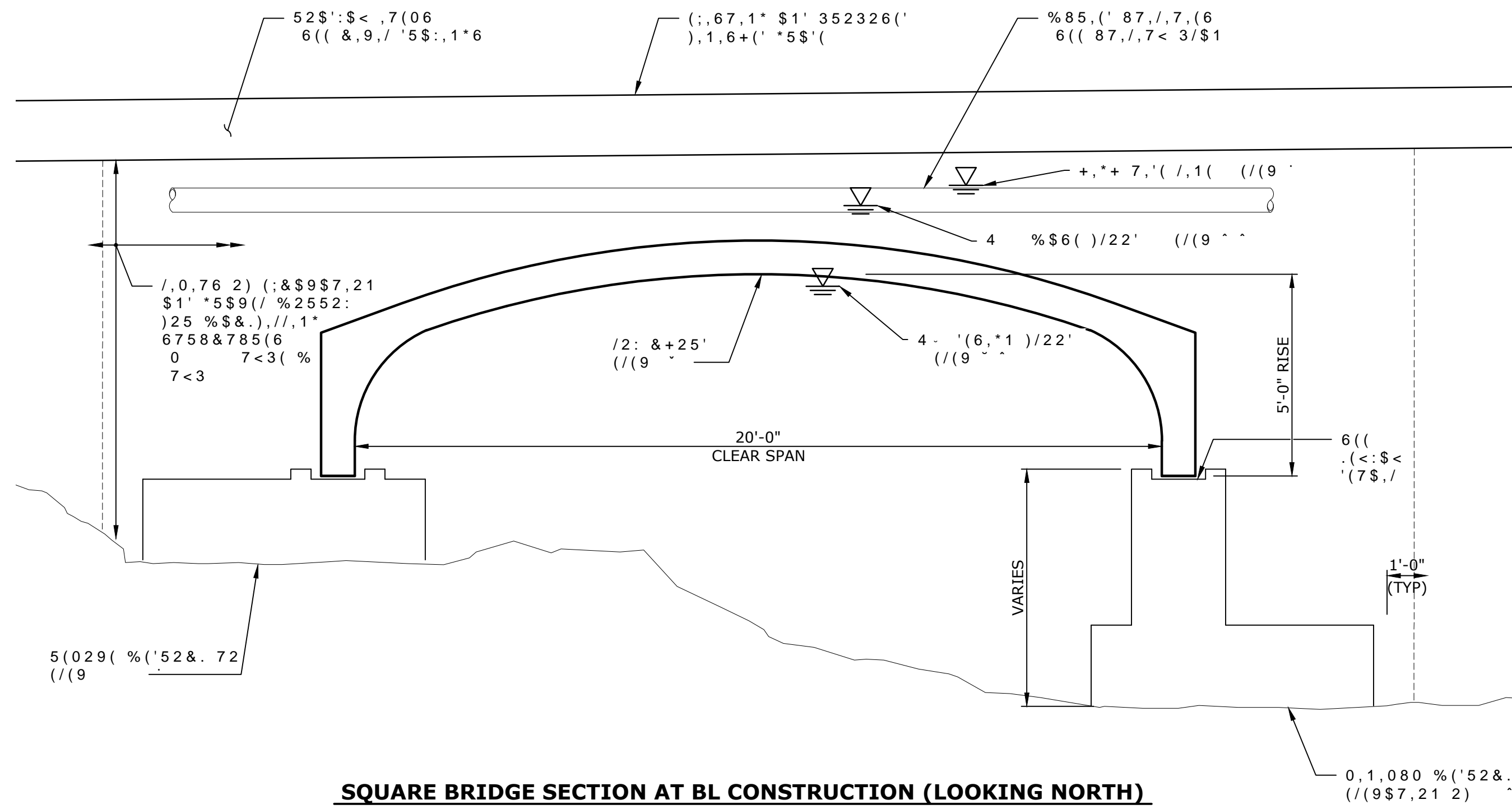
BRIDGE FRAMING AND
LAYOUT PLAN

SCALE: AS NOTED

S-103

BRIDGE FRAMING AND LAYOUT PLAN
3/16" = 1'-0"

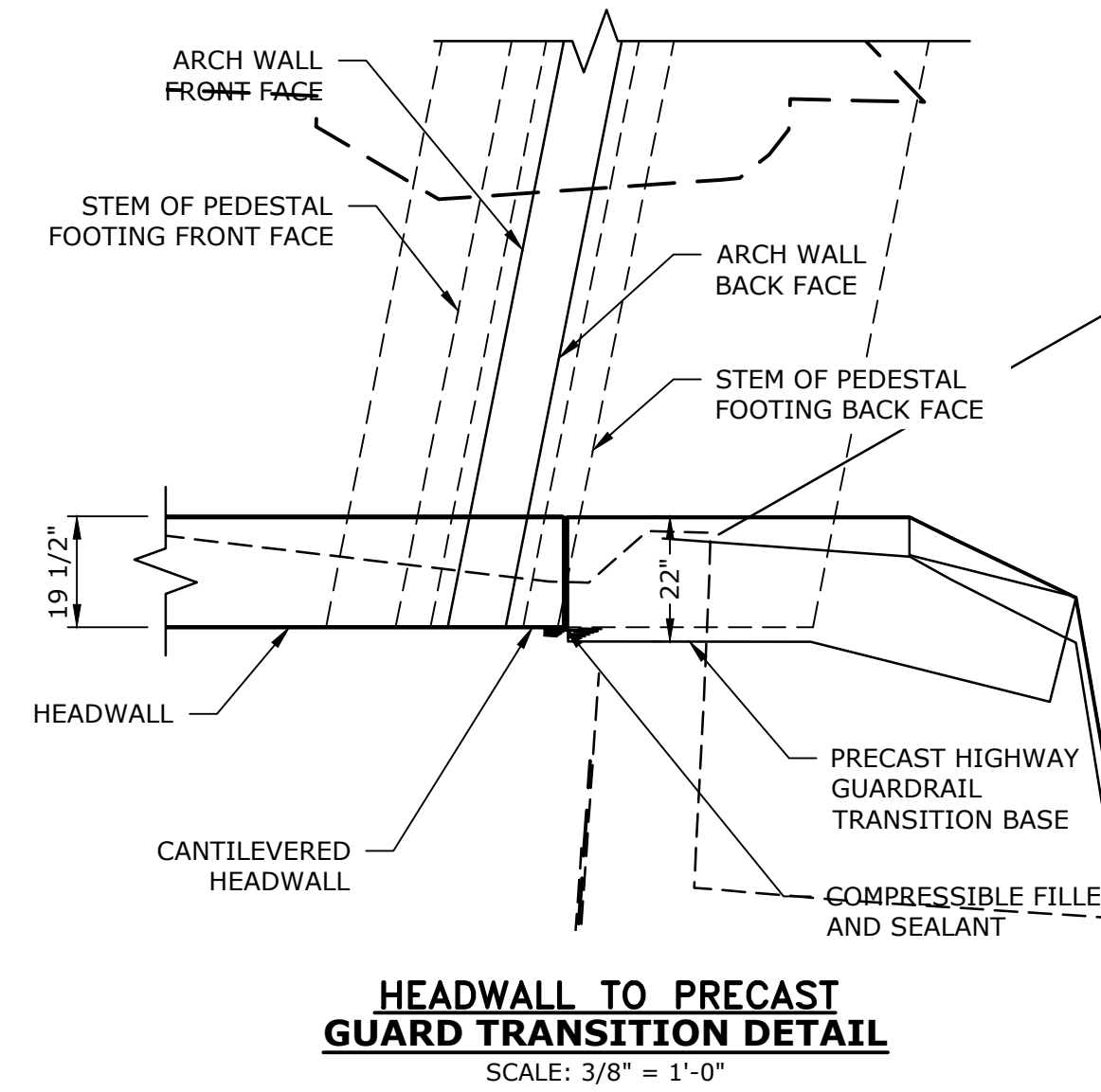
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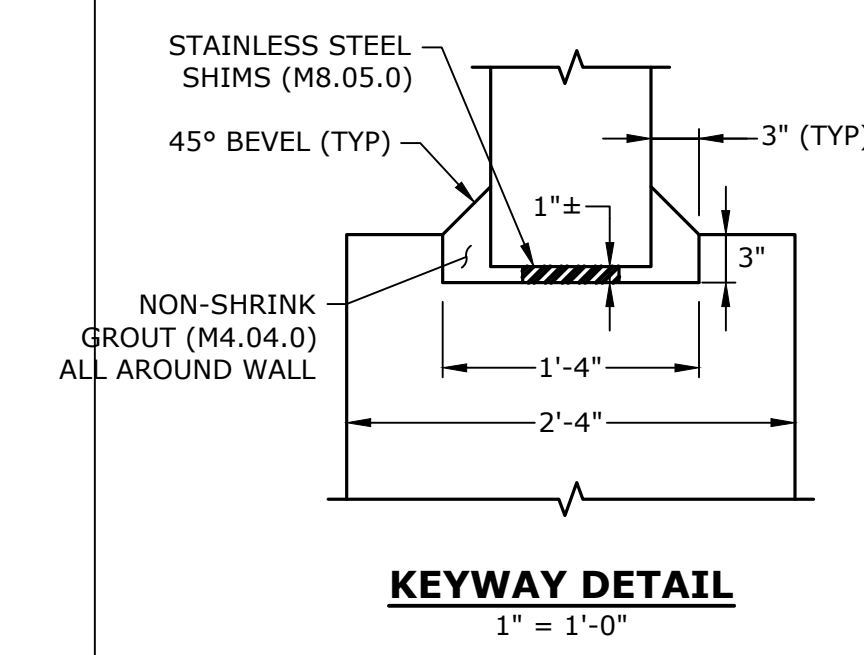
SQUARE BRIDGE SECTION AT BL CONSTRUCTION (LOOKING NORTH)

SECTION 2
3/8" = 1'-0"
S-101

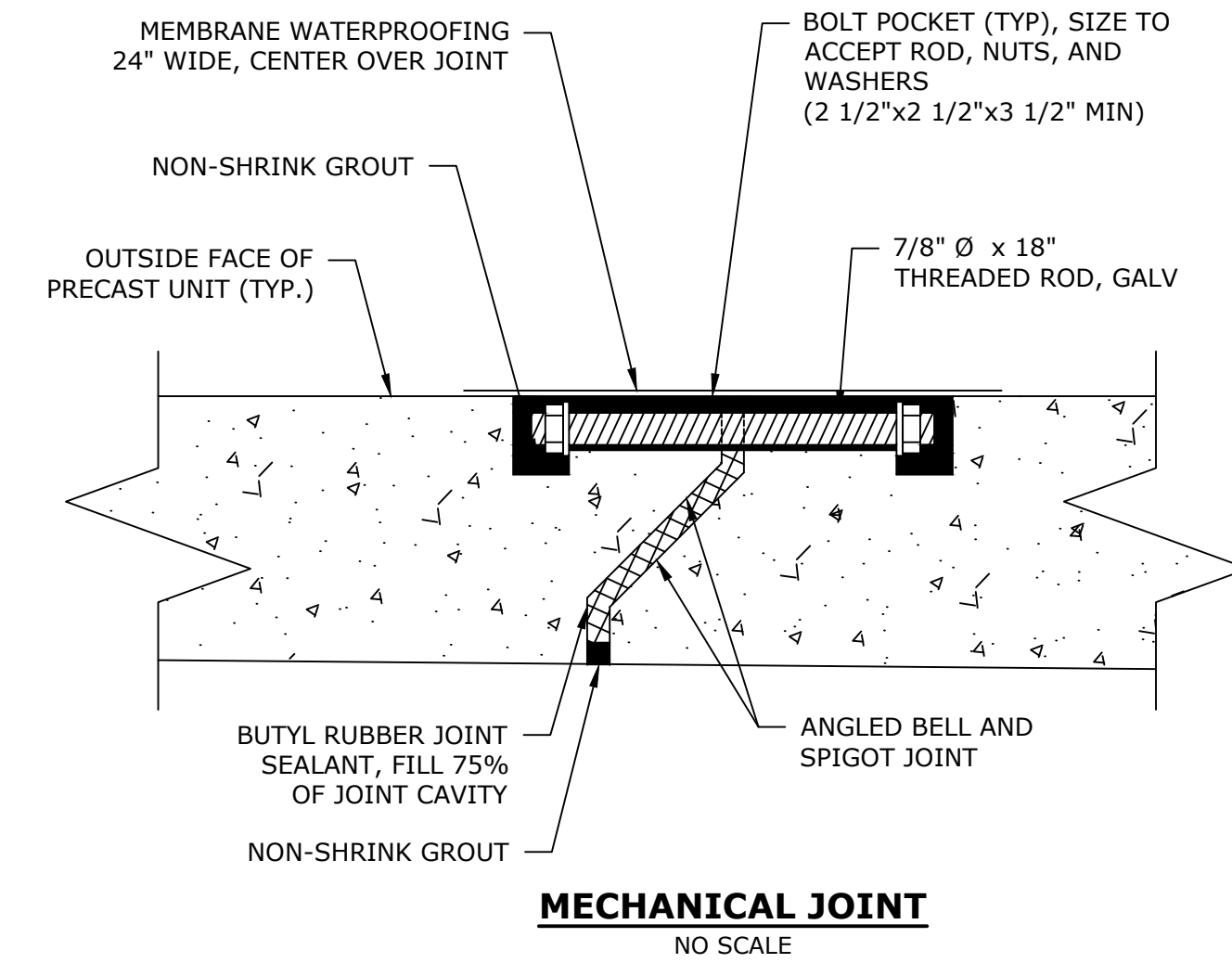
- NOTE:**
- SECTION REFLECTS MAXIMUM AND MINIMUM ANTICIPATED BEDROCK ELEVATIONS. &2175\$&725 72 (9\$/8\$7(), (/' &21' 7.216 \$7)(5 (02/7.212) (/.67.1' %5.1' (\$1' 5(3257 72 (1' 1((5 35.25 72 &\$67.1' 2) \$5&+)227.1' 6



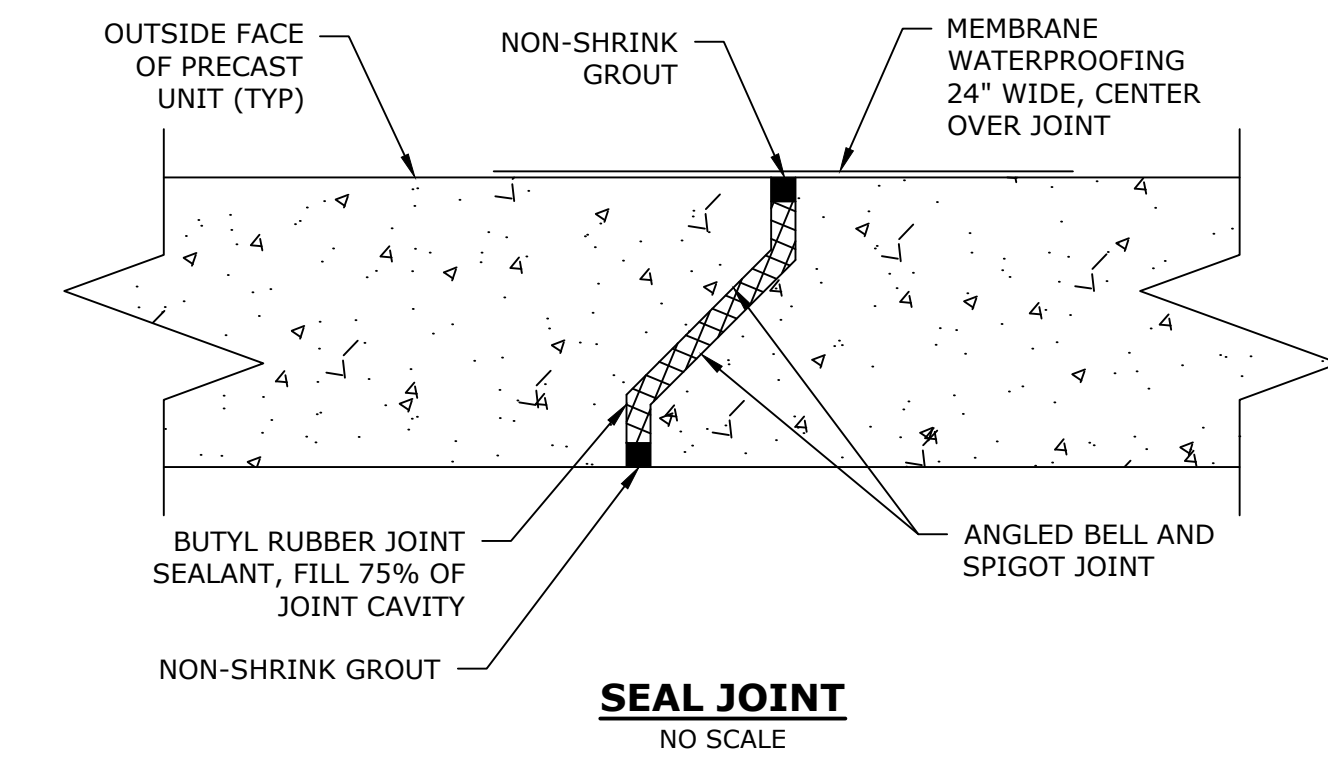
HEADWALL TO PRECAST GUARD TRANSITION DETAIL
SCALE: 3/8" = 1'-0"



KEYWAY DETAIL
1" = 1'-0"

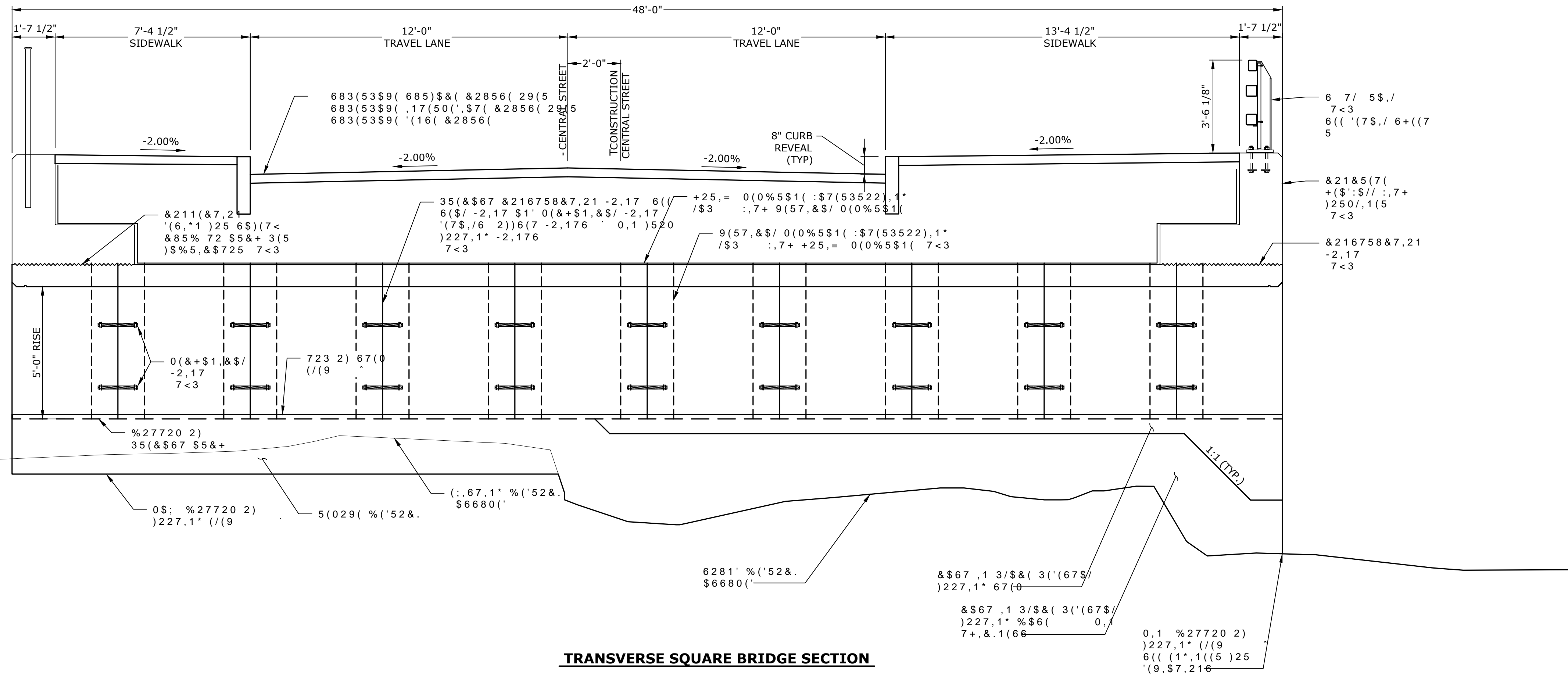


MECHANICAL JOINT
NO SCALE



SEAL JOINT
NO SCALE

- JOINT SEALANT NOTES:**
- PROVIDE BUTYL RUBBER JOINT SEALANT (AASHTO M-198) BETWEEN PRECAST CONCRETE UNITS.
 - PROVIDE A MINIMUM OF 7 MECHANICAL CONNECTORS BETWEEN EACH ARCH UNIT (3 ON TOP AND 2 ON EACH SIDE).
 - ALL BOLT POCKETS SHALL BE FILLED WITH NON-SHRINK GROUT.
 - PEEL AND STICK BARRIER MEMBRANE SHALL BE PLACED IN 2-FOOT WIDE STRIPS, CENTERED OVER THE TOP AND/OR SIDES OF EACH JOINT.



TRANSVERSE SQUARE BRIDGE SECTION

SECTION 1
3/8" = 1'-0"
S-101

&20021:(\$/7+ 2) 0\$66\$&+86(77\$
ODVV'27 +LJKZD\ 'LYLVLF
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
DISTRICT 4 BRIDGE ENGINEER DATE

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-By-The-Sea, Massachusetts

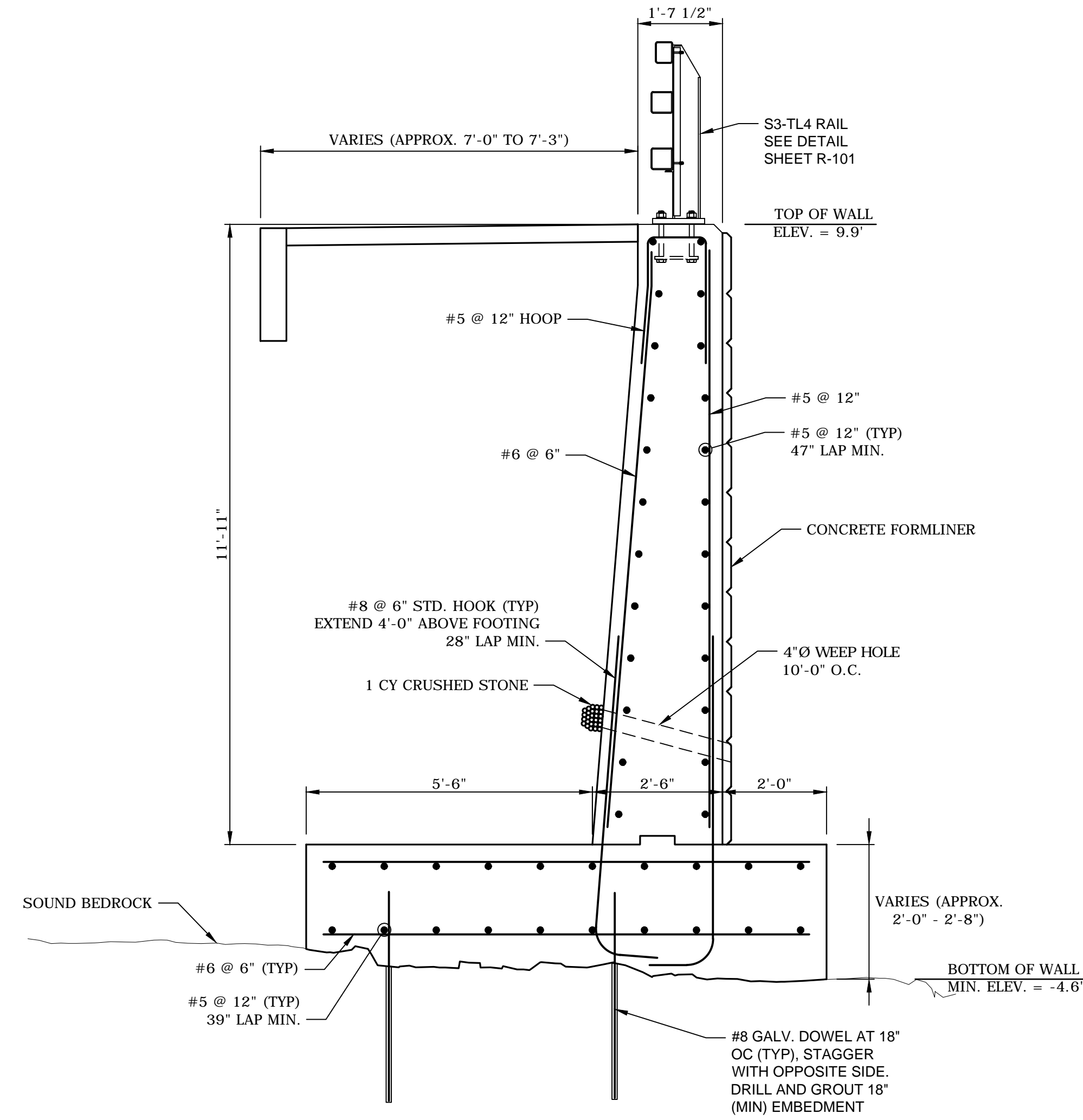
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DRAWN BY: D.BISHOP		
CHECKED BY: EAO		
APPROVED BY: DLL		

Q BRIDGE SECTION & DETAILS

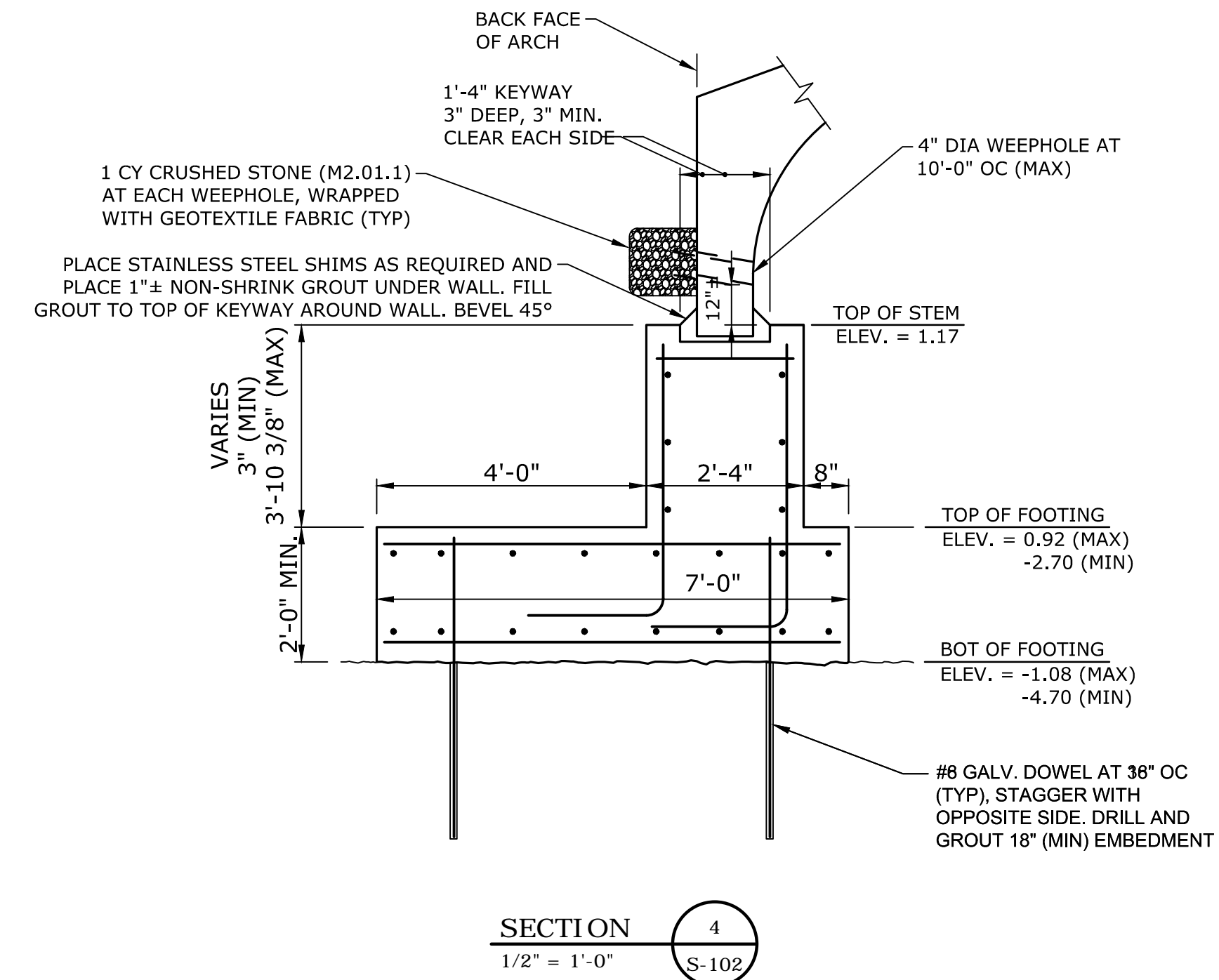
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S-104

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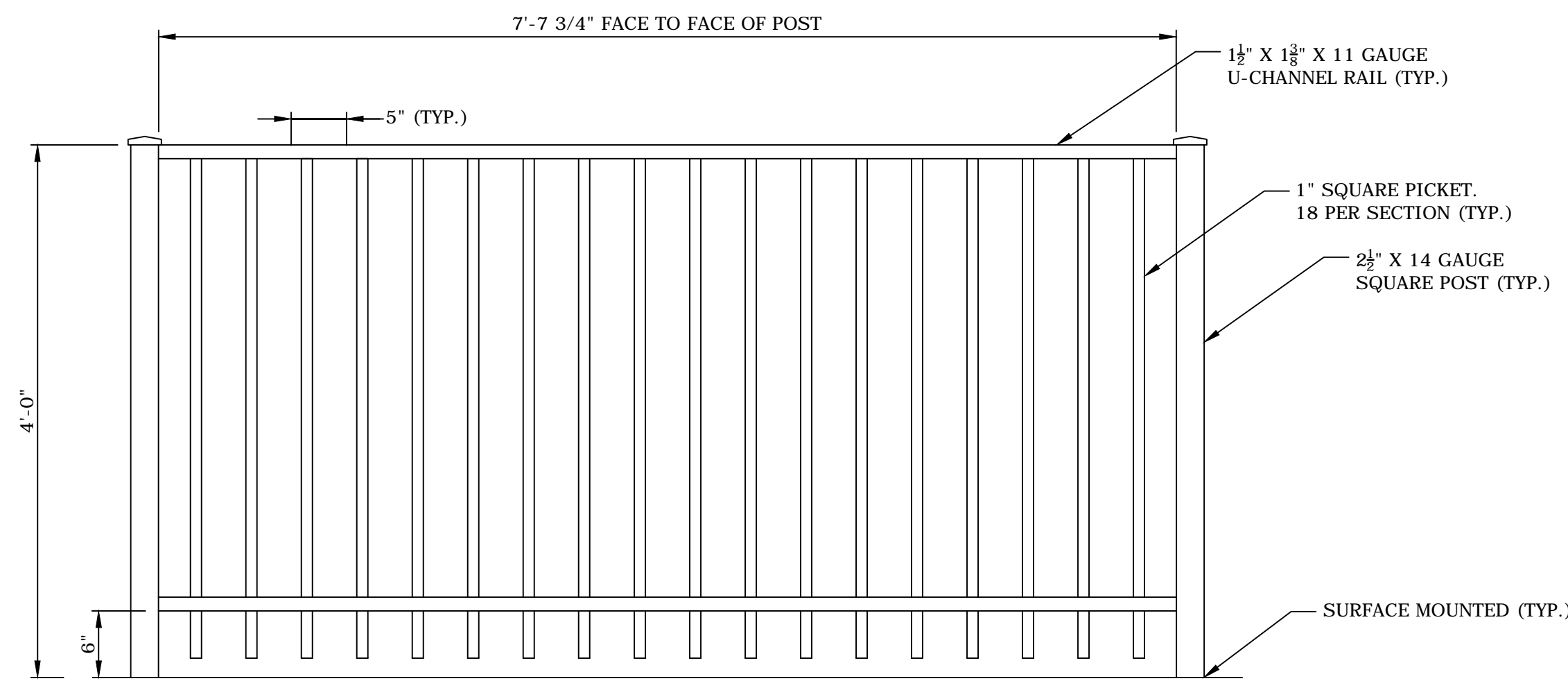
SECTION 3
1/2" = 1'-0"



