Update to Basis of Design Report

Old Swamp River Dam Removal and Restoration

Libbey Industrial Parkway
Weymouth, Massachusetts

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1.0 INTRODUCTION

The Old Swamp River dam is a low-head dam, approximately 3 feet tall, 3 feet wide, and 50 feet long, located on the Old Swamp River on the south side of Libbey Industrial Parkway, approximately a quarter mile upstream of the river's confluence with the South Cove of Whitman's Pond (at coordinates 42.192299, -70.944037). The dam was originally constructed to direct water from Old Swamp River into a Sediment Nutrient Uptake Pond (SNUP) system. The location of dam and two SNUP ponds are shown in Figure 1.

This system was constructed in the late 1980s with the goal of reducing phosphorus and other nutrients entering Whitman's Pond via the Old Swamp River. The system consists of a low head concrete dam with a metal gate and a series of treatment ponds in the adjacent riparian zone and historical wetland areas.

When operating as designed, the dam diverts river water through a sluiceway into the series of treatment ponds before discharging back into the Old Swamp River downstream of the dam. However, the dam and SNUP system have not been operated in this way for at least ten years, and the gate in the dam which controls water flow into the ponds has been left permanently open, allowing water to flow freely downstream in the river. The dam impoundment is approximately 1.6 acres, with a contributing watershed area of 4.6 square miles.

The Old Swamp River dam impedes fish passage and artificially impounds water and sediment, disrupting the natural habitat and function of the river. The Old Swamp River is a cold-water fishery resource that historically supported a wild population of brook trout. The river also serves as an anadromous fish run that provides critical spawning habitat to river herring. The Weymouth herring wardens have documented that fish passage is severely impeded by the dam and that passage only occurs under certain flow conditions.

The Town of Weymouth (the dam owner) is pursuing removal of the Old Swamp River dam in order to restore fish passage and natural riverine functions in the Old Swamp River and eliminate ongoing maintenance obligations related to the SNUP system. The Old Swamp River dam will be removed to restore connectivity to upstream spawning habitat impacted by the dam and altered flow characteristics and sedimentation during low flow events. The upstream portion of the bank impacted by the SNUP inlet will be restored to a more natural state while maintaining floodplain connectivity to the basins and adjacent wetlands during flood stage events. All fencing around the SNUP basins will be removed to eliminate wildlife barriers.

The Old Swamp River dam removal project was selected as a Priority Project by the Massachusetts Division of Ecological Restoration (MADER) in 2021 and since then MADER and the Town have been working together to advance removal. Sediment sampling, surveying and hydrologic and hydraulic modeling have been conducted to develop the design for removal and the results of these efforts are outlined in herein, and in the attached Permit Drawings plan set, included in Appendix F.

Beals and Thomas, Inc. (B+T) has been retained by MADER to advance the dam removal design and provide an Update to the Basis of Design Report previously developed by SLR

International Corporation (SLR) for a town-owned dam on Old Swamp River located near Libbey Industrial Parkway in Weymouth, Massachusetts. Significant portions of this report are based directly upon the document 'Old Swamp River Dam Removal and Restoration Basis of Design Report' by SLR and dated May 2023.

Figure 1. Locus map of the Old Swamp River Dam and SNUP ponds.

1.1 Data Collection and Review

Relevant data, mapping, reports, and information have been collected and reviewed as available from the Town of Weymouth, MADER, Federal Emergency Management Agency (FEMA), and agencies within the Commonwealth. This information includes the following:

- MassGIS 2011 Light Detection and Ranging (LiDAR) for the Northeast
- Mapping and data from utility providers
- Ground survey performed by BSC Group, Inc. in May 2022
- Bathymetric and channel survey performed by Inter-Fluve in May and June 2022
- Base mapping from BSC Group, Inc. and Inter-Fluve dated June 30, 2022, including parcel ownership information
- Aerial imagery
- Culvert inspection report for Libbey Industrial Parkway dated August 31, 2021
- Construction plans for Libbey Industrial Parkway culvert dated February 1989
- Culvert inspection reports for Route 3 (Pilgrims Highway) culvert dated July 29, 2022, and July 23, 2020
- Bridge rating report for Route 3 (Pilgrims Highway) culvert dated September 2004
- Construction plans for Route 3 (Pilgrims Highway) culvert dated September 1957
- Sediment sampling plan dated May 19, 2022, and sediment sampling results dated June 29, 2022, completed by Inter-Fluve
- Sewer System Capital Improvement Program design plans dated July 2004
- SNUP design plans dated 1988
- FEMA Flood Insurance Study (FIS) 25021CV001D for Norfolk County, Massachusetts, dated July 6, 2021
- FEMA Flood Insurance Rate Map (FIRM) 25021C0229E
- FEMA supporting HEC-2 hydraulic data from 1990 hydraulic model
- Whitman's Pond studies from 1918, 1983, and 2022
- MassWildlife fish survey data from August 2022
- Geologic data and mapping
- Old Swamp River Dam Removal Basis of Design Report, by SLR, dated May 2023

Relevant information reviewed during the data collection effort is included in Appendix A.

1.2 Detailed Site Assessment

On December 5, 2022, SLR performed a site investigation of the project area, including the dam, impoundment, SNUP basins, and surrounding riparian corridor. Beals and Thomas (B+T) conducted a similar site visit on October 20, 2023 with MADER and representatives from the Town of Weymouth to review the site conditions. Topographic survey was completed by BSC Group, Inc. in May 2022. Bathymetric and channel survey was performed by Inter-Fluve, Inc. in May and June 2022 and sediment sampling was completed by InterFluve, Inc in May 2022. Relevant information documented from the site visits and surveys are included in Appendix A and results from the sediment sampling and analysis are included in Appendix B..

As shown on Figure 2, Old Swamp River flows from east to west within the Route 3 (Pilgrims Highway) median. Portions of the river within the median have been straightened to accommodate construction of the Route 3 highway. Upstream of the Route 3 northbound crossing, the channel has a riffle-run bed formation. A Wolman pebble count conducted upstream of the Route 3 bridge indicates that the average material diameter of the armoring layer is 1.5 inches. A grain size analysis was performed upstream of the Route 3 bridge on a sample of finer channel substrate below the armoring layer. This finer channel substrate consists of sand and gravel and has an average diameter of 0.2 inch.

The Route 3 crossing consists of an 18-foot-wide by 11-foot-high reinforced concrete box culvert with concrete wingwalls. According to design plans dated September 14, 1957, the culvert invert was placed below the existing channel elevation. Sandy sediment and leaf litter have since covered the bottom of the culvert, giving an open rise of approximately 8.5 feet at the time of the site investigation.

In the dam impoundment downstream of Route 3, sandy sediment, fine material, and leaf litter have accumulated within the channel. The left stream bank looking downstream has been raised to create a berm near the SNUP project to contain water within the SNUP basins. Downstream of the dam and SNUP outlet, the channel consists of large gravel over sand and flows through twin 7-foot by 12-foot box culverts under Libbey Industrial Parkway. The channel showed signs of erosion and undercutting on the left bank downstream of the dam. A pebble count conducted between the Libbey Industrial Parkway crossing and the dam indicates that the average material diameter is 1.9 inches.

Old Swamp River has been highly modified throughout the project area, and few suitable reference reaches were found. Stream characterization measurements were performed upstream of the Route 3 bridge within the Route 3 median and upstream of Libbey Industrial Parkway, as shown in Table 1.

Table 1 Stream Characterization

Field Measurement Location	Channel Slope	Channel Substrate	Bankfull Field Measurement Dimensions
Upstream of Pilgrims Highway (Route 3)	0.70%	Gravel and sand	14’ Wide, 2.0’ Deep
Between Libbey Industrial Parkway and Dam	0.20%	Gravel and sand, sediment	---
Downstream of Libbey Industrial Parkway	0.05%	Gravel and sand	18’ Wide, 2.7’ Deep

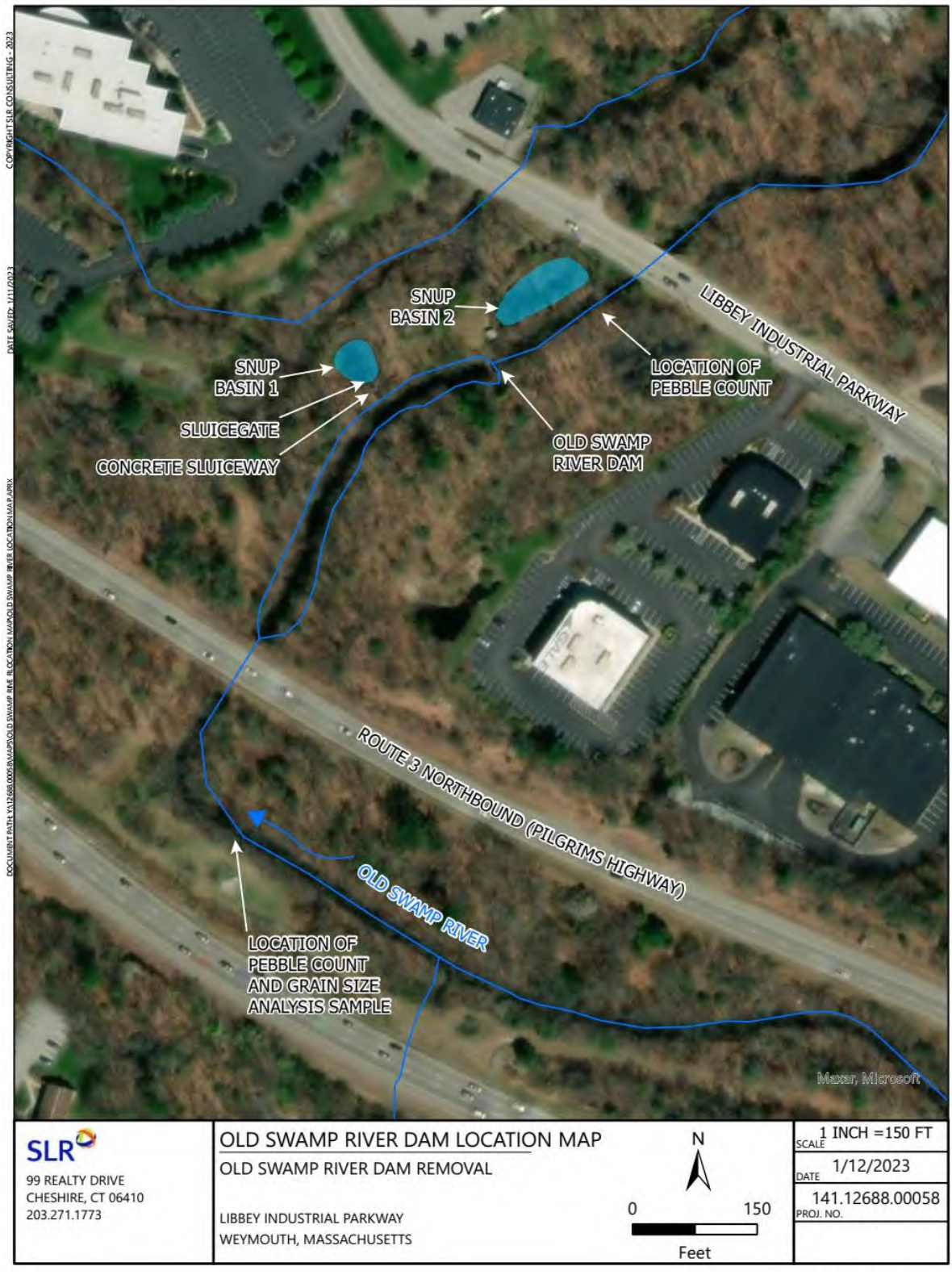


Figure 2. Old Swamp River Dam and pebble count location map.

1.3 Description of Dam

The low head concrete dam has a metal gate and is approximately 3 feet tall, 3 feet wide, and 50 feet long (Figure 3). Steps on the western side provide access to the dam and sluiceway gate. The Town indicated that the gate has been left open and is not adjusted during varying levels of stream flow. The dam raises the water surface elevation to allow water from Old Swamp River to enter the SNUP detention basins. A small concrete building that was previously located on the western bank near the dam has been demolished. Conversations with Town staff indicate that the building was intended to be used for water quality treatment downstream of the dam. The location of the dam is shown in Figure 1 and Figure 2, and the construction plans dated November 1986 and revised in January 1988 are included in Appendix A.

Figure 3: Existing concrete dam with metal gate

1.4 Description of SNUP System

The SNUP system consists of a series of treatment ponds northwest of Old Swamp River that were intended to reduce phosphorus and other nutrients from entering Whitman's Pond downstream. Upstream of the dam, a concrete sluiceway with a metal gate (Figure 4) provides access to SNUP Basin 1. SNUP Basin 1 is an earthen basin surrounded by barbed wire fencing. The basin side slopes are vegetated with brush and small trees, and grasses are growing in the center of the basin (Figure 5). From Basin 1, water flows through a 18" reinforced concrete pipe (RCP) culvert into a swale and into a wetland area. The wetland area also receives water from natural wetlands located west of the SNUP system. At the time of the site investigation on October 20, 2023, water was flowing from the wetland into Basin 1 and out through the concrete sluiceway into Old Swamp River, which is the opposite direction of flow compared to how the SNUP system was designed.

Figure 4: Concrete sluiceway with gate leading into SNUP Basin 1

Figure 5: SNUP Basin 1

From the wetland, flow enters SNUP Basin 2 through a second 18" RCP culvert. SNUP Basin 2 also has earthen sides surrounded by a barbed wire fence. The center of the basin has accumulated sediment, and tall grasses are growing within the basin (Figure 6). Flow then leaves SNUP Basin 2 through a third 18" RCP culvert and reenters the main channel of Old Swamp River downstream of the dam.

Figure 6: SNUP Basin 2

1.5 Description of Sediment

Sediment quantity and quality was assessed by InterFluve, Inc. in May 2022. The total volume of sediment estimated to be present within the SNUP system is 180 cubic yards within the Old Swamp River impoundment, 40 cubic yards in SNUP Basin 1 and 51 cubic yards in SNUP Basin 2. The sediment quality analysis indicated that the sediment impounded behind the Old Swamp River dam is relatively clean. However, sediment found within the SNUP Basin 1 contains relatively high concentrations of metals. A memorandum detailing the results of the sediment analysis including sediment sampling locations and results are included in Appendix B.

1.6 Description of Surrounding Infrastructure

Libbey Industrial Parkway is located approximately 210 feet downstream of the Old Swamp River dam. The crossing consists of twin box culverts with 12-foot spans and 7 feet of rise. At the time of SLR's site investigation, the western barrel had reduced flow capacity due to a vegetated sediment bar located upstream (Figure 7). The eastern barrel was flowing freely, with no accumulation of sediment within the culvert. As noted in the culvert inspection report dated August 31, 2021, the downstream lip of the eastern culvert floor

was exposed by up to 3 inches; however, no scour hole was observed downstream of the culvert.

The Route 3 (Pilgrims Highway) northbound crossing is approximately 470 feet upstream of the Old Swamp River dam. According to the 1957 design plans, the crossing consists of a single 18-foot span with a rise of 11 feet (Figure 8). Field measurements indicate that the bottom of the culvert has filled with approximately 1 foot of sediment, making the effective rise 10 feet. During the site visit, sediment aggradation was present throughout the length of the Route 3 culvert. Upstream of the Route 3 northbound crossing, the channel makes a 90-degree turn and is confined within the median of Route 3. At the outside of the bend on the western bank, riprap has been placed to stabilize the stream bank.

Figure 7: Upstream face of Libbey Industrial Parkway twin box culvert

Figure 8: Upstream face of Route 3 (Pilgrims Highway) northbound crossing

2.0 HYDROLOGIC ASSESSMENT

Old Swamp River is a perennial stream running 4.4 miles from its headwaters in Rockland to the South Cove of Whitman's Pond in Weymouth. The Old Swamp River is an Outstanding Resource Water (ORW), and the South Cove of Whitman's Pond is a Class A surface water source (public drinking water supply). The river is a cold-water fishery resource that historically supported a wild population of brook trout and currently provides critical spawning habitat to river herring, although river herring are only able to access habitat upstream of the dam during certain flow conditions, as observed by the Herring Wardens.

The dam impoundment is approximately 1.6 acres, with a contributing watershed area of 4.6 square miles (Figure 9). Land cover in the Old Swamp River dam watershed is approximately 30 percent forest, with areas of residential development. The watershed area includes portions of Route 3 (Pilgrims Highway) and portions of several Town roads, including, among others, Pleasant Street, Union Street, Ralph Talbot Street, and Sharp Street. The surficial geology of the project area consists of coarse glacial stratified deposits. Immediately downstream of the Old Swamp River dam watershed, Libbey Industrial Parkway serves a mix of commercial and industrial buildings.

2.1 Flood Flows

In order to assess the potential impacts of a dam removal on the flooding characteristics of the site, riverine flows were determined for floods of varying severity and frequency. This included assessing the extents and depths of the floodplain to identify any infrastructure or buildings that may be flood prone as well as evaluating the velocities and shear stresses

associated with these floods to assess the stability of the riverbanks, riverbed, and water-borne infrastructure such as bridges and dams. Multiple sources of hydrologic data were compiled in researching the Old Swamp River dam site, including the FEMA FIS, a United States Geological Survey (USGS) stream gauge located near the project site, and regional regression equations accessed through USGS *StreamStats*. For the purposes of this report, "flood flows" will be defined as flows that occur on a yearly recurrence (bankfull) interval basis as well as more severe events.

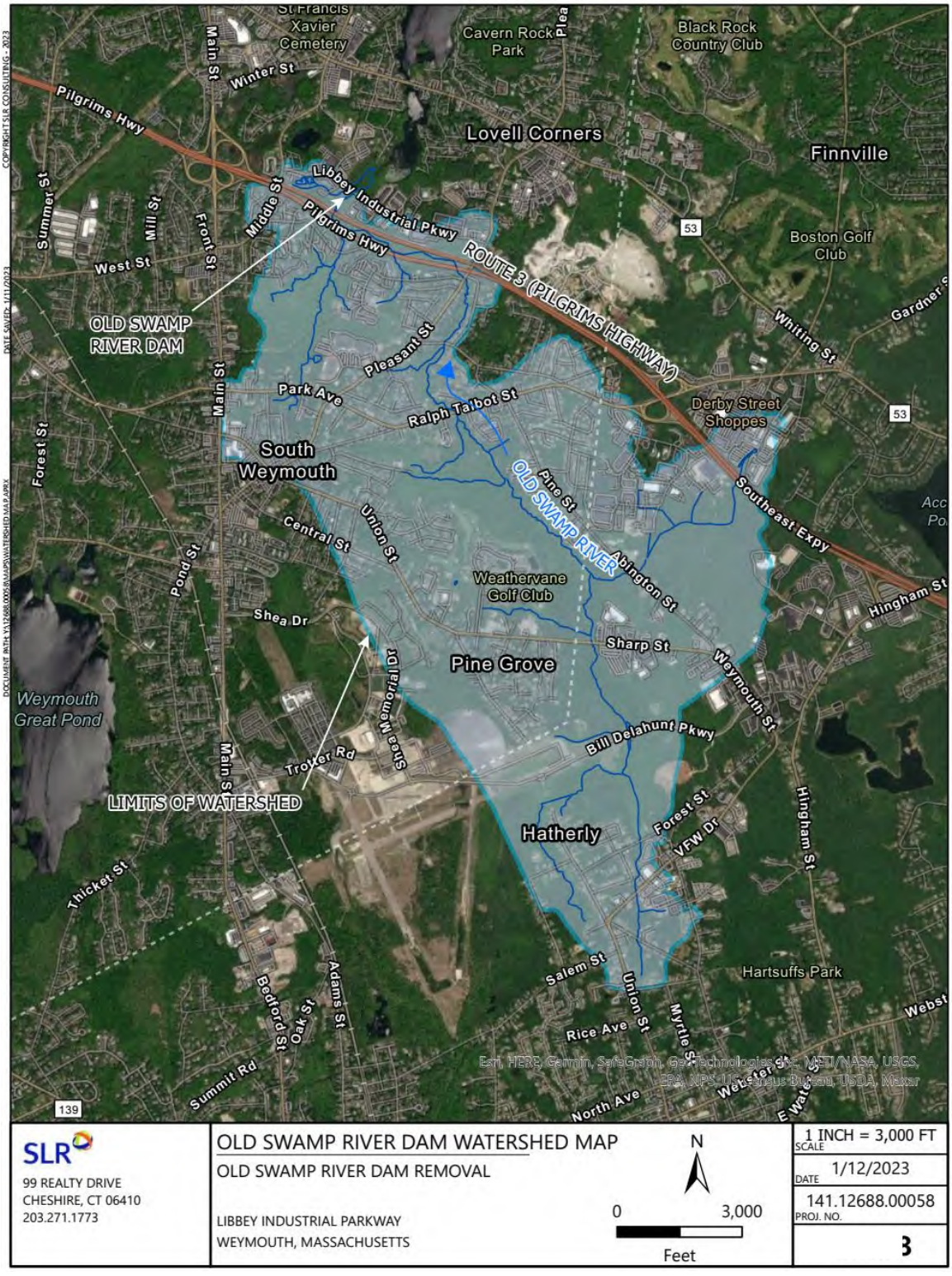


Figure 3. Old Swamp River Watershed Map

2.1.1 FEMA

The most recent detailed Flood Insurance Study (FIS) of Norfolk County, Massachusetts, is dated July 6, 2021. As part of that study, FEMA completed a hydrologic analysis for the Old Swamp River in 1990 using regression equations published by Johnson and Tasker in 1974. Table 2 summarizes the flows utilized in the FEMA analysis.