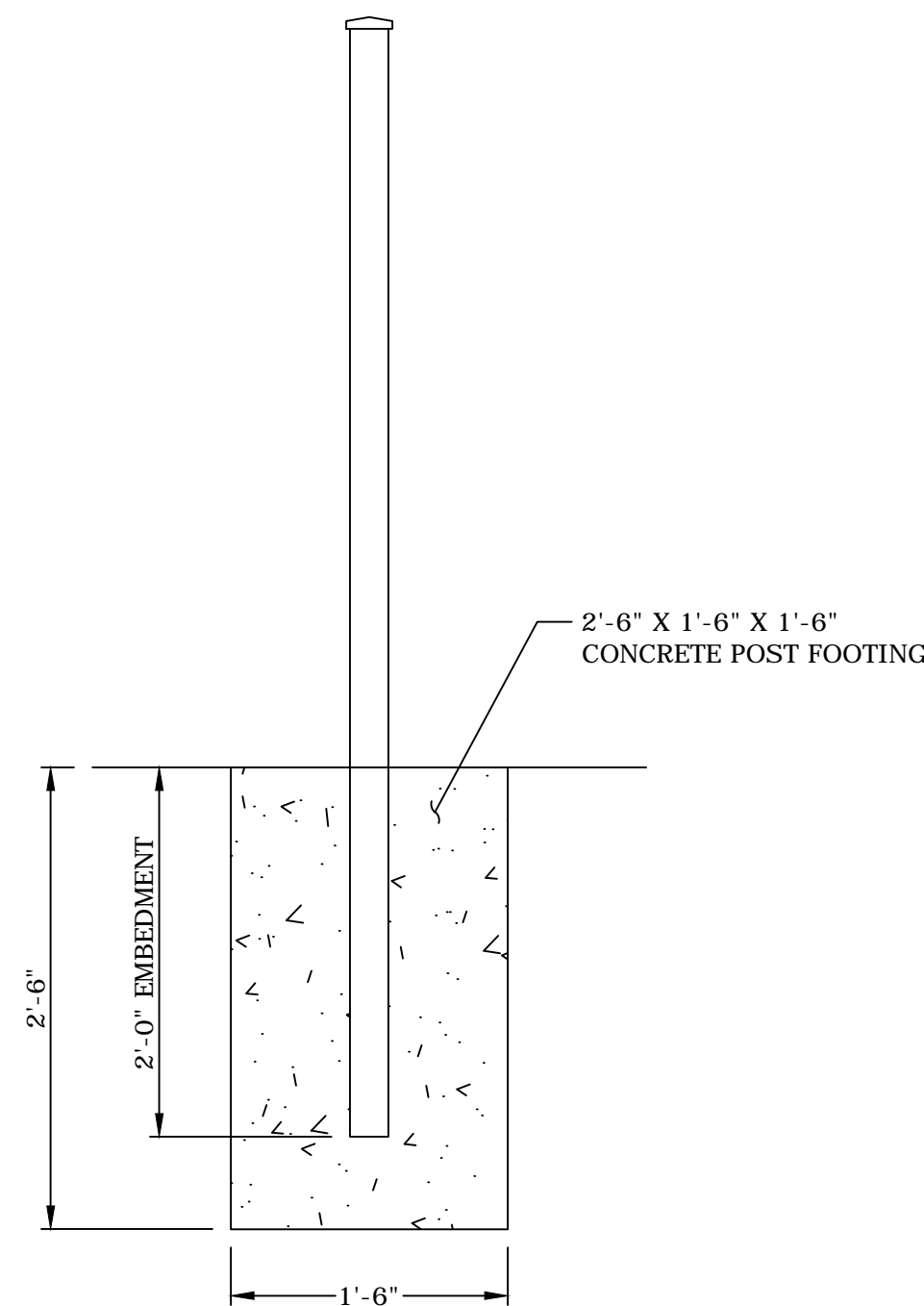
SECTION 4
1/2" = 1'-0"

CAST-IN-PLACE FOOTING NOTES:

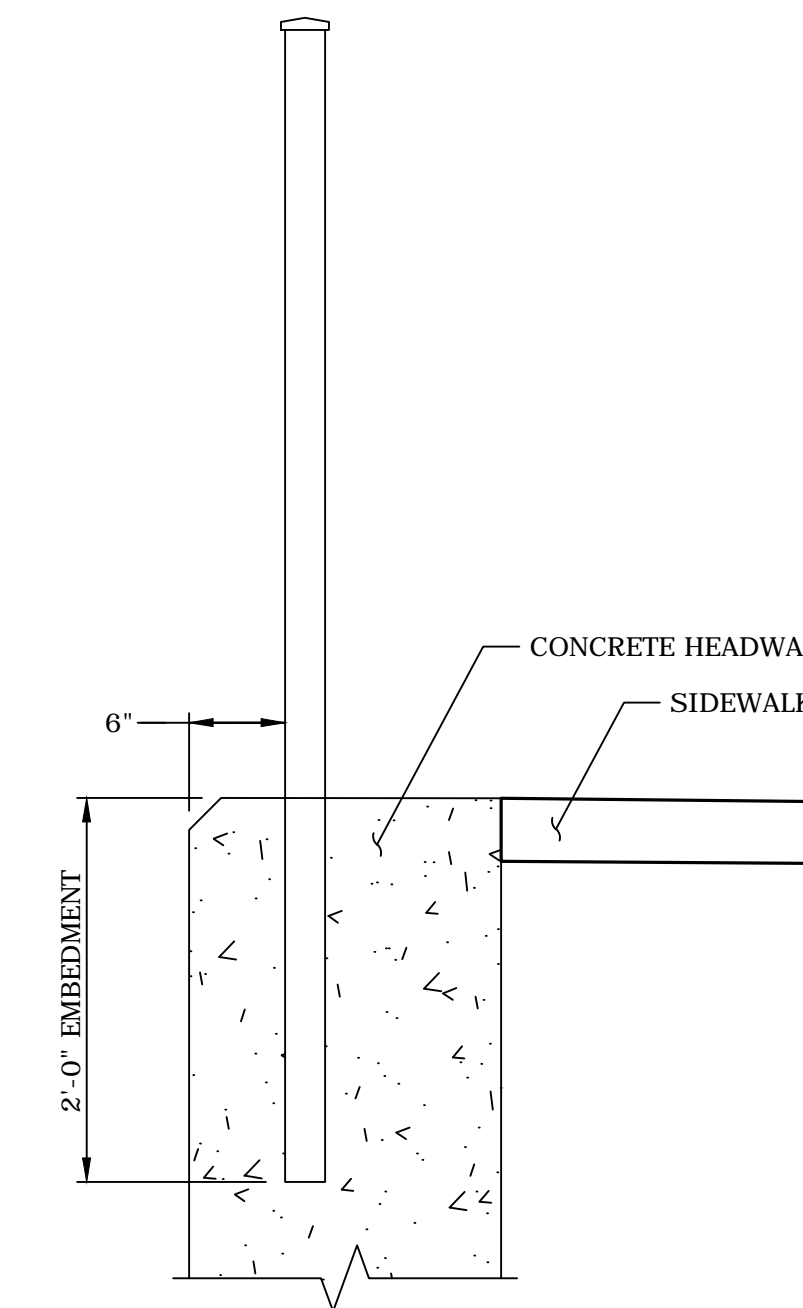
1. THE PRECAST CONCRETE ARCH UNITS SHALL BE INSTALLED ON CAST-IN-PLACE CONCRETE FOOTINGS. THE FOOTING DESIGN PROVIDED HEREIN IS BASED ON LRFD METHODOLOGIES AND THE FOLLOWING NOMINAL REACTIONS FROM THE ARCH:
 - 1.1. VERTICAL DEAD LOAD (COMPONENTS) = 1.86 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - 1.2. VERTICAL DEAD LOAD (WEARING SURFACE) = 1.04 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
 - 1.3. VERTICAL LIVE LOAD = 5.30 KIPS PER FOOT FRAME LEG SEATED ON RIGID FRAME FOOTING
2. IF THE CONTRACTOR'S FINAL DESIGN OF THE ARCH DEVIATES FROM THE RANGE PROVIDED ABOVE TO BETTER SUIT THE CONTRACTOR'S MEANS AND METHODS, THE ENGINEER WILL PROVIDE NEW FOOTING DESIGN DRAWINGS DETAILING REVISED FOOTINGS TO ACCOMMODATE THE FINAL ARCH DESIGN PROVIDED BY THE CONTRACTOR. ADDITIONAL ENGINEERING FOR REVISED FOOTING DESIGN TO SUIT THE CONTRACTOR'S MEANS AND METHODS SHALL BE AT THE CONTRACTOR'S SOLE COST.



ORNAMENTAL FENCE DETAIL (NORTH SIDE)
SCALE: 1" = 1'-0"



POST ANCHORAGE (OFF BRIDGE)
SCALE: 1" = 1'-0"



POST ANCHORAGE (ON BRIDGE)
SCALE: 1" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER _____ DATE _____

90%
Drawings
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Central Street
Bridge
Replacement

Department of
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MassDOT Bridge No.
M-02-001, BIN 8AM

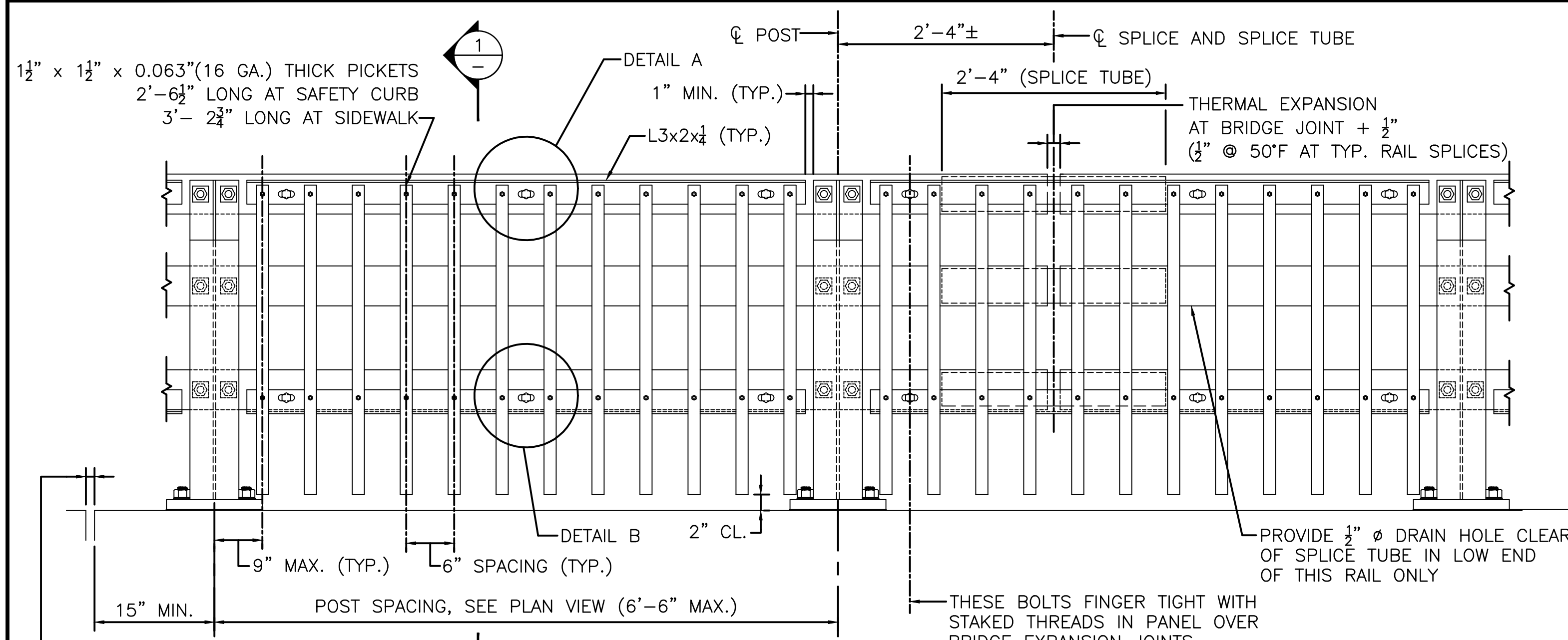
Town of
Manchester-By-
The-Sea,
Massachusetts

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DATE:	NOVEMBER 2021	
FILE:	M1476-011-S-104_105.dwg	
DRAWN BY:	D BISHOP	
CHECKED BY:	X	
APPROVED:	X	

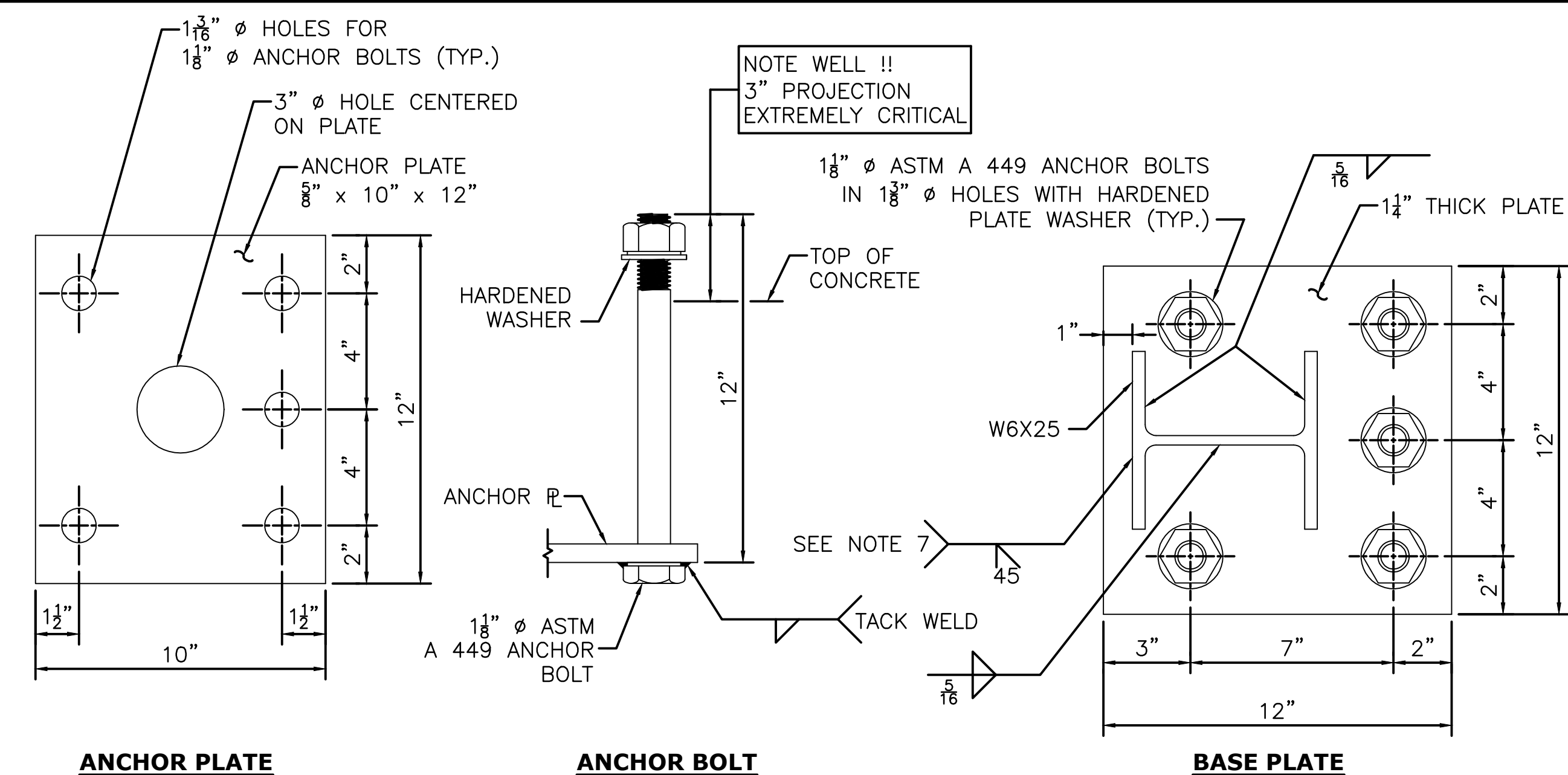
MISCELLANEOUS DETAILS

SCALE: AS NOTED

S-105
SHEET # OF #



BRIDGE RAILING ELEVATION
SCALE: 1" = 1'-0"

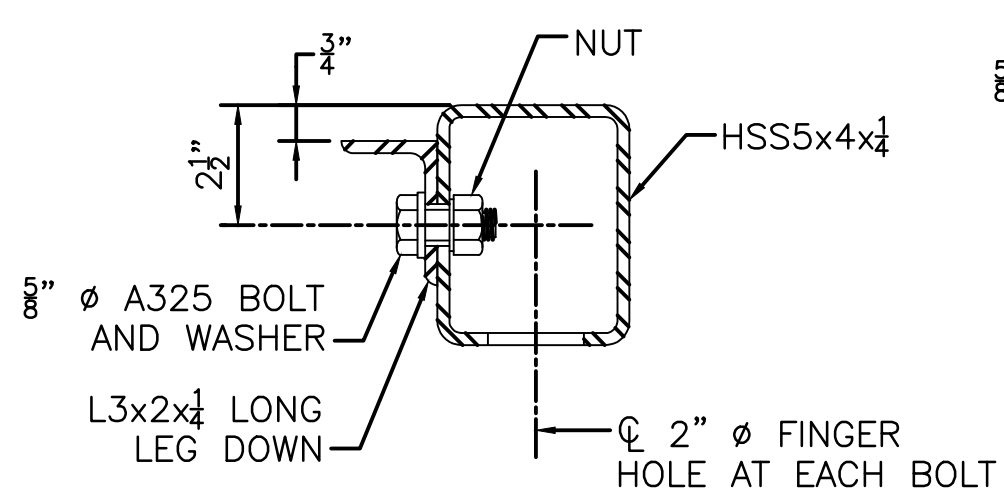


ANCHOR PLATE
SCALE: 3" = 1'-0"

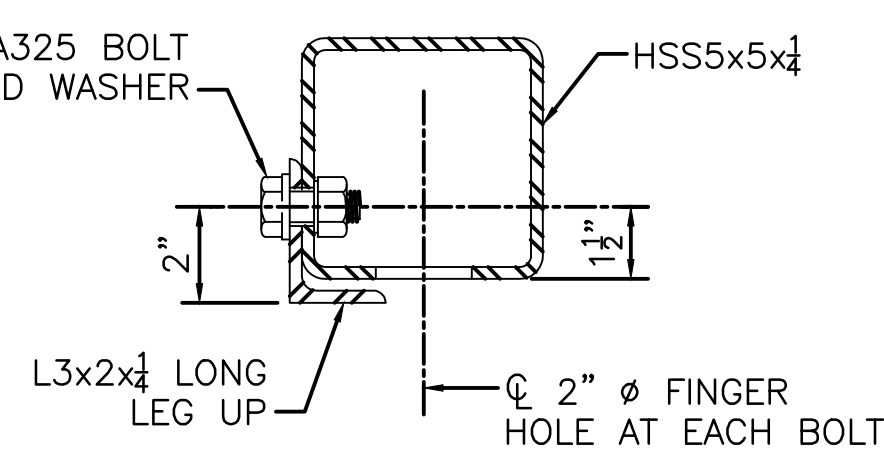
ANCHOR BOLT
SCALE: 3" = 1'-0"

BASE PLATE
SCALE: 3" = 1'-0"

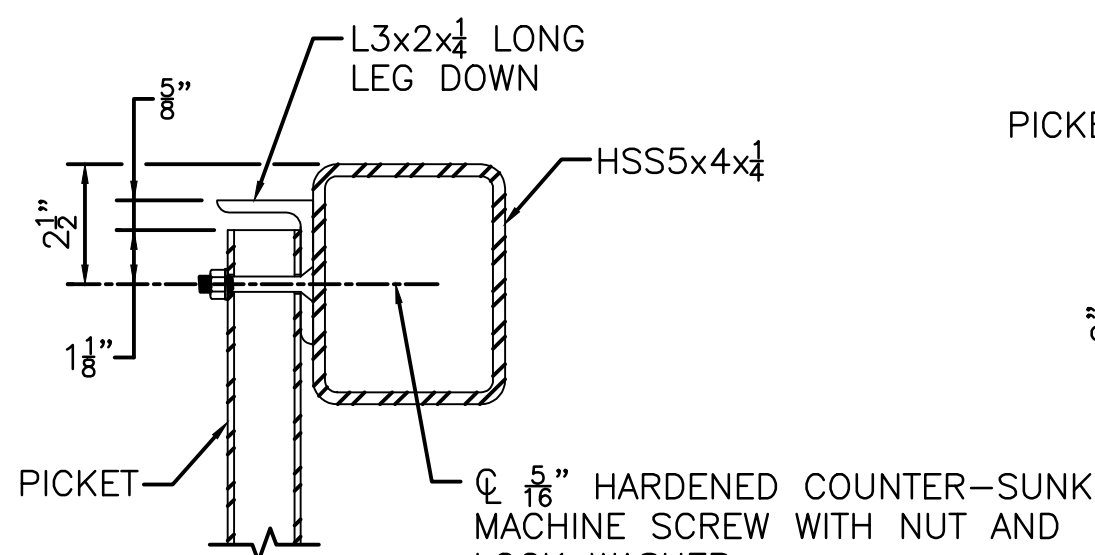
NOTE: ELEVATION AT SIDEWALK SHOWN.



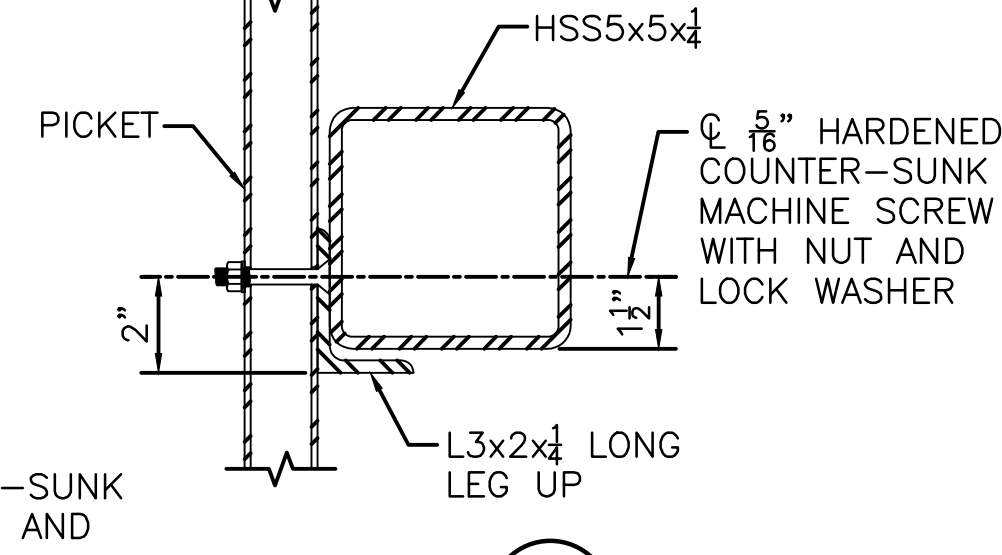
SECTION 2
3" = 1'-0"



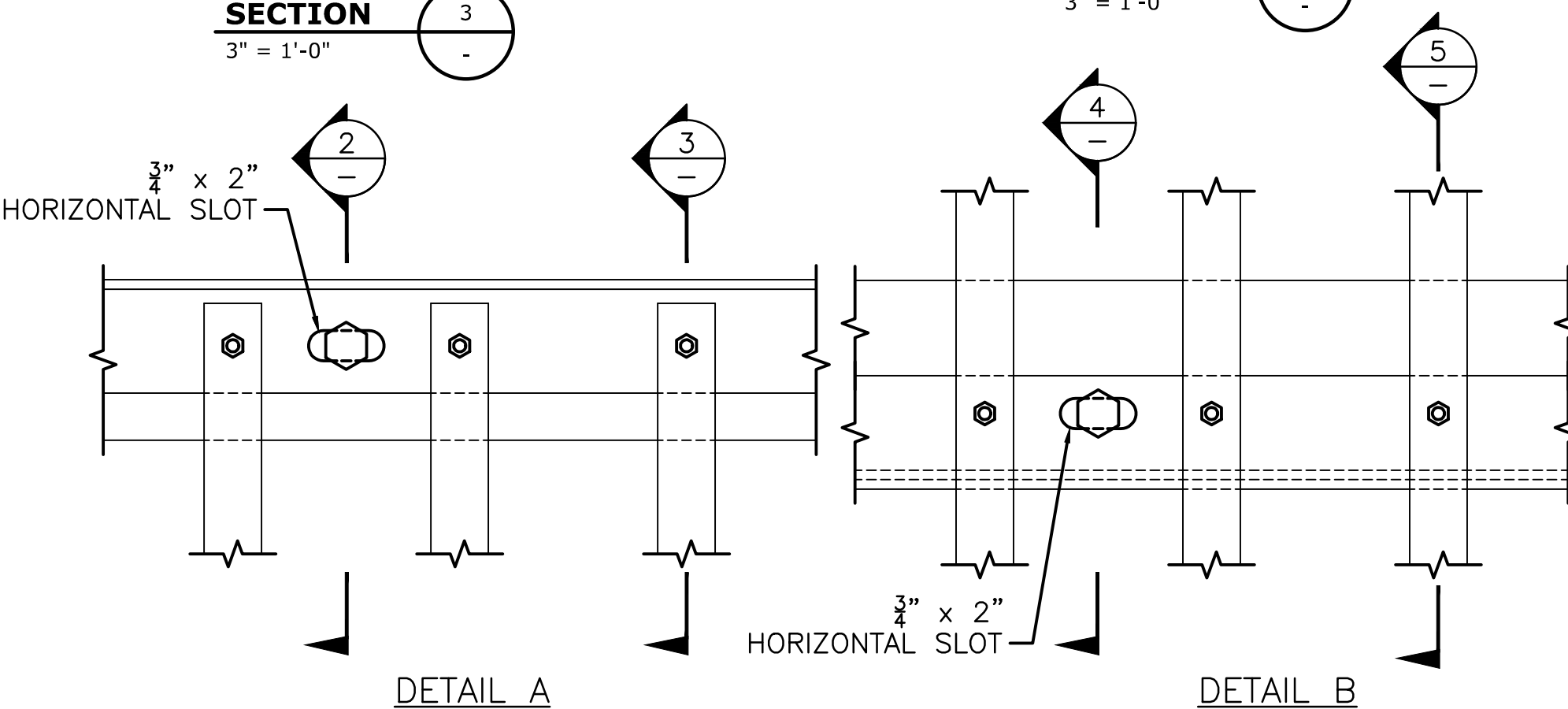
SECTION 4
3" = 1'-0"



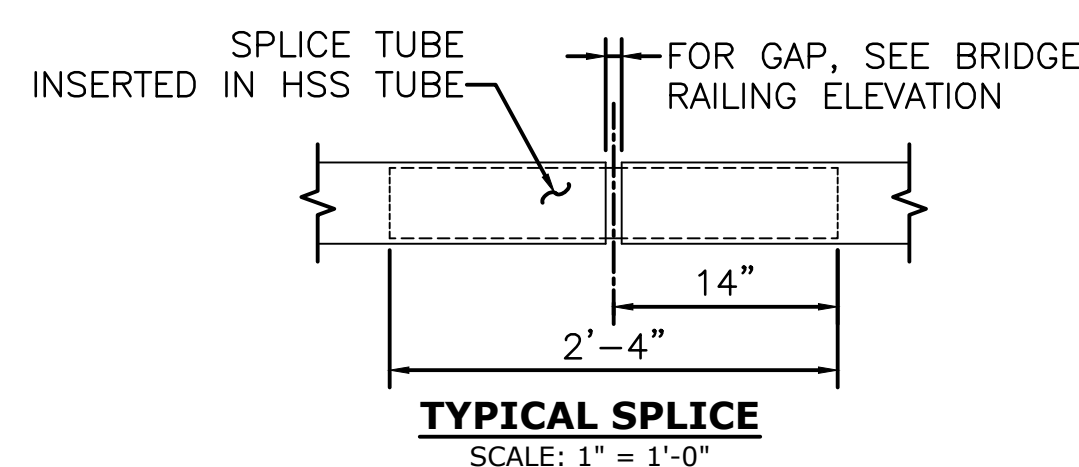
SECTION 3
3" = 1'-0"



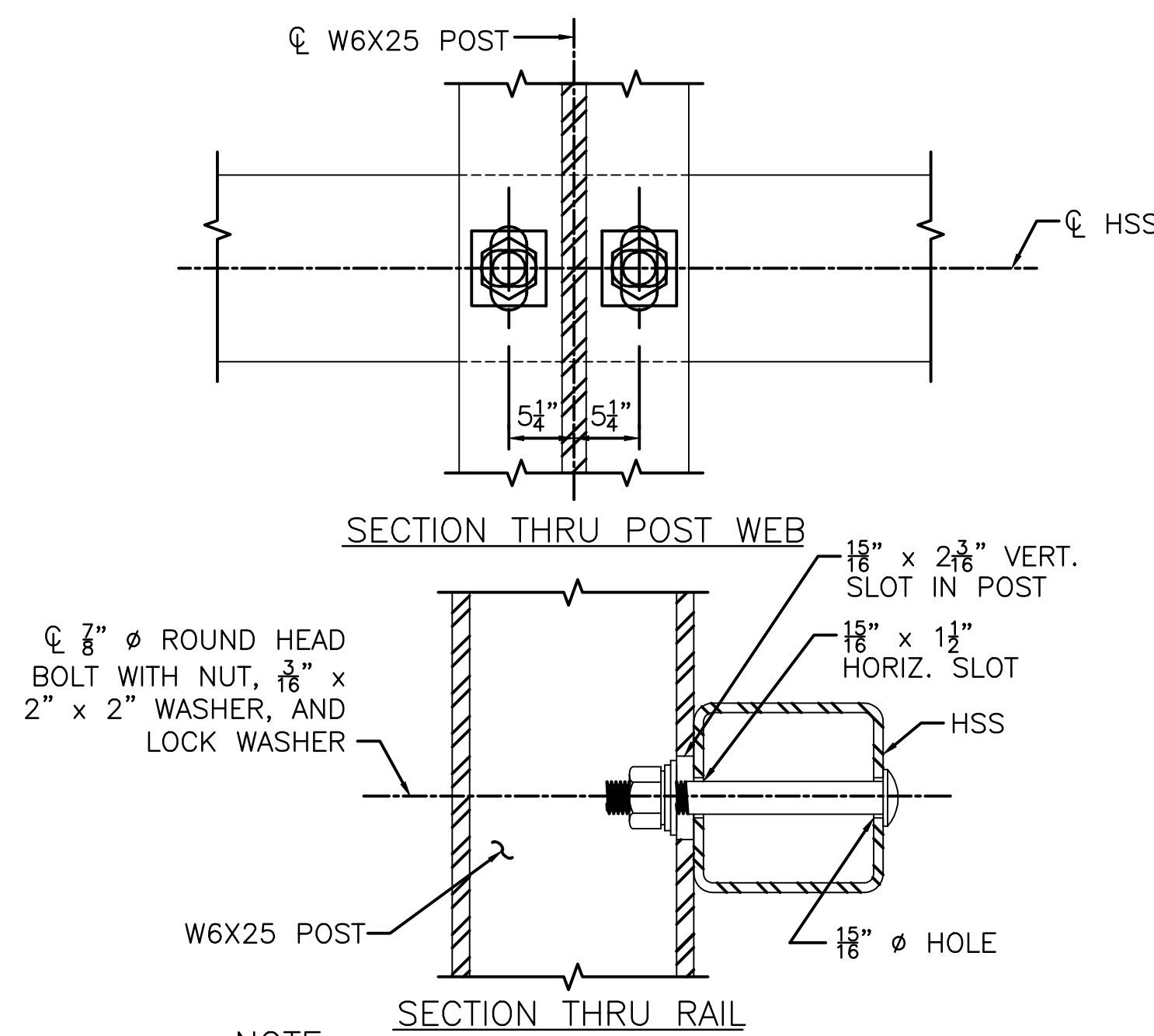
SECTION 5
3" = 1'-0"



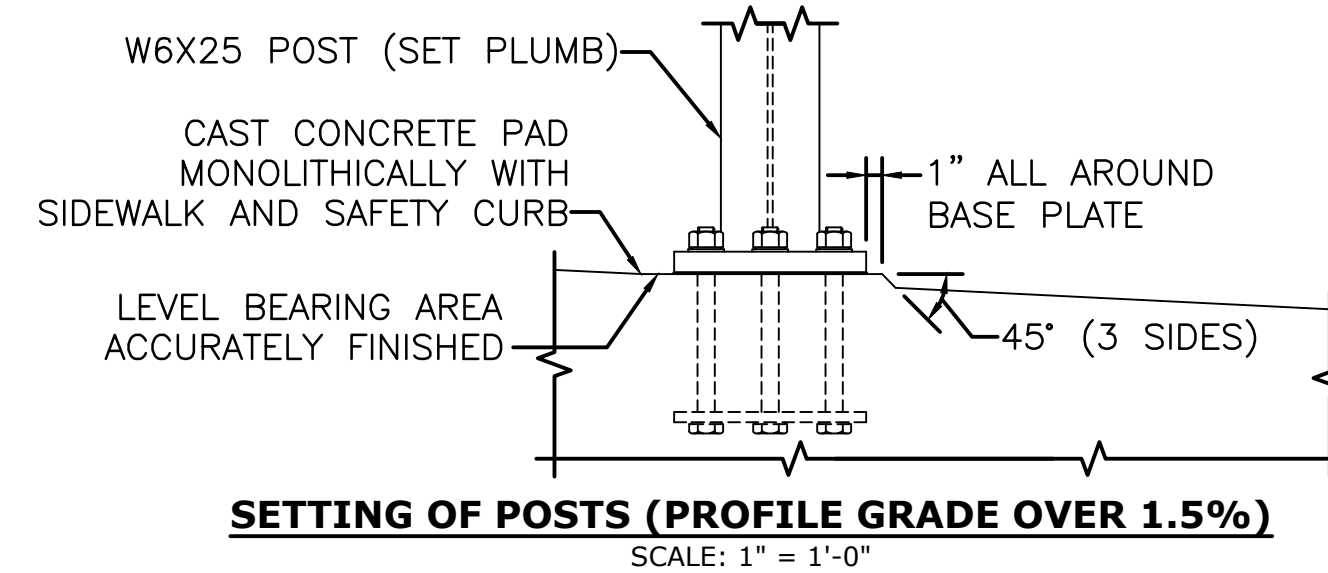
TYPICAL PICKET TO RAIL DETAILS
SCALE: 3" = 1'-0"



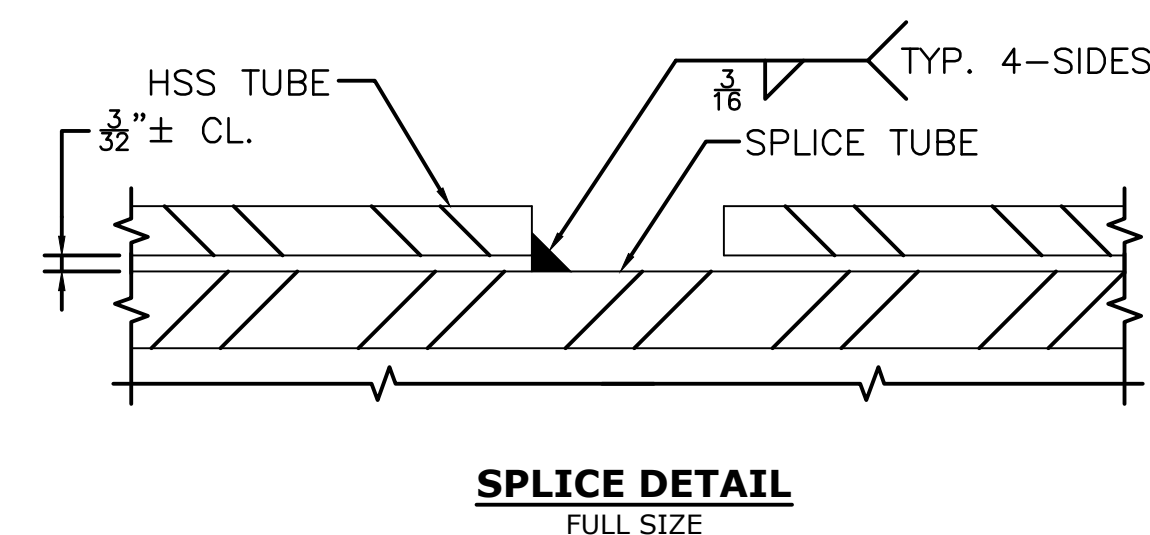
TYPICAL SPLICE
SCALE: 1" = 1'-0"



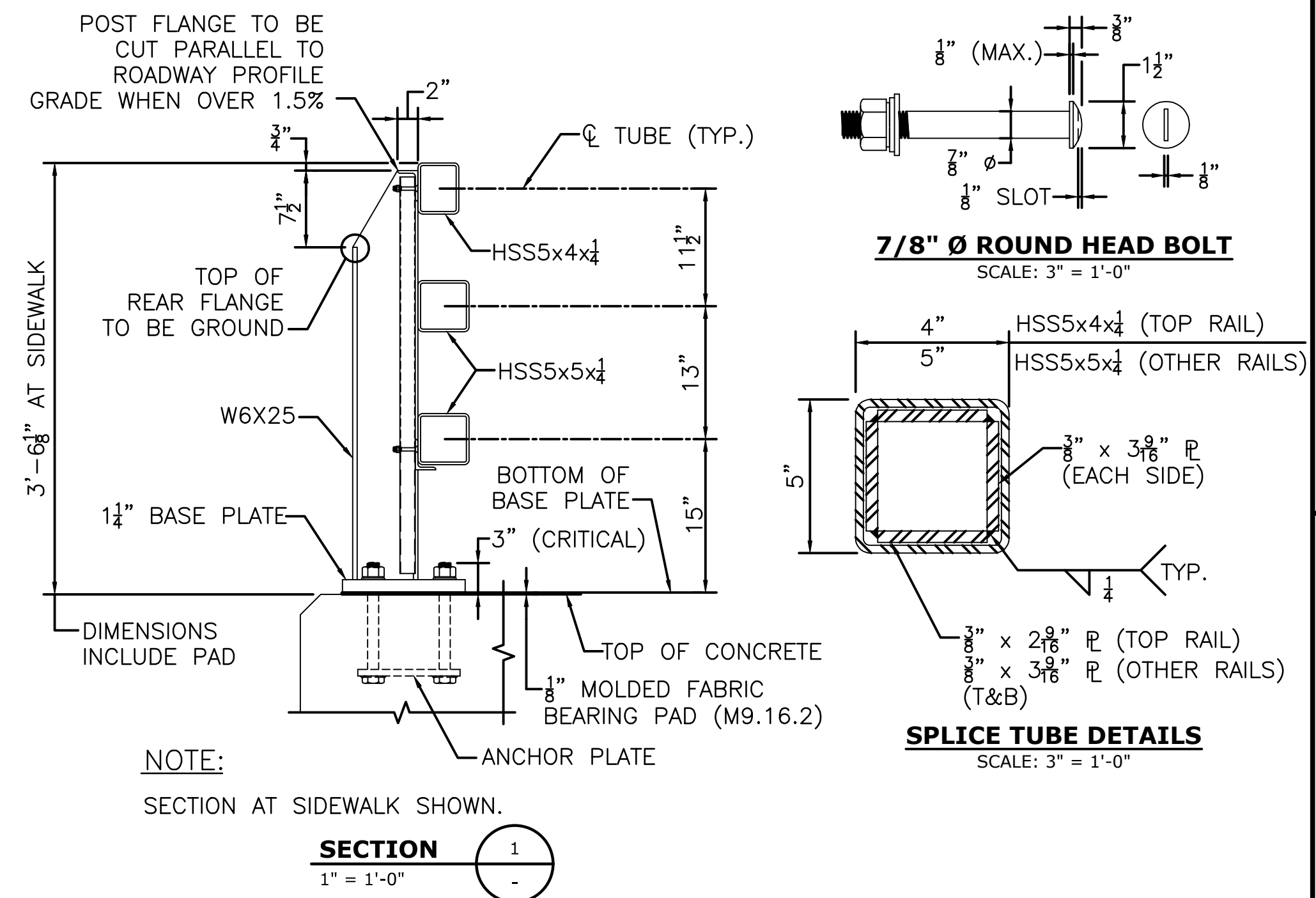
TYPICAL RAIL TO POST CONNECTIONS
SCALE: 1" = 1'-0"



SETTING OF POSTS (PROFILE GRADE OVER 1.5%)
SCALE: 1" = 1'-0"



SPLICE DETAIL
FULL SIZE



SECTION 1
1" = 1'-0"

RAILING NOTES:

- RAIL POST AND BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 50. HOLLOW RAILING STRUCTURAL TUBING (HSS) SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 500 WITH A CERTIFIED $F_y = 50$ KSI MINIMUM. THE MINIMUM HORIZONTAL BENDING RADII OF THE HSS TUBING SHALL BE 8 FEET. PICKET CARRIER ANGLES, ANCHOR PLATES, AND SPLICE TUBE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 270 GRADE 36. PICKET TUBING SHALL CONFORM TO ASTM A 513 WITH $F_y = 36$ KSI MIN. OR A 500 GRADE B.
- ALL STEEL (EXCEPT THE 8/8" ANCHOR PLATE AND FASTENERS) SHALL BE GALVANIZED AND PAINTED DARK BRONZE (FEDERAL STD. 595B COLOR NO. 10045). ANCHOR PLATE SHALL BE GALVANIZED ONLY. HEADS OF 7/8" Ø ROUND HEAD BOLTS SHALL BE PAINTED TO MATCH RAIL.
- ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
- RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF FOUR (4) POSTS WITHOUT SPLICES WHERE POSSIBLE. RAILS SHALL BE SPLICED IN THE PANELS OVER EXPANSION JOINT.
- ENDS OF TUBE SECTIONS SHALL BE SAWED. GRIND SMOOTH EXPOSED EDGES. ALL CUT ENDS SHALL BE TRUE AND SMOOTH.
- ALL POSTS TO BE PLUMB WHEN PROFILE GRADE EXCEEDS 1.5%. FOR PROFILE GRADES LESS THAN 1.5%, POSTS SHALL BE SET PERPENDICULAR TO GRADE.
- POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK-GROUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.
- 7/8" Ø ROUND HEAD BOLTS SHALL CONFORM TO THE CHEMICAL AND PHYSICAL REQUIREMENTS OF AASHTO M 164.

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.
MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL PART II CONVENTIONAL CONSTRUCTION S3-TL4 BARRIER DETAILS

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

DISTRICT 4 BRIDGE ENGINEER DATE

90% Drawings Not For Construction

Central Street Bridge Replacement

Department of Public Works

MassDOT Bridge No. M-02-001, BIN 8AM

Town of Manchester-by-the-Sea, Massachusetts

0	11/05/2021	90% Drawings
MARK	DATE	DESCRIPTION
PROJECT NO:	M1476 - 011	
DATE:	NOVEMBER 2021	
FILE:	M1476-011-R-101_R-104.dwg	
DRAWN BY:	DRF	
CHECKED:	EAO	
APPROVED:	DLL	

S3-TL4 BARRIER DETAILS

SCALE: AS NOTED

**90%
Drawings
Not For
Construction**

**Central Street
Bridge
Replacement**

Department of
Public Works

MassDOT Bridge No.
M-02-001, BIN 8AM

Town of
Manchester-By-
The-Sea,
Massachusetts

0 11/05/2021 90% Drawings

PROJECT NO: M1476-011

DATE: NOVEMBER 2021

FILE: M1476-011-R-101_R-104.dwg

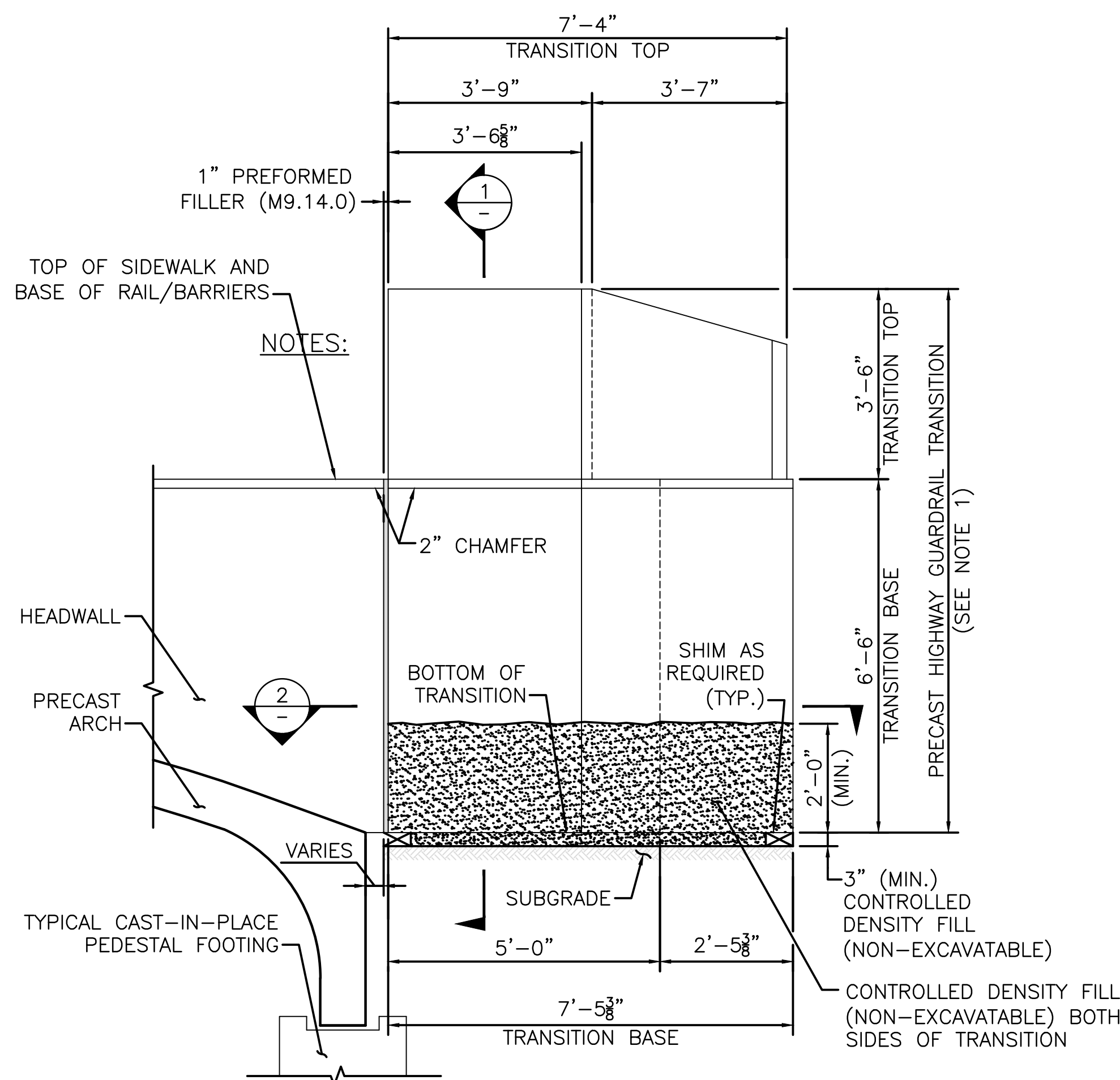
DRAWN BY: DRF

CHECKED: EAO

APPROVED: DLL

PRECAST HIGHWAY GUARDRAIL
TRANSITION AND S3-TL4
BARRIER DETAILS

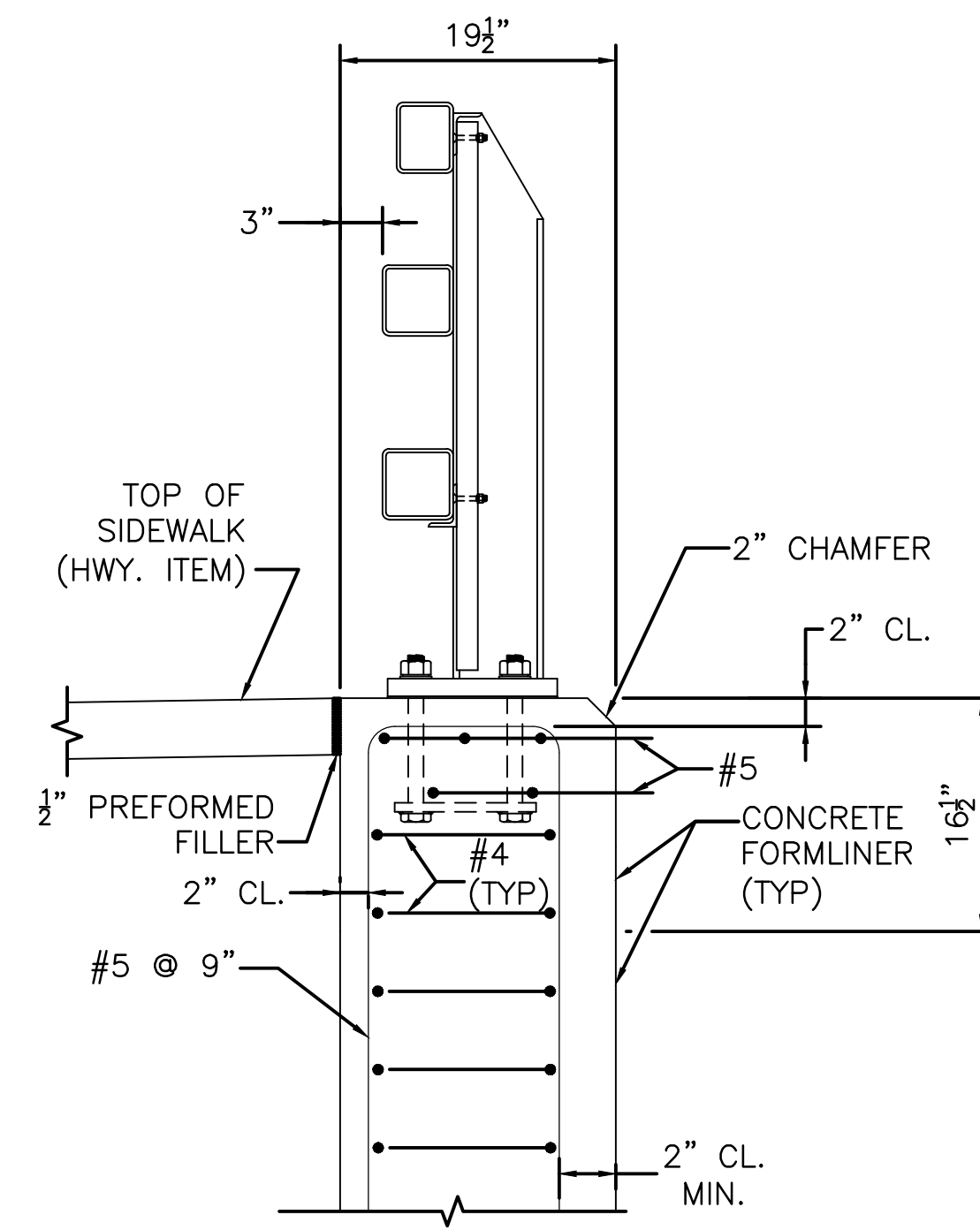
SCALE: AS NOTED



**PRECAST HIGHWAY GUARDRAIL TRANSITION
ELEVATION AT U-WINGWALL (MASSDOT 3.8.1)**
SCALE: 1/2" = 1'-0"

NOTES:

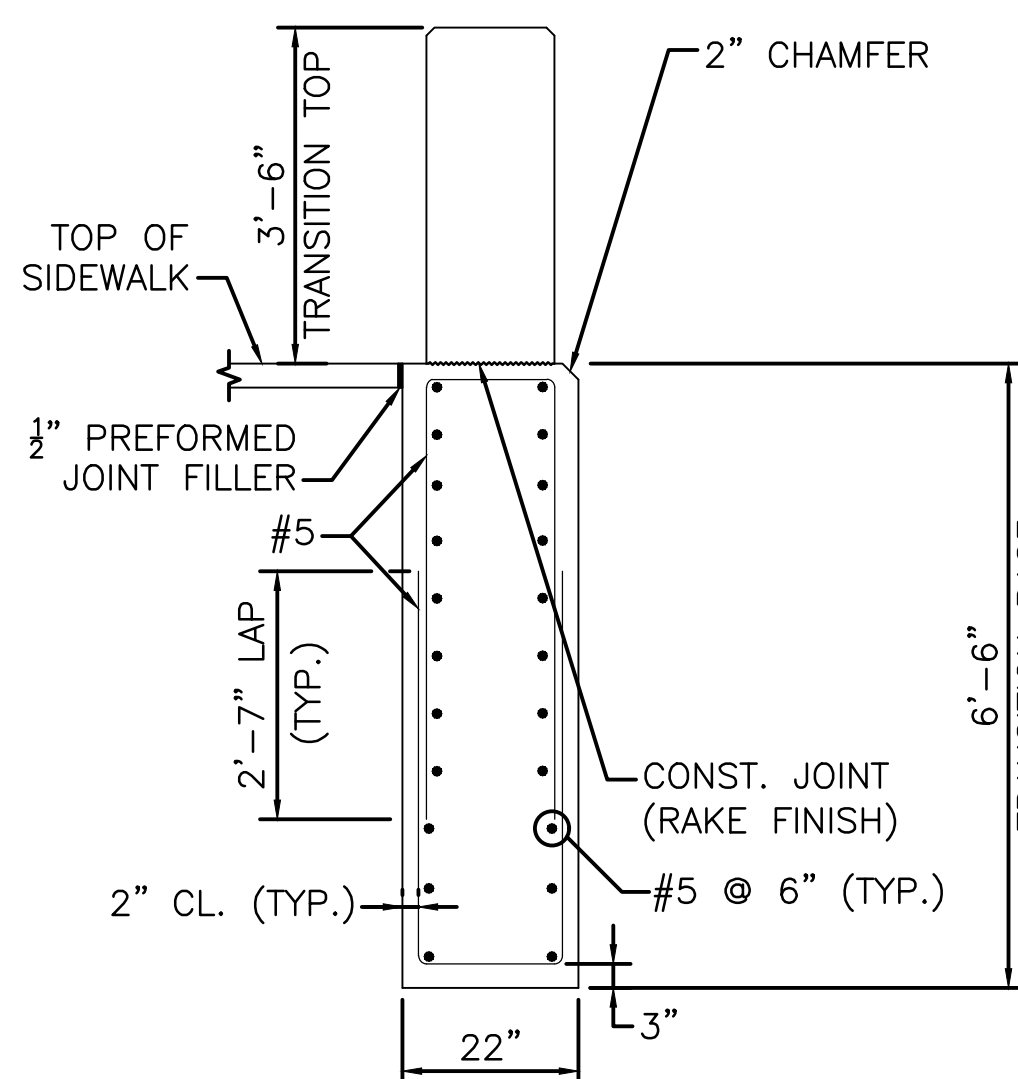
1. PRECAST GUARDRAIL TRANSITION SHALL BE 5000 PSI, 3/4 IN, 685 HP CEMENT CONCRETE.
2. GRAVEL BORROW SHALL BE PLACED AND THOROUGHLY COMPACTED TO THE GRADE OF 3" (MIN.) BELOW THE INTENDED BOTTOM OF THE PRECAST GUARDRAIL TRANSITION BASE AND TO A HEIGHT OF 2'-0" (MIN.) ON ALL SIDES OF THE TRANSITION BASE TO FORM A TRENCH IN WHICH TO SET THE TRANSITION. WHERE NO GRAVEL BORROW IS REQUIRED BELOW THE BASE, IT SHALL BE PLACED ON UNDISTURBED SOIL.
3. CONTRACTOR SHALL SET THE PRECAST GUARDRAIL TRANSITION TO THE REQUIRED ELEVATION AND ALIGNMENT, AND BACKFILL PRECAST GUARDRAIL TRANSITION WITH CONTROLLED DENSITY FILL (NON-EXCAVATABLE) TO THE ELEVATION SHOWN.



**S3-TL4 BARRIER SECTION THRU
BARRIER AT SIDEWALK (MASSDOT 9.2.7)**
SCALE: 1" = 1'-0"

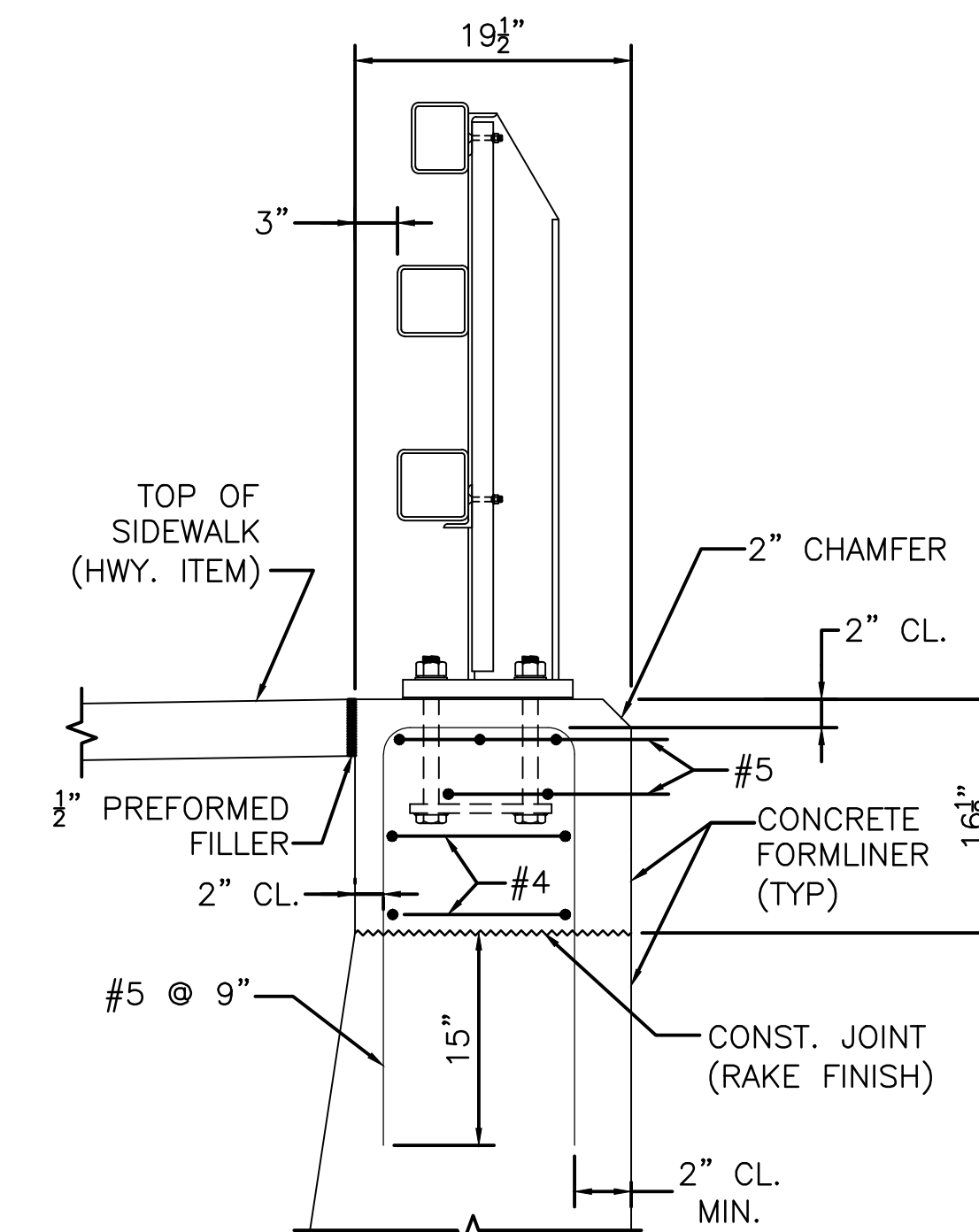
NOTES:

1. CONTRACTOR'S FABRICATOR IS RESPONSIBLE FOR DESIGN OF S3-TL4 CONNECTION TO HEADWALL AND HEADWALL CONNECTION TO PRECAST CONCRETE ARCH.
2. THIS STANDARD MASSDOT DETAIL SHOWS ADDITIONAL MINIMUM REINFORCEMENT FOR A CONNECTION TO A SLAB. IT MAY BE ASSUMED THAT THE SLAB IS THE TOP OF THE CONTRACTOR DESIGNED PRECAST ARCH.
3. CONTRACTOR'S FABRICATOR IS RESPONSIBLE FOR HEADWALL DESIGN.

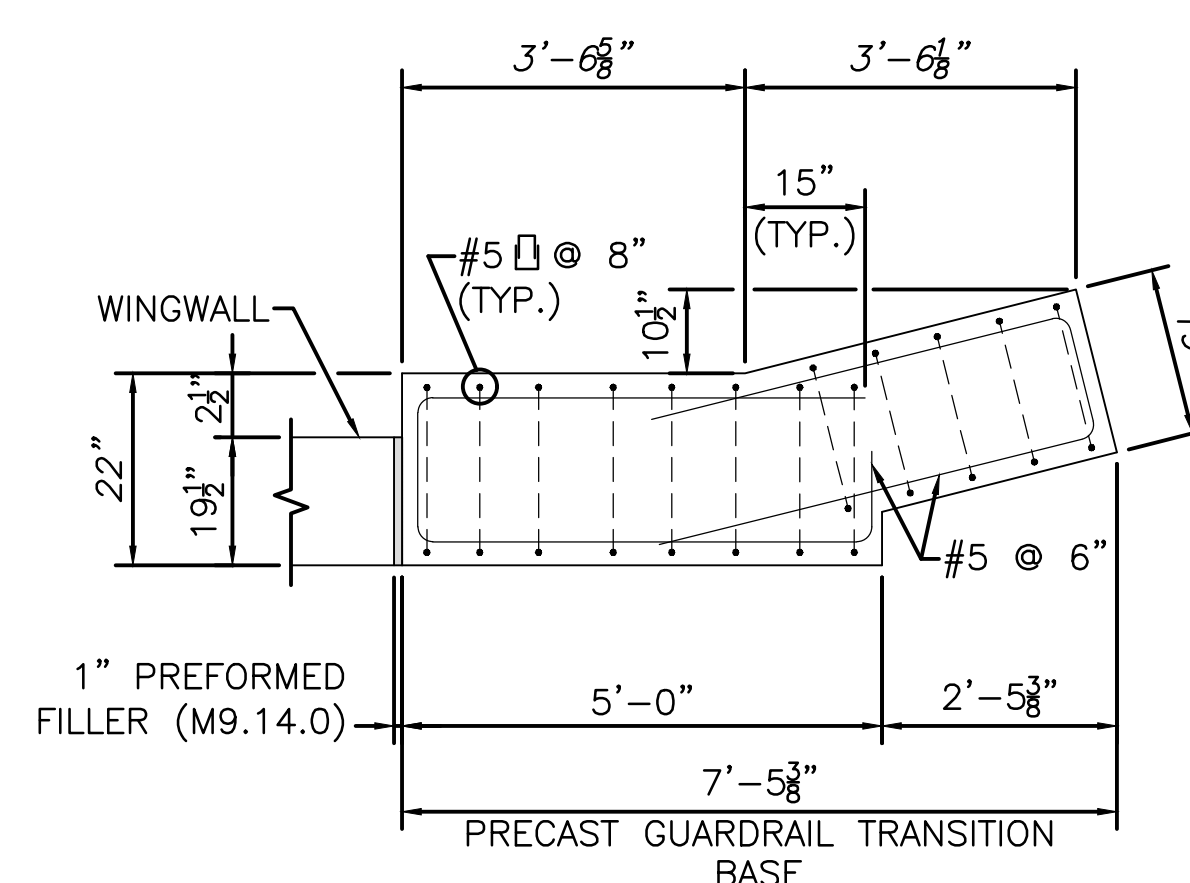


SECTION 1
1/2" = 1'-0"

**PRECAST HIGHWAY GUARDRAIL TRANSITION
VERTICAL SECTION FOR S3-TL4 BARRIER
AT SIDEWALK (MASSDOT 3.8.4)**



**S3-TL4 BARRIER TOP OF U-WINGWALL
DETAILS AT SIDEWALK (MASSDOT 9.3.12)**
SCALE: 1" = 1'-0"



NOTE:
WINGWALL REINFORCEMENT NOT SHOWN FOR CLARITY.

SECTION 2
1/2" = 1'-0"

**PRECAST HIGHWAY GUARDRAIL TRANSITION
HORIZONTAL SECTION (MASSDOT 3.8.5)**

NOTE:
DETAILS ON THIS SHEET WERE NOT DESIGNED BY TIGHE & BOND. THESE STANDARD DETAILS WERE DEVELOPED BY THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AND HAVE BEEN ADAPTED OR COORDINATED TO MEET THE SPECIFIC REQUIREMENTS OF THIS PROJECT.

MASSDOT STANDARD DETAILS:
MASSDOT 2013 LRFD BRIDGE MANUAL
PART II CONVENTIONAL CONSTRUCTION
PRECAST HIGHWAY GUARDRAIL
TRANSITION AND S3-TL4 BARRIER DETAILS

**COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE
TO MASSDOT FOR CONTRACTING**

DISTRICT 4 BRIDGE ENGINEER DATE

APPENDIX G4

Revised Impact Quantities Adjusted to HTL

This sheet provides revised impact quantities for the Central Street Bridge Replacement and Central Pond Restoration Project in Manchester-by-the Sea, Massachusetts NAE-2019-02827. These areas accompany the resubmission of the Bridge replacement drawings with the High Tide Line depicted (submitted on February 18, 2022).

The approximate volume of living shoreline elements was increased to include the proposed Apex Jams in Sawmill Brook/Central Pond

Table 1-1 Types of Material Being Discharged

Totals for Permanent Discharge			
Location	Resource Area	Material	Amount in Cubic Yards
Central Pond and Sawmill Brook	WoUS	Concrete	80
Central Pond	WoUS	Crushed stone	80
Central Pond	WoUS	Reused retaining wall blocks	550
Central Pond	WoUS	Living Shore Elements	2,500
Overall Total			±3,210

Table 1-2 was revised based on a recalculation of temporary disturbance areas for coffer dams. Revised totals are provided below

Table 1-2 Temporary Material Being Discharged

	Central Pond Restoration	Central Street Bridge Replacement	Total
Cofferdams	10,050 sf	3,300 sf	13,350 sf
Timber mats	1,000 sf	0 sf	1,000 sf

The impact areas in Table 1-3 include an increased area for the living shoreline elements based on a recalculation and includes the apex jam and root wad channel stabilization features in that area.

Table 1-3 Surface Area in Acres of Wetlands or Other Waters Filled

Location	Activity	Resource	Area (sf)	Area (acres)
Central Pond	Retaining Wall Replacement	WoUS	4,195	0.096
Central Pond	Living Shoreline Elements	WoUS	16,850	0.387
Total Fill Area			±21,045	0.483
Sawmill Brook	Tide Gate Removal	WoUS	+353	+0.008
Total Removal Area			353	0.008

G5

Proof of plan distribution to BUAR, MHC and THPO

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Board of Underwater Archaeological Resources
Attn. Victor Mastone, Director
251 Causeway Street, Suite 800
Boston, MA 02114

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)



Your package has been delivered.

Delivery Date: Wednesday, 12/04/2019

Delivery Time: 11:42 AM

At the request of Tighe&Bond, Inc. this notice alerts you that the status of the shipment listed below has changed.