Table 2 FEMA Flood Flows

Location	Drainage Area (sq. mi.)	10-Year (cfs)	50-Year (cfs)	100-Year (cfs)	500-Year (cfs)
Old Swamp River at Libbey Industrial Parkway	4.9	241	360	422	657

2.1.2 USGS Gauge Data

The USGS maintains a network of stream gauges throughout the country. These gauges can provide valuable information on the flow conditions of the stream in which they are installed. USGS stream gauge No. 01105600 on the Old Swamp River in Weymouth, Massachusetts, is located approximately 750 feet upstream of the Old Swamp River dam and 250 feet upstream of the Route 3 northbound crossing. This gauge has been recording stream flow since 1967, which provides a period of record of 55 years at the time of writing and has a drainage area of 4.5 square miles. Peak flows were calculated by performing a Bulletin 17c analysis with the Hydrologic Engineering Center – *Statistical Software Package* (HEC-SSP) program and are presented in Table 3. Full computations are provided in Appendix C.

Table 3 Summary of Peak Flows Derived from USGS Gauge No. 01105600, Old Swamp River at Weymouth, Massachusetts

Location	Drainage Area (sq. mi.)	5-Year (cfs)	10-Year (cfs)	50-Year (cfs)	100-Year (cfs)
Old Swamp River near South Weymouth, MA	4.5	299	389	620	732

2.1.3 USGS StreamStats

StreamStats is a powerful hydrology tool developed by the USGS that uses regression equations to predict flow rates, assuming natural runoff conditions. The regression equations used in the analysis for this project are based on USGS Report 2016-5156 (Zarriello, P.J, 2017). Estimated peak discharges for various frequency events at the Old Swamp River dam were calculated by SLR using *StreamStats* and are presented in Table 4 below.

Table 4 Summary of Peak Flows Derived from USGS *StreamStats*

Location	Drainage Area (sq. mi.)	5-Year (cfs)	10-Year (cfs)	50-Year (cfs)	100-Year (cfs)
At Libbey Industrial Parkway	4.6	185	241	389	460

2.1.4 Selection of Peak Flows

Substantial discrepancies exist between the peak discharges reported by FEMA and *StreamStats* and those determined using the stream gauge upstream of the project site. It is common for hydrologic analyses to offer results that vary from one method of computation to another as they involve complex calculations that are functions of many factors.

While the *StreamStats* method of peak-flow approximation provides a regional average for stream behavior, there can be substantial variability between individual watersheds that can affect peak flows such as precipitation patterns, underlying geologic conditions, and urbanization. Like the *StreamStats* flows, the FEMA discharges were also based on regional regression equations and are similarly low when compared to the gauge on Old Swamp River. USGS Stream Gauge No. 01105600 is located on the subject river within 750 feet of Old Swamp River dam and accounts for changes in the watershed due to urbanization as well as local precipitation patterns and geology. USGS stream gauge data were chosen as the source of the design discharges due to the close proximity of the stream gauge and more conservative higher flows.

2.1.5 Climate Change

In order to assess the feasibility of the Old Swamp River dam removal under future conditions, multiple guidelines regarding climate change's effect on flow and precipitation were considered. Watersheds with long-term flow records and little human influence have shown trends toward increasing stream flow over the past few decades (Collins, 2009). In a recent study, 25 of 28 flood series studied in New England showed upward flood trends, with evidence of an increase in flood magnitudes around 1970 (Collins, 2009). Project design guidelines published by Collins through the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service recommend the following (Collins, 2011):

- The most recent available data should be used to compute statistical flood frequency estimates.
- If the period of flood record allows, pre-1970 and post-1970 flood frequency curves should be computed, and the design team should consider using the larger estimated design flows.
- If little recent data is available, regional regression equations or other estimation strategies could be compared to older gauge data. The same strategy used to estimate more recent flows should also be applied to the older period of record to check for methodological bias.

Peak-flow data for USGS Gauge No. 01105600 is available starting in 1967, but this is not a long enough period of record to evaluate flows before and after 1970. A gauge on East Branch Neponset River in Canton, Massachusetts (Gauge No. 01105500), was selected for comparison of discharges before and after 1970 due to its longer period of record and location within the Boston Harbor watershed. Data from the East Branch Neponset Gauge indicates that there were two large storms prior to 1970. Consistent with design guidance from Collins (2011), annual peak flow data from USGS Gauge No. 01105500 (period of record 1953 to present day) was analyzed using HEC-SSP for the periods from 1953 to 1969, 1970 to present day, and 1953 to present day. As shown in Figures 10 and 11, contrary to New England trends, storm events in the post-1970 dataset had a smaller discharge than in the pre-1970 dataset, especially for events with low annual exceedance probability.

The East Branch Neponset River is located within Canton, Massachusetts, and experienced major flooding in 1936, 1938, 1955, and 1968. According to the Canton FIS completed in 1987, the 1955 flood event was approximately equivalent to the 100-year event. After the 1955 flood, the U.S. Army Corps of Engineers constructed the "Canton Local Protection Project," which included a diversion channel connecting Silk Mill Pond to Bolivar Pond, which are located upstream of Gauge No. 01105600 on East Branch Neponset River. A flood control communication system is used to coordinate drawdown of ponds upstream of the East Branch Neponset gauge before large storms. The implementation of the Canton Local Protection Project after 1955 likely explains the lower discharges found during the post-1970s stream gauge analysis.

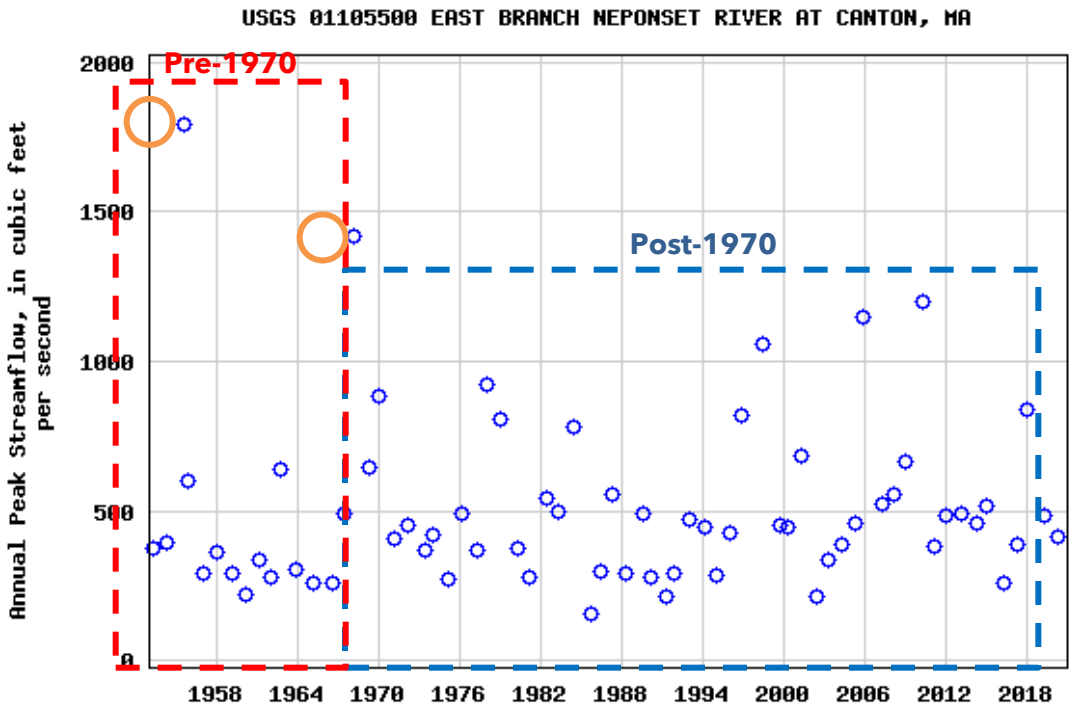


Figure 10: USGS Gauge No. 01105500 East Branch Neponset, Canton, Massachusetts Annual Peak Flow Records

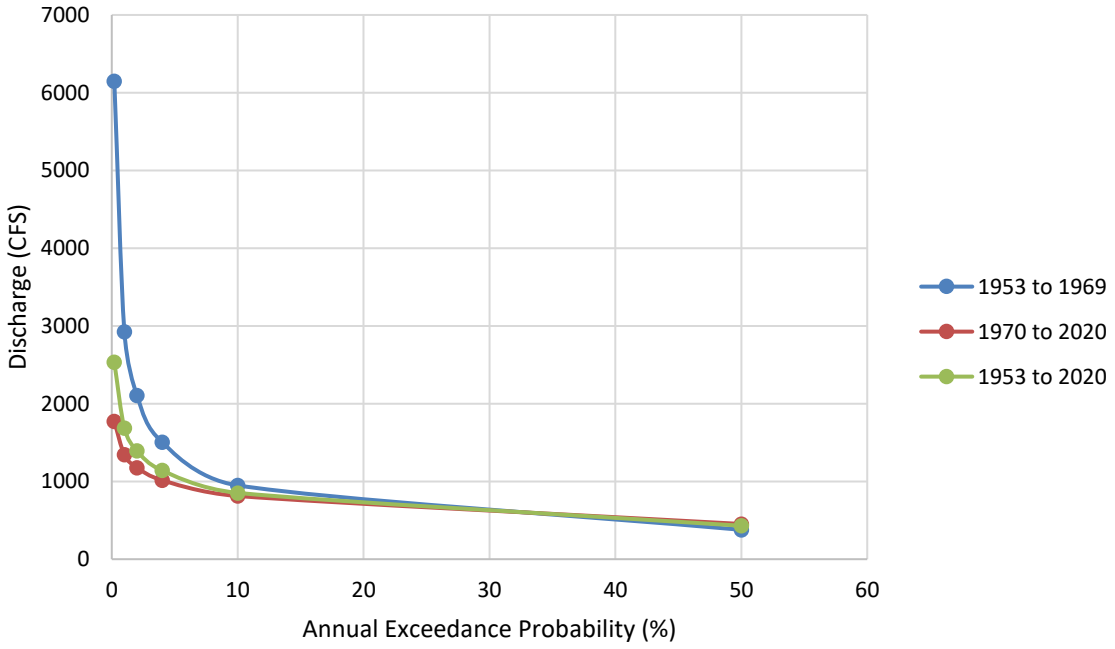


Figure 11: Bulletin 17C Analysis on East Branch Neponset River (Gauge No. 01105500) for 1953-2020, 1953-1969, and 1970-2020

The Northeast Climate Adaptation Science Center at the University of Massachusetts Amherst published projected changes in precipitation for the Commonwealth of Massachusetts in its *Massachusetts Climate Change Projections* document (Northeast Climate Adaptation Science Center, 2018). The precipitation climate change projections are based on climate models from the International Panel on Climate Change and two greenhouse gas emission scenarios. The Massachusetts Climate Change Projections state that "the severity of flood-inducing weather events and storms will increase, with events that produce sufficient precipitation to present a risk of flooding likely increasing" (Northeast Climate Adaptation Science Center, 2018).

The Massachusetts Climate Change Projections include projections specific to the Boston Harbor Basin. Within the Boston Harbor Basin, the winter season is expected to have the largest change in precipitation, with an increase of 0 to 20 percent by the 2050s and an increase of 3 to 34 percent in the 2090s. An increase in precipitation is not directly proportional to an increase in channel flow due to infiltration, evaporation, transpiration, and interception within a watershed. However, given the high level of development within the Boston Harbor watershed, the projected increase in precipitation may be similar to the projected increase in flow.

Guidelines from the State of New York were also considered. The New York State Department of Transportation (NYSDOT) *Bridge Manual* (2017) requires increasing the design flows by 20 percent in order to account for increasing projected future flows.

In consideration of the multiple approaches to adjusting for climate change, a 25 percent increase in flow was chosen as a middle ground between NYSDOT guidance and Massachusetts precipitation projections. Table 5 below shows the design flows based on Old Swamp River USGS gauge data and the projected 25 percent increase in peak flows applied to the 100-year flow.

Table 5 Summary of Peak Flows Derived from USGS Gauge Data and Climate Change Adjustment

Location	5-Year (cfs)	10-Year (cfs)	50-Year (cfs)	100-Year (cfs)	100-Year +25% (cfs)
At Old Swamp River dam	299	389	620	732	915

2.2 Low Flows

Peak flows are useful in determining flooding extents, channel stability, and erosion potential during a flood event. In order to evaluate the channel characteristics during more common scenarios, low-flow estimates are also compiled. These flows are used to determine the size of the channel that may develop in the former impoundment as well as to evaluate the ability of the channel to provide adequate fish passage. For the purposes of this report, "low flows" will be defined as flows lower than bankfull flow.

2.2.1 Monthly Exceedance Flows

In order to evaluate channel characteristics during more common scenarios, monthly exceedance flows were compiled. The 95 percent, 50 percent, and 5 percent exceedance flows were calculated using an HEC-SSP duration analysis at USGS Gauge No. 01105600 on Old Swamp River. Based on NOAA guidance, the 95 percent and 5 percent exceedance flows were used to evaluate the ability of the channel to provide adequate fish passage (NOAA, 2016). Fish passage is discussed in greater detail in Section 4.2.4. The monthly exceedance flows are shown in Table 6.

Table 6 Summary of Monthly Exceedance Flows

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
95% Exceedance Flow (cfs)	3.0	3.3	4.3	3.7	2.6	0.8	**0.2**	0.2	0.1	0.5	1.4	2.6
50% Exceedance Flow (cfs)	7.4	8.4	10.0	9.0	6.2	3.3	1.4	1.2	1.2	2.7	5.7	7.4
5% Exceedance Flow (cfs)	33.7	36.4	47.0	**40.0**	26.5	21.2	12.0	11.1	13.0	21.0	28.0	37.1

Note: Highlighted flows are utilized in fish passage.

2.2.2 Bankfull Flow

In the case of the Old Swamp River, human manipulation of the physical riverbanks as well as the upstream hydrology means that the concept of a "natural" bankfull flow and channel dimensions is very difficult to establish; therefore, regional estimates were utilized and compared in an effort to estimate the bankfull conditions of the Old Swamp River.

Bankfull flow was calculated using the regression equations from USGS Report 2013-5155, "Equations for Estimating Bankfull Channel Geometry and Discharge for Streams in Massachusetts." The USGS report provides two different regression equations for estimating bankfull flows. One equation is referred to as a "simple" equation with fewer variables but less customization per site and therefore less potential accuracy. The multivariable regression equation allows for the customization of the equation with additional parameters, which provide better site-specific results.

The equilibrium concept of "bankfull" is estimated as the 1.5-year flood in many watercourses. While such an estimation is an oversimplification of the bankfull concept and rarely aligns perfectly, it is a useful surrogate when attempting to estimate the bankfull flow of a stream or river when little other information is available. Therefore, the HEC-SSP Bulletin 17C analysis of the Old Swamp River USGS gauge was expanded to include an estimate of the 1.5-year flood. The bankfull estimates based on gauge data and regional regression equations are compared in Table 7.

Table 7 Summary of Bankfull Flows

Calculation Method	Bankfull Flow (cfs)
Bankfull Multiple Regression Equation	68
1.5-Year Flow, Old Swamp River USGS Gauge	141

The calculated bankfull flows were entered into the Hydrologic Engineering Center – River Analysis System (HEC-RAS) existing conditions model and compared to existing bank height at cross sections that appeared to resemble most closely what may have been natural conditions before development and channel manipulation. The flow calculated using the multiple regression equation appeared to align with the heights of the existing banks better than the 1.5-year flow and was selected for use as the estimated bankfull flow in the Old Swamp River.

2.3 Post-Dam Removal Hydrology

Some dams are designed to provide flood control benefits for downstream areas. Such a dam often has a large, dry storage area within the floodplain on the upstream side that is able to fill with water during a severe flood, holding the water temporarily and releasing the water in a controlled fashion after the peak of the flooding has passed. This reduces the peak-flow rate downstream of the dam and lessens the severity of the flood. The removal of a flood control dam would require the assessment of this effect and the resulting increases in downstream flood flows.

However, the Old Swamp River dam does not provide flood control benefit; it is a run-of-river dam with very little available storage and is not operated in a way that takes advantage of the little storage it has. Therefore, no post-dam-removal hydrology is necessary. Removal of the dam will not appreciably affect downstream flood rates.

3.0 EXISTING CONDITIONS HYDRAULIC ASSESSMENT

The effective FEMA hydraulic modeling was completed using an HEC-2 model in 1990. FEMA supporting data for the effective model was requested by SLR for possible use in calibrating the existing conditions model. However, the hydraulic data received was not provided in a digital format and therefore was not used for calibration.

SLR developed an existing conditions model of the Old Swamp River and B+T made minor revisions to this model in March 2024. The model was developed using data from the combined base mapping, which included ground survey collected in May 2022, bathymetric survey collected in May and June 2022, and 2011 LiDAR topographic data. Bathymetry was used for model geometry within the channel and impoundment from Libbey Industrial Parkway to approximately 310 feet upstream of the upstream side of Route 3. Cross sections beyond this point are based on LiDAR topography and do not include the low-flow channel and, therefore, were not used in the fish passage assessment.

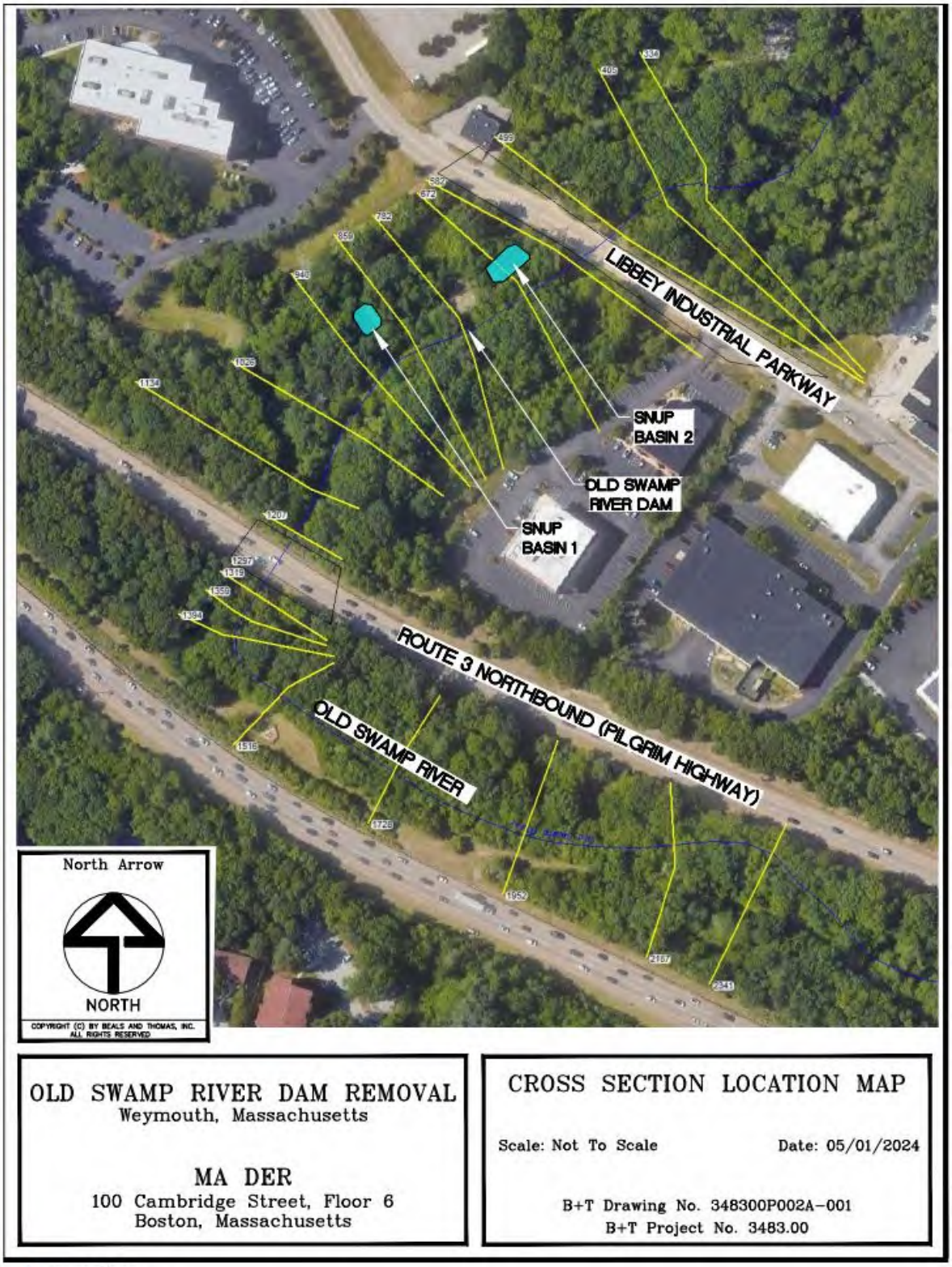
Ground survey was used to represent the dam, SNUP system, and concrete sluiceway and sluice gate at SNUP Basin 1. Floodplain and upland areas upstream of the SNUP system were mapped using LiDAR topography. All elevations in the model are referenced to North American Vertical Datum of 1988 (NAVD88). More information regarding the compiled data sources is presented in Section 1.1 and 1.2 of this report.