Shipment Detail

Tracking Number:	<u>1Z0244590355682864</u>
Ship To:	Victor Mastone, Director Board of Underwater Archae. Res. 251 CAUSEWAY ST BOSTON, MA 02114 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	2.0 LBS
Delivery Location:	MAIL ROOM SKARSKI
Reference Number 1:	221476011-01-06
Reference Number 2:	E. Tully
Reference Number 3:	D. Brennan

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02125

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)



Your package has been delivered.

Delivery Date: Wednesday, 12/04/2019

Delivery Time: 11:01 AM

At the request of Tighe&Bond, Inc. this notice alerts you that the status of the shipment listed below has changed.

Shipment Detail

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Ship To:	MA Archives Building Massachusetts Historical Commission 220 WILLIAM T MORRISSEY BLVD DORCHESTER, MA 02125 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	2.0 LBS
Delivery Location:	RECEPTION BROWN
Reference Number 1:	221476011-01-06
Reference Number 2:	E. Tully
Reference Number 3:	D. Brennan



[Download the UPS mobile app](#)

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Tribal Historic Preservation Officer
Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
 USPS CERTIFIED MAIL (ARTICLE NO. _____)

TRANSMITTAL

Tighe&Bond

Project No.: M-1476011-01

Date: December 2, 2019

Re: Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project

To: Tribal Historic Preservation Officer
Mashpee-Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649

FOR SIGNATURE FOR FILE AS REQUESTED FOR REVIEW PLEASE REPLY

Number of Copies	Description
1	Copy - Environmental Notification Form (ENF)

Enclosed, please find one copy of the Environmental Notification Form (ENF) application package for the Central Street Bridge Reconstruction & Central Pond / Sawmill Brook Restoration Project in Manchester-by-the-Sea, Massachusetts. The ENF is anticipated to be published in the December 11, 2019 edition of the Environmental Monitor. Should you have any questions or require additional information, please contact me by phone at (413) 875-1622 or by email at ETully@TigheBond.com.

Very truly yours,

Tighe & Bond, Inc.



Emily R. Tully
Environmental Planner

USPS FIRST-CLASS **HAND DELIVERY** **OTHER (UPS WITH TRACKING)**
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APPENDIX G2

Massachusetts Historic Commission and MBTS Historic
District Commission Correspondence

Tighe&Bond

APPENDIX H

APPENDIX H1

Chapter 91 Central St Bridge and License Application

M-14760-011-02
March 29, 2021

Massachusetts Department of Environmental Protection, Waterways Program
Dep.waterways@mass.gov
Attn: Alice Doyle, alice.doyle@state.ma.us

Re: **Transmittal #X286196 - Chapter 91 License Application**
Central Street Bridge Replacement Project
Central Pond/Sawmill Brook Restoration Project
Central Street and Elm Street, Manchester-by-the-Sea

Dear Ms. Doyle,

As previously discussed, on behalf of the Town of Manchester-by-the-Sea, please find attached a revised Chapter 91 Waterways License Application form for Transmittal No. X286196 that modifies the previous submittal for the Central Pond/Sawmill Brook Restoration Project to include the proposed Central Street Bridge Replacement Project. This project is part of a tidal restoration of Central Pond. The submittal describes the activities necessary for the replacement of the Central Street bridge, the removal of the tide gate structure in Sawmill Brook, and roadway improvements at Central Street. The proposed project qualifies as a water-dependent use pursuant to 310 CMR 9.12(2)(a)(12) as a flood, water level, or tidal control facilities (tidal gate and bridge).

The Chapter 91 Waterways License Application for the Central Pond/Sawmill Brook Restoration Project and Central Street Bridge Replacement Project is provided as Attachment A. License Plans for the Central Street Bridge Replacement Project are provided as Attachment B, and a project narrative for the Central Street Bridge Replacement Project is provided as Attachment C. Abutter information for the Central Street Bridge Replacement Project is included as Attachment D. License plans, narrative, and abutter information for the Central Pond/Sawmill Brook Restoration project, and copies of other permit applications and approvals submitted to date were previously submitted to the Waterways Program under Transmittal X286196.

We appreciate your review of the proposed project. Should you have any questions or require additional information please contact Emily Tully at (413) 875-1622 or ETully@TigheBond.com, or Rick Canavan at (508) 471-9631 or RCanavan@TigheBond.com.

Very truly yours,

TIGHE & BOND, INC.



Richard Canavan, PWS, PhD
Principal Environmental Scientist

Copy: Greg Federspiel, Town Administrator, Manchester-by-the-Sea
Sue Brown, Town Planner, Manchester-by-the-Sea
Chris Bertoni, Conservation Administrator, Town of Manchester-by-the-Sea
Town of Manchester-by-the-Sea Zoning Board
Ruthann Brien, Army Corps of Engineers, New England Division
Eric Hutchins, NOAA Restoration Center
Kathryn Glenn, MA Office of Coastal Zone Management
Georgeann Keer, Division of Ecological Restoration, Mass. Department of Fish & Game



Attachment A

Chapter 91 Waterways License Application (Transmittal X286196)
Central Pond/Sawmill Brook Restoration Project &
Central Street Bridge Replacement Project
Town of Manchester-by-the-Sea

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Waterways Regulation Program
Chapter 91 Waterways License Application - 310 CMR 9.00
Water-Dependent, Nonwater-Dependent, Amendment

X286196
Transmittal No.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



For assistance in completing this application, please see the "Instructions".

A. Application Information (Check one)

NOTE: For Chapter 91 Simplified License application form and information see the **Self Licensing Package for BRP WW06**.

Name (Complete Application Sections)	Check One	Fee	Application #
WATER-DEPENDENT -			
General (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$215.00	BRP WW01a
	<input checked="" type="checkbox"/> Other	\$330.00	BRP WW01b
	<input type="checkbox"/> Extended Term	\$3,350.00	BRP WW01c
Amendment (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$100.00	BRP WW03a
	<input type="checkbox"/> Other	\$125.00	BRP WW03b
NONWATER-DEPENDENT -			
Full (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$665.00	BRP WW15a
	<input type="checkbox"/> Other	\$2,005.00	BRP WW15b
	<input type="checkbox"/> Extended Term	\$3,350.00	BRP WW15c
Partial (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$665.00	BRP WW14a
	<input type="checkbox"/> Other	\$2,005.00	BRP WW14b
	<input type="checkbox"/> Extended Term	\$3,350.00	BRP WW14c
Municipal Harbor Plan (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$665.00	BRP WW16a
	<input type="checkbox"/> Other	\$2,005.00	BRP WW16b
	<input type="checkbox"/> Extended Term	\$3,350.00	BRP WW16c
Joint MEPA/EIR (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$665.00	BRP WW17a
	<input type="checkbox"/> Other	\$2,005.00	BRP WW17b
	<input type="checkbox"/> Extended Term	\$3,350.00	BRP WW17c
Amendment (A-H)	<input type="checkbox"/> Residential with \leq 4 units	\$530.00	BRP WW03c
	<input type="checkbox"/> Other	\$1,000.00	BRP WW03d
	<input type="checkbox"/> Extended Term	\$1,335.00	BRP WW03e

Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Waterways Regulation Program
Chapter 91 Waterways License Application - 310 CMR 9.00
 Water-Dependent, Nonwater-Dependent, Amendment

X286196
 Transmittal No.

B. Applicant Information Proposed Project/Use Information

1. Applicant:

Note: Please refer to the "Instructions"

Gregory Federspiel Name	_____	federspielg@manchester.ma.us E-mail Address	_____
10 Central Street Mailing Address	_____		
Manchester-by-the-Sea City/Town	_____	MA State	01944 Zip Code
(978) 526-2000 Telephone Number	_____	(978) 526-2001 Fax Number	_____

2. Authorized Agent (if any):

Tighe & Bond, Inc. (c/o Richard Canavan) Name	_____	RCanavan@tighebond.com E-mail Address	_____
120 Front Street, Suite 7 Mailing Address	_____		
Worcester City/Town	_____	MA State	01608 Zip Code
(508) 471-9631 Telephone Number	_____	_____ Fax Number	_____

C. Proposed Project/Use Information

1. Property Information (all information must be provided):

_____ Owner Name (if different from applicant)	_____		
N/A- Road right-of-way Tax Assessor's Map and Parcel Numbers	_____	42.575262 Latitude	-70.772963 Longitude
Central Street (Route 127) Street Address and City/Town	_____	MA State	01944 Zip Code

2. Registered Land Yes No

3. Name of the water body where the project site is located:

Sawmill Brook/Central Pond

4. Description of the water body in which the project site is located (check all that apply):

<u>Type</u>	<u>Nature</u>	<u>Designation</u>
<input type="checkbox"/> Nontidal river/stream	<input checked="" type="checkbox"/> Natural	<input type="checkbox"/> Area of Critical Environmental Concern
<input checked="" type="checkbox"/> Flowed tidelands	<input type="checkbox"/> Enlarged/dammed	<input type="checkbox"/> Designated Port Area
<input checked="" type="checkbox"/> Filled tidelands	<input type="checkbox"/> Uncertain	<input type="checkbox"/> Ocean Sanctuary
<input type="checkbox"/> Great Pond		<input type="checkbox"/> Uncertain
<input type="checkbox"/> Uncertain		

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Waterways Regulation Program
Chapter 91 Waterways License Application - 310 CMR 9.00
Water-Dependent, Nonwater-Dependent, Amendment

X286196
Transmittal No.

C. Proposed Project/Use Information (cont.)

Select use(s) from
Project Type Table
on pg. 2 of the
"Instructions"

5. Proposed Use/Activity description

The Town of Manchester-by-the Sea proposes to repair and replace failing retaining walls, construct living shoreline stabilization elements, and establish native plantings In addition, the Town proposes to replace the Central Street bridge, remove the tide gate structure in Sawmill Brook, and conduct roadway improvements at Central Street. Please refer to the attached narrative for additional details.

6. What is the estimated total cost of proposed work (including materials & labor)?

\$4,356,800

7. List the name & complete mailing address of each abutter (attach additional sheets, if necessary). An abutter is defined as the owner of land that shares a common boundary with the project site, as well as the owner of land that lies within 50' across a waterbody from the project.

Please see attached list

Name	Address

D. Project Plans

1. I have attached plans for my project in accordance with the instructions contained in (check one):

- Appendix A (License plan) Appendix B (Permit plan)

2. Other State and Local Approvals/Certifications

- 401 Water Quality Certificate
- Wetlands Date of Issuance
039-0832/039-0824
- Jurisdictional Determination File Number
JD-
- MEPA File Number
EEA #16127
- EOEa Secretary Certificate File Number
1/10/2020
- 21E Waste Site Cleanup Date
RTN Number

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E. Certification

All applicants, property owners and authorized agents must sign this page. All future application correspondence may be signed by the authorized agent alone.

"I hereby make application for a permit or license to authorize the activities I have described herein. Upon my signature, I agree to allow the duly authorized representatives of the Massachusetts Department of Environmental Protection and the Massachusetts Coastal Zone Management Program to enter upon the premises of the project site at reasonable times for the purpose of inspection."

"I hereby certify that the information submitted in this application is true and accurate to the best of my knowledge."


 Applicant's signature

March 18, 2021
 Date

Property Owner's signature (if different than applicant)

Date


 Agent's signature (if applicable)

March 29, 2021

Date

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F. Waterways Dredging Addendum

1. Provide a description of the dredging project

Maintenance Dredging (include last dredge date & permit no.) Improvement Dredging

Replacement of the existing bridge and retaining wall, removal of the tide gate, and the placement of bioengineering structures

2. What is the volume (cubic yards) of material to be dredged?

3,082

3. What method will be used to dredge?

Hydraulic Mechanical Other

4. Describe disposal method and provide disposal location (include separate disposal site location map)

The sediment will be reused onsite to the extent practicable. Any other material will be disposed of at a Massachusetts Lined or Unlined Landfill to be used as cover or grading material. Please refer to the attached narrative and site plans for additional details.

5. Provide copy of grain size analysis. If grain size is compatible for beach nourishment purposes, the Department recommends that the dredged material be used as beach nourishment for public beaches. **Note:** In the event beach nourishment is proposed for private property, pursuant to 310 CMR 9.40(4)(a)1, public access easements below the existing high water mark shall be secured by applicant and submitted to the Department.

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G. Municipal Zoning Certificate

Town of Manchester-by-the-Sea

Name of Applicant

0 Elm Street

Project street address

Sawmill Brook

Waterway

Manchester-by-the-Sea

Description of use or change in use:

This project entails the repair and replacement of failing retaining walls, construction of living shoreline stabilization elements, and establishment of native plantings to improve the stability of the shoreline of Central Pond and Sawmill Brook. It also includes the replacement of an existing roadway bridge due to structural deficiencies. The existing use of public roadway and sidewalk will be maintained. As part of the bridge replacement work, the removal of a tide gate under the bridge, and roadway and drainage improvements will be conducted.

To be completed by municipal clerk or appropriate municipal official:

"I hereby certify that the project described above and more fully detailed in the applicant's waterways license application and plans is not in violation of local zoning ordinances and bylaws."

PAUL M. ORLANDO

Printed Name of Municipal Official

3/13/2021

Date

R. M. Orlando

Signature of Municipal Official

Inspector of Buildings

Title

MANCHESTER

City/Town

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H. Municipal Planning Board Notification

Notice to Applicant:
Section H should be completed and submitted along with the original application material.

Town of Manchester-by-the-Sea
Name of Applicant
0 Elm Street
Project street address
Sawmill Brook
Waterway
Manchester-by-the-Sea

Description of use or change in use:

This project entails the repair and replacement of failing retaining walls, construction of living shoreline stabilization elements, and establishment of native plantings to improve the stability of the shoreline of Central Pond and Sawmill Brook. It also includes the replacement of an existing roadway bridge due to structural deficiencies. The existing use of public roadway and sidewalk will be maintained. As part of the bridge replacement work, the removal of a tide gate under the bridge, and roadway and drainage improvements will be conducted.

To be completed by municipal clerk or appropriate municipal official:

"I hereby certify that the project described above and more fully detailed in the applicant's waterways license application and plans have been submitted by the applicant to the municipal planning board."

Susan Brown
Printed Name of Municipal Official
3/18/2021
Date

Susan Brown
Signature of Municipal Official
Town Planner
Title
Manchester-by-the-Sea
City/Town

Note: Any comments, including but not limited to written comments, by the general public, applicant, municipality, and/or an interested party submitted after the close of the public comment period pertaining to this Application shall not be considered, and shall not constitute a basis for standing in any further appeal pursuant to 310 CMR 9.13(4) and/or 310 CMR 9.17.

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Appendix A: License Plan Checklist

General View

- PE or RLS, as deemed appropriate by the Department, stamped and signed, in ink, each sheet within 8 1/2 inch by 11 inch border
- Format and dimensions conform to "Sample Plan" (attached)
- Minimum letter size is 1/8 of an inch if freehand lettering, 1/10 of an inch if letter guides are used
- Sheet number with total number in set on each sheet
- Title sheet contains the following in lower left: Plans accompanying Petition of [Applicant's name, structures and/or fill or change in use, waterway and municipality]
- North arrow
- Scale is suitable to clearly show proposed structures and enough of shoreline, existing structures and roadways to define its exact location
- Scale is stated & shown by graphic bar scale on each sheet
- Initial plans may be printed on bond; final plans due before License issuance must be on 3mil Mylar.

Structures and Fill

- All Structures and Fill shown in full BLACK lines, clearly labeling which portions are existing, which are Proposed and indicating Existing Waterways Licenses
- Cross Section Views* show MHW* and MLW* and structure finish elevations
- Dredge or Fill*, actual cubic yardage must be stated and typical cross sections shown
- All Structures and Fill shown in full BLACK lines, clearly labeling which portions are existing, which are Proposed and indicating Existing Waterways Licenses
- Cross Section Views* show MHW* and MLW* and structure finish elevations
- Dredge or Fill*, actual cubic yardage must be stated and typical cross sections shown
- Actual dimensions of structures(s) and or fill and the distance which they extend beyond MHW* or OHW*
- Change in Use of any structures on site must be stated

* See 310 CMR 9.02, Waterways Regulations definitions of High Water Mark, Historic High Water Mark, Historic Low Water Mark, and Low Water Mark. *Note:* DEP may, at its discretion, accept appropriately scaled preliminary plans in lieu of the plans described above. In general, DEP will

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accept preliminary plans only for non-water dependent projects and projects covered by MEPA to address site design components such as visual access, landscaping & site coverage. *Anyone wishing to submit preliminary plans must obtain prior approval of the DEP Waterways Program before submitting them with their application.*

Appendix A: License Plan Checklist (cont.)

Boundaries

- Property lines, full black lines, _____, along with abutters' names and addresses
- Mean High Water (MHW)* or Ordinary High Water (OHW)*, full black line _____
- Mean Low Water (MLW)*, black dotted line, (.....)
- Historic MHW* or OHW* (— — — —)
- Historic MLW* (...__...__...__)
- State Harbor Lines, black dot-dash line (- . - . - .) with indication of Chapter & Act establishing them (Ch. , Acts of)
- Reference datum is National Geodetic Vertical Datum (NGVD) or (NAVD).
- Floodplain Boundaries according to most recent FEMA maps
- Proposed & Existing Easements described in metes & bounds

Water-Dependent Structures

- Distance from adjacent piers, ramps or floats (minimum distance of 25' from property line, where feasible)
- Distance from nearest opposite shoreline
- Distance from outside edge of any Navigable Channel
- Access stairs at MHW for lateral public passage, or 5 feet of clearance under structure at MHW.

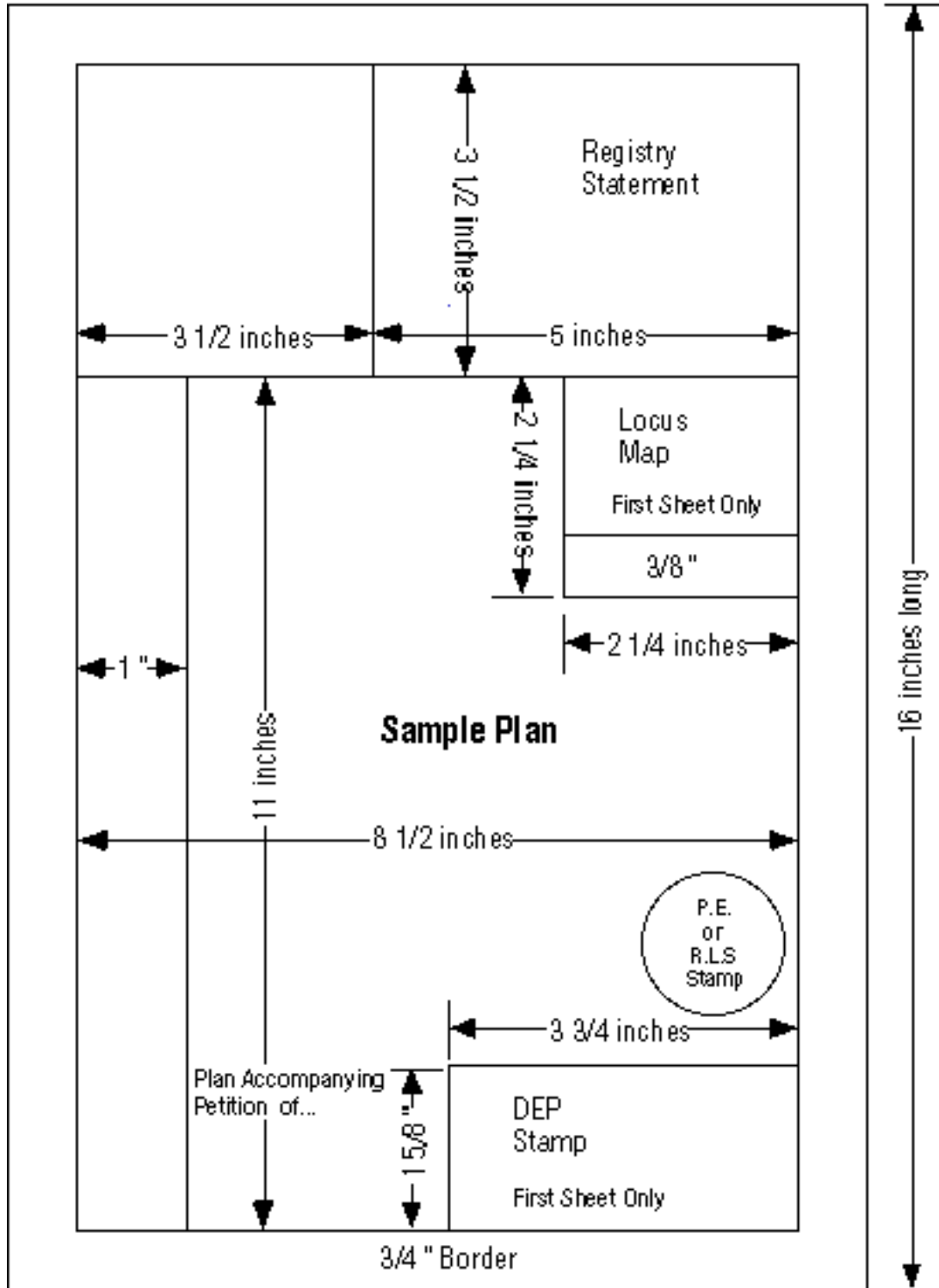
Non Water-Dependent Structures

- Depict extent of "Water-dependent Use Zone".

See Waterways Regulations at 310 CMR 9.51-9.53 for additional standards for non water-dependent use projects.

Note: Final Mylar project site plans will be required upon notice from the Department, prior to issuance of the Chapter 91 Waterways License.

Appendix A: License Plan Checklist Cont.



Appendix B: Dredging Permit Plan Checklist

For projects applying for dredging permits only, enclose drawings with the General Waterways Application that include the following information:

General View

- Submit one original of all drawings. Submit the fewest number of sheets necessary to adequately illustrate the project on 8-1/2 inch X 11 inch paper.
- A 1-inch margin should be left at the top edge of each drawing for purposes of reproduction and binding. A 1/2 inch margin is required in the three other edges.
- A complete title block on each drawing submitted should identify the project and contain: the name of the waterway; name of the applicant; number of the sheet and total number of sheets in the set; and the date the drawing was prepared.
- Use only dot shading, hatching, and dashed or dotted line to show or indicate particular features of the site on the drawings.
- If deemed appropriate by the Department, certification by the Registered Professional Engineer or Land Surveyor is included.

Plan View

- North Arrow
- Locus Map
- Standard engineering scale.
- Distances from channel lines and structures if appropriate.
- Mean high water and mean low water shorelines (see definitions of "High Water Mark" and "Low Water Mark" at 310 CMR 9.02, C. 91 Regulations).
- Dimensions of area proposed to be dredged or excavated.
- Notation or indication of disposal site.
- Volume of proposed dredging or excavation.
- Ordinary high water, proposed drawdown level, and natural (historic) high water (for projects lowering waters of Great Ponds).

Section Views

- Existing bottom and bank profiles.
- Vertical and/or horizontal scales.

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- Proposed and existing depths relative to an indicated datum.
- Elevation and details of control structure (for projects lowering waters of Great Ponds).

Appendix C: Application Completeness Checklist

Please answer all questions in the General Waterways Application form. If a question does not apply to your project write "not applicable" (n/a) in that block. Please print or type all information provided on the form. Use black ink (blue ink or pencil are not easily reproducible, therefore, neither will be accepted). If additional space is needed, attach extra 8-1/2" x 11" sheets of paper.

- Proper Public Purpose:** For nonwater-dependent projects, a statement must be included that explains how the project serves a proper public purpose that provides greater benefit than detriment to public rights in tidelands or great ponds and the manner in which the project meets the applicable standards. If the project is a nonwater-dependent project located in the coastal zone, the statement should explain how the project complies with the standard governing consistency of the policies of the Massachusetts Coastal Zone Management Program, according to 310 CMR 9.54. If the project is located in an area covered by a Municipal Harbor Plan, the statement should describe how the project conforms to any applicable provisions of such plan pursuant to 310 CMR 9.34(2).
- Plans:** Prepared in accordance with the applicable instructions contained in Appendix A-B of this application. For initial filing, meet the requirements of 310 CMR 9.11(3)(b)(3).
- Applicant Certification:** All applications must be signed by "the landowner if other than the applicant. In lieu of the landowner's signature, the applicant may provide other evidence of legal authority to submit an application for the project site." If the project is entirely on land owned by the Commonwealth (e.g. most areas below the current low water mark in tidelands and below the historic high water mark of Great Ponds), you may simply state this in lieu of the "landowner's signature".
- Municipal Zoning Certification:** If required, applicants must submit a completed and signed Section E of this application by the municipal clerk or appropriate municipal official or, for the initial filing, an explanation of why the form is not included with the initial application. If the project is a public service project subject to zoning but will not require any municipal approvals, submit a certification to that effect pursuant to 310 CMR 9.34(1).
- Municipal Planning Board Notification:** Applicants must submit a copy of this application to the municipal planning board for the municipality where the project is located. Submittal of the complete application to DEP must include Section H signed by the municipal clerk, or appropriate municipal official for the town where the work is to be performed, except in the case of a proposed bridge, dam, or similar structure across a river, cove, or inlet, in which case it must be certified by every municipality into which the tidewater of said river, cove, or inlet extends.
- Final Order of Conditions:** A copy of one of the following three documents is required with the filing of a General Waterways Application: (1) the Final Order of Conditions (with accompanying plan) under the Wetlands Protection Act; (2) a final Determination of Applicability under that Act stating that an Order of Conditions is not required for the project; or (3) the Notice of Intent for the initial filing (if the project does not trigger review under MEPA).
- Massachusetts Environmental Protection Act (MEPA):** MGL 30, subsections 61-61A and 301 CMR 11.00, submit as appropriate: a copy of the Environmental Notification Form (ENF) and a Certificate of the Secretary of Environmental Affairs thereon, or a copy of the final Environmental Impact Report (EIR) and Certificate of the Secretary stating that it adequately and properly complies with MEPA; and any subsequent Notice of Project change and any determination issued thereon in accordance with MEPA. For the initial filing, only a copy of the ENF and the Certificate

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of the Secretary thereon must be submitted.

Note: If the project is subject to MEPA, the Chapter 91 Public Notice must also be submitted to MEPA for publication in the "Environmental Monitor". MEPA filing deadlines are the 15th and 30th of each month.

Appendix C: Application Completeness Checklist (cont.)

- Water Quality Certificate:** if applicable, pursuant to 310 CMR 9.33, is included.
- Other Approvals:** as applicable pursuant to 310 CMR 9.33 or, for the initial filing, a list of such approvals which must be obtained.

Projects involving dredging:

- The term "dredging" means the removal of materials including, but not limited to, rocks, bottom sediments, debris, sand, refuse, plant or animal matter, in any excavating, clearing, deepening, widening or lengthening, either permanently or temporarily, of any flowed tidelands, rivers, streams, ponds or other waters of the Commonwealth. Dredging includes improvement dredging, maintenance dredging, excavating and backfilling or other dredging and subsequent refilling. Included is a completed and signed copy of Part F of the application.

Filing your Completed General Waterways Application:

- For all Water-Dependent applications** – submit a completed General Waterways Application and all required documentation with a *photocopy* of both payment check and DEP's *Transmittal Form for Permit Application & Payment* to the appropriate DEP Boston or regional office (please refer to Pg. 10 of the "Instructions" for the addresses of DEP Regional Offices).
- For all Non Water-Dependent applications** – submit a completed General Waterways Application and all required documentation with a *photocopy* of both payment check and DEP's *Transmittal Form for Permit Application & Payment* to DEP's Boston office.

Department of Environmental Protection
 Waterways Regulation Program
 One Winter Street
 Boston, MA 02108

- Application Fee Payment for ALL Waterways Applications:** Send the appropriate Application fee* (please refer to Page 1 of the "Application"), in the form of a check or money order, along with DEP's *Transmittal Form for Permit Application & Payment*.

Department of Environmental Protection
 P.O. Box 4062
 Boston, MA 02211

* Under extreme circumstances, DEP grants extended time periods for payment of license and permit application fees. If you qualify, check the box entitled "Hardship Request" on the *Transmittal Form for Permit Application & Payment*. See 310 CMR 4.04(3)(c) to identify

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procedures for making a hardship request. Send hardship request and supporting documentation to the above address.

NOTE: You may be subject to a **double application fee** if your application for Chapter 91 authorization results from an enforcement action by the Department or another agency of the Commonwealth or its subdivisions, or if your application seeks authorization for an existing unauthorized structure or use.

Attachment B

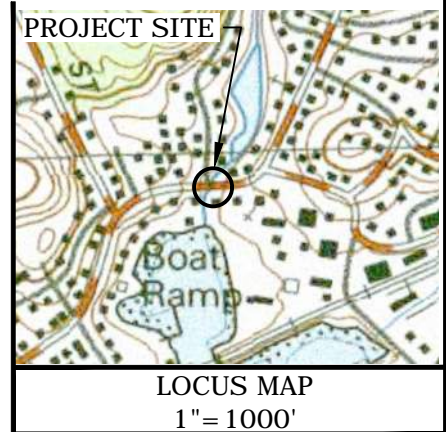
Chapter 91 License Plans
Central Street Bridge Replacement Project
Town of Manchester-by-the-Sea

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

DATE

PROFESSIONAL ENGINEER

**TOWN OF
MANCHESTER-BY-THE-SEA
CENTRAL STREET BRIDGE
REPLACEMENT
MANCHESTER-BY-THE-SEA, MASSACHUSETTS**



LIST OF DRAWINGS

SHEET NO.	SHEET TITLE
1	COVER SHEET
2	KEY PLAN
3	PROFILE - CENTRAL STREET
4	PROFILE - SAWMILL BROOK
5	GENERAL BRIDGE PLAN
6	ELEVATION (LOOKING NORTH)
7	SOUTHWEST WINGWALL
8	TYPICAL CAST-IN-PLACE ABUTMENT SECTION
9	ELEVATION - UPSTREAM COFFERDAM AND DOWNSTREAM COFFERDAM
10	COMPOST FILTER TUBE DETAIL
11	SEDIMENT TRAP AND DEWATERING DETAIL
12	COFFERDAMS, PUMPING, DEWATERING, AND STREAM BYPASS NOTES
13	SQUARE BRIDGE SECTION AT BL CONSTRUCTION (LOOKING NORTH)
14	TRANSVERSE SQUARE BRIDGE SECTION

Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT
MANCHESTER-BY-THE-SEA, MASSACHUSETTS

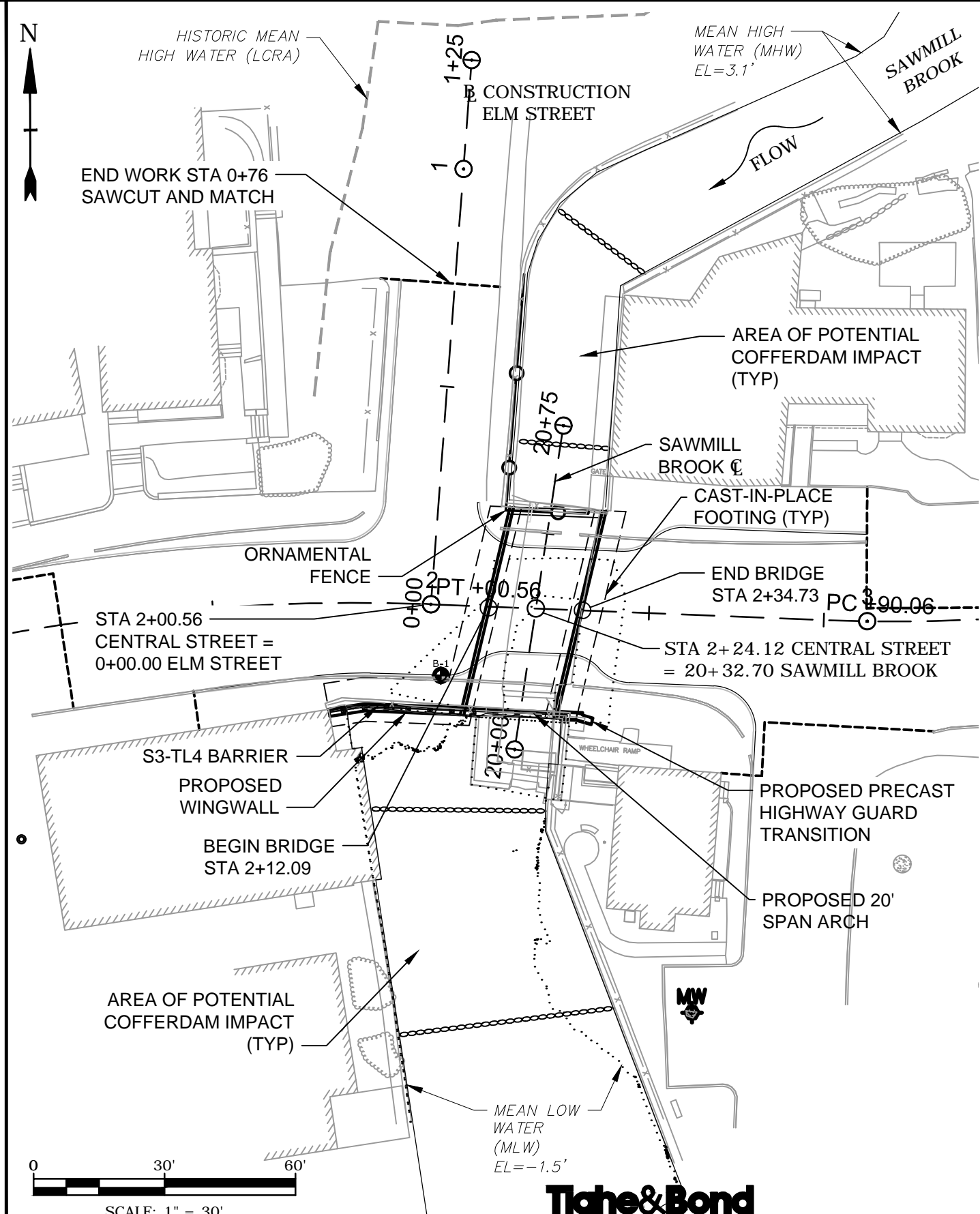
DATE: 3/26/21
SHEET 1 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

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KEY PLAN

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

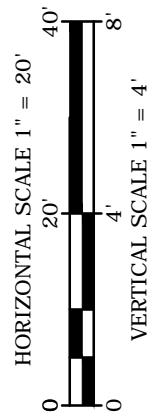
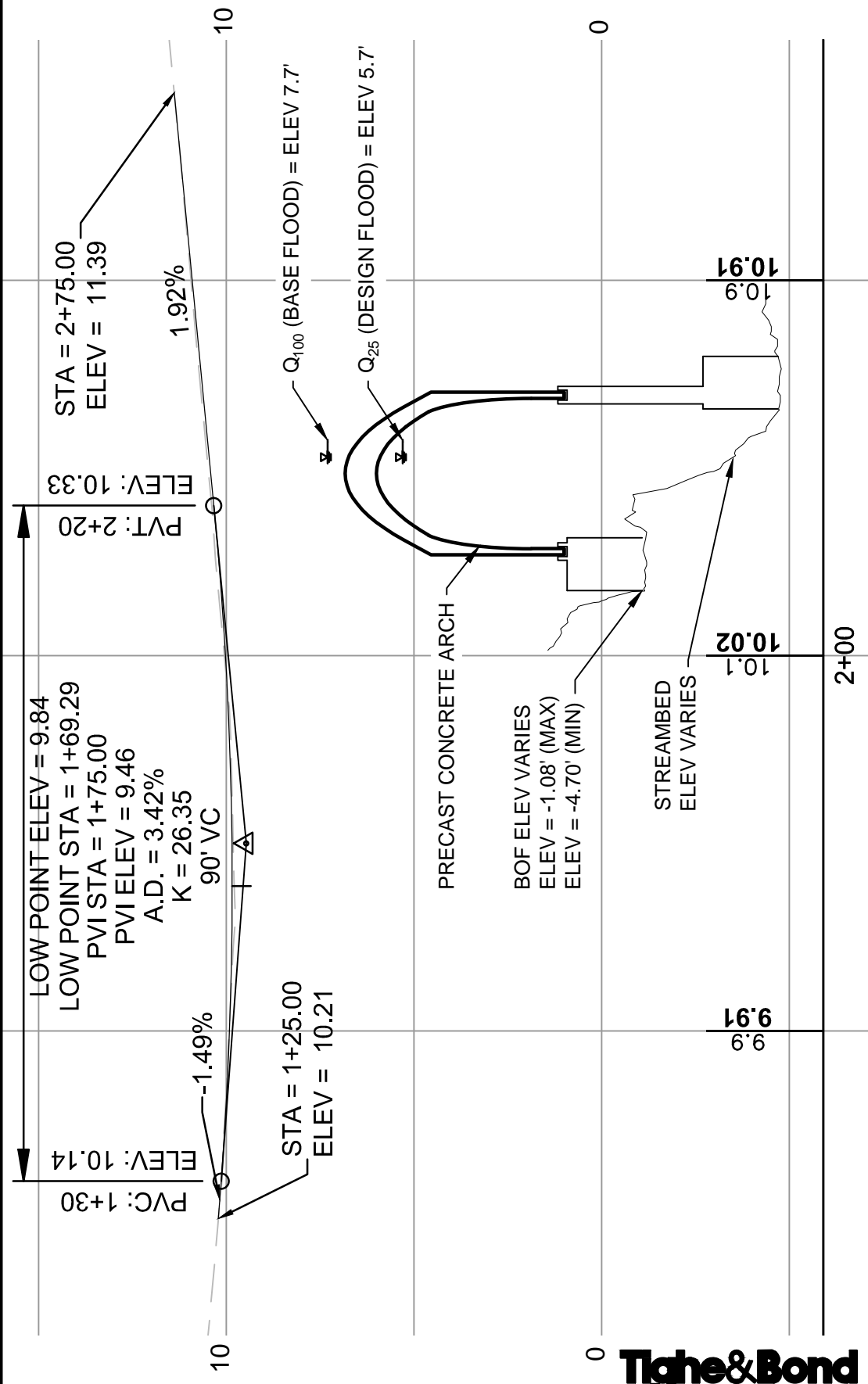
PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

DATE: 3/26/21
SHEET 2 OF 14

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

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PROFILE - CENTRAL STREET

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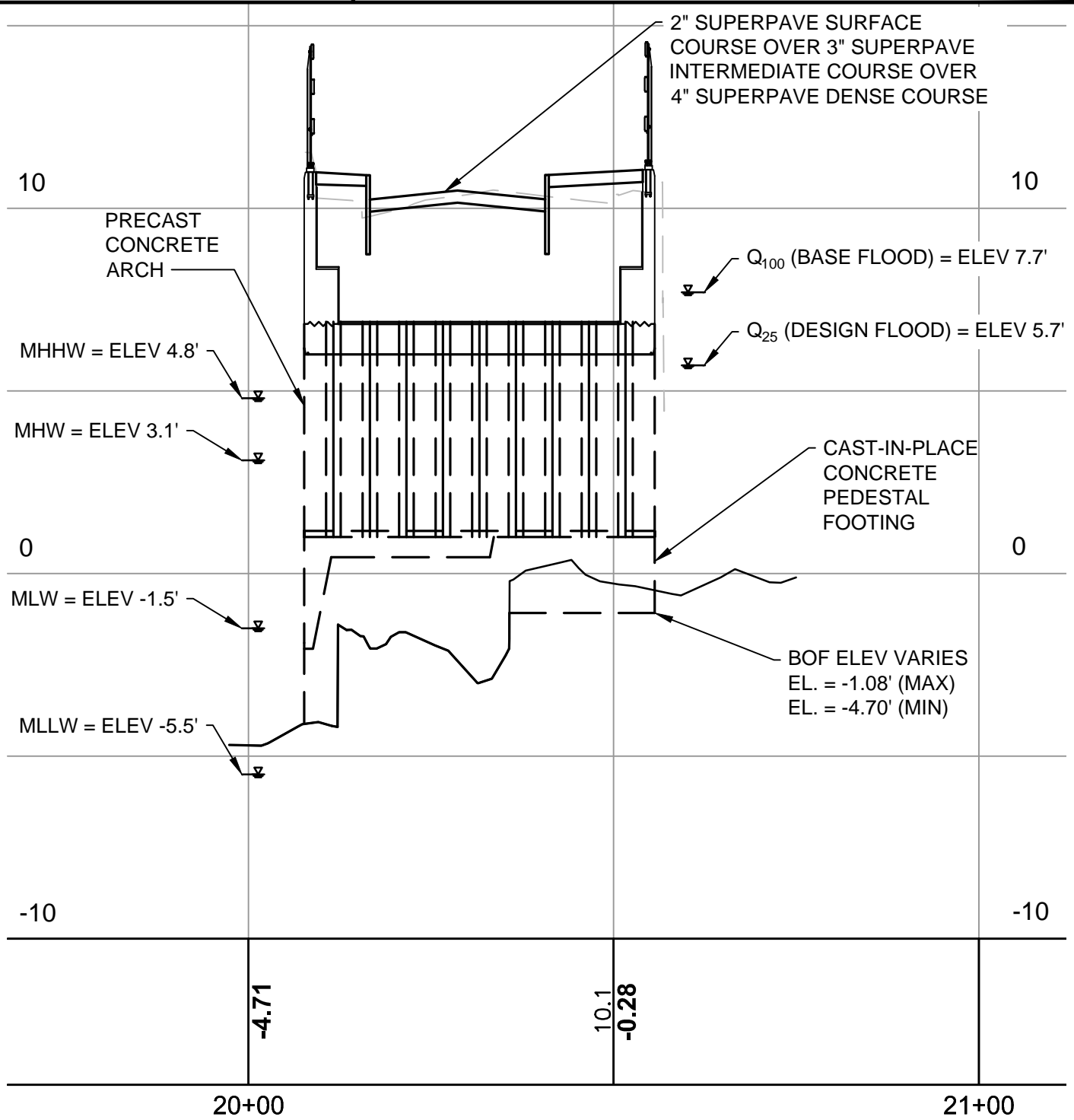
DATE: 3/26/21
SHEET 3 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

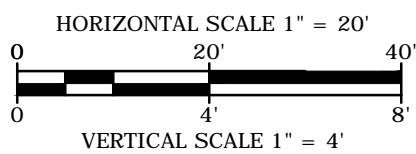
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PROFILE - SAWMILL BROOK

SCALE: 1" = 20'H, 1" = 4'V



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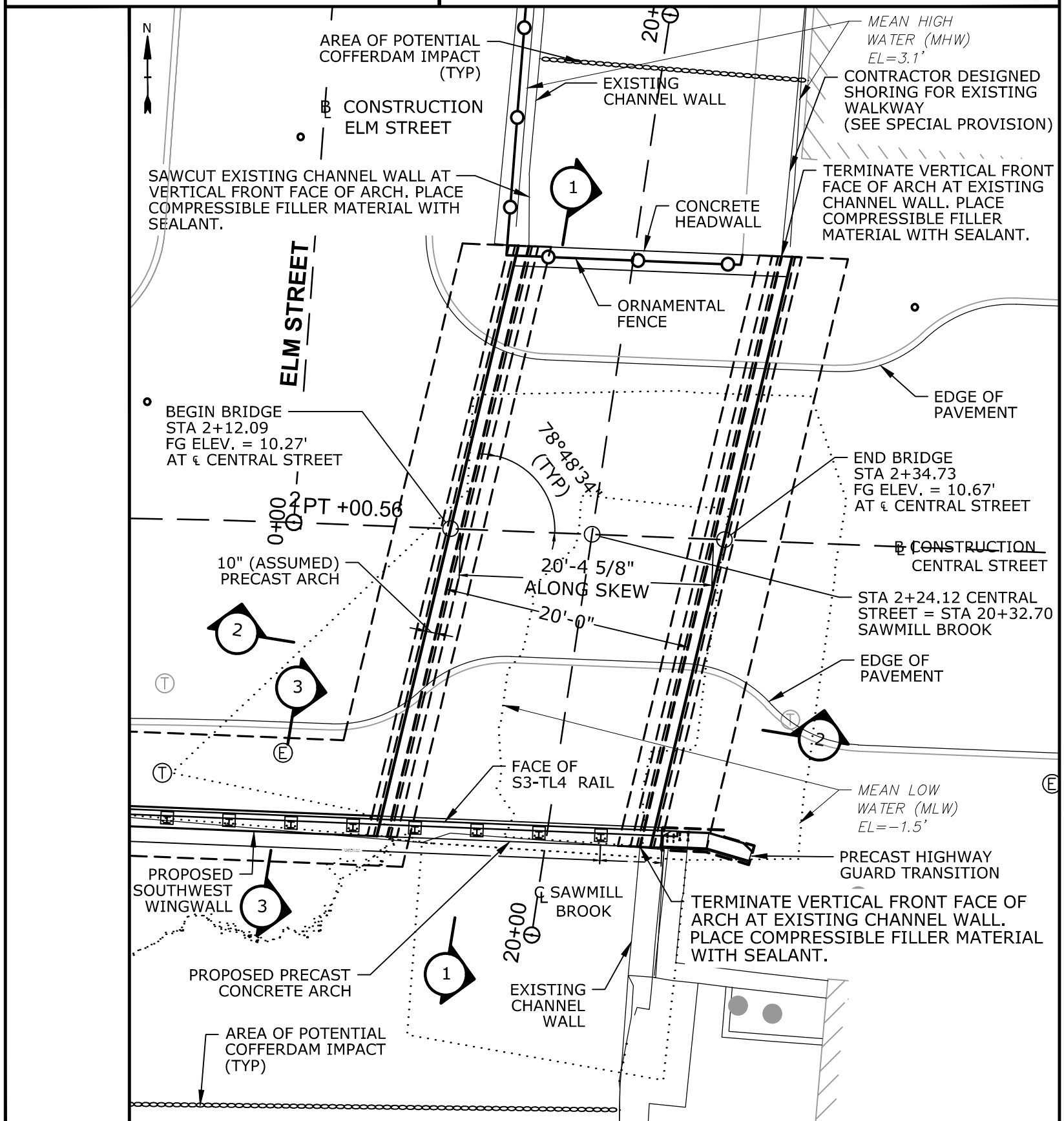
DATE: 3/26/21
 SHEET 4 OF 14

PROJECT DATUM:
 HORIZONTAL-NAD83
 VERTICAL-NAVD88

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

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GENERAL BRIDGE PLAN

1" = 10'

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT
MANCHESTER-BY-THE-SEA, MASSACHUSETTS

DATE: 3/26/21
SHEET 5 OF 14

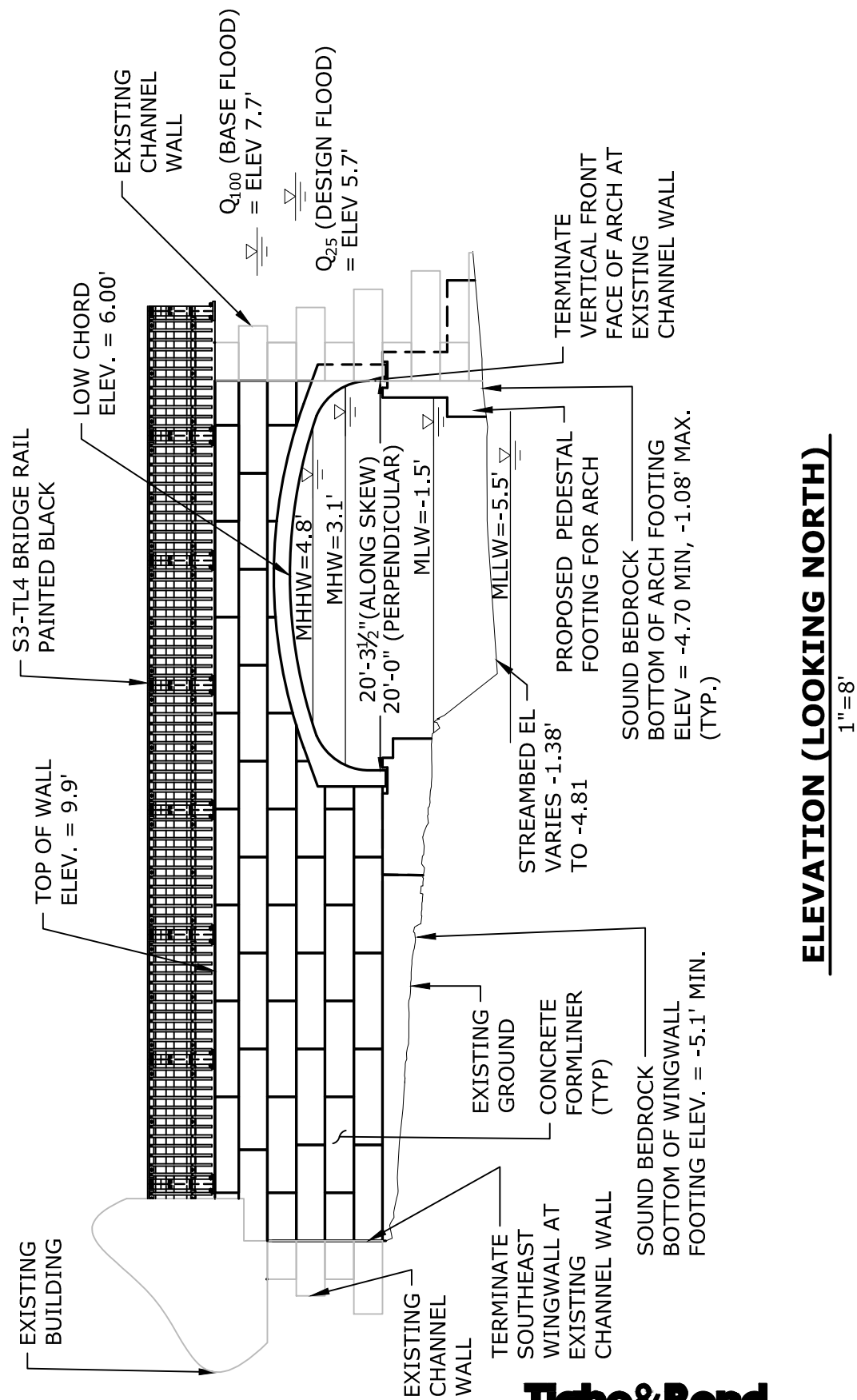
PROJECT DATUM:
HORIZONTAL-NAD83
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Tighe & Bond

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PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

DATE: 3/26/21
SHEET 6 OF 14

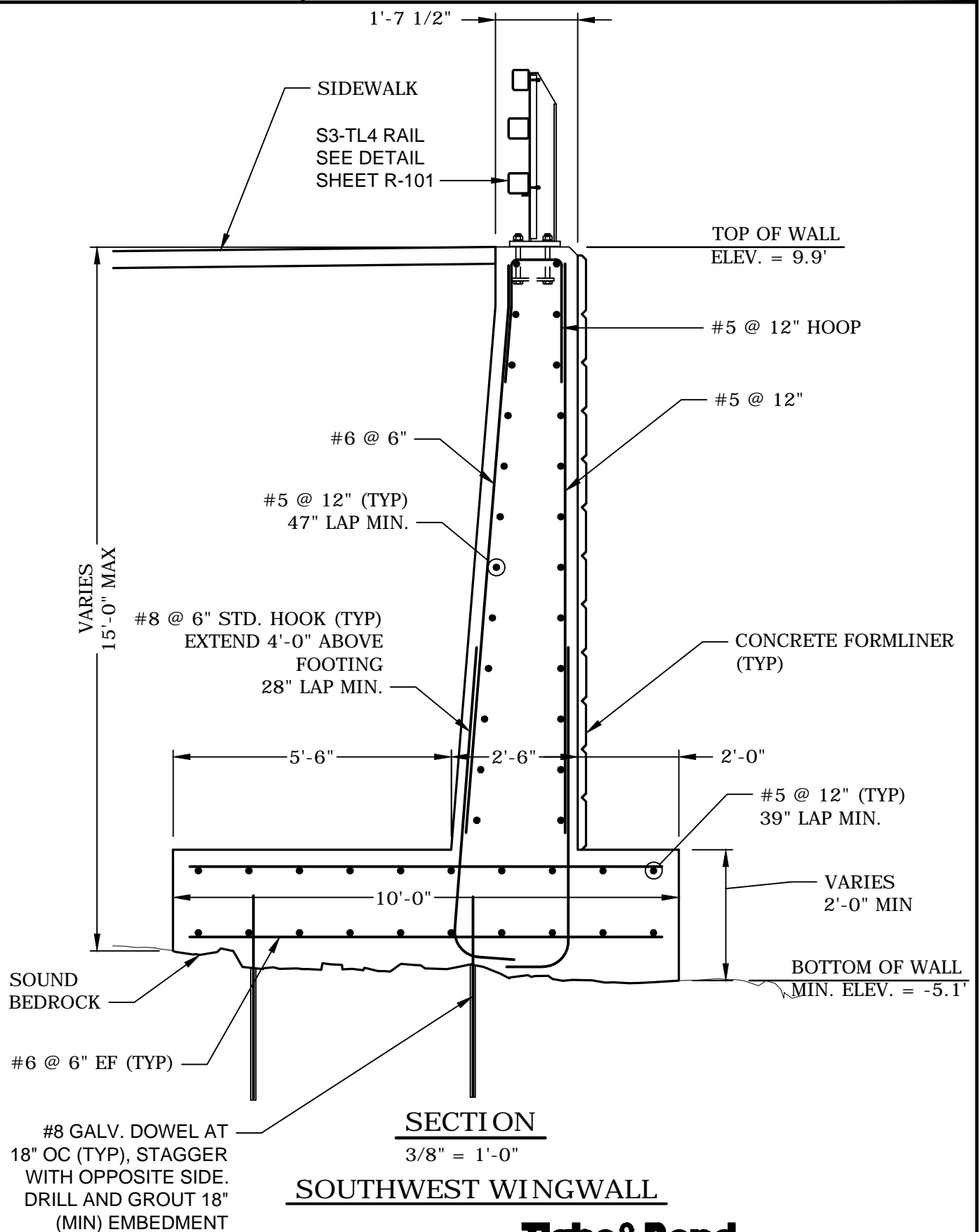
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Tighe & Bond

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PROFESSIONAL ENGINEER



PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

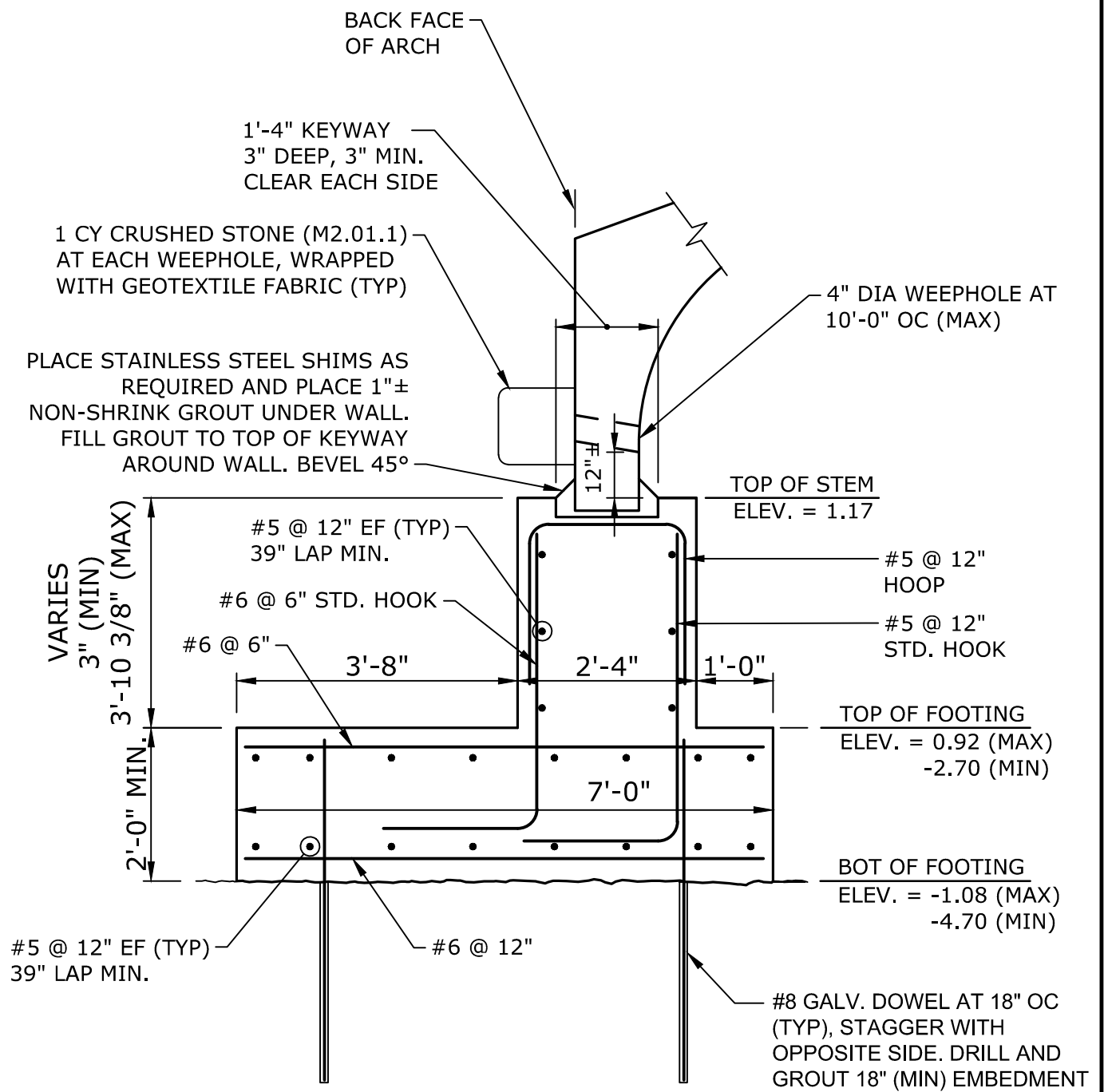
DATE: 3/26/21
SHEET 7 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

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DATE

PROFESSIONAL ENGINEER



SECTION

1/2" = 1'-0"

TYPICAL CAST-IN-PLACE ABUTMENT SECTION

Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE
TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT
OF PUBLIC WORKS FOR THE CENTRAL STREET
BRIDGE REPLACEMENT
MANCHESTER-BY-THE-SEA, MASSACHUSETTS

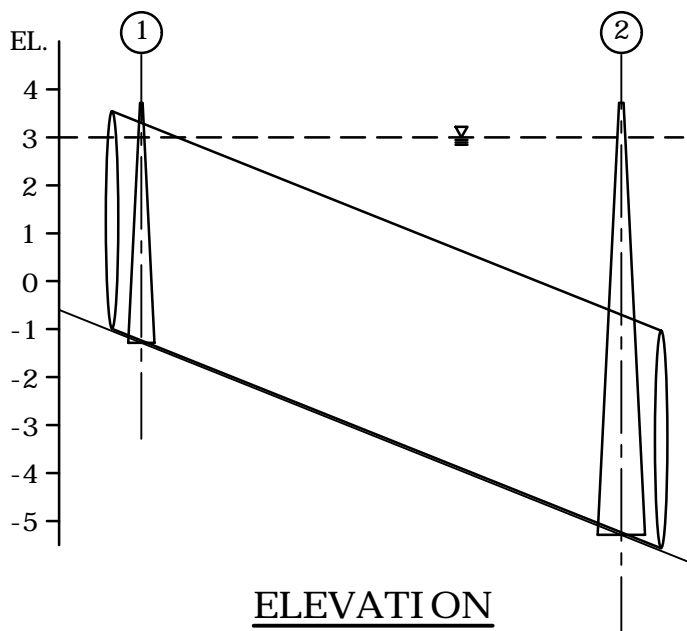
DATE: 3/26/21
SHEET 8 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

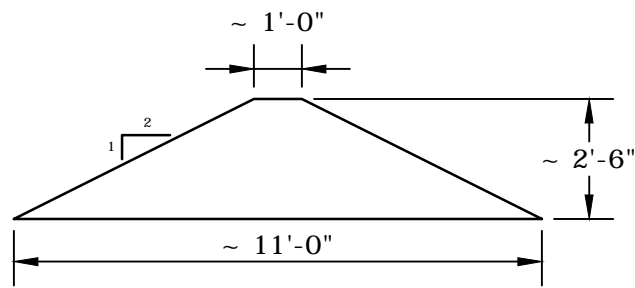
I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

DATE

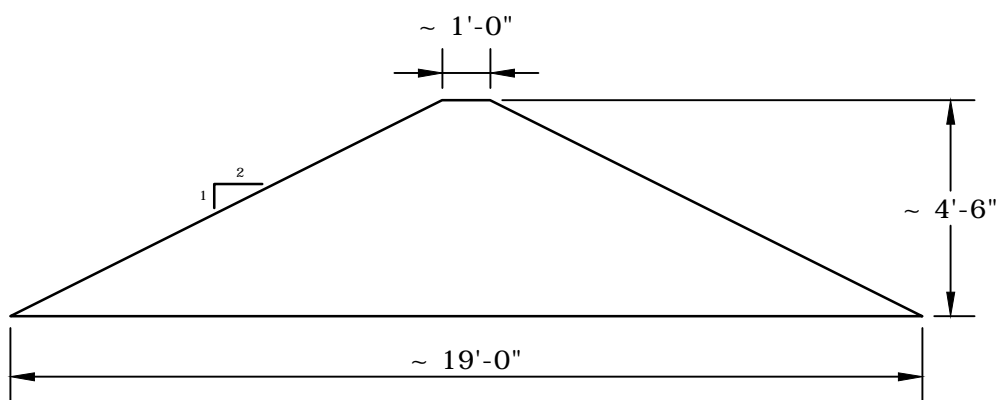
PROFESSIONAL ENGINEER



ELEVATION
NO SCALE



SECTION 1: UPSTREAM COFFERDAM
NO SCALE



SECTION 2: DOWNSTREAM COFFERDAM
NO SCALE

Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE
TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT
OF PUBLIC WORKS FOR THE CENTRAL STREET
BRIDGE REPLACEMENT
MANCHESTER-BY-THE-SEA, MASSACHUSETTS

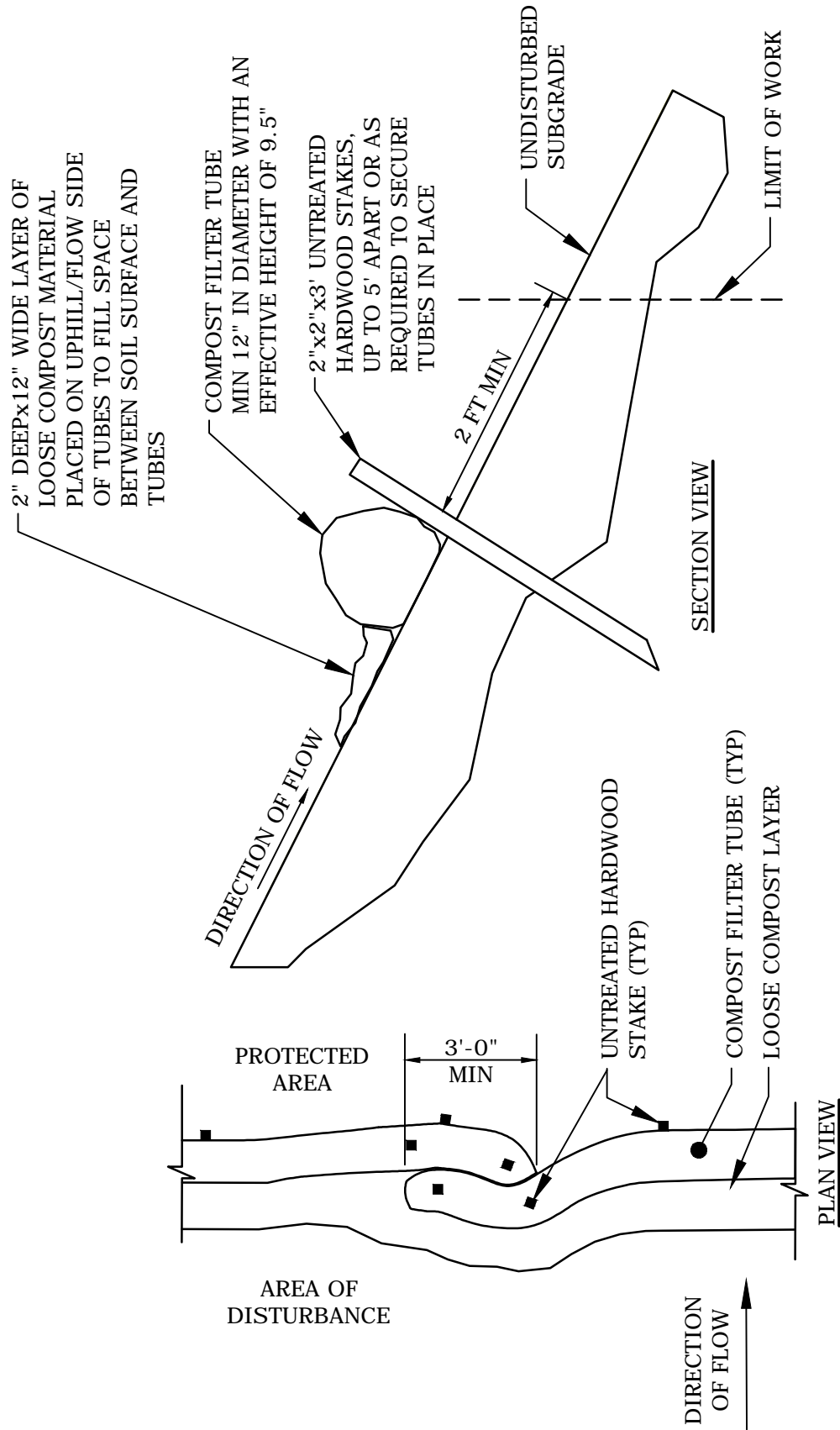
DATE: 3/26/21
SHEET 9 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

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DATE

PROFESSIONAL ENGINEER



COMPOST FILTER TUBE

NO SCALE



PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

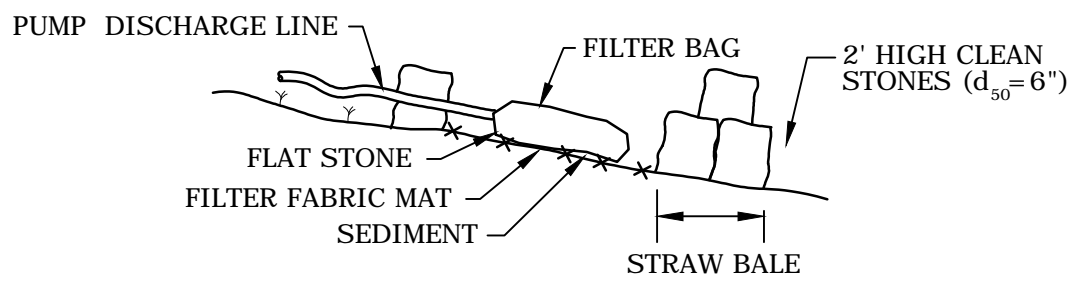
DATE: 3/26/21
SHEET 10 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

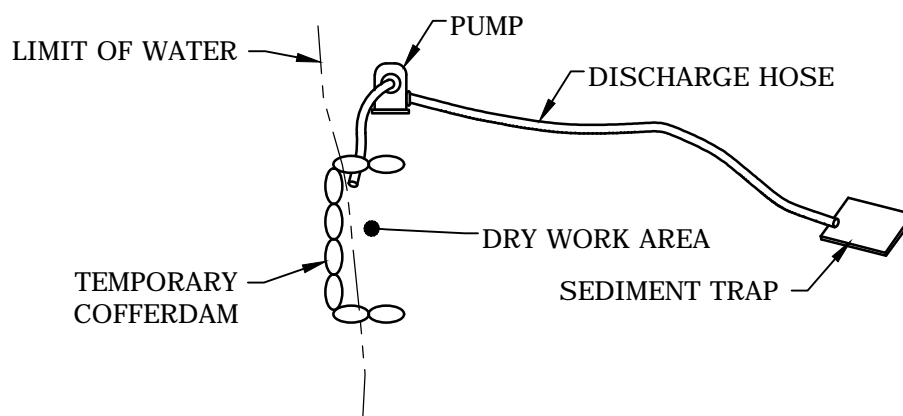
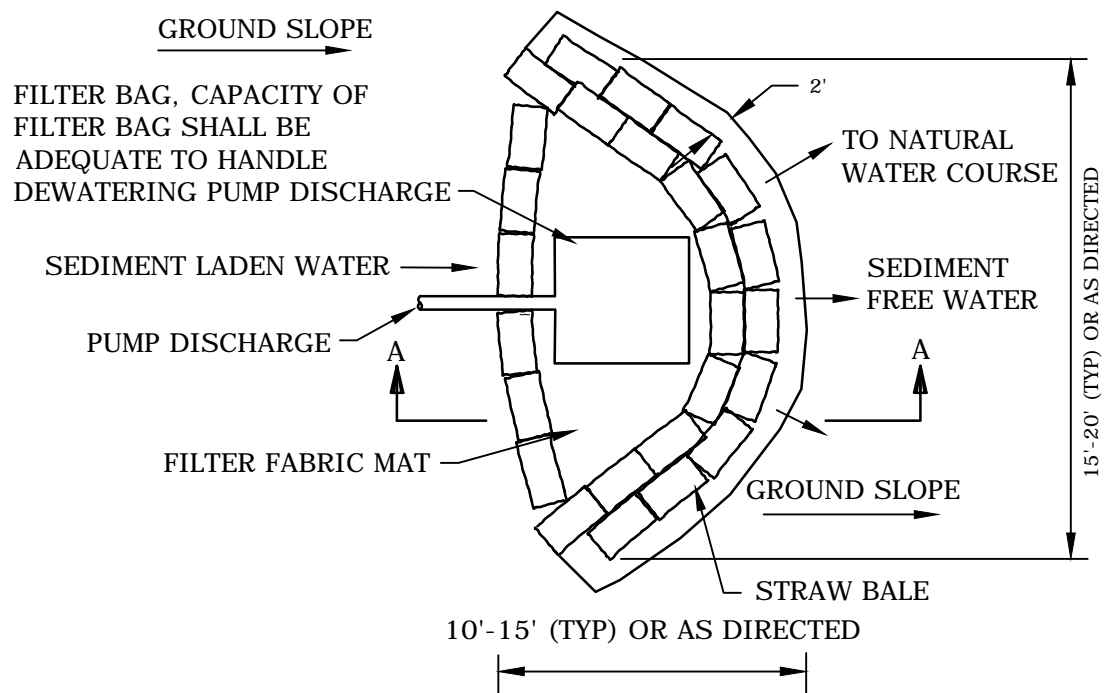
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DATE

PROFESSIONAL ENGINEER



SECTION A-A



SEDIMENT TRAP AND DEWATERING

NO SCALE

Tighe&Bond

NOTES:

1. DEWATERING EQUIPMENT SHALL REMAIN WITHIN THE PERMANENTLY IMPACTED AREAS AND SHALL DISCHARGE OUTSIDE OF THE WETLAND BOUNDARY.
2. DISCHARGE HOSE SHALL NOT CROSS THE STREAM AT ANY LOCATION.