Nineteen sections were placed to capture channel morphology and existing structures, as shown in Figure 12. B+T eliminated one cross-section from SLR's analysis (which included 20 cross sections) to improve the hydrologic model. The Manning's friction coefficients were selected based upon field observations, pebble counts, and grain size analysis. A Manning's n of 0.03 was used for the channel in the impounded area upstream of the dam. A Manning's n of 0.035 was used downstream of the dam and upstream of the impounded area. Manning's n values of 0.03 to 0.10 were used for the overbanks, depending on the type of groundcover.

The existing dam was input into the HEC-RAS model as a broad-crested inline structure, with a thickness of 3 feet in the direction of flow and length of 50 feet. The Libbey Industrial Parkway crossing was modeled as a two-barrel box culvert. Each culvert has a span of 12 feet and a rise of 7 feet, with a length of 50 feet in the direction of flow. The Route 3 northbound (Pilgrims Highway) bridge was entered as a single box culvert, with an 18-foot span and 11-foot rise and a length of 78 feet in the direction of flow. Based on the bridge design plans and observation of accumulated sediment within the Route 3 culvert during the site visit, 1 foot of the culvert depth was modeled as blocked and Manning's n values for the bottom of the culvert were adjusted to 0.03 represent sediment.

Two model runs were created to represent existing conditions; one model run used mixed flow with normal depth used as the upstream and downstream boundary conditions, and one model run used subcritical flow with starting water surface elevations from the FEMA flood profile. The model run in mixed flow was created using normal depth with a slope of 0.0070 feet per foot (ft/ft) as the upstream boundary condition and normal depth with a slope of 0.00095 ft/ft as the downstream boundary condition. The mixed-flow model run was used to more conservatively assess velocities, shear stress, and fish passage.

Figure 4. Cross Section Location Map



The FEMA effective model used normal elevations determined during field inspection as the starting water surface elevations. This creates a backwater condition at the downstream end of the FEMA model. The starting water surface elevations from the FEMA profile were used with the subcritical run to create a more conservative condition for the evaluation of water surface elevations. Starting water surface elevations from the FEMA profile were plotted against discharge in order to interpolate a downstream boundary condition for the climate change 100-year plus 25 percent flow. A summary of water surface elevations, velocities, and shear stresses for various flows are provided in Tables 8 and 9.

Table 8 Existing Conditions Water Surface Elevations

	Station	Water Surface Elevation (ft)		
		10-Year	100-year	100-year + 25%
Upstream	2341	76.78	77.78	78.19
	2187	76.29	77.41	77.88
	1952	74.98	75.69	76.01
	1728	73.94	75.14	75.82
	1516	73.00	74.68	75.50
	1394	72.84	74.59	75.43
	1359	72.72	74.44	75.27
	1319	72.66	74.16	74.93
	1297	Route 3 Northbound (Pilgrims Highway)		
Impoundment	1207	72.46	73.61	74.12
	1134	72.39	73.54	74.09
	1026	72.35	73.52	74.08
	940	72.27	73.33	73.85
	859	72.28	73.43	74.00
	782	72.27	73.43	73.99
	773	Old Swamp River Dam		
	672	72.28	73.44	73.98
	582	72.22	73.29	73.95
	567	Libbey Industrial Parkway		
	499	72.12	73.01	73.45
	405	72.12	73.03	73.44
	334	72.10	73.00	73.40

Note: Ft = feet
Water surface elevations were calculated using subcritical flow.

Table 9 Existing Conditions Shear Stress and Velocity

	Station	Channel Velocity (ft/sec)			Shear Stress (lb/sq ft)		
		Bankfull	10-Year	100-year + 25%	Bankfull	10-Year	100-year + 25%
Upstream	2341	4.23	6.52	4.86	0.68	1.18	0.55
	2187	2.19	3.98	4.18	0.17	0.40	0.37
	1952	3.23	6.30	9.42	0.38	1.05	2.07
	1728	2.63	5.02	5.21	0.24	0.64	0.58
	1516	4.68	6.11	5.44	0.82	0.93	0.60
	1394	2.50	4.34	4.12	0.19	0.47	0.37
	1359	2.46	5.01	5.25	0.18	0.59	0.54
	1319	1.48	4.22	6.09	0.06	0.42	0.75
	1297	Route 3 Northbound (Pilgrims Highway)					
Impoundment	1207	1.21	3.80	6.30	0.04	0.32	0.80
	1134	1.37	3.76	5.71	0.05	0.38	0.77
	1026	1.14	3.10	4.39	0.03	0.17	0.30
	940	0.98	3.30	5.70	0.02	0.25	0.69
	859	1.09	2.83	3.19	0.02	0.23	0.25
	782	1.37	2.43	2.71	0.04	0.10	0.11
	773	Old Swamp River Dam					
	672	1.07	1.66	1.96	0.03	0.06	0.07
	582	0.68	2.04	3.64	0.01	0.09	0.26
	567	Libbey Industrial Parkway					
	499	0.62	1.89	3.58	0.02	0.12	0.39
	405	1.24	1.63	2.04	0.04	0.06	0.09
	334	1.63	2.66	3.11	0.07	0.19	0.25

ft/sec – feet per second
lb/sq ft – pounds per square feet

Modeling results indicate that the existing channel is subject to relatively low velocities and shear stresses during larger storm events The highest velocities for the 100-year plus 25 percent flood event are 6.3 feet per second at the downstream side of the Route 3 crossing and 9.4 feet per second at cross section 1952, which is 660 feet upstream of Route 3. The higher velocities and shear stresses at cross section 1952 are caused by topography that constricts the floodplain. The full results of the HEC-RAS modeling can be found in Appendix D.

4.0 PROPOSED CONDITIONS DESIGN AND ASSESSMENT

4.1 Alternatives Analysis

After reviewing the preliminary hydraulic modeling and discussing design alternatives with MADER and the Town of Weymouth, three project alternatives were prepared for the Old Swamp River Dam Removal project. All alternatives involved the removal of the existing concrete dam and spillway, stabilization and restoration of the bed and banks in the vicinity of the dam, removal of barbed wire fencing around both SNUP ponds, and passive sediment management upstream of the dam. The alternatives differed, however, as described in Sections 4.1.1 and 4.1.2.

After discussion with MADER and the Town of Weymouth, Alternative 3 was selected to minimize tree clearing and site disturbance and reduce future maintenance.

4.1.1 Alternative 1

In addition to the dam removal, Alternative 1 included the following design elements, as shown on Figure 12:

- Removal of 40 cubic yards of contaminated sediment from SNUP Basin 1.
- Removal of the floodplain fill and berm between the SNUP basins and Old Swamp River to return the site to conditions before the SNUP project was constructed. Lowering the berm and floodplain bench will allow Old Swamp River limited access its natural floodplain. SNUP design plans from Whitman & Howard, Inc. indicate that Old Swamp River's northern bank elevation was between 71 and 73 feet (NAVD88) prior to construction of a berm and gravel roadway compared to current elevation of 73 feet.
- Mature trees will be avoided to the extent possible when lowering the berm and floodplain.
- Filling of sluiceway and sluice gate at SNUP Basin 1 to reconstruct former stream bank.
- Potential replacement of the vehicular gate at the entrance from Libbey Industrial Parkway.
- Removal of RCP between SNUP basin 1 and the open wetland area and replacing it with an open channel.

4.1.2 Alternative 2

In addition to the dam removal, Alternative 2 included the following design elements, as shown on Figure 13:

- Removal of 40 cubic yards of contaminated sediment from SNUP Basin 1.
- Retention of most site features such as the sluiceway near SNUP Basin 1 and the berm along the river-left bank.
- Potential replacement of the vehicular gate at the entrance from Libbey Industrial Parkway.
- Removal of RCP between SNUP basin 1 and the open wetland area and replacing it with an open channel.
-

4.1.3 Alternative 3

In addition to the dam removal, Alternative 3 included the following design elements, as shown on Figure 14:

- Removal of 40 cubic yards of contaminated sediment from SNUP Basin 1.
- Removal of the SNUP Basin 1 sluiceway and regrading and stabilization of a portion of the river-left bank at SNUP Basin 1
- Potential replacement of the vehicular gate at the entrance from Libbey Industrial Parkway.
- Removal of RCP between SNUP basin 1 and the open wetland area and replacing it with an open channel.

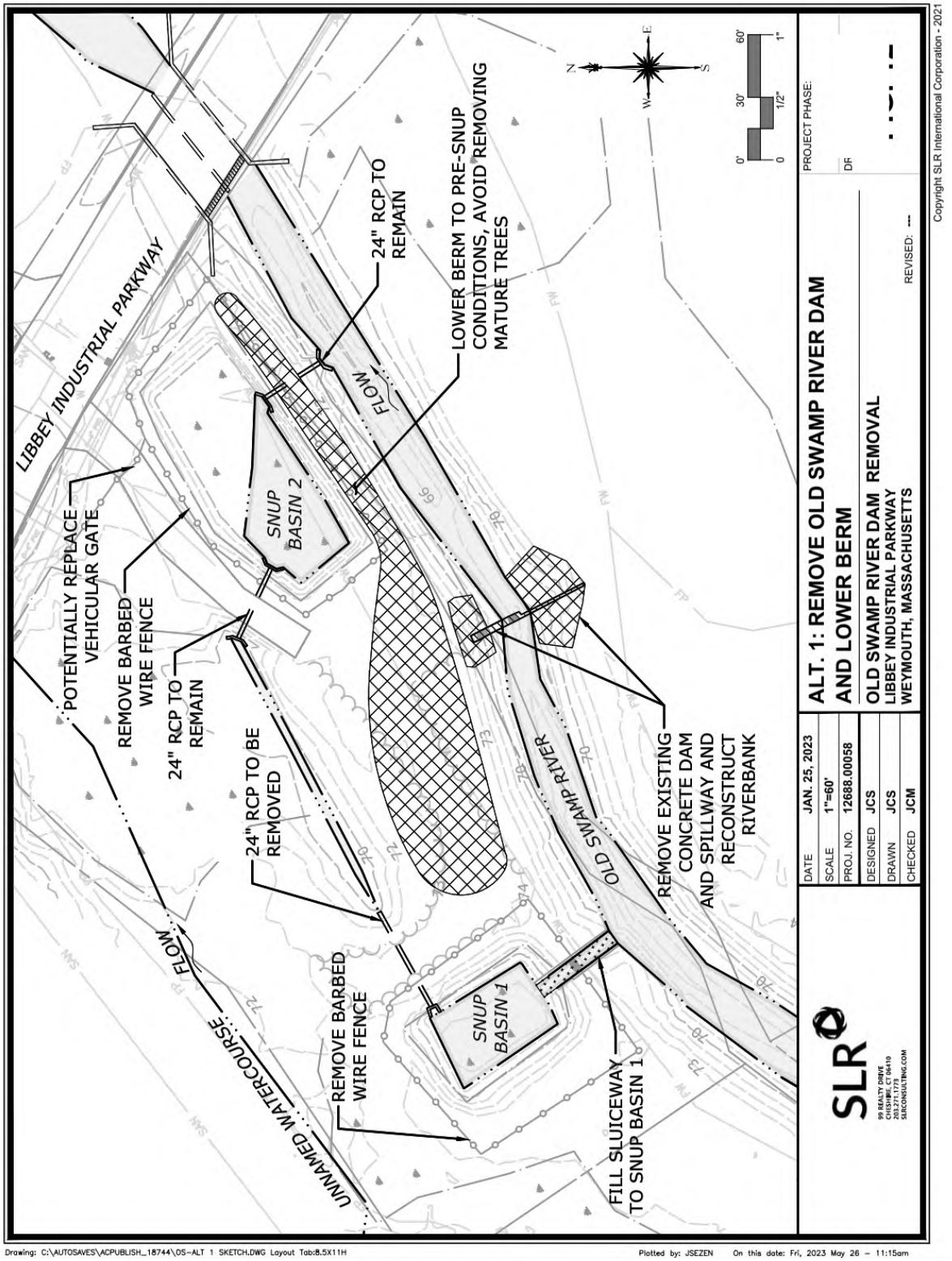


Figure 5. Alternative 1 Design Sketch

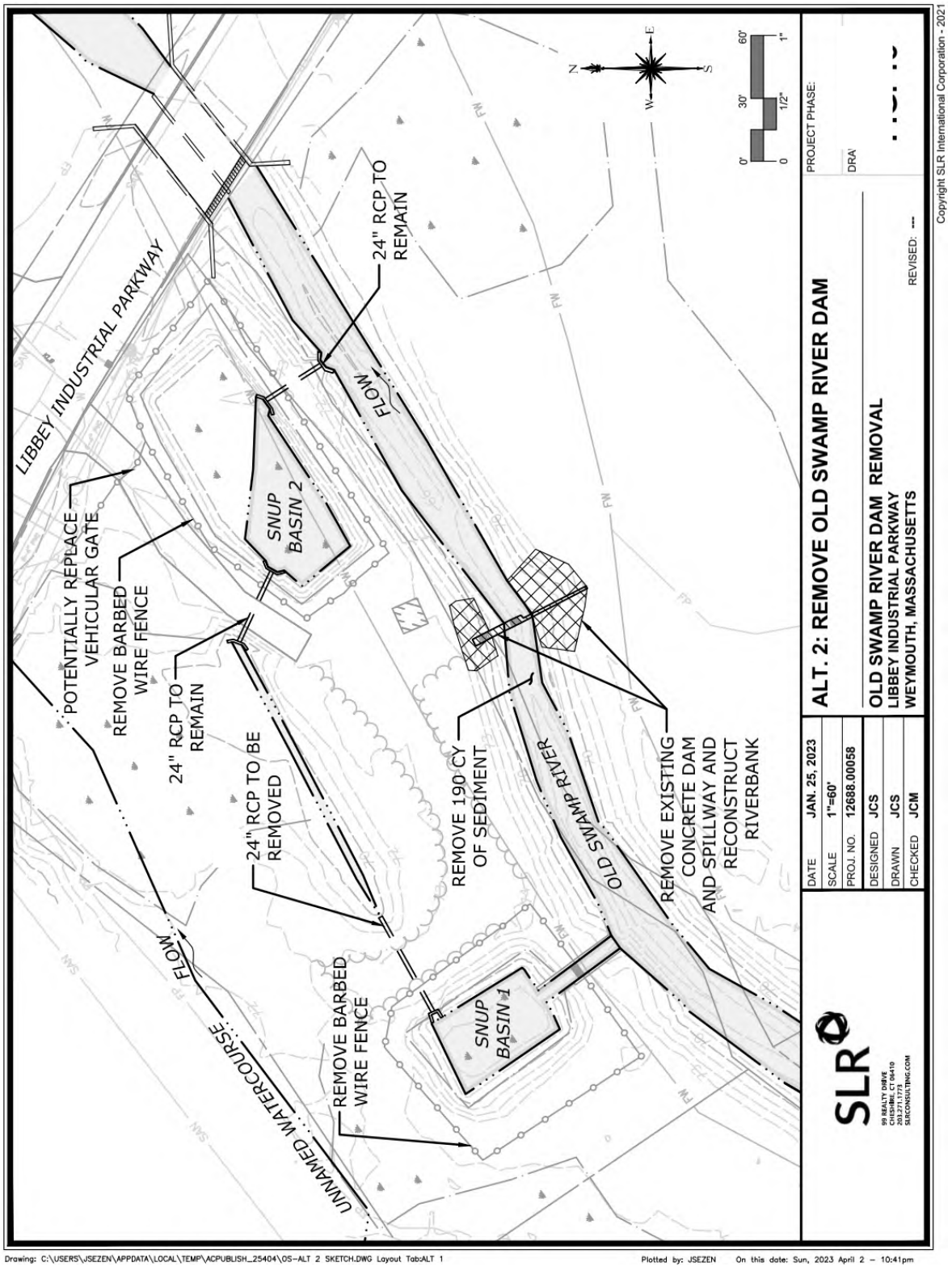


Figure 6. Alternative 2 Design Sketch

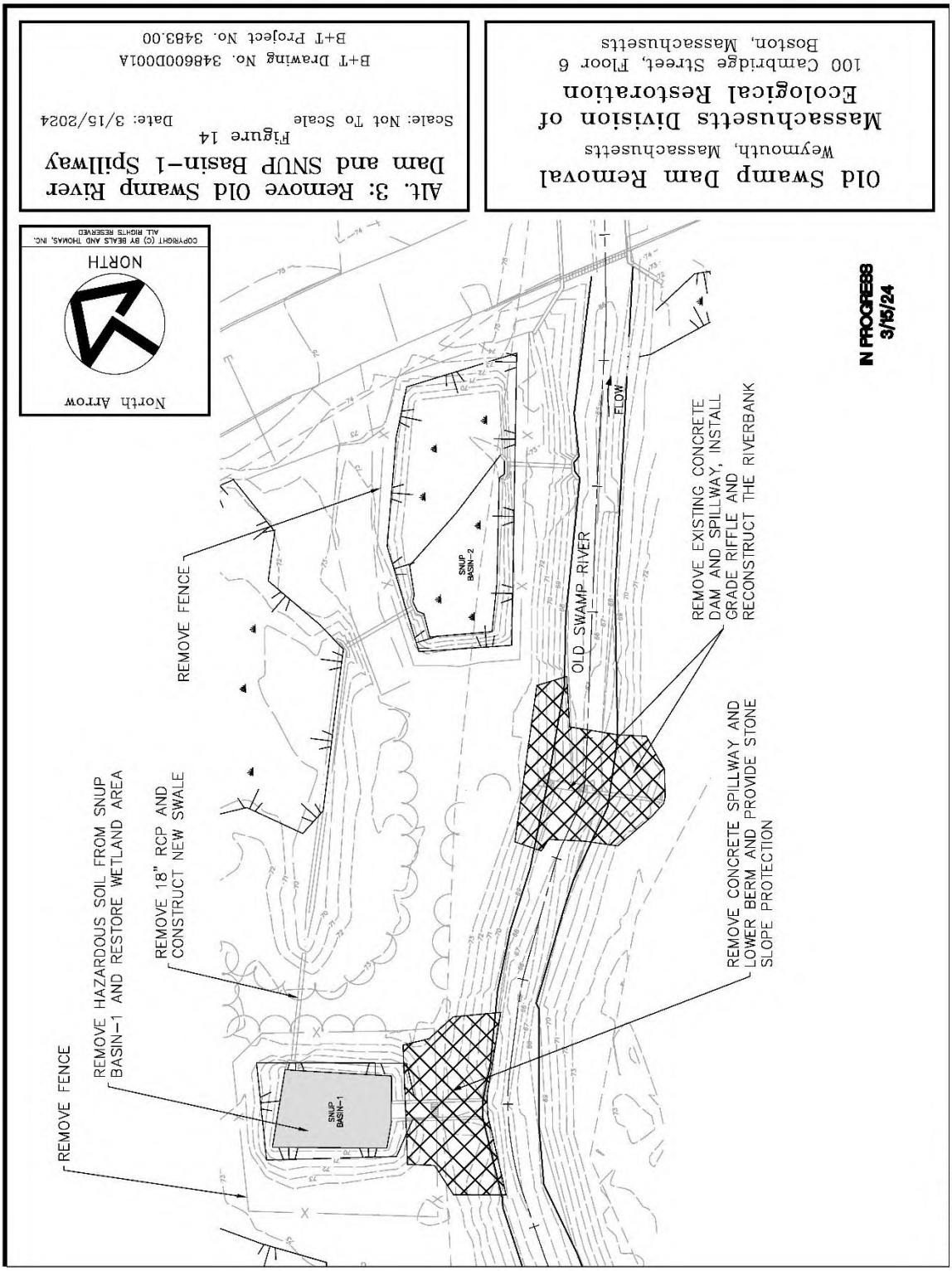


Figure 15. Alternative 3 Design Sketch

4.2 Selected Alternative: Dam Removal and Removal of SNUP Sluiceway

After selection of Alternative 3, the preliminary design was further refined and is included in Appendix F. The proposed design includes removal of the Old Swamp River dam. A grade control riffle will be placed in the former dam location to stabilize the channel after removing the dam and nearby concrete structures. The channel elevation immediately upstream and downstream of the dam will be lowered by approximately 0.5 foot to be consistent with the existing channel slope between the Libbey Industrial Parkway and Route 3 crossings.

The sluiceway leading to SNUP Basin 1 will be removed and regraded to maintain hydraulic connectivity between the river and the adjacent bordering vegetated wetlands. A boulder revetment will be used to protect the stream bank in the vicinity of the former sluiceway. The 18" RCP leading from SNUP Basin 1 to the wetland area will be removed and replaced with a swale to reduce future maintenance. Barbed wire fence around the SNUP basins will be removed to restore wildlife access.

Approximately 40 cubic yards of sediment contaminated with chromium will be removed from SNUP Basin 1. Sediment management is described in greater detail in Section 4.2.4.

4.2.1 Proposed Conditions Hydraulic Analysis

The existing conditions models were copied and modified to reflect the proposed dam removal, and channel restoration. As in the existing conditions hydraulic analysis, two model runs were created to represent proposed conditions; one model run used mixed flow for assessment of velocities, shear stress, and fish passage, and one model was run in subcritical flow for the evaluation of water surface elevations. The same boundary conditions were used for existing and proposed hydraulic analyses.

The proposed geometry was modified to reflect removal of the Old Swamp River dam spillway, gate, dam, and concrete steps. The channel elevation was lowered by 0.5 foot immediately upstream and downstream of the dam to be consistent with the existing channel slope between the Route 3 and Libbey Industrial Parkway crossings. The floodplain north of Old Swamp River dam and the berm between SNUP Basin 2 and Old Swamp River were lowered to represent elevations before construction of the SNUP system. Manning's n values were modified to reflect the revegetation of the floodplain areas.

Changes in proposed water surface elevations, velocities, and shear stress are provided in Tables 10, 11, and 12. In the existing 100-year plus 25 percent flood event, Old Swamp River dam is overtopped by approximately 3 feet and has little influence on water surface elevations. Upstream of the Old Swamp River dam, de minimus change in water surface elevation (WSEL) is predicted during the evaluated flow events.

Modeling results indicate that the proposed channel is subject to relatively low velocities and shear stresses. The maximum increase in velocity is 0.9 feet per second and occurs upstream of the Route 3 crossing under bankfull flow conditions. The maximum increase in shear stress is 0.2 pounds per square foot and occurs upstream of the Route 3 crossing under bankfull flow conditions.

Table 10 Proposed Conditions Water Surface Elevation Comparison

	Station	Proposed Conditions Water Surface Elevation (ft)			Existing versus Proposed Change in Water Surface Elevation (ft)		
		10-Year	100-year	100-year + 25%	10-Year	100-year	100-year + 25%
Upstream	2341	76.78	77.78	78.19	0.0	0.0	0.0
	2187	76.29	77.41	77.88	0.0	0.0	0.0
	1952	74.98	75.69	76.01	0.0	0.0	0.0
	1728	73.94	75.15	75.83	0.0	0.0	0.0
	1516	73.01	74.69	75.50	0.0	0.0	0.0
	1394	72.85	74.60	75.43	0.0	0.0	0.0
	1359	72.73	74.45	75.28	0.0	0.0	0.0
	1319	72.67	74.17	74.93	0.0	0.0	0.0
	1297	Route 3 Northbound (Pilgrims Highway)					
Impoundment	1207	72.48	73.63	74.13	0.0	0.0	0.0
	1134	72.41	73.56	74.10	0.0	0.0	0.0
	1026	72.36	73.55	74.08	0.0	0.0	0.0
	940	72.29	73.34	73.86	0.0	0.0	0.0
	859	72.30	73.45	74.00	0.0	0.0	0.0
	782	72.30	73.45	74.00	0.0	0.0	0.0
	773	Former Location of Old Swamp River Dam					
Downstream of Dam	672	72.28	73.44	73.98	0.0	0.0	0.0
	582	72.22	73.29	73.95	0.0	0.0	0.0
	567	Libbey Industrial Parkway					
	499	72.12	73.01	73.45	0.0	0.0	0.0
	405	72.12	73.03	73.44	0.0	0.0	0.0
	334	72.10	73.00	73.40	0.0	0.0	0.0

Note: A negative change in WSEL indicates that proposed WSEL is lower than existing WSEL. A positive change in WSEL indicates that proposed WSEL is higher than existing WSEL.

Table 11 Proposed Conditions Velocity Comparison

	Station	Proposed Conditions Channel Velocity (ft/sec)			Existing versus Proposed Change in Velocity (ft/sec)		
		Bankfull	10-Year	100-year + 25%	Bankfull	10-Year	100-year + 25%
Upstream	2341	4.23	6.52	4.86	0.0	0.0	0.0
	2187	2.21	3.98	4.18	0.0	0.0	0.0
	1952	3.15	6.30	9.42	-0.1	0.0	0.0
	1728	2.77	5.03	5.20	0.1	0.0	0.0
	1516	4.09	6.07	5.43	-0.6	0.0	0.0
	1394	3.35	4.31	4.11	0.9	0.0	0.0
	1359	3.30	4.98	5.24	0.8	0.0	0.0
	1319	1.83	4.20	6.07	0.4	0.0	0.0
	1297	Route 3 Northbound (Pilgrims Highway)					
Impoundment	1207	1.48	3.77	6.28	0.3	0.0	0.0
	1134	1.84	3.73	5.67	0.5	0.0	0.0
	1026	1.52	3.07	4.35	0.4	0.0	0.0
	940	1.24	3.27	5.66	0.3	0.0	0.0
	859	1.33	2.78	3.13	0.2	-0.1	-0.1
	782	1.63	1.62	1.63	0.3	-0.8	-1.1
	773	Former Location of Old Swamp River Dam					
Downstream of Dam	672	1.07	1.66	1.96	0.0	0.0	0.0
	582	0.68	2.04	3.64	0.0	0.0	0.0
	567	Libbey Industrial Parkway					
	499	0.62	1.89	3.58	0.0	0.0	0.0
	405	1.18	1.47	2.04	-0.1	-0.2	0.0
	334	1.63	2.66	3.11	0.0	0.0	0.0

Note: ft/sec = feet per second
A negative change in velocity indicates that proposed velocity is lower than existing velocity. A positive change in velocity indicates that proposed velocity is higher than existing velocity.

Table 12 Proposed Conditions Shear Stress Comparison

	Station	Proposed Conditions Shear Stress (lb/sq ft)			Existing versus Proposed Change in Shear Stress (lb/sq ft)		
		Bankfull	10-Year	100-year + 25%	Bankfull	10-Year	100-year + 25%
Upstream	2341	0.68	1.18	0.55	0.0	0.0	0.0
	2187	0.17	0.40	0.37	0.0	0.0	0.0
	1952	0.36	1.05	2.07	0.0	0.0	0.0
	1728	0.27	0.64	0.58	0.0	0.0	0.0
	1516	0.60	0.92	0.60	-0.2	0.0	0.0
	1394	0.38	0.47	0.37	0.2	0.0	0.0
	1359	0.35	0.58	0.54	0.2	0.0	0.0
	1319	0.10	0.41	0.75	0.0	0.0	0.0
	1297	Route 3 Northbound (Pilgrims Highway)					
Impoundment	1207	0.06	0.32	0.79	0.0	0.0	0.0
	1134	0.09	0.37	0.76	0.0	0.0	0.0
	1026	0.05	0.17	0.29	0.0	0.0	0.0
	940	0.03	0.25	0.68	0.0	0.0	0.0
	859	0.03	0.22	0.24	0.0	0.0	0.0
	782	0.08	0.13	0.12	0.0	0.0	0.0
	773	Former Location of Old Swamp River Dam					
	672	0.03	0.06	0.07	0.0	0.0	0.0
	582	0.01	0.09	0.26	0.0	0.0	0.0
	567	Libbey Industrial Parkway					
	499	0.02	0.12	0.39	0.0	0.0	0.0
	405	0.04	0.05	0.09	0.0	0.0	0.0
	334	0.07	0.19	0.25	0.0	0.0	0.0

Note: lb/sq ft = pounds per square foot
A negative change in shear stress indicates that proposed shear stress is lower than existing shear stress. A positive change in shear stress indicates that proposed shear stress is higher than existing shear stress.

4.2.2 Bed and Bank Stability

The proposed conditions modeling for the post-dam removal channel predicts that water velocities through the project area will have de minimus changes following dam removal. Erosion in a streambed occurs when the hydraulic forces in the flow exceed the resisting forces of the channel boundary (Fischenich, USACE). Permissible (or critical) velocity is defined as the maximum velocity for the channel that will not cause erosion of the channel boundary. The proposed conditions will not increase water velocities or shear stress sufficiently to mobilize existing sediment within the impoundment. Passive sediment removal is proposed, however, with the de minimus changes in water velocity and shear stress, scouring and transportation of sediments is not anticipated. The de minimus increase in water velocity indicates that additional rip/rap at the downstream limit of the Route 3 Culvert is not necessary.

Table 13 is a summary of substrate types and permissible velocities and shear stresses per the USACE Fischenich report. These values are useful in evaluating the stability of channel banks given estimated velocities and known bank material. Figures 16 and 17 shows the proposed conditions channel shear stress and water velocities with ranges of permissible shear stress for various types of substrate.

Table 13 Substrate Types and Permissible Velocities and Shear Stress

Substrate Type	Substrate Size (Inches)	Permissible Velocity (ft/sec)	Permissible Shear Stress (lb/sq ft)
Gravel/Cobble	2 in. 6 in. 12 in.	3 - 6 4 - 7.5 5.5 - 12	0.67 2.0 4.0
Riprap	6 in. d_{50} 9 in. d_{50} 12 in d_{50} 18 in d_{50} 24 in d_{50}	5 - 10 7 - 11 10 - 13 12 - 16 14 - 18	2.5 3.8 5.1 7.6 10.1

ft/sec = feet per second
lb/sq ft = pounds per square foot

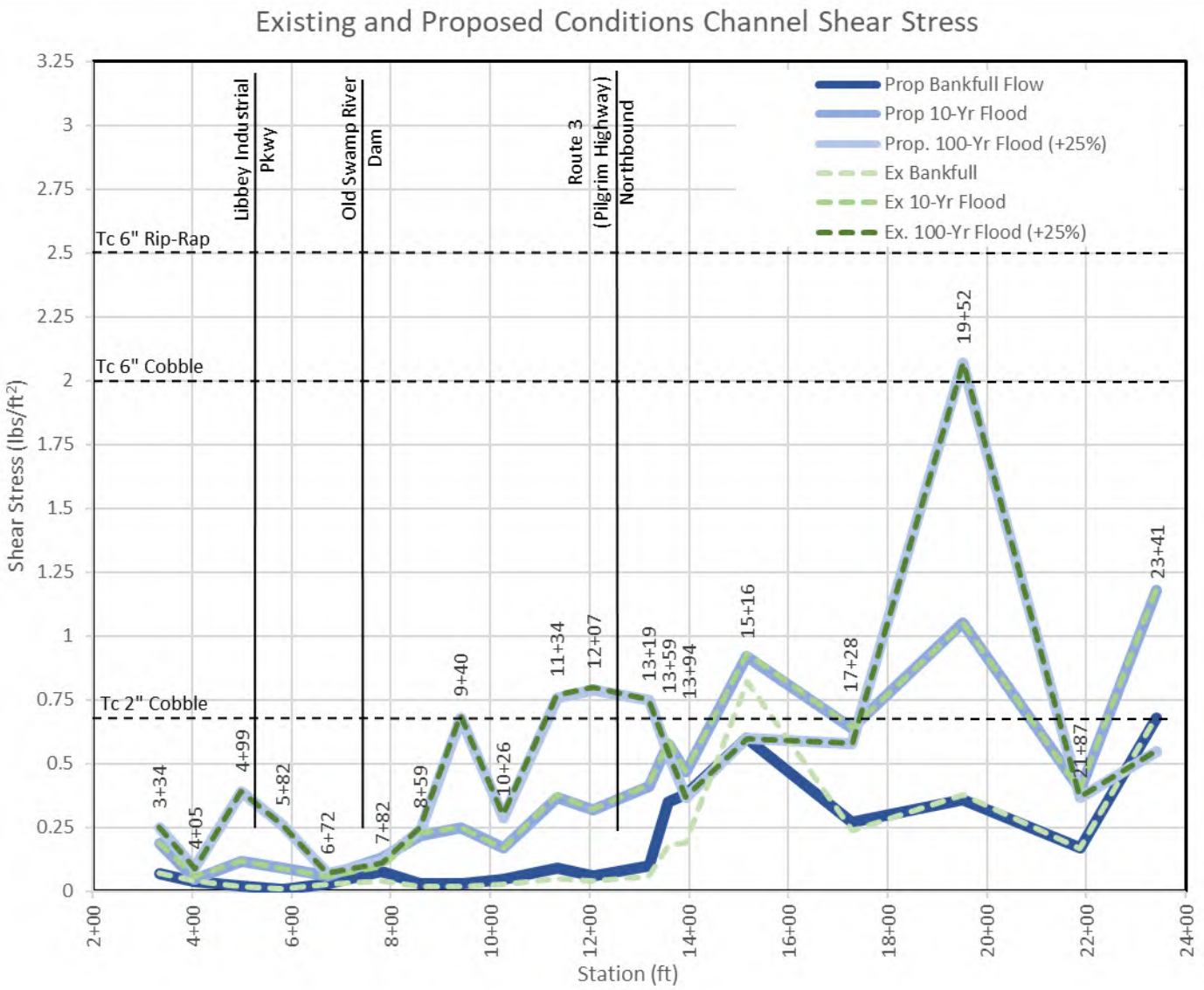


Figure 16: Existing and Proposed Conditions Shear Stress with Fischenich Substrate Types

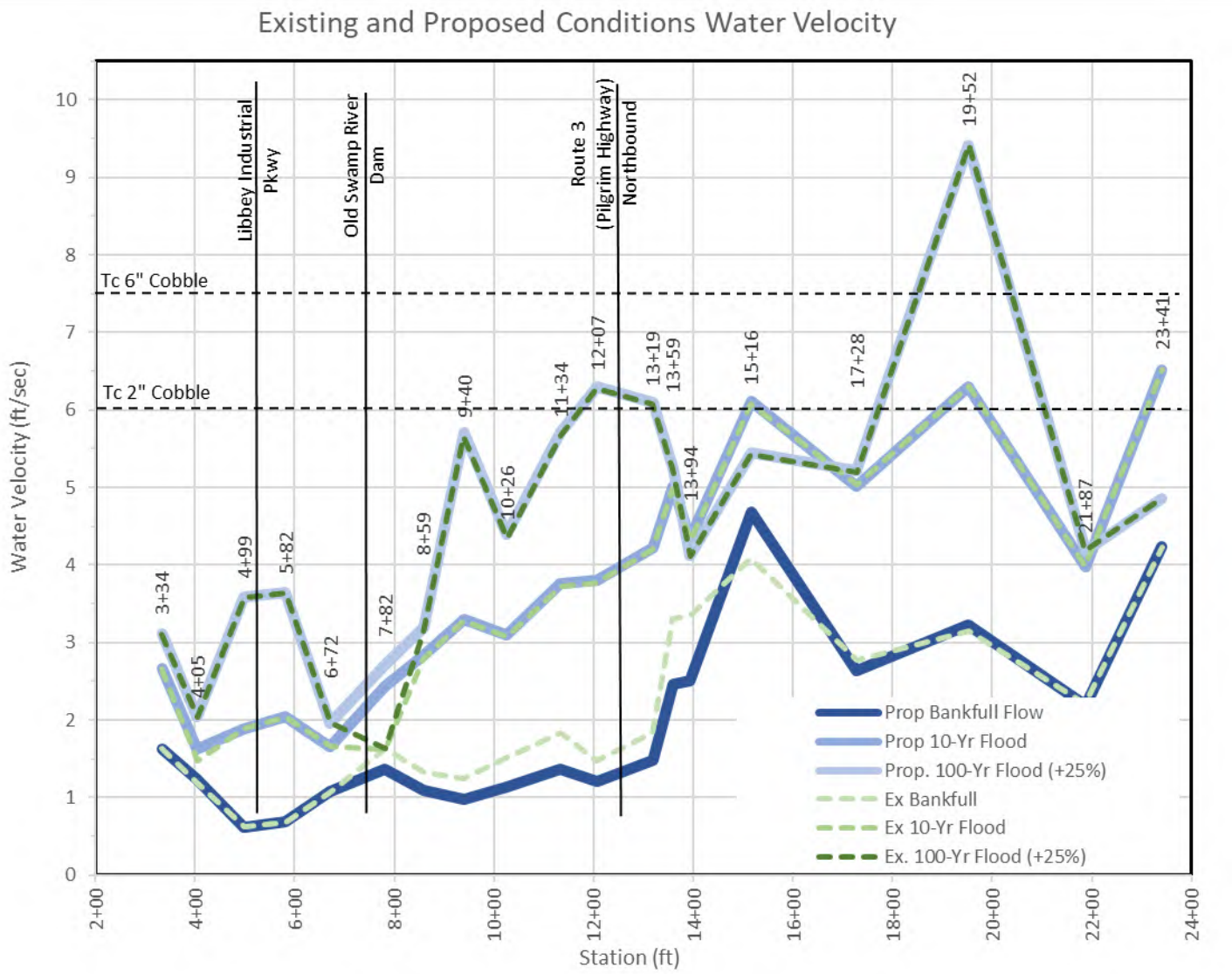


Figure 17: Existing and Proposed Conditions Water Velocities with Fischenich Substrate Types

The highest velocity and shear stress occur at cross section 1952 upstream of the project area with a velocity of 9.4 feet per second and a shear stress of 2.1 pounds per square foot in the 100-year plus 25 percent event; however, the comparison of existing and proposed conditions indicates that there is little change post-dam removal. Within the area of proposed channel grading and stabilization at the dam removal (Station 782), velocities are predicted at 1.6 feet per second and shear stresses are predicted to be 0.1 pound per square foot in the 100-year plus 25 percent flood within the main channel, which falls within the lower range of permissible velocity and shear stress for 2-inch cobble. The proposed riffle conservatively provides 6-inch cobble as substrate. The greatest increase in velocity is anticipated upstream of the Route 3 culvert (Station 1394) where velocity

increases from 2.5 to 3.35 feet per second during the bankfull storm event, where both values fall below the stable velocity for 2-inch cobble. It is not anticipated that these minor changes will adversely affect the substrate.

The RipRap Design function in HEC-RAS was used to calculate the mean stable particle size (D_{30}) of the bed and bank armoring for the 100-year plus 25 percent flood at the maximum velocity and shear values predicted between the Route 3 crossing and Libbey Industrial Parkway.