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

DATE: 3/26/21
SHEET 11 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

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DATE

PROFESSIONAL ENGINEER

COFFERDAMS, PUMPING, DEWATERING, AND STREAM BYPASS NOTES:

1. THE DETAILS SHOWN ON SHEETS 9, 10, AND 11 ARE AN EXAMPLE OF ACCEPTABLE METHODS TO USE DURING CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND SUBMITTING A COFFERDAM PLAN, PUMPING AND DEWATERING PLAN FOR REVIEW AND APPROVAL BY THE CONTRACTING AGENCY OR ENGINEER. THE PLAN SHALL INCLUDE SUFFICIENT DETAIL OF MEANS AND METHODS TO SATISFY THE PROJECT SPECIFICATIONS AND PERMIT REQUIREMENTS. IF APPROVED, OTHER METHODS MAY BE USED SUCH AS UTILIZING INFLATABLE BLADDERS, PLATES, OR BARRIERS OF VARIOUS MATERIALS. COFFERDAMS SHALL INCLUDE PLASTIC LINER OR FINE MESH SILT FENCE TO REDUCE TURBIDITY AND FINES FROM ENTERING THE FREE FLOWING PORTION OF LIVE WATER.
2. THE CONTRACTING AGENCY IS RESPONSIBLE FOR MEASURING TURBIDITY HOWEVER THE CONTRACTOR SHALL ADHERE TO THE SPECIAL PROCEDURES REGARDING IN-STREAM WORK, TURBIDITY, AND DEWATERING IN THE DESIGN DRAWINGS.
3. CONSERVATION MEASURES ARE SUMMARIZED IN THE PLANS AND SHALL BE STRICTLY ADHERED TO.
4. THE CONTRACTOR SHALL NOTIFY THE OWNER AND CONTRACTING OFFICER AT LEAST 5 DAYS BEFORE EACH COFFERDAM INSTALLATION DATE. ANTICIPATED COFFERDAM LOCATIONS ARE SHOWN IN THE PLANS.
5. FILL MATERIAL FOR BULK BAGS FOR "SUPER SACKS", IF USED, SHALL BE CLEAN, WASHED, AND ROUNDED MATERIAL MEETING STANDARD SPECIFICATIONS FOR DRAIN ROCK, STREAMBED AGGREGATES, STREAMBED SEDIMENTS, OR STREAMBED COBBLES. MATERIAL USED TO FILL BULK BAGS SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PERMITS. IF PERMITS ALLOW, MATERIAL MAY BE DISPOSED OF IN UPLAND AREAS AS DIRECTED BY THE CONTRACTING OFFICER.
6. DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
7. EXCAVATIONS ASSOCIATED WITH CHANNEL, FLOODPLAIN, AND STRUCTURES SHALL BE DEWATERED.
8. WATER SHALL BE PUMPED AND DISCHARGED AWAY FROM THE WORK AREAS TO SEDIMENT TRAPS.
9. DEWATERING PUMP DISCHARGE FROM WITHIN COFFERDAM WORK AREAS SHALL BE RELEASED INTO SEDIMENT TRAPS AWAY FROM WETLANDS AND CONSTRUCTION ACTIVITIES. DISCHARGE SHALL BE COMPLETELY INFILTRATED PRIOR TO REACHING WETLANDS OR SURFACE WATERS UNLESS APPROVED BY THE CONTRACTING OFFICER. ALL RETURN FLOWS MUST MEET PERMIT REQUIREMENTS FOR TURBIDITY.
10. ALL PUMP INTAKES SHALL BE SCREENED FOR FISH PROTECTION AS REQUIRED BY NOAA.
11. ALL EARTHWORK ACTIVITIES AND STRUCTURE CONSTRUCTION WITHIN THE ORDINARY HIGH WATER CHANNEL SHALL CONFORM TO THE WATER QUALITY STANDARDS ESTABLISHED BY REGULATORY AGENCY PERMITS FOR THIS PROJECT.

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PLANS ACCOMPANYING PETITION OF THE
TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT
OF PUBLIC WORKS FOR THE CENTRAL STREET
BRIDGE REPLACEMENT
MANCHESTER-BY-THE-SEA, MASSACHUSETTS

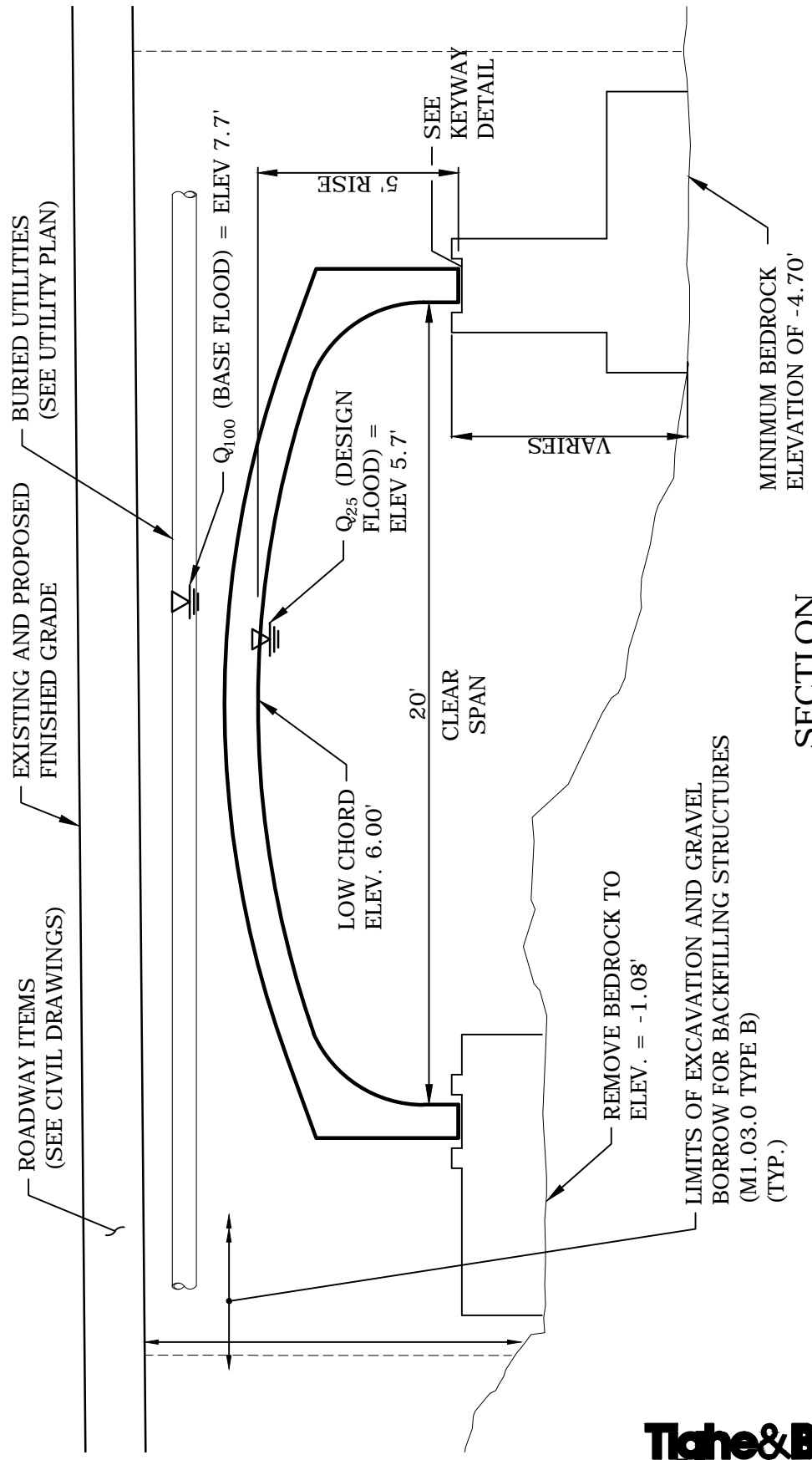
DATE: 3/26/21
SHEET 12 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

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DATE

PROFESSIONAL ENGINEER



SECTION
1"=4'

SQUARE BRIDGE SECTION AT BL CONSTRUCTION (LOOKING NORTH)

NOTE:

- SECTION REFLECTS MAXIMUM AND MINIMUM ANTICIPATED BEDROCK ELEVATIONS. CONTRACTOR TO EVALUATE FIELD CONDITIONS AFTER DEMOLITION OF EXISTING BRIDGE AND REPORT TO ENGINEER PRIOR TO CASTING OF ARCH FOOTINGS.



PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

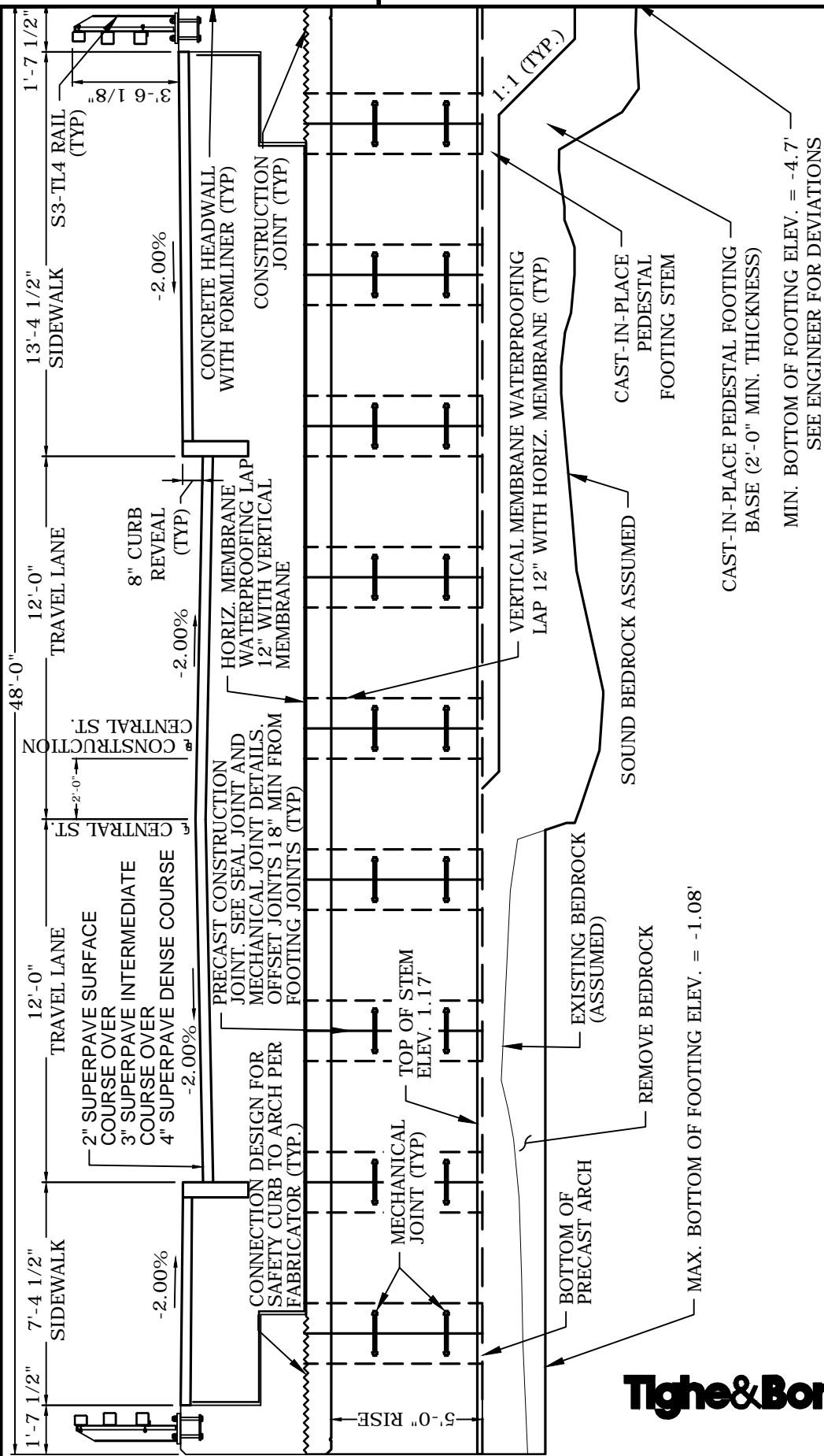
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SHEET 13 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
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PROFESSIONAL ENGINEER



SECTION
1" = 5'

TRANSVERSE SQUARE BRIDGE SECTION

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT MANCHESTER-BY-THE-SEA, MASSACHUSETTS

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

DATE: 3/26/21
SHEET 14 OF 14

Attachment C

Chapter 91 License Application Narrative
Central Street Bridge Replacement Project
Town of Manchester-by-the-Sea



Central Street Bridge Replacement Project
Central Street, Manchester-by-the-Sea

Chapter 91 License

Town of Manchester-by-the-Sea
10 Central Street
Manchester-by-the-Sea, Massachusetts

March 2021

Tighe&Bond

Introduction

This Chapter 91 License Application is being submitted on behalf of the Town of Manchester-by-the-Sea for the replacement of the Central Street Bridge (a water-dependent structure) and the removal of the existing tide gate structure at the downstream face of the bridge on Sawmill Brook in Manchester-by-the-Sea, Massachusetts (the site). The bridge replacement includes roadway improvements at Central Street, including new ADA compliant sidewalks and curb ramps to enhance the walkability and accessibility of downtown Manchester-by-the-Sea. The goal of this project is to replace the existing bridge which is in poor condition with deficiencies that should be addressed as soon as possible. The bridge replacement project will include the removal of the tide gate structure which will restore the tidal flushing to Sawmill Brook and Central Pond. An ecological restoration project is proposed in these areas to occur in coordination with the tide gate removal.

The project area is located at (42.575262, -70.772963), east of the Elm Street and Central Street (Route 127) intersection. This project will require work within flowed tidelands (Sawmill Brook) and within filled tidelands adjacent to Sawmill Brook, areas subject to Chapter 91 Tidelands Jurisdiction. A project history as well as the proposed activities and project site are described in detail in the following sections.

Background, Purpose, & Need

The Town of Manchester-by-the-Sea is a vibrant coastal community with an abundance of natural coastal resources, a stable population, and thriving year-round and seasonal businesses. Flooding events have severely impacted these assets in the past, including economic loss from businesses closed due to floods and disrupted utilities, flood related safety concerns due to impassable roadways and restrained access for emergency vehicles, inoperable wastewater and stormwater systems, and environmental concerns due to loss of habitat from tidal restrictions and erosion by flood waters.

Flooding is a particular problem within the Sawmill Brook watershed. Flood events during extreme storm events are due to the combination of storm surge, hydraulic restrictions from undersized culverts and the tide gate, stormwater runoff from impervious areas, the channelized stream system in the lower portion of the watershed, and poor infiltration conditions. Flooding is most intense in the lower reaches of the Brook. There, undersized culverts and an improperly functioning tide gate have caused stream banks to overtop, leading to stream bank erosion.

The bridge is in poor condition with deficiencies that should be addressed as soon as possible based on a 2016 MassDOT bridge inspection report. That inspection notes several deficiencies including:

- The arch is missing granite keystones along the northern portion of the bridge and a majority of the arch has concrete patches throughout
- The northern headwall is covered with concrete patching and efflorescence over a majority of its surface
- The headwall also has areas of spalling with exposed reinforcement
- Moderate cracking is evident throughout the roadway surface, which suggests loss of fill material around the structure

Previous site investigations revealed significant water seepage through joints between stones in the adjacent stone wingwall, indicating significant loss of fill material around the bridge and behind the wingwall. The seepage is believed to be made worse by the presence of the tide gate. Removal of the tide gate is proposed as part of the bridge replacement to improve conditions for the bridge structure, hydraulic connectivity in Sawmill Brook, fish passage, and ecological conditions in upstream areas of Sawmill Brook and Central Pond.

The Central Street tide gate and related structures are in need of modification to provide better functionality for drainage and fish passage. The tide gate and bridge at Central Street impede stream flows in Sawmill Brook, especially during coastal storm events, resulting in localized flooding. The Central Street Bridge structure currently overtops during extreme storm events and is structurally deficient.

Existing Chapter 91 Licenses

Based on a review of the Town of Manchester-by-the-Sea historic files, there are two existing Chapter 91 license plans for projects within Manchester Bay adjacent to the project area, as summarized below. Copies of the existing license plans are provided in Appendix D.

There are two existing license plans in the vicinity of the project area for Manchester Harbor:

- License Plan #197, recorded January 17, 1922, authorized building retaining walls and riprap slopes and filling in Manchester Harbor
- License Plan #650, recorded April 12, 1926, authorized building a pile pier and bulkhead and filling for an extension of an existing pier in Manchester Harbor

Existing Conditions

General Project Area

Sawmill Brook and associated tributaries have a five square mile watershed in the central portion of the Town of Manchester-by-the-Sea. Sawmill Brook flows to Manchester Harbor through a 16-foot wide bridge at Central Street (Route 127) that has a tide gate at the downstream face of the bridge. The crossing is constructed of three integrated parts including a bridge, tide gate and coastal wingwall. The bridge consists of a 16-foot span mortared stone masonry circular arch bridge with stone masonry wingwalls and headwalls. Timber cribs functioning as weirs are imbedded into the bottom of the stream bed. A concrete and iron tide gate abuts the bridge to the south. The bridge was originally constructed in the mid-1800s and rebuilt around 1938 and a tide gate was installed to control the Brook and create Central Pond just upstream. A stone and masonry wingwall abuts the bridge in the southwest quadrant, functioning as a seawall.

Tighe & Bond evaluated the condition of the bridge and tide gate in June 2015. The bridge has historically suffered due to the tide gate impounding waters upstream of the bridge, causing seepage and loss of backfill material when large precipitation events and high tide elevations are concurrent. Multiple hydrologic and hydraulic models of the watershed and bridge indicate that the bridge opening is undersized.

In June of 2016, the bridge underwent interim repairs intended to temporarily stabilize the structure. The open joints were grouted and a void below the footing was formed and

filled with cast-in-place concrete. The temporary repairs were not a long-term solution for the deficiencies noted in the project need section above.

Downstream of the Central Street Bridge is the tide gate that consists of a concrete gravity weir surrounding the Sawmill Brook outlet. The Sawmill Brook passes through an opening in the weir restricted by a 6.5 by 5.5-foot cast iron slide gate controlled with an electric actuator. The actuator is located on a modern galvanized catwalk above the gate.

The tide gate serves as a major hydraulic restriction for Sawmill Brook. When the tide gate is closed, it reduces tidal fluctuations within Sawmill Brook and Central Pond, although it is overtopped during very high tides. During rainstorms, it causes flooding of low-lying properties abutting Central Pond. To alleviate this flooding the slide gate has been left open since February 27, 2018, partially restoring upstream tidal flows.

On January 4, 2018 a record high tide event, Winter Storm Grayson, overtopped the bridge. The frequency of tidal flooding of the roadway will be increasing based on the current mean sea level rise relative to land (including land subsidence) of 0.92 feet per 100 years recorded in Boston (NOAA), and also based on forecast predictions of an increasing rate of relative sea level rise (IPCC).

Chapter 91 Jurisdictional Resource Areas

The proposed project occurs within filled and flowed tidelands as defined at 310 CMR 9.02. MassGIS online was consulted during the review process to determine the extent of Chapter 91 jurisdictional areas.

Filled tidelands are defined as former submerged lands and tidal flats which are no longer subject to tidal action due to the presence of fill. The historic high water of Sawmill Brook was shown extending landward approximately 45 feet at the greatest extent on the eastern and western banks. Currently the area consists of commercial businesses and paved roadway. The jurisdictional boundaries of the filled tidelands are depicted on the site plans in Appendix A.

Flowed tidelands are defined as presently submerged lands and tidal flats which are subject to tidal action. The project site contains a tidal segment of Sawmill Brook. The MHW (*i.e.*, MHT) line defines the upper limit of the flowed tidelands. The project site is not located within a Designated Port Area, Area of Critical Environmental Concern, or Ocean Sanctuary.

Description of Work

The proposed condition improvements include replacing the existing Central Street bridge with a 20-foot wide arch bridge and removing the tide gate structure. The proposed culvert would maintain the existing upstream and downstream invert elevations (-0.2 feet NAVD88, and -4 feet NAVD88, respectively), and provide a constant low chord elevation of 6 feet NAVD88.

The proposed project includes:

-
- **Replacement of the Central Street Bridge.** The existing bridge, including the concrete beam span section on the downstream side and upstream stone arch culvert, will be demolished and replaced with a concrete arch culvert with a span

of approximately 20 feet, which will have greater capacity than the existing structure. The visible elements of the replacement structure and street furnishings will have a stone appearance in keeping with the aesthetic of the adjacent stone sea wall.

- **Removal of the tide gate.** This work will include demolition of the concrete tide gate structure, slide gate, catwalk, and associated infrastructure to restore the unrestricted flow of Sawmill Brook into Manchester Harbor.
- **Central Street roadway improvements.** The bridge replacement project does require minor modifications to the approach roadway to the bridge. Proposed work in the approach roadways is limited to minimize the overall footprint of the work to limit project impacts and cost. The existing horizontal and vertical alignments were matched to the extent practicable, roadway function was matched, and drainage patterns were preserved. Minor improvements were made to curb line geometry to improve overall traffic operation.

The proposed roadway section matches with the objectives of the Town of Manchester-by-the-Sea to have a more pedestrian friendly downtown village environment. The Town has taken a “complete streets” approach to the downtown area including recent corridor improvement studies. The proposed roadway cross-section is consistent with the overall plan for the area and will interface well with future improvements. The design includes new ADA compliant sidewalks and curb ramps to enhance the walkability and accessibility of downtown. The design also includes a curb extension (“bump-out”) on the bridge to enhance pedestrian safety and provide traffic calming along the corridor. Given the limited right-of-way, bicycle accommodation is provided in the travel lane. A “take-the-lane” cycling approach is appropriate through the downtown due to low motor vehicle speeds and ample sight distance.

The increased connectivity from Sawmill Brook to Manchester Harbor is expected to improve fish passage through the project area.

Best Management Practices

Best Management Practices (BMPs) will be implemented for the project to limit the footprint of project disturbance. BMPs will include:

- Erosion control barriers, such as compost filter tubes, or silt fence and straw bale barriers, between upland limits of work and sensitive resource areas. Note that much of the separation of work area will be provided by cofferdams described below.
- Sediment filter bags at pump discharges to collect sediment that is mobilized by pumping, should pumping be necessary.
- Limiting the area of disturbance of work to the minimum necessary to allow for safe construction.
- Temporary coffer dams will be necessary to isolate the work area from normal flows. The coffer dams will be installed in phases. The Contractor will submit their means and methods for coffer dams for engineering and municipal review which are expect to include such materials as Port-A-Dams, sandbags, and/or Jersey barriers (unconfined earth-fill materials will not be allowed). Regardless of the measures implemented, the footprint and phased approach to work in Sawmill Brook will be limited to an area approved in all environmental permits.

- A turbidity curtain may be installed, if needed.

Project contractors will be required to maintain reserve supplies of erosion control barriers on-site to make repairs as necessary. Disturbed upland areas will be loamed and seeded and mulched, paved, or otherwise stabilized.

Construction Timing & Sequencing

The anticipated construction start date for this project is in late Summer 2022, with in-water work to occur during the coastal Time-of-Year work window for fish, pending receipt of all regulatory permits and approvals.

The anticipated construction sequence is based on Tighe & Bond's experience with past similar projects, with intent of providing guidance to the contractor towards meeting the terms and conditions of environmental permits and best management practices. With that in mind, the anticipated construction sequence is as follows:

- Notify pertinent regulatory agencies of the construction schedule
- Post MassDEP File Number sign at the entrance to the work areas
- Install erosion and sedimentation controls and establish work areas
- Schedule and conduct site walks with pertinent regulatory agencies to inspect construction-phase BMPs
- Install coffer dams, turbidity curtain, and oil booms for water control for phased construction at one abutment then the other
- Construct temporary Elm Street roadway and establish detours and road closures
- Provide temporary utilities as necessary for demolition
- Remove tide gate and existing bridge structure with demolition shielding
- Reconstruct Central Street bridge with roadway improvements
- Remove coffer dam, temporary stream access points and in-channel BMPs
- Restore disturbed areas in-kind
- Remove erosion and sedimentation controls pending approval from the Manchester-by-the-Sea Conservation Commission

Please note that the above sequence may change and some tasks may be performed concurrently. The contractor who performs the work will determine the actual sequencing based on their means and methods of construction.

Regulatory Compliance

The existing and proposed coastal engineering structures qualify as water-dependent uses pursuant to 310 CMR 9.12(2)(a)(12) as flood, water level, or tidal control facilities (tide gate and bridge). The proposed improvements to tidal flows within Sawmill Brook include the replacement of existing bridge and the removal of the existing tide gate. The replacement of the bridge will not preclude public access to Sawmill Brook.

In accordance with the Engineering and Construction Standards described in 310 CMR 9.37(3), the extent of the bridge that extends beyond the high-water mark is necessary to provide the structural support required to maintain the integrity footings. Compliance

with the License and Permit Requirements described in 310 CMR 9.31 is summarized below.

(1) *Basic Requirements.* No license or permit shall be issued by the Department for any project subject to 310 CMR 9.03 through 9.05 and 9.09 unless said project:

(a) *includes only fill and structures for uses that have been categorically determined to be eligible for a license, according to the provisions of 310 CMR 9.32;*

The proposed project includes replacement of the existing bridge and removal of a tide gate (fill and structures) for water-dependent use per 310 CMR 9.12(2)(a)(12) as tidal and flood control structures.

As described in the existing conditions section, the project area is not located within a Designated Port Area, Area of Critical Environmental Concern, or Ocean Sanctuary.

(b) *complies with applicable environmental regulatory programs of the Commonwealth, according to the provisions of 310 CMR 9.33;*

As described in the following sections, the Town submitted a Notice of Intent to the Town of Manchester-by-the-Sea Conservation Commission on September 15, 2020, and the Order of Conditions was received on November 18, 2020. The Secretary of Energy and Environmental Affairs issued a Certificate on the Environmental Notification Form on January 10, 2020. The proponent is currently applying to the U.S. Army Corps of Engineers for a Pre-Construction Notification Authorization per Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

(c) *conforms to applicable provisions of a municipal harbor plan, if any, and local zoning law, according to the provisions of 310 CMR 9.34;*

The Town of Manchester-by-the-Sea does not have a Municipal Harbor Plan. The project will adhere to all permit approvals and conditions. The project area parcel is located within the General Area zoning district and no new structures are proposed. The proposed project will assist in protecting existing infrastructure from flood events.

(d) *complies with applicable standards governing the preservation of water-related public rights, according to the provisions of 310 CMR 9.35;*

The proposed replacement and removal project will not extend seaward of the state harbor line, is not within a Designated Port Area, and will not extend into any existing channels. The replacement of the existing bridge will not impair navigation line of sight, require the alteration of an established course of vessels, or permanently interfere with access to adjoining areas.

The goal of the tide gate removal and bridge replacement design is to restore the tidal influence within Sawmill Brook and Central Pond. The existing conditions with the tide gate blocking the bridge inhibit navigation of vessels. Navigation should not be negatively impaired as a result of the project and should improve with the removal of the tide gate and widening of the bridge span. Water-borne traffic is not expected to be generated as part of the project, and the project does not include berthing facilities.

- (e) *complies with applicable standards governing the protection of water-dependent uses, according to the provisions of 310 CMR 9.36;*

The existing and proposed coastal engineering structures qualify as water-dependent uses pursuant to 310 CMR 9.12(2)(a)(12) as flood, water level, or tidal control facilities (tide gate and bridge). Private and public access to this area is limited given the existing infrastructure. There are no stairs or public access points within the proposed project area. Due to the current location of the infrastructure, the project can not be moved to a different location away from property lines.

- (f) *complies with applicable standards governing engineering and construction of structures, according to the provisions of 310 CMR 9.37;*

The proposed project includes replacing an existing bridge, removal of a tide gate, and roadway improvements. The proposed project does not involve the construction of a coastal engineering structure.

- (g) *complies with applicable standards governing use and design of boating facilities for recreational or commercial vessels, according to the provisions of 310 CMR 9.38 and 9.39;*

The proposed project does not involve any changes to berths, marinas, boatyards, or boat launching ramps.

- (h) *complies with applicable standards governing dredging and disposal of dredge materials, according to the provisions of 310 CMR 9.40;*

Dredging for the proposed project includes dredging associated with the replacement of the existing bridge and the removal of the tide gate. Compliance with the 310 CMR 9.40 Standards for Dredging and Dredged Material Disposal 310 CMR are summarized below.

(1) Limitations on Dredging and Disposal Activity

- (a) The project shall not include any dredging of channels, mooring basins, or turnaround basins to a mean low water depth greater than 20 feet, unless said project:*

- 1. is located within a Designated Port Area; or*
- 2. serves a commercial navigation purpose of state, regional, or federal significance, and cannot reasonably be located in a Designated Port Area.*

The proposed project does not include dredging of channels, mooring basins, or turnaround basins.

- (b) If the project is located in an ACEC, the project shall not include any of the following activities:*

- 1. improvement dredging, unless the dredging is: for the sole purpose of fisheries or wildlife enhancement; part of an Ecological Restoration Project; or conducted by a public entity for the sole purpose of the maintenance or restoration of historic, safe navigation channels or turnaround basins of a*

minimum length, width and depth consistent with a Resource Management Plan adopted by the municipality(ies) and approved by the Secretary.