The stable bed armoring was estimated to be 1-inch and the required side slope armoring was estimated at 1.5-inches.

The Wolman pebble counts conducted downstream of the dam and upstream of the Route 3 northbound crossing indicate that the armoring material diameter is between 1.5 and 2 inches. Because velocities and shear stress under proposed conditions are not substantially higher than under existing conditions, and the channel within the impoundment is stable under current conditions placement of bed armoring is not proposed within the impoundment. Conservatively, six to nine inch rip/rap will be be used to stabilized the bank at the former sluiceway to SNUP Basin 1, and a grade control riffle will be placed at the former dam location to stabilize the channel.

The Stable Channel Design function in HEC-RAS was used to assess the sediment transport capability of the channel reach. The model was run with a trial median channel width of 18 feet, a bankfull discharge (Qbf) of 68 cubic feet per second (cfs), and a trial channel slope of 0.004 ft/ft. The sediment gradation for the existing subarmor substrate was used for the initial starting run of the model. After the first run, variables of sediment size and flow magnitude were iterated to test the sensitivity of the model to those variables. Table 14 presents a summary of this input data.

Table 14 Initial Values for Sediment Transport/Stable Channel Assessment

Variable	Value
Discharge (Qbf)	68 cfs
Median Channel Width	18 feet
Side Slope	2:1
Supply Reach Bottom Width	15 feet
Supply Reach Bank Height	1.7 feet
Channel Slope (S)	0.004 ft/ft
Manning's Roughness	0.035
Sediment Gradation	Subarmor gradation

The resulting calculation implied that during existing and proposed conditions a de minimus amount of sediment (32 parts per million) of sediment would be mobilized and moved through the system during a bankfull flow event. This is a relatively small amount of sediment, indicating it would take greater flows to mobilize significant amounts of the existing channel sediment and that additional armoring of the bed is not necessary.

The results indicate that of the range of possible stable channel configurations, the configuration with the minimum energy requirements has a base width of 16 feet, side slopes of 2:1, a depth of 2 feet, and an energy slope of 0.003 ft/ft. These values agree closely with the existing bankfull measurements taken on site, with base widths ranging from 14 to 18 feet and depths ranging from 2 to 2.7 feet and the proposed channel grading. This indicates that the channel as proposed following dam removal will be stable. The full results of the stable channel analysis can be found in Appendix D.

4.2.3 Impacts to Surrounding Infrastructure

Libbey Industrial Parkway is located downstream of the influence of Old Swamp River dam. Based on the comparison of existing and proposed conditions hydraulic modeling, the WSELs upstream and downstream of Libbey Industrial parkway will not be influenced by the dam removal upstream. Shear stress and velocity also remain the same under existing and proposed conditions. Therefore, removal of the dam is not expected to increase susceptibility of the Libbey Industrial Parkway to scour or undermining.

At the Route 3 northbound crossing, changes to WSELs, velocities and shear stress are expected to be de minimis in the 10-year flood and the 100-year plus 25 percent flood post-dam removal. Since there are no significant changes in shear stress and velocity, scour is not expected to be a concern.

4.2.4 Fish Passage Assessment

In order to confirm that the channel will be fish passable after the dam is removed, hydraulic modeling was performed using typical flow values seen during the spawning run of the target species of river herring and brook trout, which extends from April through July. Two flows were chosen for use to provide an upper and lower boundary on sunny day flows between the months of April and July, representing the peak of fish passage.

Recent guidance on the design of nature-like fishways suggests using 95 percent and 5 percent flow duration during the target species migratory run to assess the potential for fish passage of a man-made fishway (NOAA, 2016). Assessment of the full channel using 5 percent and 95 percent duration flows resulted in much of the existing and proposed channel presenting potential barriers to passage due to low stream depth, including downstream and upstream of the areas of influence of the project. Within the area of proposed work, the channel meets the 95 percent and 5 percent performance goals.

The following table presents the target flows to assess fish passage at the project site.

Table 15 Summary of Flows for Fish Passage Assessment

	April	May	June	July
95% Exceedance Flow (cfs)	3.7	2.6	0.8	**0.2**
5% Exceedance Flow (cfs)	**40.0**	26.5	21.2	12.0

Note: Shaded values indicate minimum and maximum flows used in fish passage analysis.

Barriers to fish passage can occur when water velocity, turbulence, and depth become impassible for the target species. Table 16 provides a summary of current research on the depth and velocity requirements of river herring (both alewife and blueback herring) and brook trout.

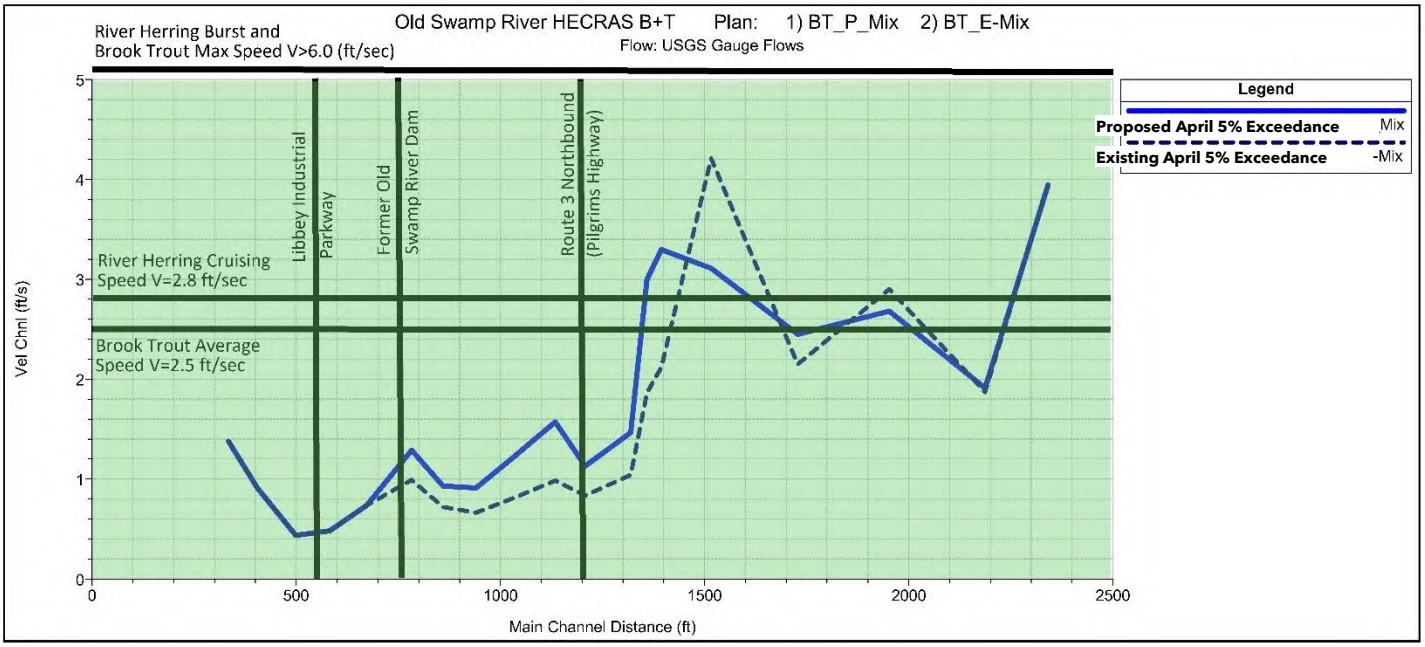
As shown in Figure 18, the dam removal and grade control riffle are not predicted to present any likely or definitive barriers to fish passage in water depth or velocity; however, select locations downstream (and outside the influence of) the project, as well as in the upstream portion of the impoundment, are predicted to have shallow flow depths.

Table 16 Summary of Fish Passage Requirements for River Herring and Brook Trout

Common Name	Brook Trout	Alewife	Blueback Herring
(Scientific Name)	*(Salvelinus fontinalis)*	*(Alosa pseudoharengus)*	*(Alosa aestivalis)*
Spawning Run	April – July	April 1 – May 15	May 1 – June 15
Average Size (length in inches)	6 – 15	9 – 12	8 – 12
Minimum Water Depth (inches)	5.0 – 6.0	>6	>6
Swimming Speed (ft/s)	--	2.8 Cruising Speed	2.8 Cruising Speed
	2.5 Average Speed	4.8 Sustained Speed	4.8 Sustained Speed
	6.0 Max Speed	6.8 Burst Speed	6.8 Burst Speed

Fish Passage Requirements Data Sources:

1. B. Kynard. 1993. Fish Behavior Important for Fish Passage. Proc. Fish Passage and Technology Symposium, Portland, OR.
2. C. Katapodis. 1992. Introduction to Fishway Design, working document.
3. G. Kissil. 1974. Spawning of Anadromous Alewives, Alosa pseudoharengus, in Bride Lake, CT. TAFS 103: 312 – 317.
4. W. Whitworth. 1996. Freshwater Fishes of Connecticut, Second Edition.
5. U.S. Fish & Wildlife Service. Accessed March 30, 2023. https://www.fws.gov/species/brook-trout-salvelinus-fontinalis
6. C. Katopodis, R. Gervais. Fisheries and Oceans Canada. 2016. Fish Swimming Performance Database and Analyses.



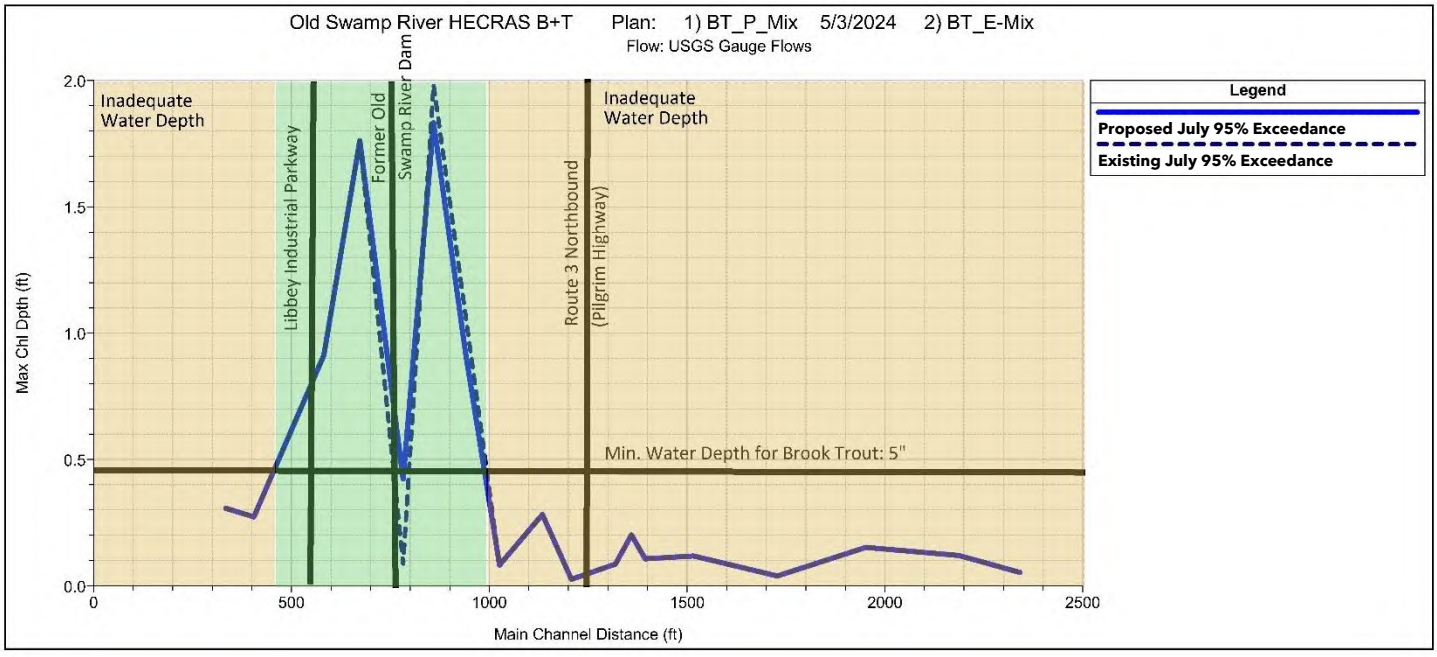


Figure 18: Existing and Proposed Conditions Fish Passage Assessment

4.2.5 Wetland Resource Area Impacts

The Project will result in temporary disturbances to wetland resource areas. However, once completed, the dam removal will provide permanent environmental and community benefits for water quality and fish habitat by enabling passage to critical spawning habitat. No loss of resource areas or conversion of resource areas from one type to another will occur as a result of the Project.

Bank: There will be temporary bank impacts for the installation of the construction period installation of the cofferdam, straw bale check dams, and silt curtain. Permanent bank impacts are the result of the removal of the dam, grading of the bank and installation of slope stabilization.

Land Under Water Bodies and Waterways (LUW): There will be temporary LUW impacts for the construction period installation of the cofferdam, straw bale check dams, and silt curtain. Permanent LUW impacts are the result of removal of the dam, grading of the stream, installation of the grade riffle and installation of slope stabilization.

Bordering Land Subject to Flooding (BLSF) and Riverfront Area (RFA): There will be temporary BLSF and RFA impacts for construction period site disturbances. Permanent BLSF and RFA impacts are the result of removal of existing drainage piping, removal of the SNUP Basin-1 sluiceway, tree removal, dam removal, site grading and installation of slope stabilization.

Bordering Vegetated Wetlands (BVW): There will be temporary BVW impacts for the removal of contaminated soils from SNUP Basin-1 and the restoration of that area, and the construction period installation of the cofferdam.

Table 17: Temporary and Permanent Wetland Impacts

Resource Area	Estimated Extent of Proposed Alteration		Estimated Extent of Proposed Replacement or other 310 CMR 10.00 required mitigation (if any)
	Temporary	*Permanent*	
Bank	25 LF	210 LF	N/A
Land Under Waterbodies and Waterways	350 SF	2,100 SF	N/A
Bordering Land Subject to Flooding	23,700 SF	6,800 SF	N/A
Riverfront Area	23,700 SF	6,800 SF	N/A
Bordering Vegetated Wetland	-	2,300 SF	N/A

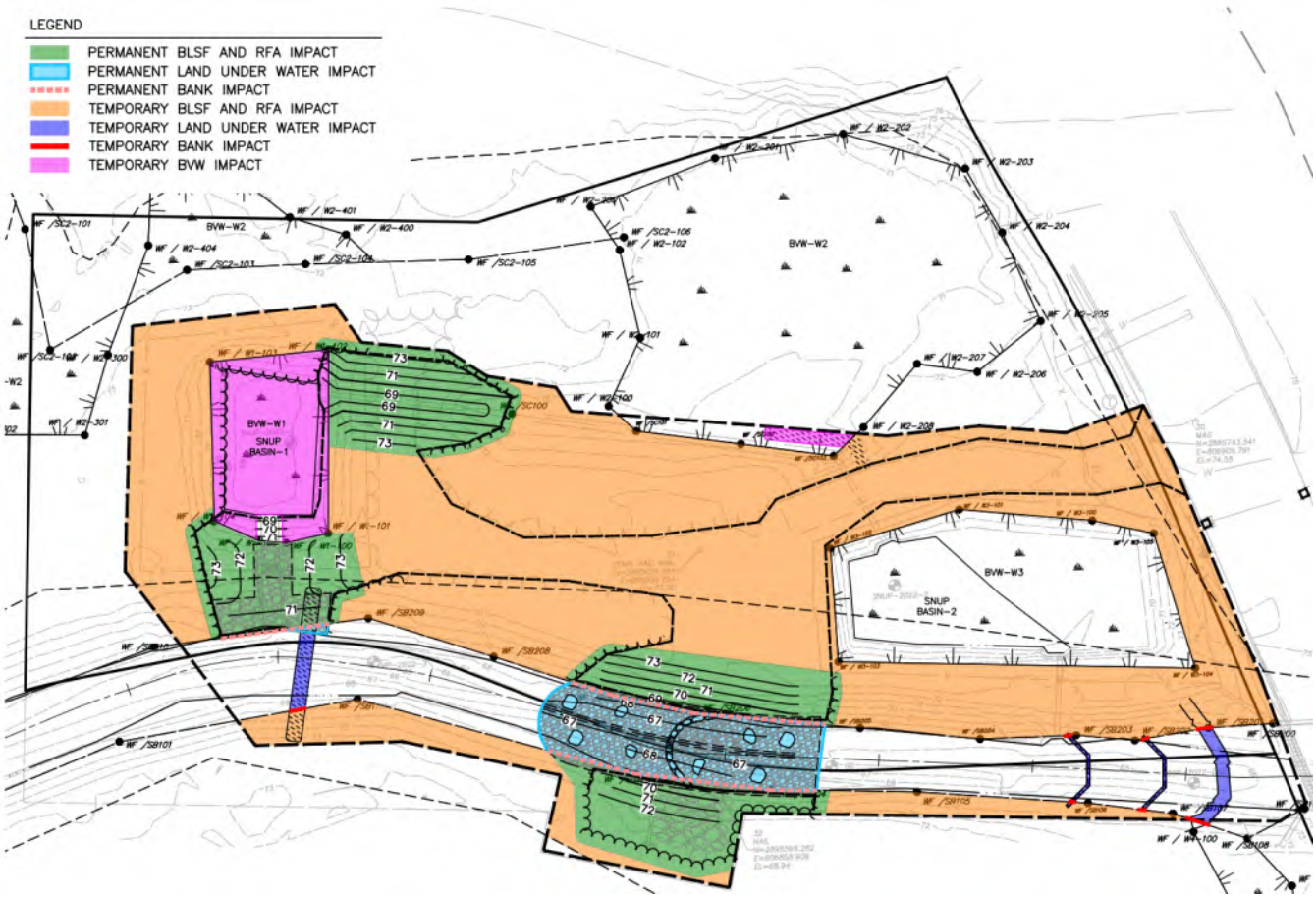


Figure 19: Impacts to Wetland Resource Areas

4.2.6 Sediment Management Plan

Dam removal often requires sediment management through removal/disposal or in-situ stabilization of the excess sediment. Methods of sediment removal can include excavation, mechanical or hydraulic dredging, onsite relocation, and/or partial removal of sediments through staged breaching and natural stabilization.

Results of previous sediment testing in the SNUP Basins indicate elevated levels of heavy metals (above S-1 Reportable Concentration (RCS-1) limit) in SNUP Basin-1. Results upstream and downstream of the project area indicate elevated heavy metal and PAH levels in samples. These testing results are included in Appendix B. The estimated 40 cubic yards of contaminated sediment in SNUP Basin 1 will be removed and disposed of at a licensed facility.

Previous analysis indicates the impoundment contains approximately 180-cubic yards of sediments which are a coarse sand with less than 7% silt. The approximately 40-cubic yards of sediments within SNUP-Basin-1 are a fine sandy silt with 47% silt.

As noted in Section **Error! Reference source not found.**, no significant changes to v elocity and shear stress, the two factors that contribute to sediment mobilization and

transport, are anticipated following removal. Additionally, the volume of sediment within the impoundment is small, 180 cubic yards and based on previous sediment sampling, is relatively clean (no samples in the impoundment exceeded the Massachusetts Contingency Plan Cleanup Standards, see Appendix B for full sampling results). Typically, sediments within impoundments are predominantly fine-grained silty sediment which can become mobilized upon dam removal. The sediments impounded by the Old Swamp River Dam, however, are coarse sand containing less than 7% fine grained silty sediment. As such, no change in sediment transport is expected to occur from the existing conditions as a result of the dam removal and a passive sediment management plan approach allowing passive release of sediment following dam removal is proposed. While it is not expected that sediment will be mobilized as a part of the project, sediment transport is a natural and necessary function for healthy rivers and maintaining spawning habitat.

The approximately 40-cubic yards of fine sandy silt located within SNUP Basin-1 which contains elevated levels of heavy metals will be excavated and hauled to an authorized disposal site. The area will be backfilled with appropriate organic wetland soils prior to replanting.

4.2.7 Permitting

Wetlands and aquatic habitat can be negatively impacted during the removal of some dams. The removal of the dam would result in the restoration of the stream to its pre-dam conditions, which is generally preferred to man-made impoundments. Dam removal will also restore fish passage and natural riverine and wetland functions. Removal of fencing around the SNUP basins will improve wildlife access.

The removal of the Old Swamp River dam will trigger regulatory permits from federal, state, and local agencies. The following permits and regulatory coordination are anticipated:

- Local Coordination
  - Weymouth Conservation Commission, Ecological Restoration Order of Conditions
- State Permits
  - Chapter 91, Massachusetts Public Waterfront Act
  - 401 Water Quality Certification
  - Massachusetts Environmental Policy Act (MEPA) Streamlined Process for an Ecological Restoration Project within 1 mile of an Environmental Justice Community
  - Massachusetts Historical Commission Review
- Federal Permits
  - Section 404 General Permit No. 10 – Aquatic Habitat Restoration, establishment & Enhancement Activities

4.2.7.1 Ecological Restoration Criteria

The project meets all of the criteria of an ecological restoration Ecological Restoration Project, allowing it to be permitted by the Weymouth Conservation Commission with a Restoration Order of Conditions, and follow the streamlined process for MEPA review, per 301 CMR 11.01(2)(b)(4), as described below. A memo was provided to the Weymouth Conservation Commission outlining these criteria, and during a meeting on September 26, 2023, the Commission agreed that the project meets the qualifications for an ecological restoration project.

310 CMR 10.13: Eligibility Criteria for Restoration Order of Conditions for an Ecological Restoration Project:

(1) *An Ecological Restoration Project shall be permitted by a Restoration Order of Conditions if it meets all of the following eligibility criteria:*

(a) *The project is an Ecological Restoration Project as defined in 310 CMR 10.04, is a project type listed in 310 CMR 10.13(2) through (7), and the applicant has submitted a Notice of Intent that meets all applicable requirements of 310 CMR 10.12.*

The primary purpose of this dam removal project is to restore the natural capacity of the stream and floodplain by restoring fish passage and natural riverine functions in the Old Swamp River. The Old Swamp River dam will be removed, restoring connectivity and upstream spawning habitat impacted by altered flow characteristics and sedimentation. The upstream portion of the bank impacted by the SNUP inlet will be restored to a more natural state to improve and maintain floodplain connectivity to the basins and adjacent wetlands during flood stage events. All fencing around the site will be removed to eliminate wildlife barriers.

(b) *The project will further at least one of the interests identified in M.G.L. c. 131, § 40.*

The project furthers the interests of protection of fisheries and wildlife habitat as the main project goal is to restore fish passage for diadromous and coldwater fish species. The project team will coordinate with Natural Heritage Endangered Species Program, Massachusetts Division of Fisheries and Wildlife (DFW) and the Massachusetts Division of Marine Fisheries (DMF) on this project. Both DMF and DFW are in support of the project and DMF has provided a Time of Year restriction of March 15-June 30.

(c) *The project will not have any short-term or long-term adverse effect, as identified by the procedures established by 310 CMR 10.11, on specified habitat sites of Rare Species located within the Resource Areas that may be affected by the project or will be carried out in accordance with a habitat management plan that has been approved in writing by the Natural Heritage and Endangered Species Program and submitted with the Notice of Intent.*

The project location is not within or nearby any habitats of Rare Species or Rare Wildlife (Figure) and therefore, no short- or long-term impacts to habitat sites of Rare Species are anticipated. The project team is coordinating with the Massachusetts Natural Heritage and Endangered Species Program to ensure this.

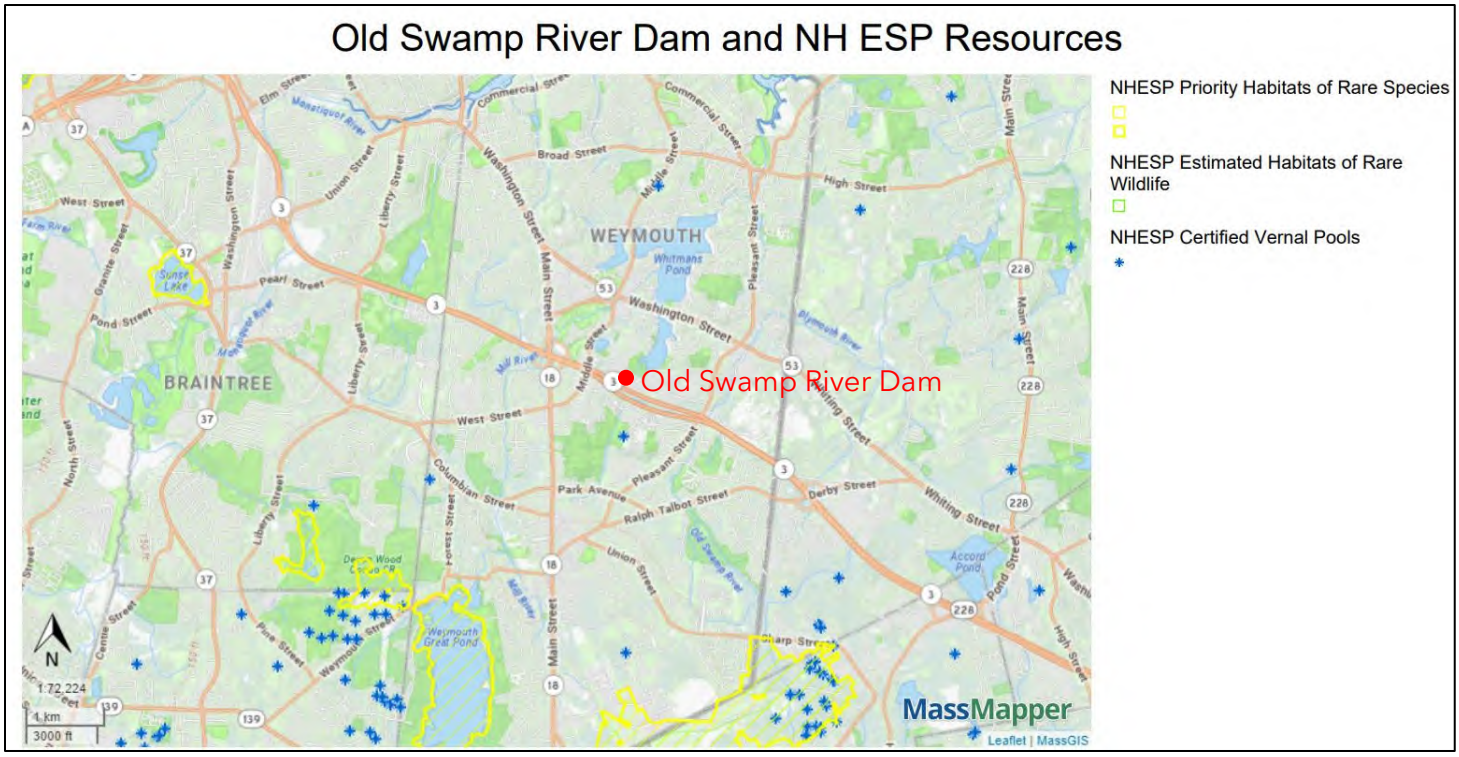


Figure 20: SNUP Dam Relative to NHESP Habitats

(d) *To the maximum extent practicable, the project will:*

1. *avoid adverse impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40, that can be avoided without impeding the achievement of the project's ecological restoration goals;*
2. *minimize adverse impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40, that are necessary to the achievement of the project's ecological restoration goals; and*
3. *utilize best management practices such as erosion and siltation controls and proper construction sequencing to prevent and minimize adverse construction impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40*

As outlined within this project description and overview and in the attached design plans (Appendix F), the project will result in minimal short-term impacts to resource areas limited only to construction and includes restoration of impacted areas following construction. Best management practices such as sedimentation control barriers and temporary check dams to control sediment and erosion and minimize adverse construction impacts to Resource Areas.

(e) *The project will not have significant adverse effects on the interests of flood control and storm damage prevention in relation to the built environment (i.e., the project will not result in a significant increase in flooding or storm damage affecting buildings, wells, septic systems, roads or other human-made structures or infrastructure).*

Removal of the Old Swamp River SNUP dam will not significantly change Water Surface Elevations, as shown in **Error! Reference source not found.**.

(f) *If the project will involve the dredging of 100 cubic yards of sediment or more or dredging of any amount in an Outstanding Resource Water, the Notice of Intent includes a Water Quality Certification issued by the Department in accordance with 314 CMR 9.00: 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the United States Within the Commonwealth.*

A Water Quality Certification will be obtained. Approximately 40 cy from the SNUP Basin 1 will be removed due to contamination. Within the impoundment, there is approximately 180 cy of sediment, and the proposed sediment management plan includes passive release of impounded sediment, as described in section **Error! Reference source not found.**. Due to low velocities and shear stresses projected in Old Swamp River before and after dam removal, sediment mobilization in the impoundment will not significantly change following dam removal.

Additionally, the sediment within the impoundment is "clean" (within human health and environmental thresholds in accordance with the Massachusetts Contingency Plan (MCP)) and sediment transport is a natural and necessary function for healthy rivers.

This approach will require less water control which would result in less disturbance to the resource area and surrounding area. Further coordination with DEP regarding sediment management will occur during the permitting process.

(g) *The project will not substantially reduce the capacity of a Resource Area to serve the habitat functions identified in 310 CMR 10.60(2). A project will be presumed to meet this eligibility criteria if the project as proposed in the Notice of Intent will be carried out in accordance with any time of year restrictions or other conditions recommended by the Division of Marine Fisheries for coastal waters, and by the Division of Fisheries and Wildlife for inland waters in accordance with 310 CMR 10.11(3) through (5). As set forth in 310 CMR 10.12(3), a person submitting a Notice of Intent for an Ecological Restoration Project that meets the requirements of 310 CMR 10.12(1) and (2) is exempt from the requirement to perform a wildlife habitat evaluation in accordance with 310 CMR 10.60.*

The project team will coordinate with Natural Heritage Endangered Species Program, Massachusetts Division of Fisheries and Wildlife (DFW) and the Massachusetts Division of Marine Fisheries (DMF) on this project. Both DMF and DFW are in support of the project and DMF has provided a Time of Year restriction of March 15-June 30 which the construction schedule will adhere to.

(h) *If the Ecological Restoration Project involves work on a stream crossing, the stream crossing has been designed in accordance with 310 CMR 10.24(10) for work in coastal resource areas and 310 CMR 10.53(8) for work in inland resource areas, as applicable.*

Not applicable

(i) *The Ecological Restoration Project will not result in a discharge of dredged or fill material within 400 feet of the high-water mark of a Class A surface water (exclusive of its tributaries unless the project is conducted by a public water system under 310 CMR 22.00: Drinking Water or a public agency or authority for the maintenance or repair of existing public roads or railways in accordance with 314 CMR 4.06(1)(d)1.*

While Whitman's Pond downstream is a Class A surface water, as the dam owner and project lead, the Town is a Drinking Water authority and therefore exempt from these criteria. This was confirmed verbally during a conversation with a DEP staff member on 7/28/23.

(j) *The Ecological Restoration Project will not result in a discharge of dredged or fill material to a vernal pool certified by the Division of Fisheries and Wildlife.*

No vernal pool is downstream (Figure).

(k) *The Ecological Restoration Project will not result in a point source discharge to an Outstanding Resource Water.*

The project will not result in a point source discharge. Sediment analysis indicates the sediment within the impoundment is within human health and environmental thresholds in accordance with the Massachusetts Contingency Plan (MCP). Based on this information, we consider the sediment in the impoundment to be "clean" and therefore does not constitute a point source.

(l) *The Ecological Restoration Project will not involve the armoring of a Coastal Dune or Barrier Beach.*

Not applicable

(2)<u>*Additional Eligibility Criteria for Dam Removal Projects*</u>*. If the Ecological Restoration Project is a dam removal project, the project shall be presumed to meet the eligibility criteria set forth in 310 CMR 10.13(1)(d), if the project is consistent with the Department's guidance entitled Dam Removal and the Wetlands Regulations, dated December 2007. If the Ecological Restoration Project is a dam removal project, the Ecological Restoration Project shall be approved by a Restoration Order of Conditions, provided that in addition to the eligibility criteria set forth in 310 CMR 10.13(1), the project meets all of the following eligibility criteria:*
(a) *The project will not involve the removal of a dam that was constructed or is managed for flood control by a municipal, state, or federal agency*

The Old Swamp River SNUP Dam was not constructed for and is not operated for flood control.

(b) *The project will not adversely impact public water supply wells or water withdrawals permitted or registered under the Water Management Act, M.G.L. c. 21G, and 310 CMR*

36.00: Massachusetts Water Resources Management Program within the reach of the stream impacted by the impoundment.

Based on hydrologic and hydraulic modeling herein, there will be no significant changes in water surface elevation following the removal of the dam, and therefore, significant impacts are not expected to occur to nearby groundwater surface elevations.

(c) *The project will not adversely impact private water supply wells including agricultural or aquacultural wells or surface water withdrawal points.*

Based on hydrologic and hydraulic modeling herein, there will be no significant changes in water surface elevation following the removal of the dam, and therefore, significant impacts are not expected to occur to nearby groundwater surface elevations.

(d) *The project provides for the removal of the full vertical extent of the dam such that no remnant of the dam will remain at or below the streambed as determined prior to commencement of the dam removal project, or if such determination cannot be made at that time, as determined during construction of the project.*

The entire vertical extent of the dam will be removed.

(e) *The project provides for the removal of enough of the horizontal extent of the dam such that after removal no water will be impounded during the 500-year flood event.*

The entire horizontal extent of the dam will be removed, and the upstream portion of the bank impacted by the SNUP inlet will be restored to a more natural state while maintaining floodplain connectivity to the basins and adjacent wetlands during flood stage events.

(f) *The project will not involve a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license.*

Not applicable.

(g) *The applicant has obtained from the Department of Conservation and Recreation Office of Dam Safety a written determination that the dam is not subject to the jurisdiction of the Office under 302 CMR 10.00: Dam Safety, a written determination that the dam removal does not require a permit under 302 CMR 10.00: Dam Safety or a permit authorizing the dam removal in accordance with 302 CMR 10.00: Dam Safety has been issued.*

The Old Swamp River SNUP dam is non jurisdictional.

(h) *If the project is exempt from the requirement to obtain a license or permit under 310 CMR 9.05(3)(n), the project will not have an adverse effect on navigation or on any docks, piers or boat ramps authorized under 310 CMR 9.00: Waterways.*

Not applicable.

4.2.8 Resilient MA Action Team Climate Resilience Standards Tool

The *Climate Resilience Design Standards Tool* was developed by the Resilient Massachusetts Action Team (RMAT) to rate a project's risk and exposure to climate change, provide design standards that account for climate change, and provide guidance related to best practices. The RMAT tool provided the recommendations in Figure 18 based on the proposed dam removal and restoration project. The full RMAT report is provided in Appendix E.

The RMAT *Climate Resilience Standards Tool* recommends the 25-year storm as the design storm and the year 2030 as the planning horizon. Sea level rise and storm surge are not applicable to this project site. The proposed design accounts for the RMAT recommendations by using the 100-year event as the design storm, in excess of the recommended 25-year storm event. The 100-year discharge was also increased by 25 percent to ensure that the proposed design will function in projected climate change conditions.

Ecosystem Service Benefits	**Scores**
Project Score	High
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	Moderate Exposure
Extreme Precipitation - Riverine Flooding	High Exposure
Extreme Heat	High Exposure

Figure 21: RMAT Project Summary (Source: Climate Resilience Design Standards Tool)

4.2.9 Cost

The cost opinion provided below includes anticipated costs associated with additional design, permitting applications, and construction administration. Table 17 presents a breakdown of the work items necessary to accomplish the full removal of the dam and a preliminary estimate of costs associated with each.

Table 18 Preliminary Design Cost Opinion

Item Description	Preliminary Cost
Mobilization and Site Preparation	$50,000
Concrete Demolition and Removal	$10,000
Temporary Cofferdam	$50,000
Earthwork	$20,000
Sediment Removal – SNUP Basin 1	$30,000
Riffle	$66,000
Wetland soil and plantings	$10,000
Site Restoration	$10,000
Subtotal:	**$246,000**
Contingency (30%):	**$75,000**
Total:	**$321,000**

Note:
1) Does not account for future inflation or changes in construction prices

5.0 SUMMARY AND RECOMMENDATIONS

The removal of the Old Swamp River dam will involve the complete deconstruction and removal of the dam and the restoration of the channel to restore fish passage . The following recommendations are included provided to advance the dam removal and restoration:

- Drawdown of the impoundment and water control during construction
- Removal of the existing dam, spillway, and concrete steps
- Lowering Grading of the channel in the immediate vicinity of the dam to be consistent with channel slope between Libbey Industrial Parkway and Route 3 (Pilgrims Highway) northbound
- Construction of a grade control riffle in the former dam location for channel stabilization
- Removal of concrete spillway between SNUP Basin 1 and Old Swamp River.
- Removal of contaminated sediment within SNUP Basin 1 and replace with wetland soils and plantings.
- Stabilization of the stream bank in the former sluiceway location with bank treatment
- Preparation of detailed design plans and specifications for construction
- Preparation of necessary permit applications for removal of the dam and restoration

Further detail relating to the dam removal and channel reconstruction stabilization can be found in the design drawings (see Appendix F).

6.0 REFERENCES

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Northbound over Old Swamp River (Relocated).

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Appendices

APPENDIX A

DATA COLLECTION

Basis of Design Report

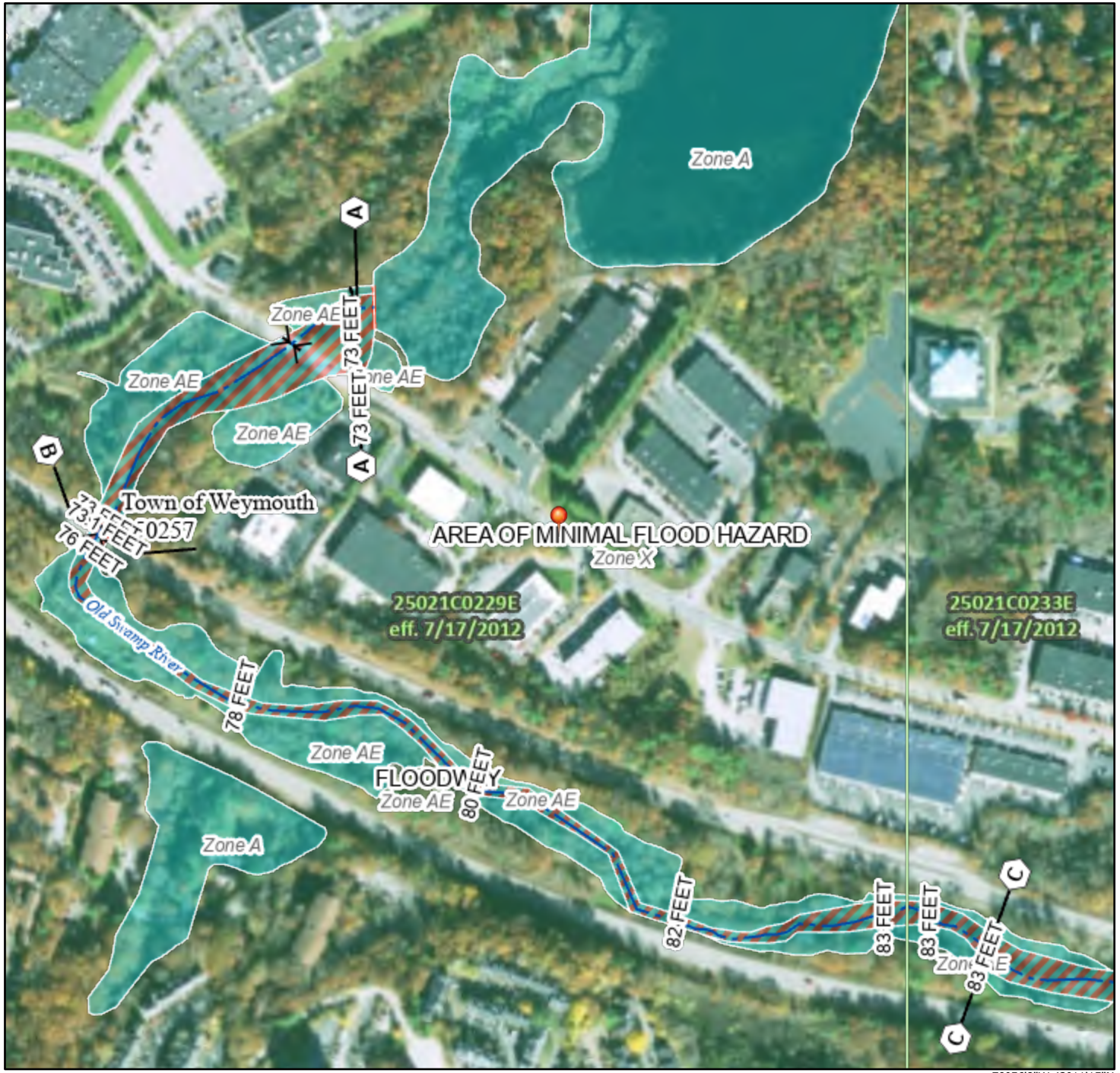
Massachusetts Division of Ecological Restoration
251 Causeway Street, Suite 400
Boston, MA 02114

May 2023

National Flood Hazard Layer FIRMette

FEMA

70°56'45"W 42°11'42"N



70°56'8"W 42°11'15"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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 11/30/2022 at 3:07 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.