2. *dredged material disposal, except for the sole purpose of beach nourishment, dune construction, reconstruction or stabilization with proper vegetative cover, the enhancement of fishery or wildlife resources, or unless the dredged material disposal is part of an Ecological Restoration Project in accordance with 314 CMR 9.07(1)(c) and 310 CMR 10.11(6)(b) and 310 CMR 40.000: Massachusetts Contingency Plan, if applicable, provided that any fill or dredged material used in an Ecological Restoration Project may not contain a chemical above the RCS-1 concentration, as defined in 310 CMR 40.000: Massachusetts Contingency Plan.*

The Central Street Bridge Replacement project area is not located within an ACEC.

(2) Resource Protection Requirements.

- (a) The design and timing of dredging and dredged material disposal activity shall be such as to avoid interference with anadromous/catadromous fish runs. At a minimum, no such activity shall occur in such areas between March 15 and June 15 of any year, except upon a determination by the Division of Marine Fisheries, pursuant to M.G.L. c. 130, § 19, that such an activity will not obstruct or hinder the passage of fish.*

The DMF requested that no in-water work should be conducted from March 1st through June 30th to protect migratory fish habitat for the rainbow smelt and American eel (*Anguilla rostrata*). Work will be conducted accordingly within this time restriction. Further coordination with DMF is ongoing and any additional time frame restrictions will be incorporated into the construction schedule.

- (b) The design and timing of dredging and dredged material disposal activity shall be such as to minimize adverse impacts on shellfish beds, fishery resource areas, and submerged aquatic vegetation. The Department may consult with the Department of Fish and Game or the natural resource officer of the municipality regarding the assessment of such impacts.*

Tighe & Bond observed areas below the MHW during low tide conditions. No shellfish or other submergent aquatic vegetation were observed. The Project incorporates specific design elements to avoid or minimize impacts to resource areas including maintaining existing footprints and employing best management practices.

(3) Operational Requirements for Dredging.

- (a) *The extent of dredging shall not exceed that reasonably necessary to accommodate the navigational requirements of the project and provide adequate water circulation.*

The proposed dredging will occur within temporary coffer dams that will isolate the work area from normal flows. The coffer dams will be installed in phases to limit the area that will be impacted at a time. Adequate water circulation and navigation outside of active work zones will be maintained during construction.

- (b) *The shoreward extent of dredging shall be a sufficient distance from the edge of adjacent marshes to avoid slumping. In general, for improvement dredging projects the edge of the dredging footprint, including any side cuts, should be at least 25 feet from any marsh boundary. In areas where significant wake or wash will be generated by vessel traffic, increased setbacks may be incorporated based on appropriate design calculations.*

Dredging for the proposed project is associated with the removal of the tide gate and the existing bridge abutments. None of the proposed dredging areas include delineated salt marsh. In addition, the overall proposed project aims to restore the tidal influence within Sawmill Brook.

- (c) *In general, no basin, canal, or channel shall be dredged deeper than the main channel to which it is connected.*
- (d) *To the maximum reasonable extent, basins shall have wide openings and short entrance channels to promote tidal exchange within the basin.*

The proposed project does not include dredging of basins, canals, or channels.

- (e) *In general, hydraulic dredging shall be favored over mechanical methods, except when open water disposal of fine-grained material is proposed.*

As the proposed dredging will occur within cofferdams for the bridge replacement and removal of the tidal gate. This does not include open water dredging or disposal, mechanical dredging methods are proposed in part because dredge material may include bedrock.

- (i) *does not deny access to its services and facilities to any person in a discriminatory manner, as determined in accordance with the constitution of the Commonwealth of Massachusetts, of the United States of America, or with any statute, regulation, or executive order governing the prevention of discrimination.*

The proposed project includes removal of a tide gate, replacement of a bridge, and roadway improvements. The proposed infrastructure will improve the coastal resiliency within the area and help protect the existing infrastructure. In addition, the proposed roadway improvements include new ADA compliant sidewalks and curb ramps to enhance the walkability and accessibility of

downtown. The proposed project elements will not impede access nor discriminate against individuals.

Other Pertinent Regulatory Programs

Manchester-by-the-Sea Wetlands Regulations and MA WPA Order of Conditions

A Notice of Intent was submitted to the Manchester-by-the-Sea Conservation Commission on September 15, 2020, pursuant to the Massachusetts Wetlands Protection Act (MA WPA, MGL c. 131 § 40) and its implementing regulations (310 CMR 10.00) and the Town of Manchester-by-the-Sea Wetlands Regulations. The Order of Conditions was received on November 18, 2020. The Order of Conditions will function as a Water Quality Certification in accordance with 314 CMR 9.03(1) and 314 CMR 9.03(3).

Massachusetts Environmental Policy Act (MEPA)

The project is subject to environmental review pursuant to Section 11.01.2.a. of the MEPA regulations as it requires a State Agency action (*i.e.* a permit and funding). The project meets several ENF review thresholds related to wetlands, waterways, and tidelands. No mandatory Environmental Impact Report (EIR) thresholds are triggered by the proposed project. The project requires MEPA review as it will require state permits and exceeds MEPA review thresholds as defined by 301 CMR 11.00. An Environmental Notification Form (ENF) was submitted for review on December 11, 2019 (EEA #16127). The Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form was issued on January 10, 2020.

Section 404/10 Army Corps of Engineers MA General Permits

The proposed project is subject to United States Army Corps of Engineers (Army Corps) authorization jurisdiction under Section 404 of the Clean Water Act, required due to work (fill) within waters of the United States (*i.e.*, work below the High Tide Line (HTL) of coastal waters). Army Corps authorization is also required under Section 10 of the Rivers and Harbors Act due to work within navigable waters of the United States (*i.e.*, work below the MHTL).

The Army Corps General Permits (GPs) for Massachusetts cover specific activities within the limits of Army Corps jurisdiction. Specific area limits apply when 1) there is a discharge of dredged or fill material into waters of the U.S., and 2) as stated in each of the activity General Permits. The total temporary and permanent impact area is used to determine if a project is eligible for Self-Verification, Pre-Construction Notification, or Individual Permit coverage.

The project appears to qualify for authorization under multiple GP categories, including GP 1. Maintenance; GP 5. Dredging, Disposal of Dredged Material; GP 10. Linear Transportation Projects and Stream Crossings, GP 14. Temporary Construction, Access, and Dewatering, and GP 23. Aquatic Habitat Restoration, Enhancement, and Establishment Activities.

A Pre-Construction Notification application will be submitted to the Army Corps in March 2021, and will be concurrently reviewed by other federal agencies, including the U.S. Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS) and the U.S. Fish & Wildlife Service (USFWS).

In addition to environmental factors, the MA GPs require notification of the State Historic Preservation Office (SHPO), Tribal Historic Preservation Officers (THPOs), and Board of Underwater Archeological Resources (MA BUAR) (for underwater projects) per Section 106. Tighe & Bond provided copies of the MEPA ENF to the SHPO, THPOs, and BUAR describing the proposed activities and providing a general description of the area where construction is proposed. The applicant will continue to coordinate with these parties as the project progresses in accordance with the Section 106 review process.


Attachment D

Chapter 91 License Application Abutting Property Owner Information
Central Street Bridge Replacement Project
Town of Manchester-by-the-Sea

Abutting Property Owner Addresses

Owner Name	Owner Address	Owner City	Owner State	Owner Zip
ASHLAND AVE LTD PARTNERSHIP	PO BOX 1522	MANCHESTER	MA	01944
WOOD DAVID N & MARYANN A	6 HIGHWOOD RD	MANCHESTER	MA	01944
WADIA-ELLS SUSAN	0 ELM ST, UNIT A	MANCHESTER	MA	01944
MARTIN KRISTIN HODGES JONATHAN	0 ELM ST., UNIT B	MANCHESTER	MA	01944
TORY ANTHONY D. TORY JEMMA	27 CENTRAL ST., UNIT C	MANCHESTER	MA	01944
DUNGENESS MANCHESTER REALTY TR	10 COUNTRY RD	BOYNTON BEACH	FL	33436
1 ELM ST LLC	5 ELM ST	MANCHESTER	MA	01944
19 CENTRAL ST. LLC	PO BOX 85	PRIDES CROSSING	MA	01965
TOWN OF MANCHESTER-BY-THE-SEA C/O Greg Federspiel	10 CENTRAL ST	MANCHESTER	MA	01915



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APPENDIX H2
Agency Review Discussion Notes

Transmittal #X286196 Manchester-by-the-Sea Central St Bridge / Central Pond Ch 91 License Application – MassDEP Waterways Review Comments Discussion Call

To: Manchester-by-the-Sea Central Street Bridge Replacement Permitting File
FROM: Emily Tully, Tighe & Bond
COPY: Dan Murphy and Gabrielle Belfit, Tighe & Bond
DATE: November 3, 2021

Meeting Date & Time: November 2, 2021, 2:30 – 3:30 PM

Meeting Location: Microsoft Teams

Attendees:

- Christine Hopps, Supervisor, MassDEP Waterways
- Alice Doyle, Reviewer, MassDEP Waterways
- Dan Murphy, Project Manager, Tighe & Bond
- Emily Tully, Planner, Tighe & Bond
- Barbara Lamb, Drafter, Tighe & Bond

Agenda:

- Central Street Bridge plan set review comments
- Central Pond plan set review comments
- Combined license application comments
- Next steps

Notes:

- Currently are two separate plan sets for bridge and pond – will need to combine
- Bridge Plans
 - Can't use color (e.g., locus map on bridge plans) or gray, black lines only
 - Anything related to means and methods that are temporary and are not being licensed, like cofferdam and dewatering, should be removed and just referenced in notations – remove sheets 9, 11, 12
 - In the bridge license application form, change "Greg Federspiel" to DPW so that it's consistent between the plans and the form and also needs to be linked to Town not person
 - Every property within the work area needs to be listed on license application as licensee, or can reference exhibit – need to confirm before public notice whether project from Ch 91 perspective (e.g., fill/structures and dredge within filled and flowed tidelands) is entirely on Town property
 - Remove fill pattern for access easements (e.g., through Fire Station property)
 - Add area of dredging – show footprint on plans, square footage and max dredge depth (also for Pond plans)

- For combined plan set, have a project site plan then focus in on components
 - For bridge, can use zoomed in area on Sheet 5 if moved over to show entirety of SW wingwall and complete work area; can remove railing if referenced in notes
- Show square footage of area of footings installed waterward of MHW
 - Bedrock removal within flowed tidelands is “dredging”
 - Show footings to be demolished
 - Add MHW, MLW to Square Bridge Section
- Identify clearance between MHW and low chord of bridge – kayak clearance and ability to navigate relative to existing conditions
- ID limit of existing channel wall relative to waterward limit (existing culvert opening)
- Can remove all patterns and fill related to means and methods like erosion controls and easements and just include in notes
- Pond Plans
 - ---0--- line type not in legend – references center of Sawmill Brook channel?
 - Can remove fill patterns and backgrounds – do not need this level of detail with regard to plantings on site plans or number and detail of cross sections
 - For both plan sets, need a plain existing conditions plan that shows property lines, MLW, MHW, HHW
 - For proposed conditions plan, identify where will be dredging, where will be fill via two line types
 - Use representative cross sections, e.g., one near where boulders will be placed at southern end of pond, oen in root wad area with dimensions, max width of fill, do not need veg types, will be licensing as “fill and vegetative material”, can reference as “typical” sections with notes on width varying between x and x+1 feet
 - Is the Sawmill Brook channel wide enough to navigate by kayak?
 - Keep sheet 21, don’t need MHW, MLW on that sheet
 - Remove references to MHHW, MLLW
 - Don’t need guard rails if not within filled tidelands (looks like stairs and railing are on Fire Station property within filled tidelands, but guard rail next to parking area might not be)
 - On dredge site plan, call out area and dimensions of dredging
- Need table of total fill area below MHW for total scope of work

APPENDIX H3
Revised Plan Set

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

DATE

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PROJECT INFORMATION:

1. BASE PLAN ENTITLED "TOPOGRAPHIC PLAN FOR TIGHE & BOND OF SAWMILL BROOK BRIDGE STREET TO NORWOOD AVE, MANCHESTER-BY-THE-SEA, MASSACHUSETTS" PREPARED BY DOUCET SURVEY INC. IN DECEMBER 2017.
2. HISTORIC PLANS:
 - 2.1. LICENSE PLAN #197, RECORDED JANUARY 17, 1922, AUTHORIZED BUILDING RETAINING WALLS AND RIPRAP SLOPES AND FILLING IN MANCHESTER HARBOR.
 - 2.2. LICENSE PLAN #650, RECORDED APRIL 12, 1926, AUTHORIZED BUILDING A PILE PIER AND BULKHEAD AND FILLING FOR AN EXTENSION OF AN EXISTING PIER IN MANCHESTER HARBOR.

LEGEND

	INTERMEDIATE CONTOURS
	INDEX CONTOURS
	PROPOSED CONTOURS
	OVERHEAD WIRES
	EXISTING GUARD RAIL
	PROPOSED GUARD RAIL
	FEMA FLOODZONE
	COASTAL BANK
	EDGE OF WATER
	MEAN LOW WATER
	MEAN HIGH WATER
	HISTORIC HIGH WATER
	EROSION CONTROL BARRIER
	PROPOSED COFFERDAM
	LIMIT OF WORK
	PROPERTY BOUNDARY
	WETLAND LIMIT
	RETAINING WALL
	REVTMENT/COBBLE BOTTOM
	WETLAND FLAG
	UTILITY POLE
	DECIDUOUS/CONIFER TREE
	PIPING, STRUCTURES, ETC. TO BE REMOVED

ABBREVIATIONS

BIT	BITUMINOUS
CONC	CONCRETE
CMP	CORRUGATED METAL PIPE
ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
EOW	EDGE OF WATER
HMA	HOT MIXED ASPHALT
MHHW	MEAN HIGH HIGH WATER
MLW	MEAN LOW WATER
MLLW	MEAN LOW LOW WATER
R&D	REMOVE AND DISPOSE
R&S	REMOVE AND STACK
RET	RETAIN
SPK	SPIKE
TBM	TEMPORARY BENCHMARK
TYP	TYPICAL
UP	UTILITY POLE

**CENTRAL POND
GENERAL NOTES AND LEGEND**

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

DATE: 2/25/22
SHEET 1 OF 14

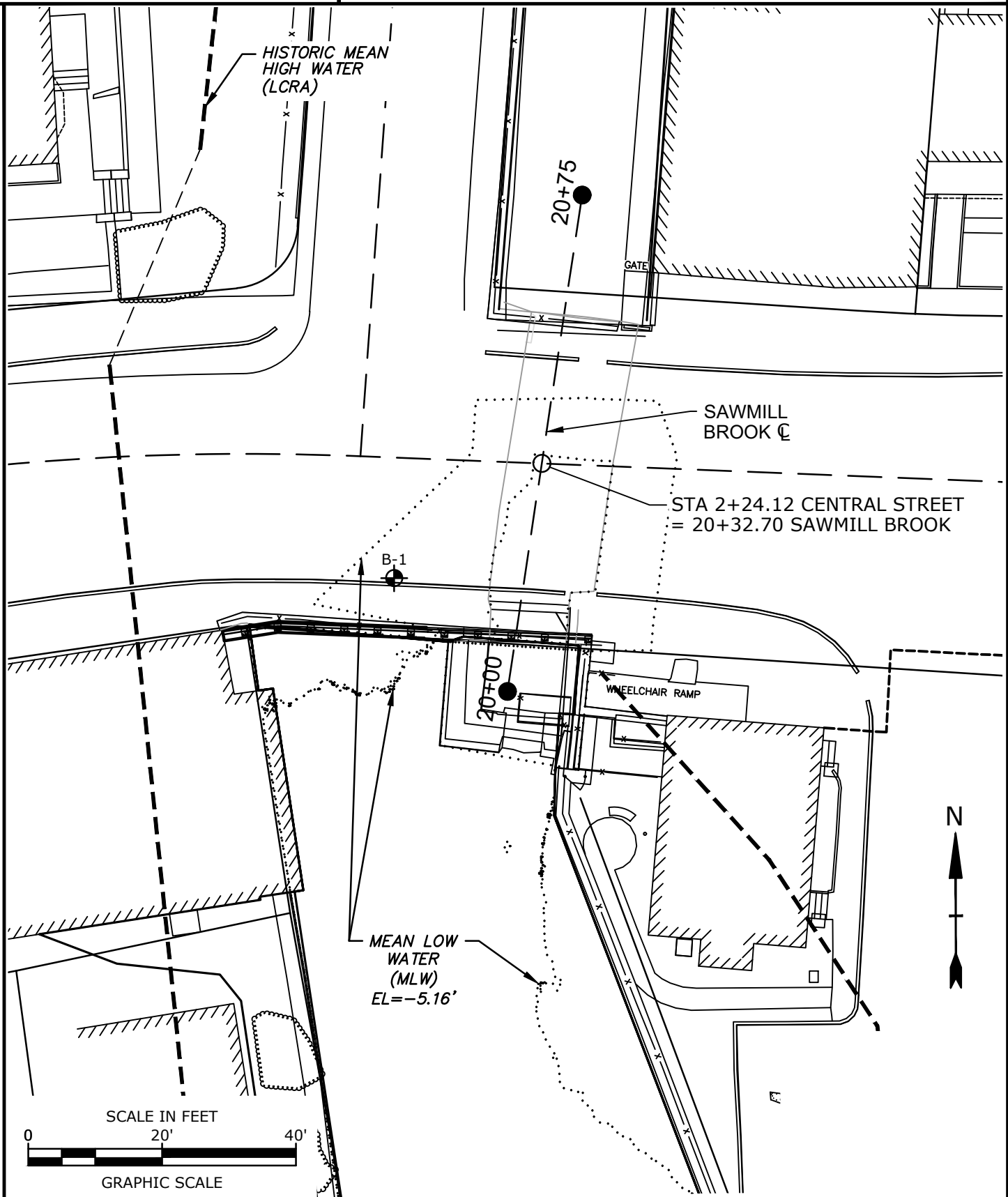
PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

Tighe&Bond

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**CENTRAL STREET BRIDGE
EXISTING CONDITIONS PLAN**

Tighe & Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

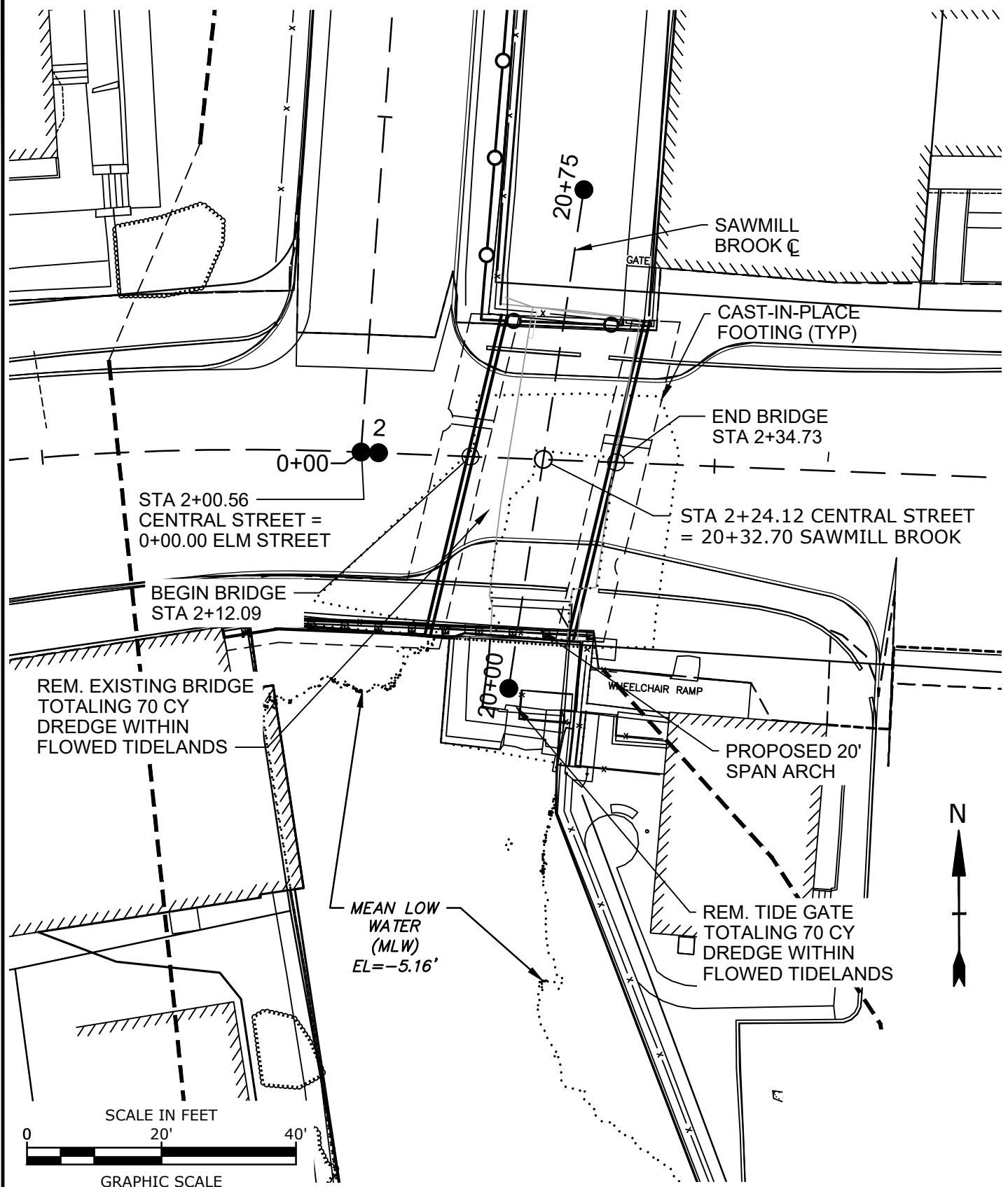
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SHEET 2 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
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CENTRAL STREET BRIDGE

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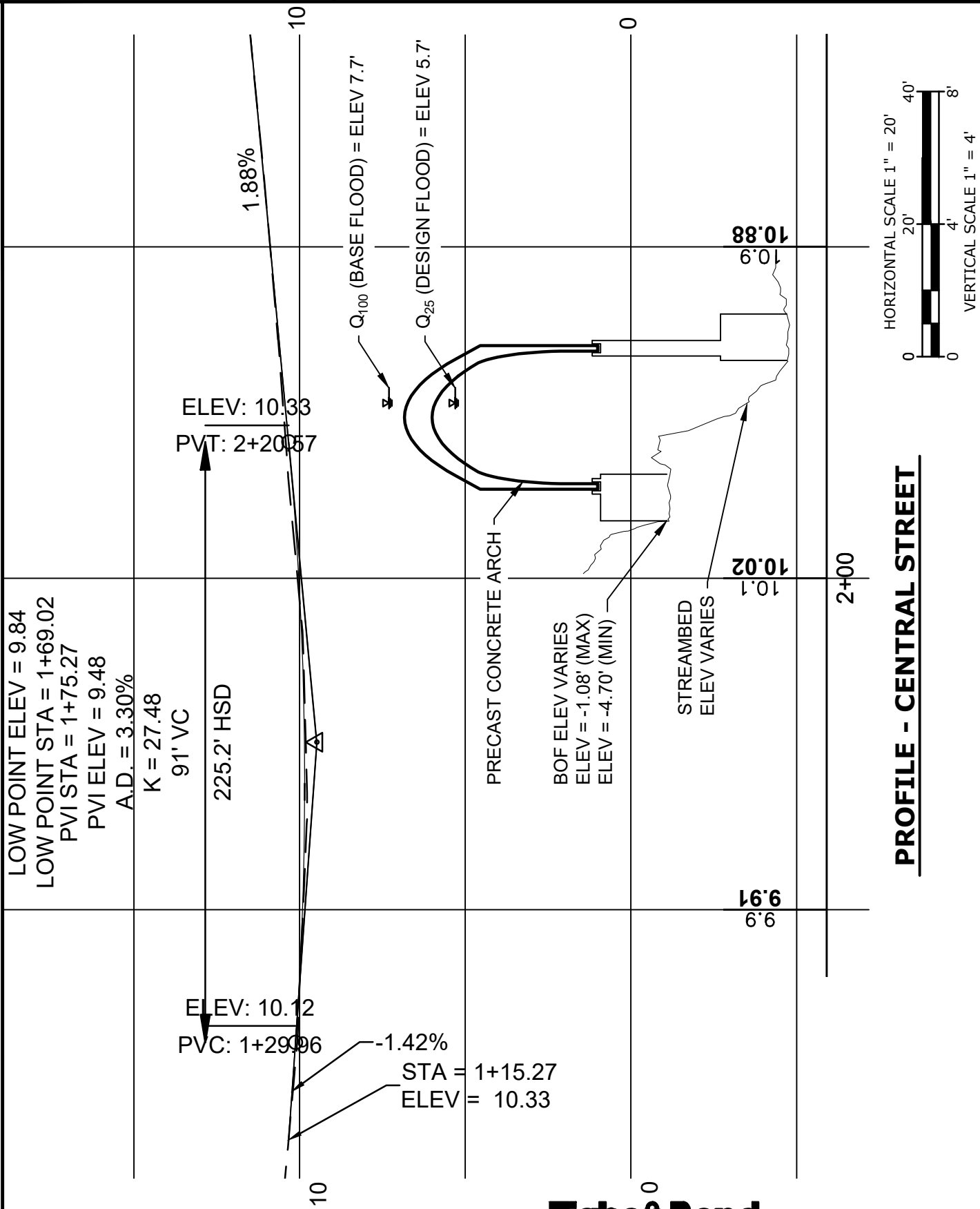
DATE: 2/25/22
SHEET 3 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

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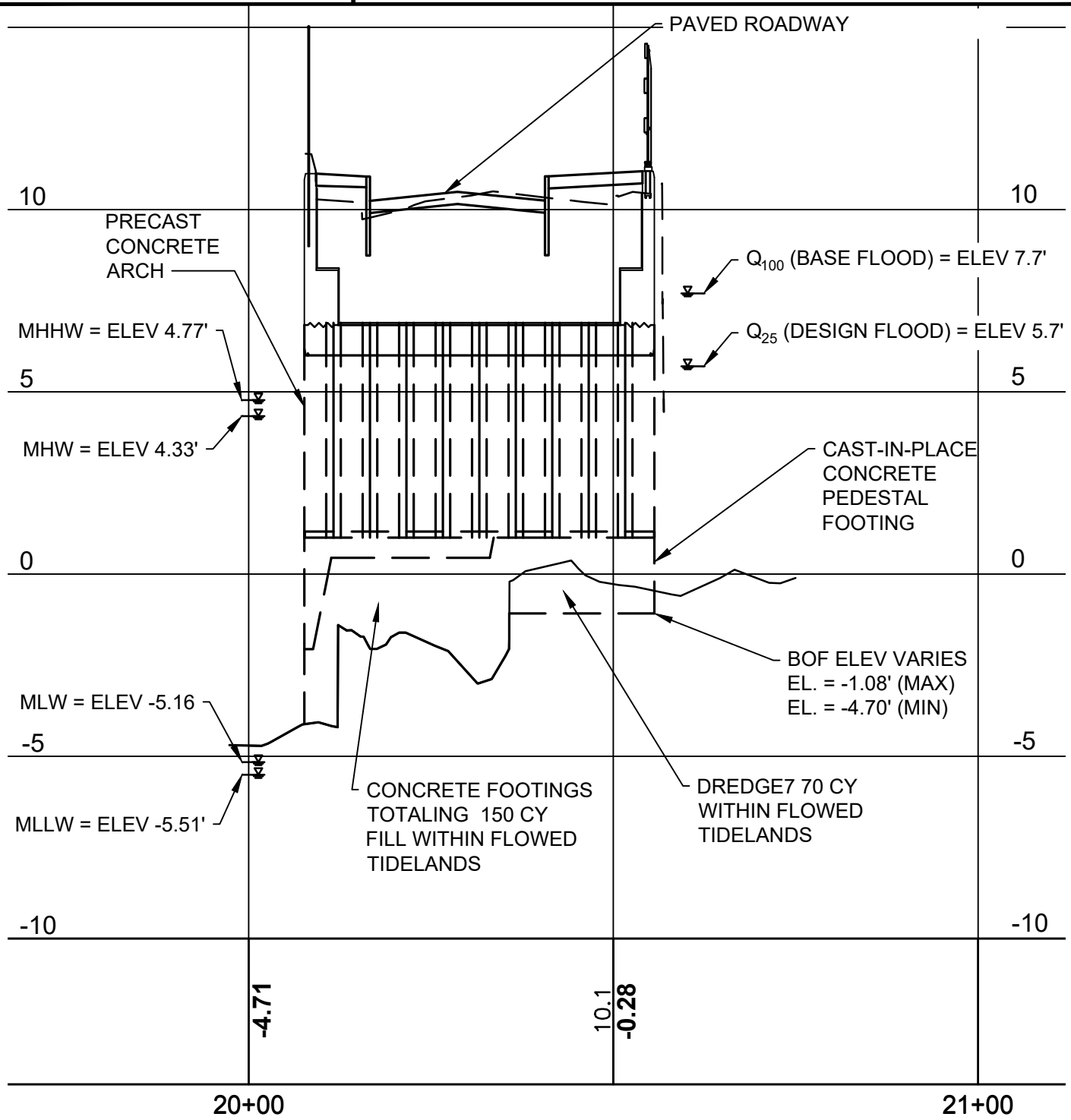
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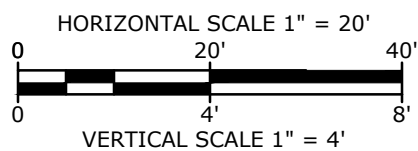
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PROFILE - SAWMILL BROOK

SCALE: 1" = 20'H, 1"=4'V



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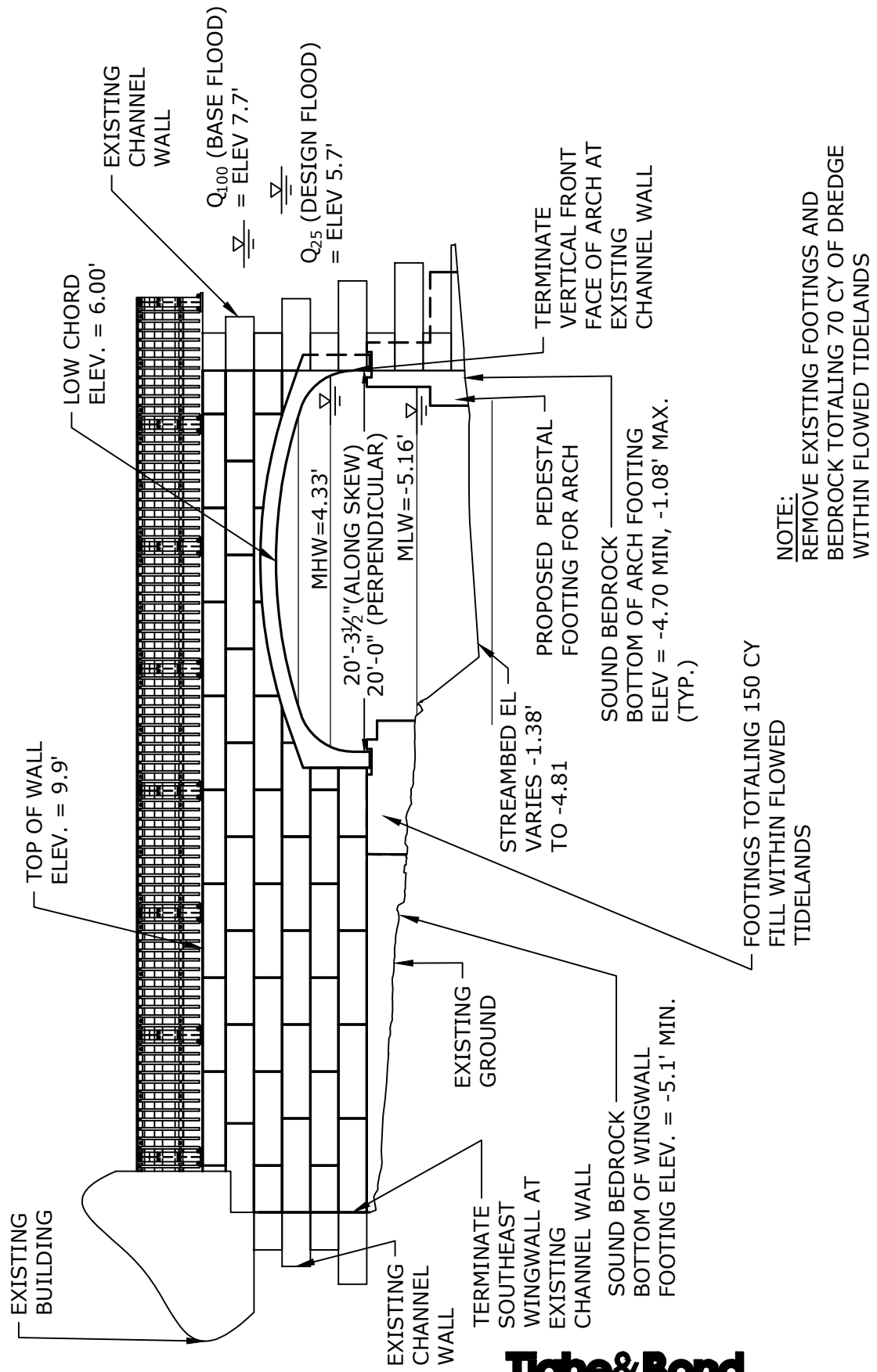
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SHEET 5 OF 14

PROJECT DATUM:
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NOTE:
REMOVE EXISTING FOOTINGS AND
BEDROCK TOTALING 70 CY OF DREDGE
WITHIN FLOWED TIDELANDS

FOOTINGS TOTALING 150 CY
FILL WITHIN FLOWED
TIDELANDS

ELEVATION (LOOKING NORTH)