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Neponset River	Downstream of 1-95 Interchange near Canton/Norwood corporate limits	78.20	1,030	*	1,800	2,070	3,450
Neponset River	Neponset Street	76.50	1,060	*	1,850	2,254	3,550
Neponset River	Upstream crossing of I-95	41.90	720	*	1,150	1,508	2,300
Neponset River	Upstream of Traphole Brook	38.10	633	*	1,098	1,354	2,189
Neponset River	USGS gaging station (Section Y)	35.20	609	*	1,020	1,260	1,980
Neponset River	Upstream of Hawes Brook confluence	26.20	463	*	786	958	1,515
Neponset River	At Walpole/Norwood downstream corporate limits	25.80	700	*	1,025	1,225	2,575
Neponset River	At Washington Street	25.70	700	*	1,025	1,225	2,550
Neponset River	At Bird and Son Co. Dam	25.70	695	*	1,032	1,234	2,565
Neponset River	At Plimpton Pond Dam	24.90	683	*	1,024	1,235	2,527
Neponset River	At State Route 1A	22.90	575	*	900	1,100	2,350
Neponset River	At Stetson Pond Dam	22.20	574	*	906	1,114	2,336
Neponset River	At Elm Street	10.60	300	*	475	550	1,025
Neponset River	At South Street	*	261	*	416	498	1,050
Neponset River	At Summer Street	3.50	232	*	456	570	928
Norway Brook		*	*	*	*	*	*
Old Swamp River	At Libbey Industrial Parkway	4.90	241	*	360	422	657

*Not calculated for this Flood Risk Project

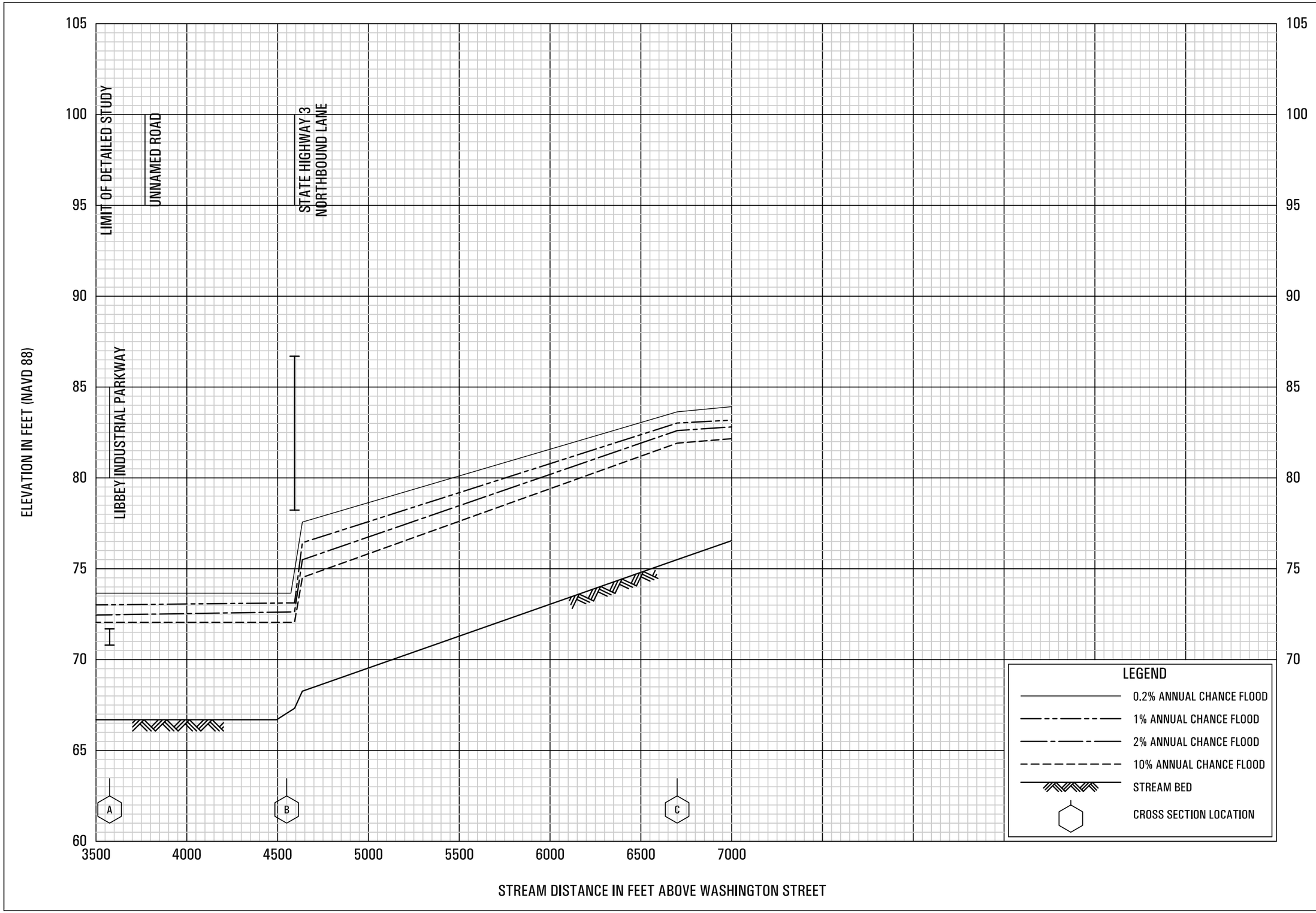
Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Old Swamp River	At State Route 3 Northbound lane	4.70	222	*	336	389	608
Old Swamp River	Approximately 800 feet downstream of Pleasant Street	4.10	190	*	288	334	537
Old Swamp River	At State Route 3 southbound lane	4.00	183	*	273	313	480
Old Swamp River	At Pleasant Street	4.00	182	*	272	310	475
Old Swamp River	Approximately 750 feet upstream of Pleasant Street	3.90	180	*	270	308	472
Old Swamp River	At Elm Street	3.80	179	*	267	305	469
Old Swamp River	Approximately 1,150 feet downstream of Talbot Street	3.60	170	*	254	300	453
Old Swamp River	At Talbot Street	3.40	160	*	239	289	437
Old Swamp River	Approximately 950 feet downstream of Ralph Talbot Street	3.10	147	*	220	268	396
Old Swamp River	At Ralph Talbot Street	3.00	143	*	212	250	375
Old Swamp River	Approximately1,400 feet upstream of Ralph Talbot Street	2.90	140	*	206	235	356
Paintshop Pond	At Wellesley	8.90	125	*	175	210	285
Pequid Brook (Lower Reach)	At Reservoir Pond	6.23	180	*	190	210	300

*Not calculated for this Flood Risk Project

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Old Swamp River	Approximately 80 feet downstream of Libbey Industrial Parkway	2,750 feet upstream of Ralph Talbot Street	Regression equations (Johnson and Tasker 1974)	HEC-2 (USACE 1974)	5/1/1990	AE w/Floodway	Drainage areas and slopes were taken from topographic maps (USGS 1971). Annual regional precipitation value of 3.67 feet per year was taken from USWB (1961). These variables were used to calculate 10-, 2-, and 1-percent-annual-chance floods. 0.2-percent-annual-chance floods were extrapolated. Contributing flows from adjacent communities were incorporated. Discharges were compared against streamgage records from Old Swamp River near Whitmans Pond. Areas of swamp, bog, open water, and urban development were computed and assigned weighting values to account for storage and rapid urban run-off. These values were used to adjust final discharges. Structures were obtained from field surveys. No more than 0.25 mile is between each cross section. Starting water-surface elevations were from normal elevations as determined from field inspection.
Peters River	County limits	Silver Lake	Drainage-area ratio	HEC-2 (USACE 1974)	7/1/1980	AE w/Floodway	Discharge at Woonsocket boundary was taken from Woonsocket FIS. Upstream, drainage-area ratio equation was used with exponent of 0.7. Structure geometry was obtained from bridge plans, except for those structures which were unavailable or out of date, which were surveyed. Underwater portions of cross sections were obtained from field surveys. Overbank portions were obtained from topographic maps. Starting water-surface elevations were from adjacent studies.
Pickerel Brook	Confluence with Traphole Brook	Approximately 1,800 feet upstream of Wolcott Avenue	unknown	WSP-2 (SCS 1976)	12/1/1975	AE w/Floodway	Cross sections were obtained from field surveys. Overbank portions of cross sections were derived from topographic maps (Avis 1980c). Starting water-surface elevations were from normal depth.



FLOOD PROFILES

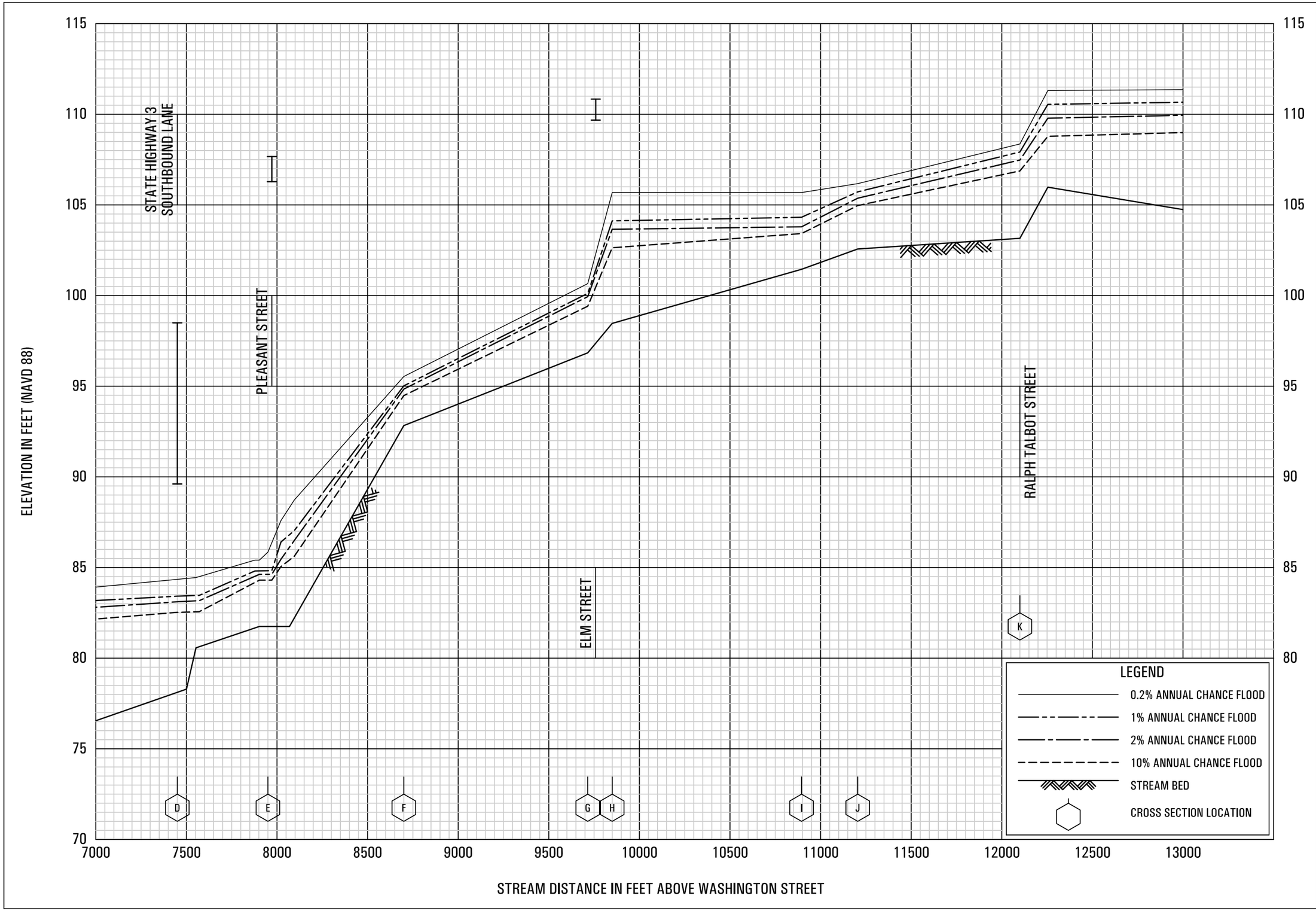
OLD SWAMP RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NORFOLK COUNTY, MA

(ALL JURISDICTIONS)

153P



FLOOD PROFILES

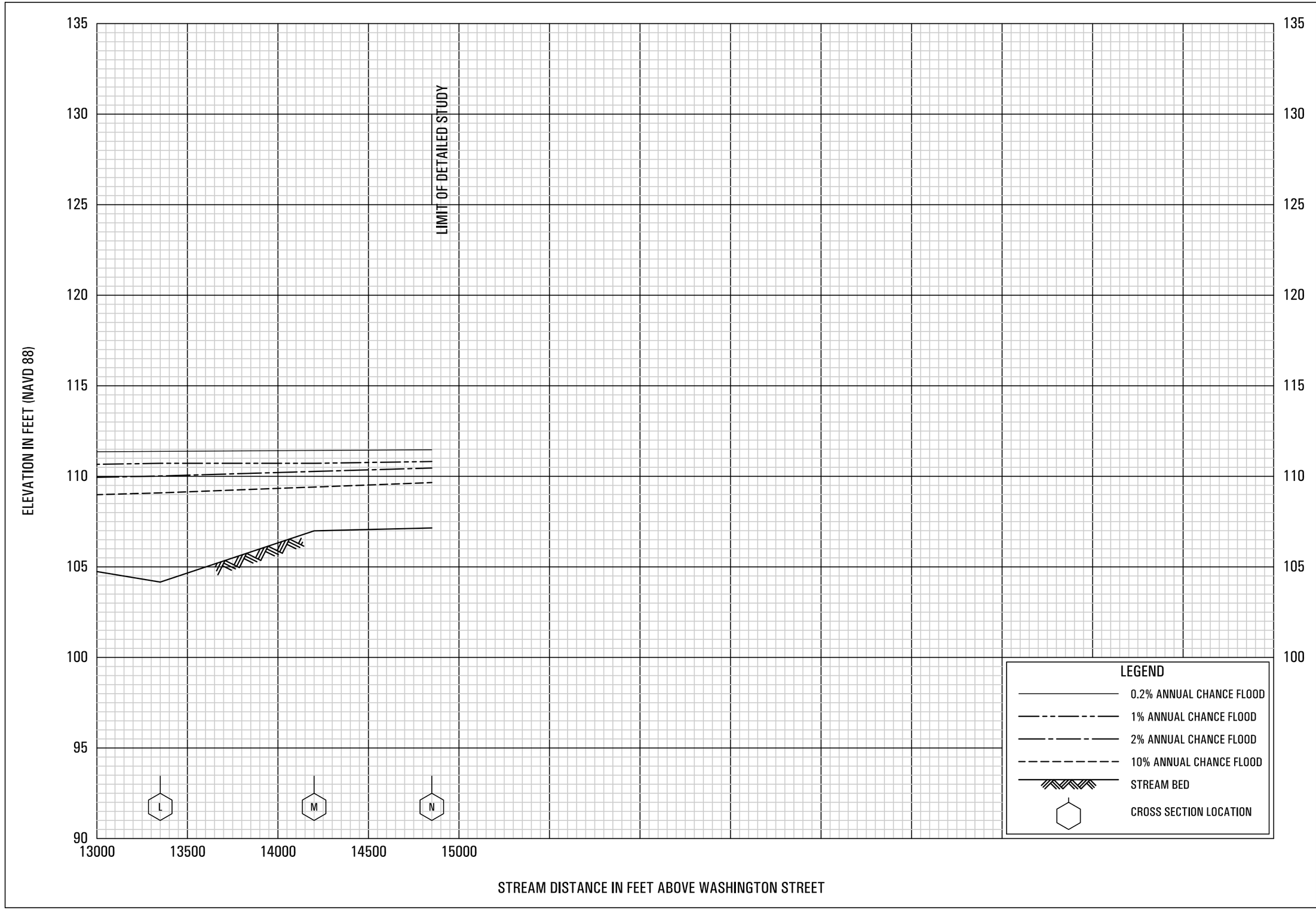
OLD SWAMP RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

NORFOLK COUNTY, MA

(ALL JURISDICTIONS)

154P



FLOOD PROFILES

OLD SWAMP RIVER

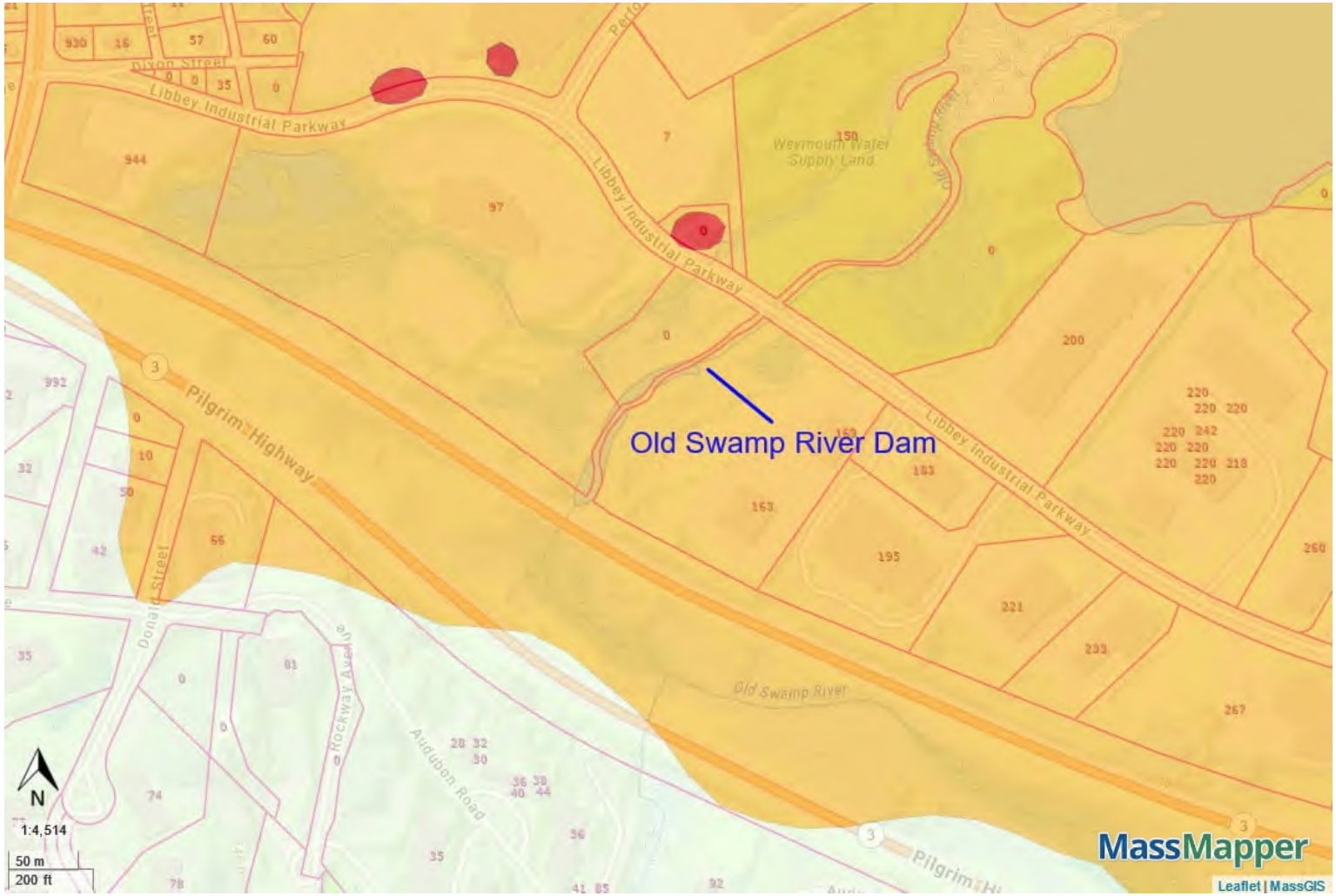
FEDERAL EMERGENCY MANAGEMENT AGENCY

NORFOLK COUNTY, MA

(ALL JURISDICTIONS)