1"=8'



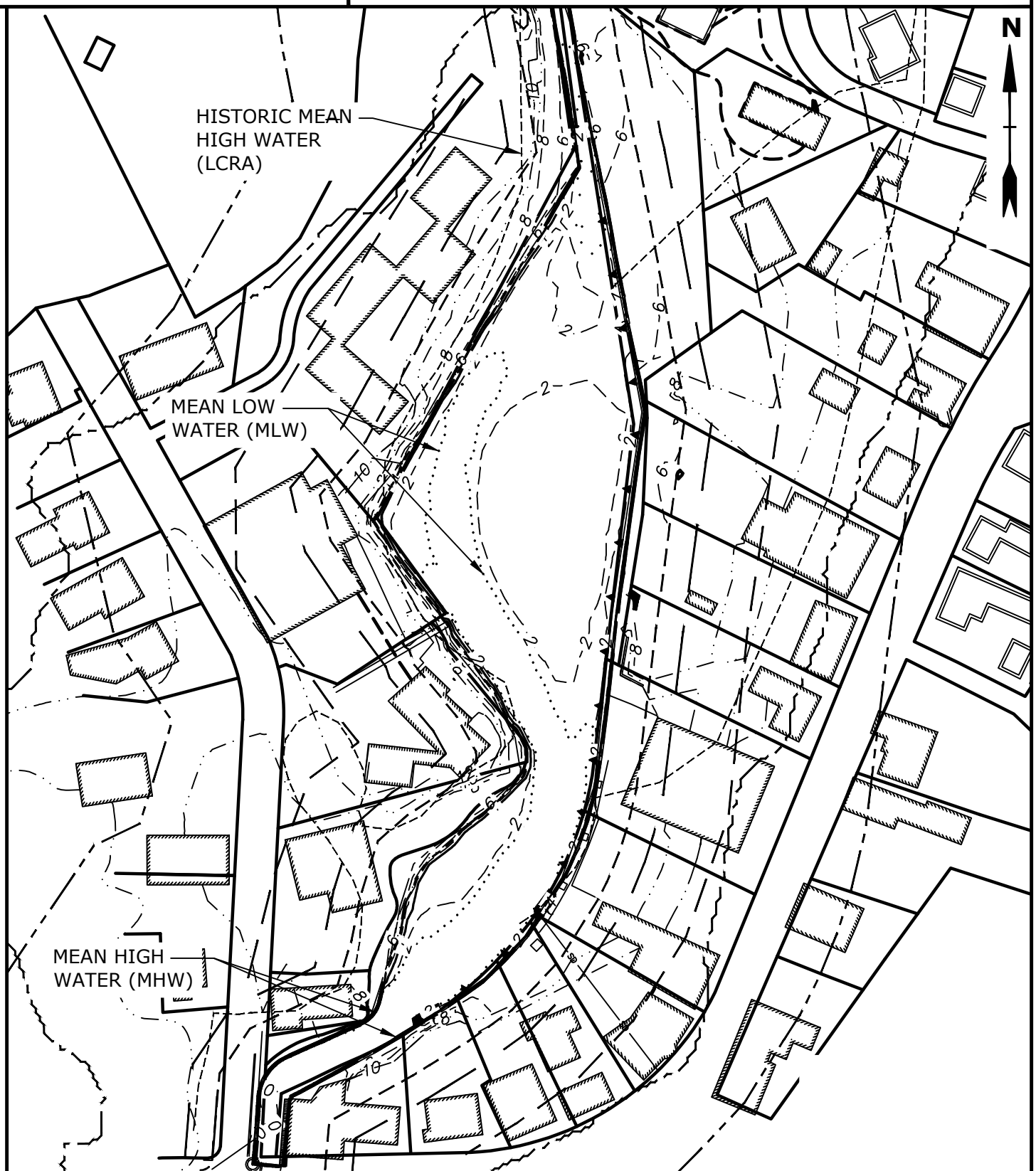
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MANCHESTER-BY-THE-SEA, MASSACHUSETTS
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SHEET 6 OF 14

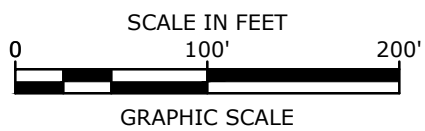
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CENTRAL POND EXISTING CONDITIONS PLAN



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PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

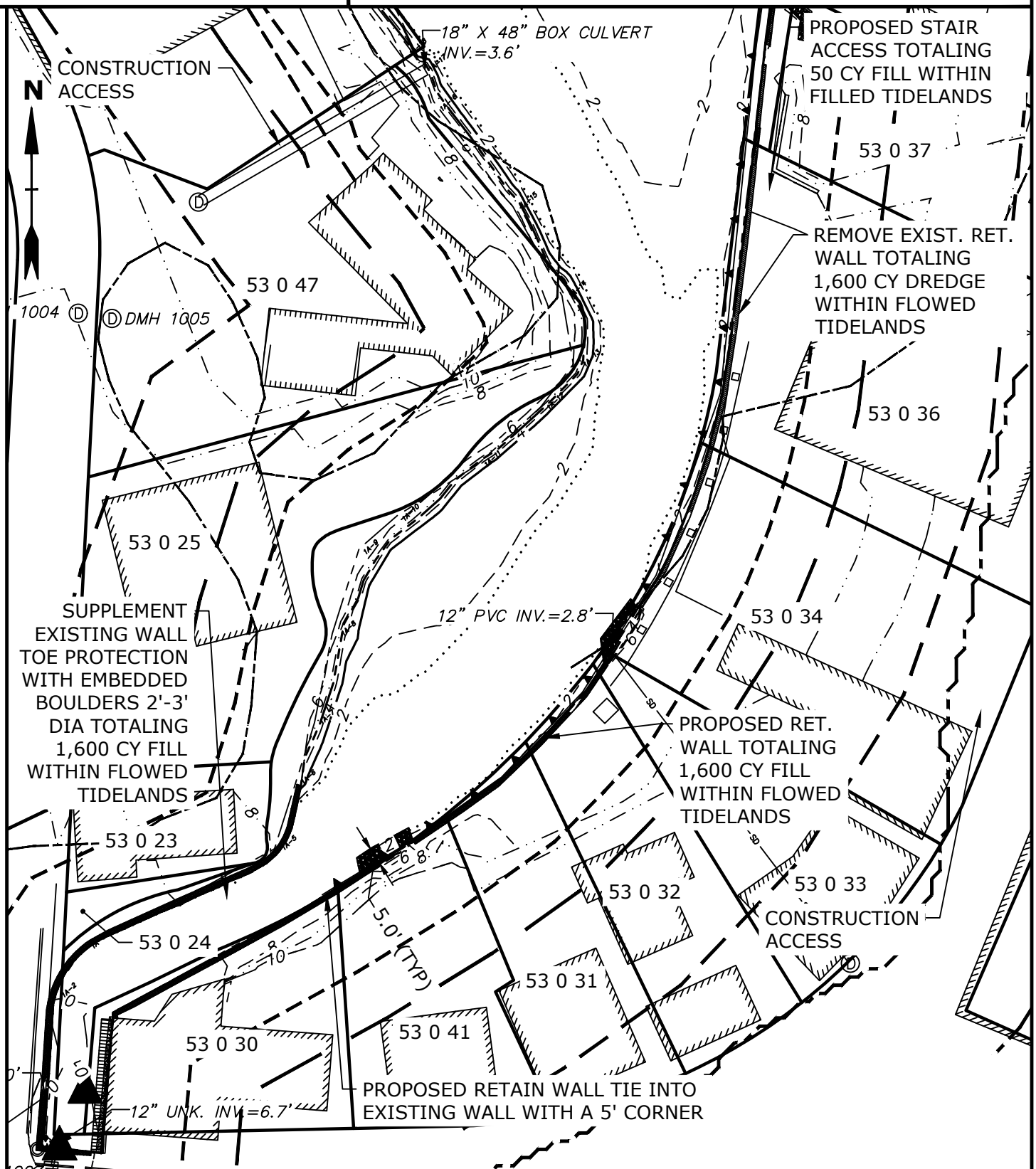
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SHEET 7 OF 14

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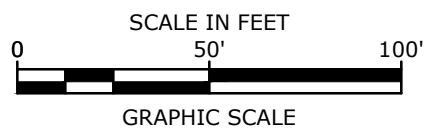
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CENTRAL POND ENLARGED SITE PLAN (1)



Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

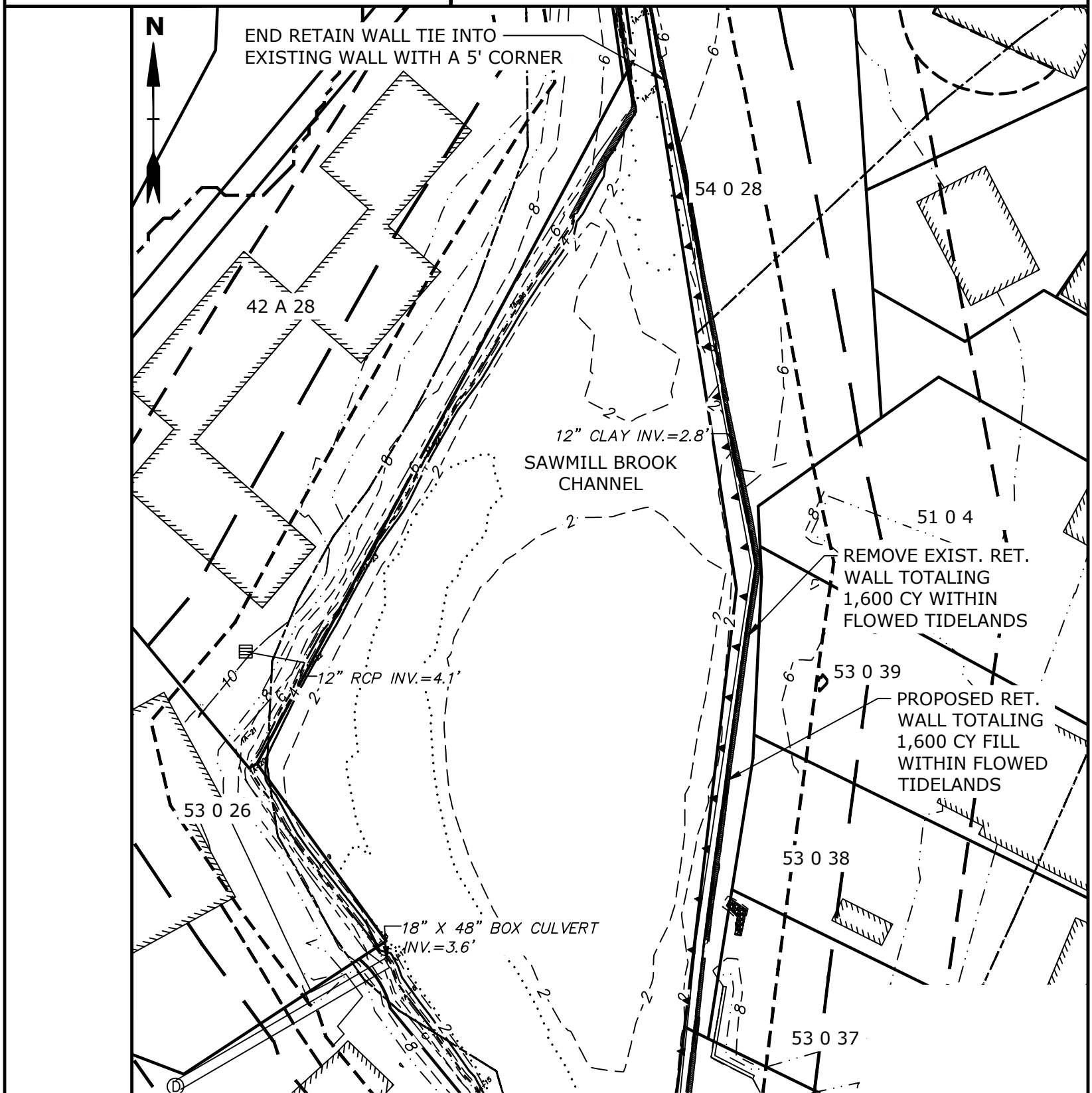
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SHEET 8 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

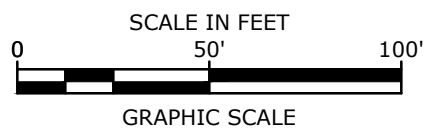
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CENTRAL POND ENLARGED SITE PLAN (2)



Tighe & Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

DATE: 2/25/22
SHEET 9 OF 14

PROJECT DATUM:
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DATE

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LIST OF ABUTTERS

PARCEL ID	OWNER	ADDRESS
53 0 31	BOLENA LLC	40 BEACH ST, UNIT 305, MANCHESTER, MA 01944
53 0 23	1 ELM ST LLC	5 ELM ST, MANCHESTER, MA 01944
53 0 37	SCHOOL STREET ASSOCIATES, LLC	16 SCHOOL ST, MANCHESTER, MA 01944
53 0 25	COWAN LIVIA A TR	5 ELM ST, MANCHESTER, MA 01944
53 0 26	127 PINE ST LTD PARTNERSHIP	PO BOX 413, LONG KEY, FL 33001-0413
53 0 47	MELKEEMAR, LLC	21 UNION ST, MANCHESTER, MA 01944
51 0 4	OETTINGER HENRY F	22 SCHOOL ST, MANCHESTER, MA 01944
53 0 39	FIRST BAPTIST CHURCH SOCIETY	20 SCHOOL ST, MANCHESTER, MA 01944
42 0 28	PH LANE RLTY LLC SERIES 2-5 POWDER HOUSE	5C PEELE HOUSE SQUARE, MANCHESTER, MA 01944
53 0 41	19 CENTRAL ST. LLC	PO BOX 85, PRIDES CROSSING, MA 01965
53 0 24	MANCHESTER TOWN OF	10 CENTRAL ST, MANCHESTER, MA 01944
53 0 30	ASHLAND AVE LTD PARTNERSHIP	PO BOX 1522, MANCHESTER, MA 01944
53 0 38	KARPOWICH JEFFREY A.	18 SCHOOL ST, MANCHESTER, MA 01944
53 0 32	7 CENTRAL NOMINEE TRUST ADAM M. ZAIGER, TR	40 BEACH ST, UNIT 305, MANCHESTER, MA 01944
53 0 36	MANCHESTER TOWN OF	12 SCHOOL ST, MANCHESTER, MA 01944
53 0 34	HOOPERS GROCERY INC	14 EAGLE HEAD RD, MANCHESTER, MA 01944
53 0 33	2 SCHOOL NOMINEE TRUST	40 BEACH ST, UNIT 305, MANCHESTER, MA 01944
54 0 28	MANCHESTER TOWN OF	10 CENTRAL ST, MANCHESTER, MA 01944

CENTRAL POND ABUTTER PLAN LIST



PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

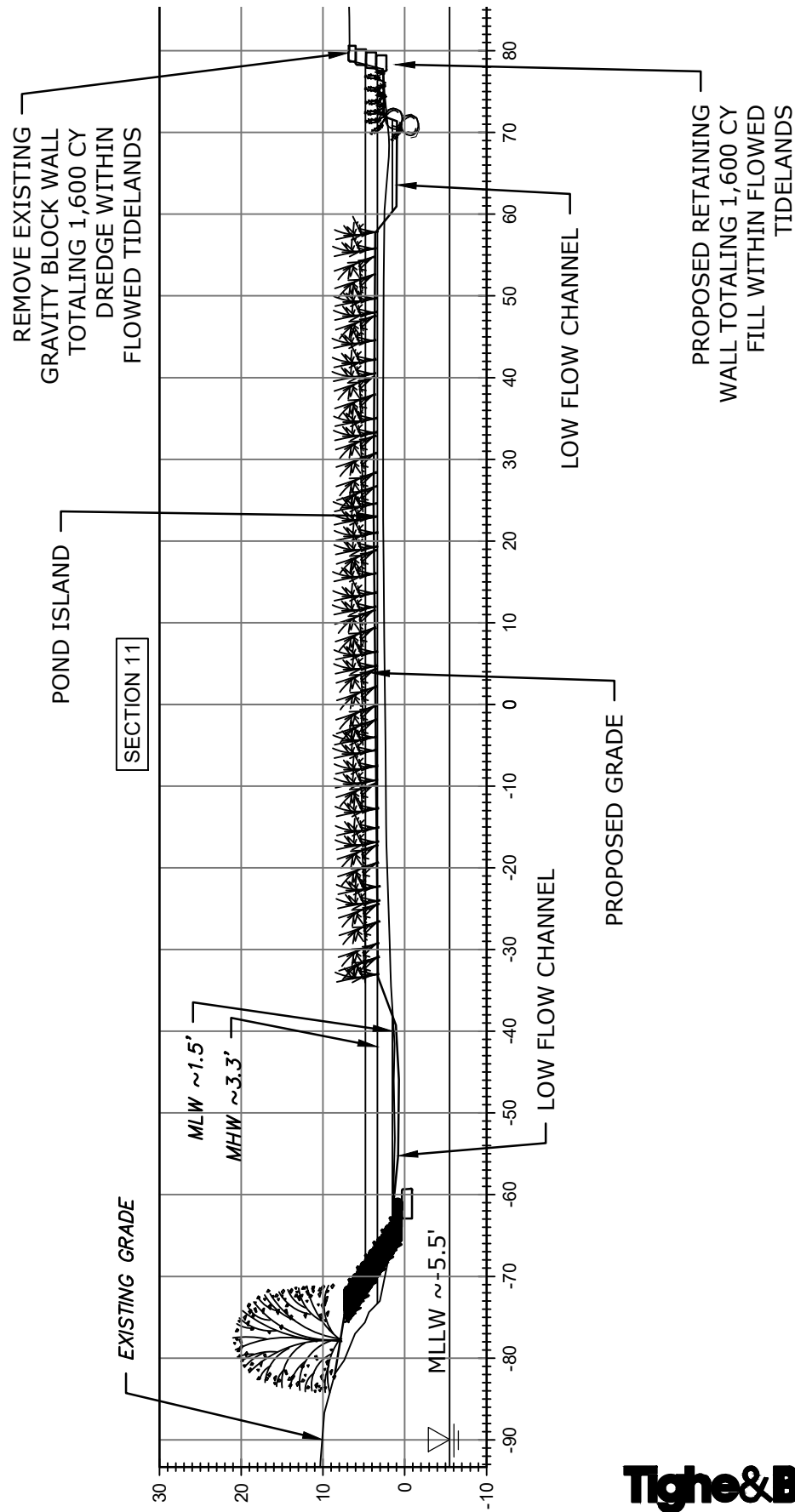
DATE: 2/25/22
SHEET 10 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

DATE

PROFESSIONAL ENGINEER



TYPICAL CENTRAL POND CROSS-SECTION

HOR: 1"=20'; VER: 1"=20'



PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

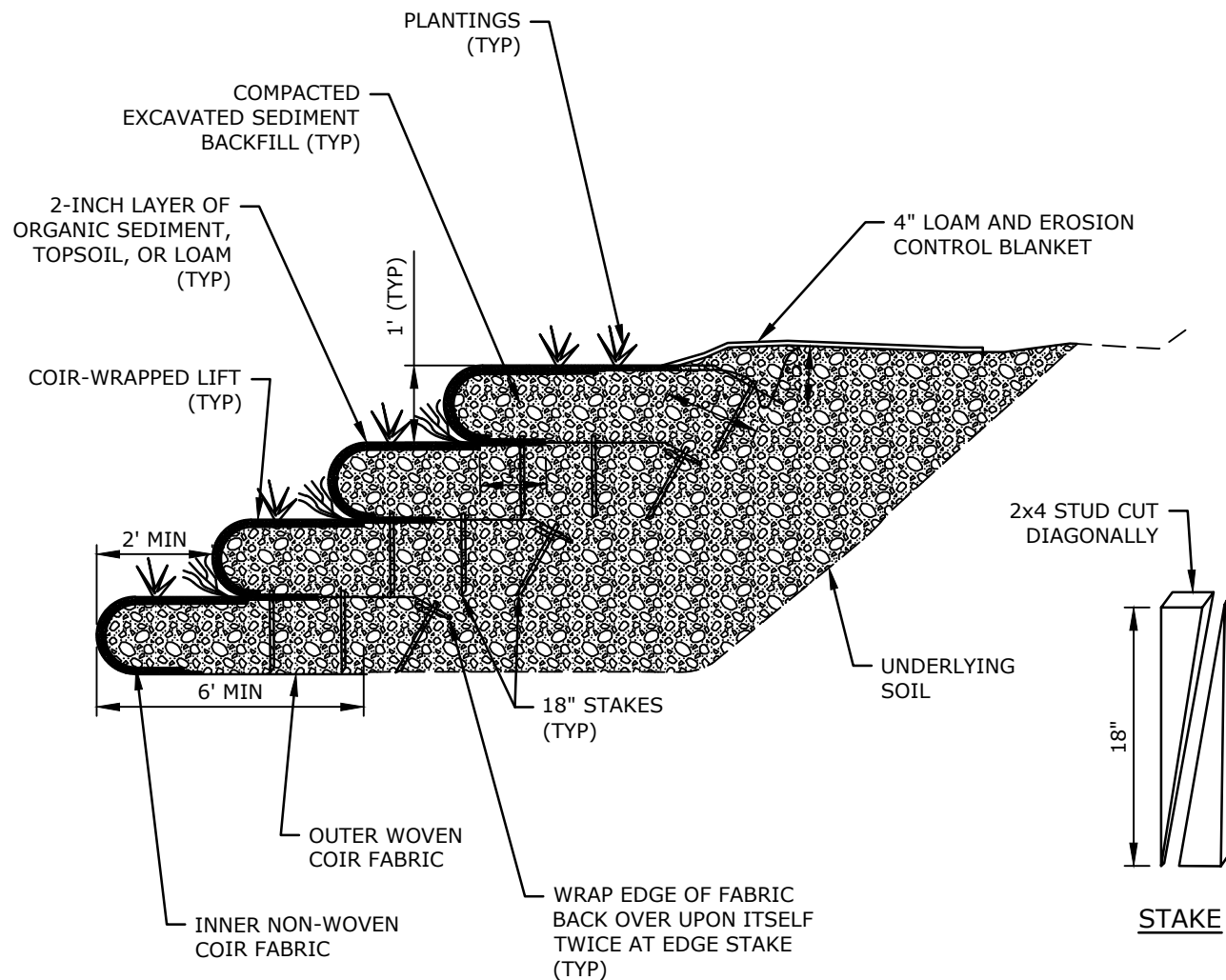
DATE: 2/25/22
SHEET 11 OF 14

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

DATE

PROFESSIONAL ENGINEER



NOTES:

1. INSTALL ENCAPSULATED SOIL LIFTS FROM DOWNSTREAM TO UPSTREAM, WITH UPSTREAM COIR FABRIC OVERLAPPING DOWNSTREAM FABRIC BY 18" MINIMUM.
2. USE SANDBAGS, TIMBER FORM, OR OTHER AS NECESSARY TO FORM FACE OF LIFT AND KEEP LOWER LIFTS SUFFICIENTLY DRY FOR INSTALLATION AND COMPACTION.
3. PROTECT FROM DAMAGE WHEN CONSTRUCTED BELOW TEMPORARY ACCESS ROAD OR NEAR OTHER WORK.

BANK TREATMENT C
ENCAPSULATED SOIL LIFT

NO SCALE

CENTRAL POND DETAILS

Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

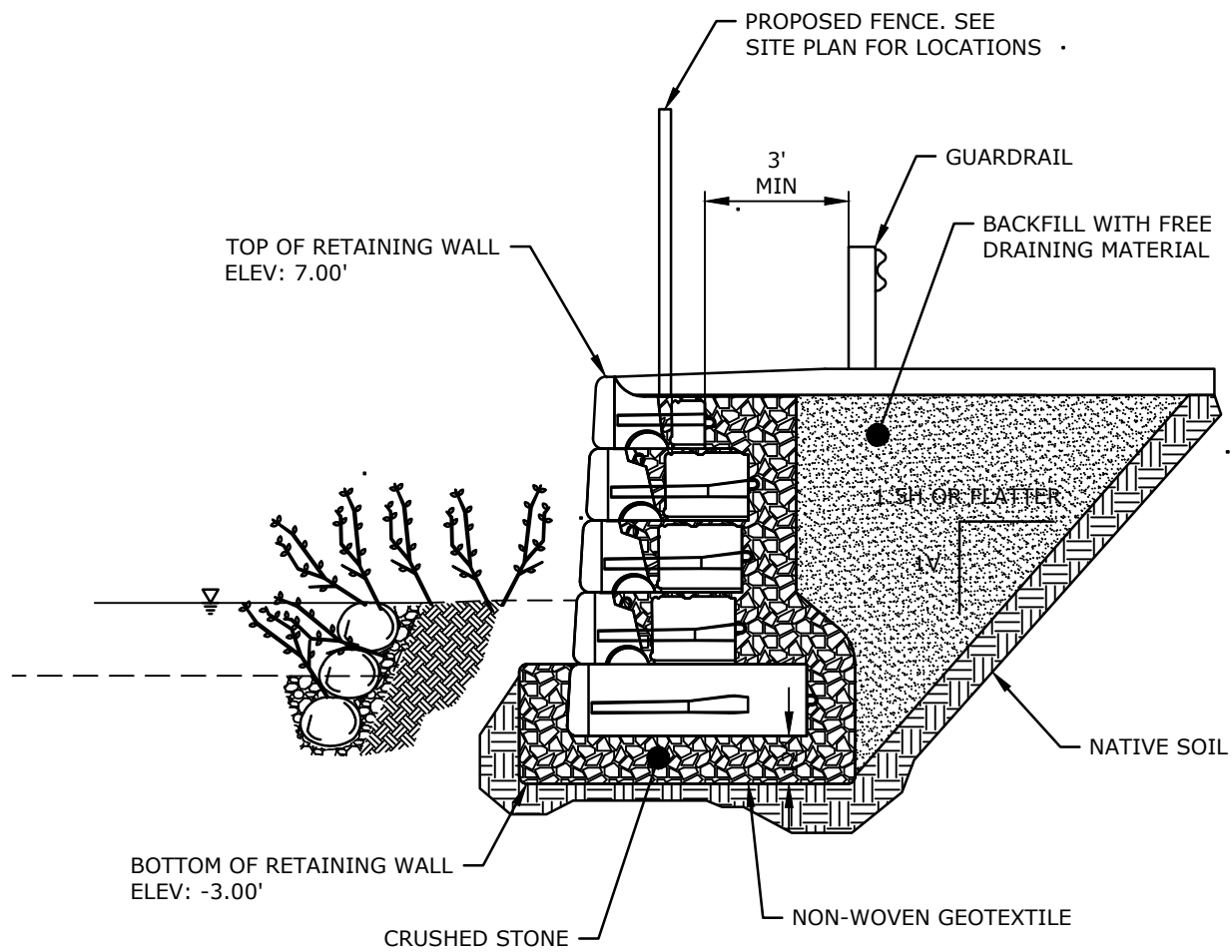
DATE: 12/XX/21
SHEET 12 OF 37

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED ACCORDING TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS AND I CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

DATE

PROFESSIONAL ENGINEER



GRAVITY BLOCK WALL

NO SCALE

CENTRAL POND DETAILS

Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

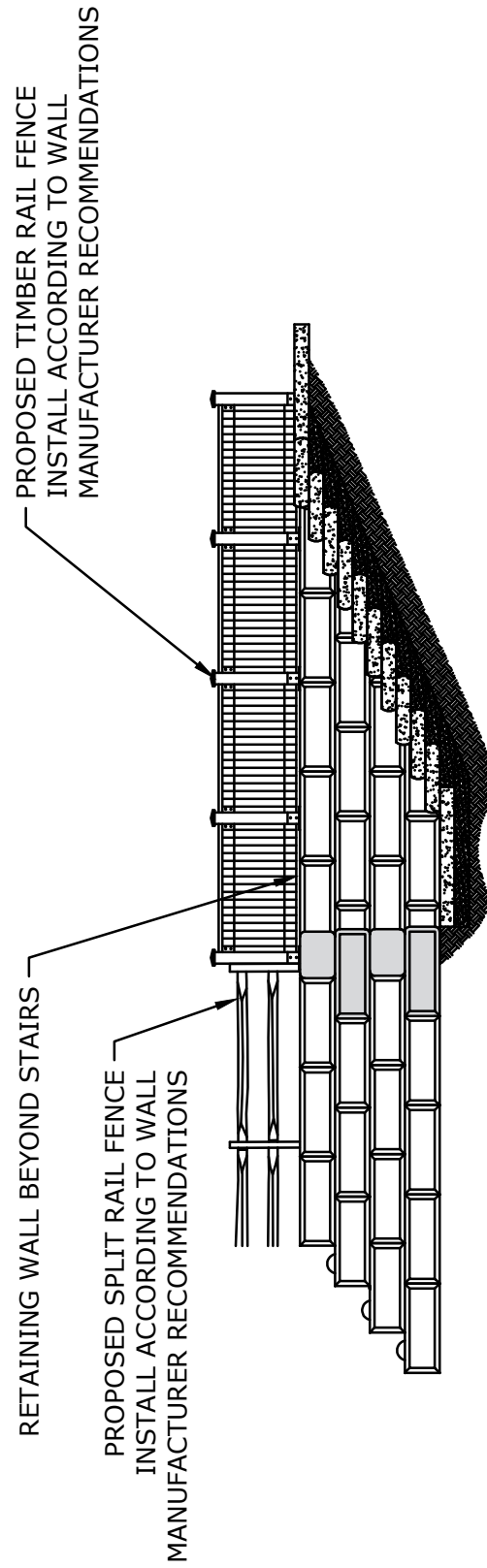
DATE: 12/XX/21
SHEET 13 OF 37

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

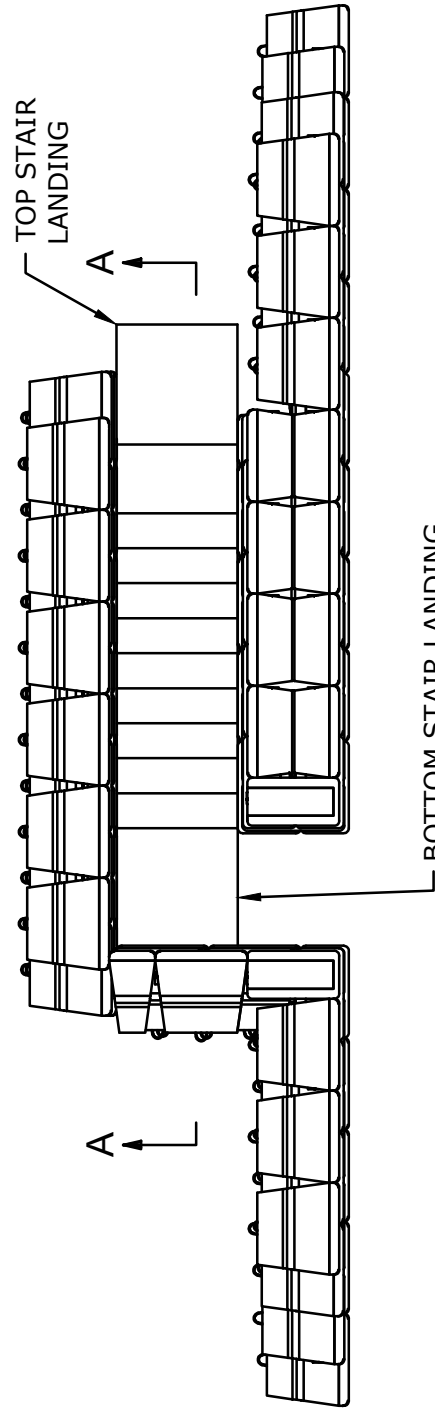
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DATE

PROFESSIONAL ENGINEER



SECTION A-A



NOTES:
1. PROPOSED STAIRS TO WATER LEVEL TOTALING 50 CY FILL WITHIN FILLED TIDELANDS.

STAIR ACCESS
NO SCALE

CENTRAL POND DETAILS

Tighe&Bond

PLANS ACCOMPANYING PETITION OF THE TOWN OF MANCHESTER-BY-THE-SEA DEPARTMENT OF PUBLIC WORKS FOR THE CENTRAL STREET BRIDGE REPLACEMENT AND CENTRAL POND RESTORATION MANCHESTER-BY-THE-SEA, MASSACHUSETTS

DATE: 12/XX/21
SHEET 14 OF 37

PROJECT DATUM:
HORIZONTAL-NAD83
VERTICAL-NAVD88

APPENDIX H4

Response to Comments

Response to Comments

1. The form has been revised to reference the Town of Manchester-by-the-Sea as the applicant
2. Confirmed that project dredge, fill, structures will be on Town-owned property on both sides
3. Tabulated summary of proposed dredging and fill that will occur within Chapter 91 programmatic jurisdictional areas is provided below

	Central Street Bridge Replacement Project		Central Pond / Sawmill Brook Restoration Project		Combined Project Totals
	Quantitative	Narrative	Quantitative	Narrative	
Dredge within flowed tidelands	70 CY	Removal of existing bridge footings, tide gate structure, slide gate	1600 CY	Removal of existing retaining wall, placement of bioengineering structures	1670 CY
Fill within flowed tidelands	150 CY	New footings	1600 CY	Replacement retaining wall, plantings and bioengineering structures	1750 CY
Fill within filled tidelands			50 CY	Addition of stairs in retaining wall to water level	50 CY

4. Existing conditions with tide gate blocking the bridge inhibits navigation of vessels
 Project should improve with removal of tide gate and widening of opening
 Low chord elevation of 6 ft NAVD proposed
 Proposed roadway improvements include new ADA compliant sidewalks and curb ramps