155P

Surficial Geology



Surficial Geology 24k Map Units

- Artificial fill
- Cranberry bog deposits
- Beach and dune deposits
- Swamp deposits
- Salt-marsh and estuarine deposits
- Floodplain alluvium
- Valley-floor fluvial deposits
- Alluvial-fan deposits
- Inland-dune deposits
- Marine regressive deposits
- Stream-terrace deposits
- Talus deposits
- Glacial stratified deposits, coarse
- Glacial stratified deposits, fine
- Glacial stratified deposits, glaciomarine fine
- Stagnant-ice deposits
- End moraine deposits
- Thrust-moraine deposits
- Thick till
- Thick valley till and fine deposits
- Glacially-modified coastal plain hill deposits
- Thin till
- Bedrock outcrops

Property Tax Parcels

Project/Sample Information

Project	Old Swamp River Dam Removal - Weymouth, MA
Stream	Old Swamp River
Location	At sharp bend upstream of Route 3
Sample ID	
Sample Date	
Sampled By	MGS, JCS
Sample Method	Wolman Pebble Count

Particle Distribution (%)

silt/clay	0
sand	0
gravel	84
cobble	16
boulder	0
bedrock	0

Sample Site Descriptions by Observations

Channel type	riffle run
D100 (mm)	
Colluvium	
Debris	
Other	

Particle Sizes (mm)

D16	21
D35	30
D50	**37**
D84	64
D95	89

(Bunte and Abt, 2001)

Particle Name	Size Limits (mm) lower	upper	Tally	Count	Percent Passing	Cumulative % Finer
silt/clay	0	**0.063**			0.0	0.0
very fine sand	0.063	**0.125**			0.0	0.0
fine sand	0.125	**0.250**			0.0	0.0
medium sand	0.250	**0.500**			0.0	0.0
coarse sand	0.500	**1**			0.0	0.0
very coarse sand	1	**2**			0.0	0.0
very fine gravel	2	**4**			0.0	0.0
fine gravel	4	**5.7**			0.0	0.0
fine gravel	5.7	**8**		1	0.9	0.9
medium gravel	8	**11.3**		2	1.9	2.8
medium gravel	11.3	**16**		2	1.9	4.6
coarse gravel	16	**22.6**		15	13.9	18.5
coarse gravel	22.6	**32**		23	21.3	39.8
very coarse gravel	32	**45**		27	25.0	64.8
very coarse gravel	45	**64**		21	19.4	84.3
small cobble	64	**90**		12	11.1	95.4
medium cobble	90	**128**		3	2.8	98.1
large cobble	128	**180**		2	1.9	100.0
very large cobble	180	**256**			0.0	100.0
small boulder	256	**362**			0.0	100.0
small boulder	362	**512**			0.0	100.0
medium boulder	512	**1024**			0.0	100.0
large boulder	1024	**2048**			0.0	100.0
very large boulder	2048	**4096**			0.0	100.0
bedrock	4096	**-**			0.0	100.0
(Wenthworth, 1922)			Total	108	100.0	-

F-T Particle Sizes (mm)

F-T n-value	0.5
D16	3.8
D5	0.4

(Fuller and Thompson, 1907)

D (mm) of the largest mobile particles on bar

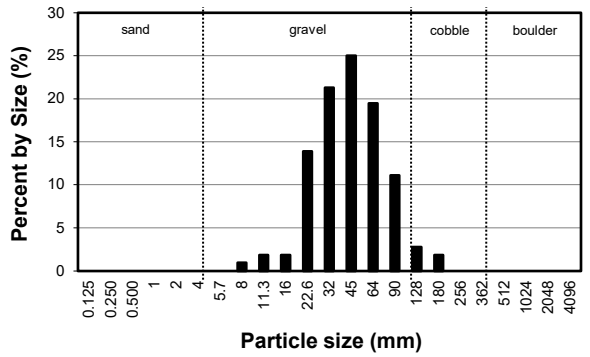
Mean	

Riffle Stability Index (%)

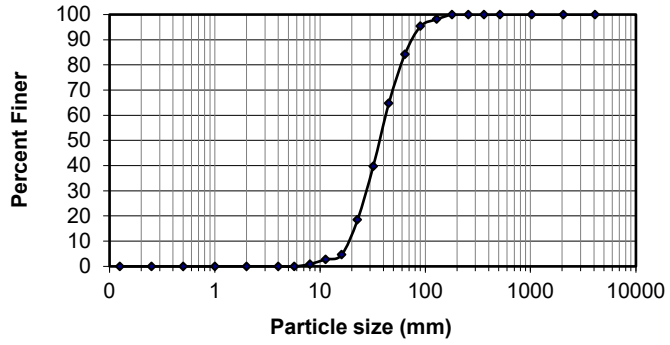
(Kappesser, 2002)

Notes

Particle Size Histogram



Gradation Curve



Project/Sample Information

Project	Old Swamp River Dam Removal - Weymouth, MA
Stream	Old Swamp River
Location	Between Libbey Pkwy and Outlet Culvert for SNUP Basin 2
Sample ID	
Sample Date	12/5/2022
Sampled By	MGS, JCS
Sample Method	Wolman Pebble Count

Particle Distribution (%)

silt/clay	0
sand	1
gravel	70
cobble	29
boulder	0
bedrock	0

Sample Site Descriptions by Observations

Channel type	
D100 (mm)	
Colluvium	
Debris	
Other	Note, too deep to collect in center of channel, collected on channel edges

Particle Sizes (mm)

D16	23
D35	34
D50	**47**
D84	96
D95	147

(Bunte and Abt, 2001)

Particle Name	Size Limits (mm) lower	upper	Tally	Count	Percent Passing	Cumulative % Finer
silt/clay	0	**0.063**			0.0	0.0
very fine sand	0.063	**0.125**			0.0	0.0
fine sand	0.125	**0.250**			0.0	0.0
medium sand	0.250	**0.500**			0.0	0.0
coarse sand	0.500	**1**			0.0	0.0
very coarse sand	1	**2**		1	1.0	1.0
very fine gravel	2	**4**			0.0	1.0
fine gravel	4	**5.7**			0.0	1.0
fine gravel	5.7	**8**			0.0	1.0
medium gravel	8	**11.3**		1	1.0	2.0
medium gravel	11.3	**16**		6	6.0	8.0
coarse gravel	16	**22.6**		6	6.0	14.0
coarse gravel	22.6	**32**		18	18.0	32.0
very coarse gravel	32	**45**		15	15.0	47.0
very coarse gravel	45	**64**		24	24.0	71.0
small cobble	64	**90**		11	11.0	82.0
medium cobble	90	**128**		11	11.0	93.0
large cobble	128	**180**		5	5.0	98.0
very large cobble	180	**256**		2	2.0	100.0
small boulder	256	**362**			0.0	100.0
small boulder	362	**512**			0.0	100.0
medium boulder	512	**1024**			0.0	100.0
large boulder	1024	**2048**			0.0	100.0
very large boulder	2048	**4096**			0.0	100.0
bedrock	4096	**-**			0.0	100.0
			Total	100	100.0	-

(Wenthworth, 1922)

F-T Particle Sizes (mm)

F-T n-value	0.5
D16	4.8
D5	0.5

(Fuller and Thompson, 1907)

D (mm) of the largest mobile particles on bar

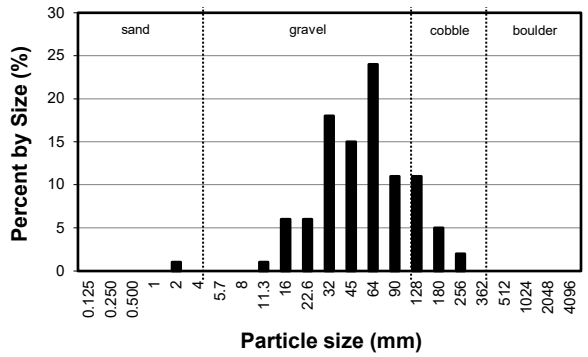
Mean	

Riffle Stability Index (%)

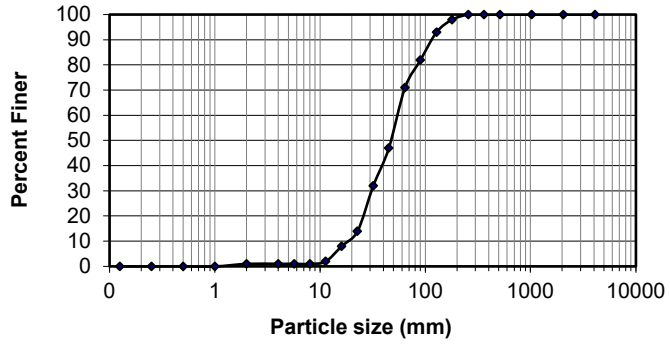
(Kappesser, 2002)

Notes

Particle Size Histogram



Gradation Curve



IMTL

Accurate information you can rely on.

Soil Gradation Report

GRADATION ASTM D-422; WET WASH ASTM D-1140

PROJECT:	INFO – OLD SWAMP RIVER – WYMOUTH, MA	PROJECT NO.:	1267
CLIENT:	SLR INTERNATIONAL	REPORT NO.:	406
LAB NO.:	41100	DATE:	02/17/2023
USE:	CLIENT INFO	SAMPLED BY:	CLIENT
SPEC A:	NOT AVAILABLE*	SOURCE:	ON-SITE EXISTING
		EST. PARTICLE SHAPE/HARDNESS:	ANGULAR/HARD

GRADATION RESULTS

SIEVE #		% PASS	SPEC A
50 mm	(2")	100.0	
37.5 mm	(1-1/2")	95.9	
25 mm	(1")	84.1	
19 mm	(3/4")	78.5	
12.5 mm	(1/2")	67.2	
9.5 mm	(3/8")	62.2	
6.3 mm	(1/4")	54.5	
4.75 mm	(#4)	50.4	
2.0 mm	(#10)	39.0	
425 µm	(#40)	5.2	
150 µm	(#100)	0.4	
75 µm	(#200)	0.2	
COMPLIED WITH:			SPEC A: *
. . .AS PER GRADATION ABOVE			

SOIL DESCRIPTION: DARK BROWN GRAVEL AND SAND; TRACE FINES

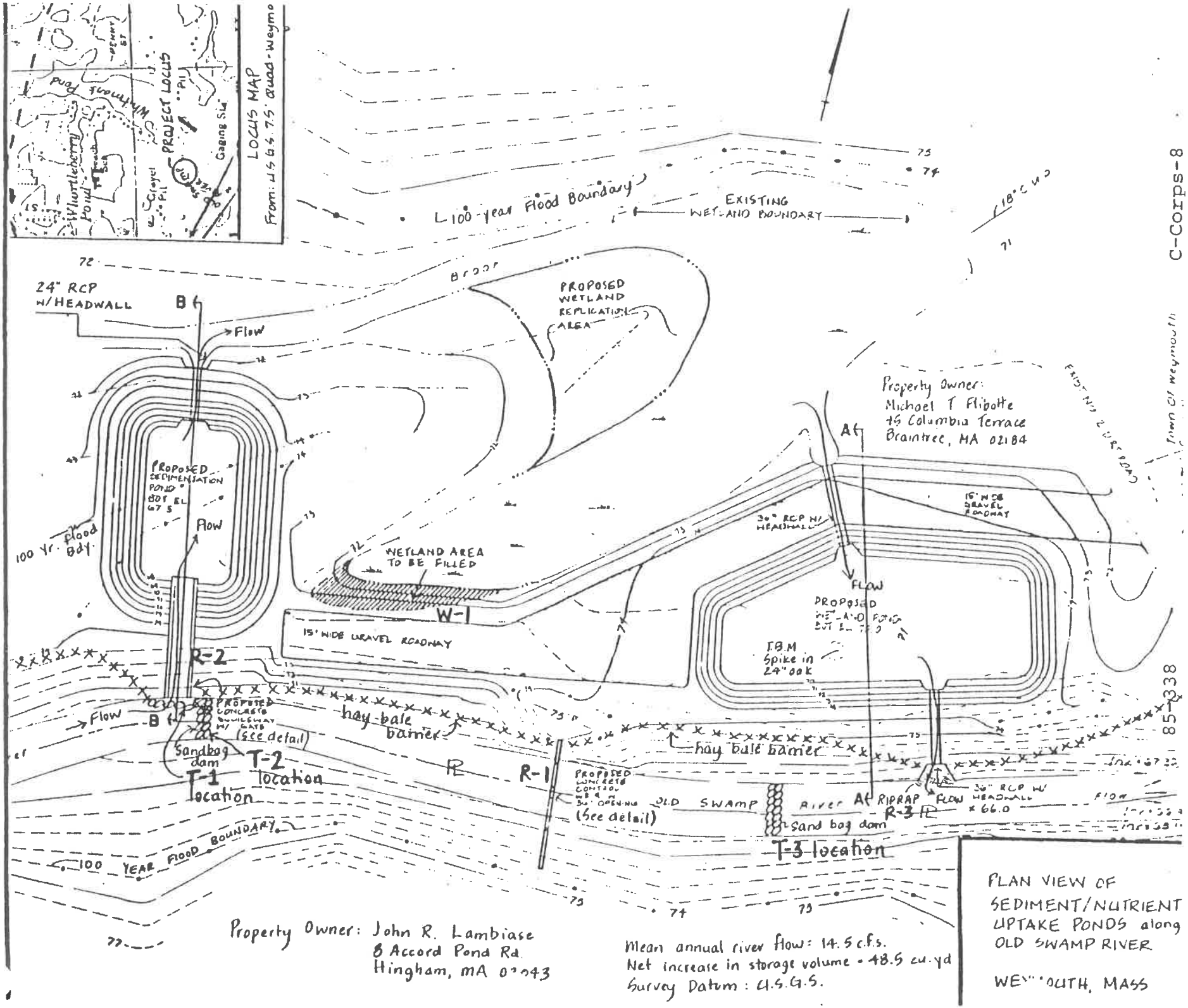
Results apply to the sample as received (customer sampled material)

*Requires Engineer's Approval

REVIEWED BY: 2-21-23

pc: Robert Luff, Jenabay Sezen, SLR International
km

Independent Materials Testing Laboratories, Inc.
57 N. Washington St., P.O. Box 745, Plainville, CT 06062
T 860.747.1000 F 860.747.6455
mail@imtlct.com www.imtlct.com



From SWUP Spec. (Construction)

JAN 15 19

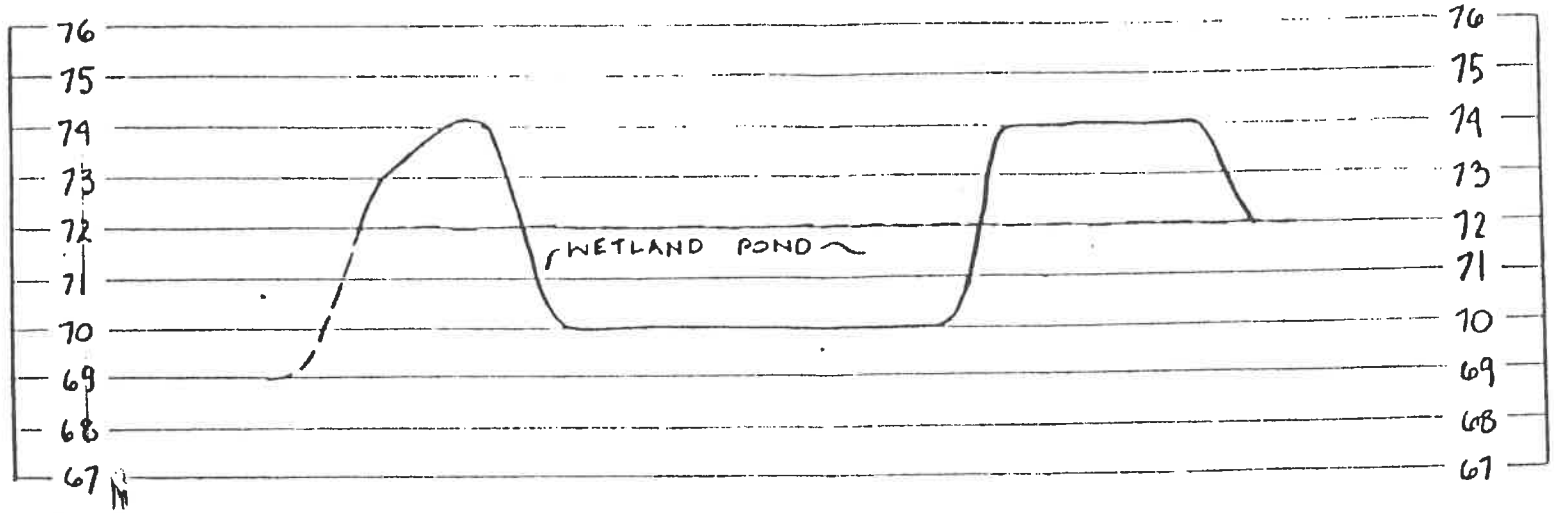
C-Corps-8

85-338

PROPOSED SEDIMENT, NUTRIENT UPTAKE POND. WEYMOUTH, MASS.

JANUARY, 1988. JOB NO. 85-338

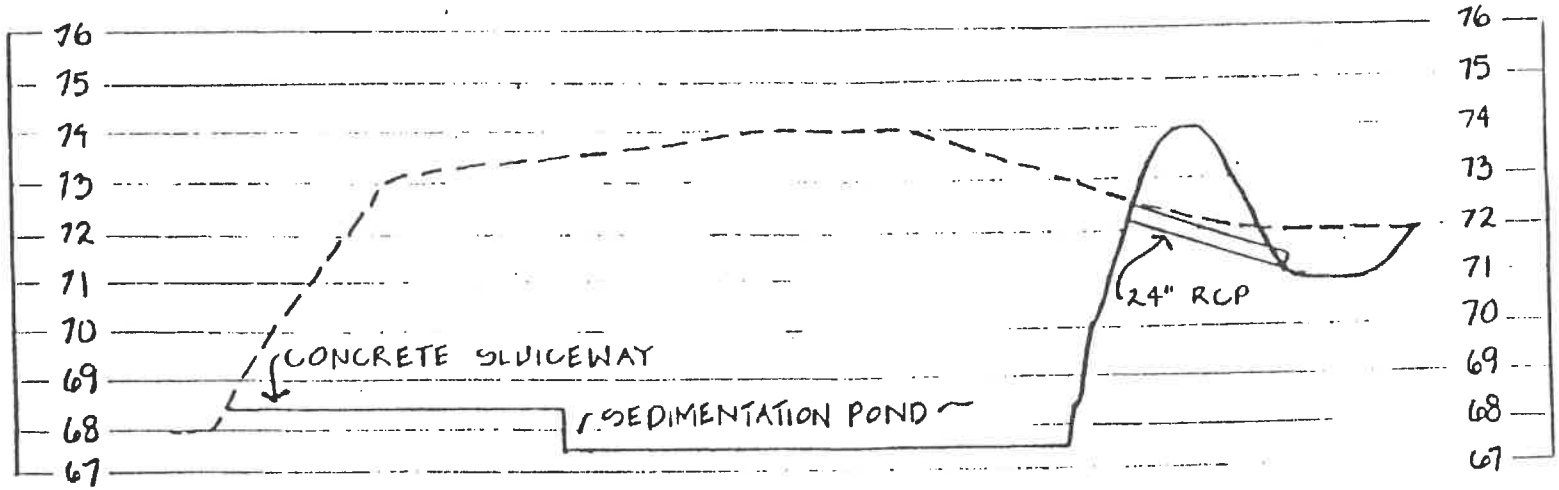
SCALE: HORIZONTAL: 1" = 20'-0". VERTICAL: 1" = 4'-0"



SECTION A-A

----- EXISTING GRADE

——— FINISH GRADE



SECTION B-B

WHITMAN & HOWARD, INC. 45 WILLIAM STREET, WELLESLEY, MASS.

1/5/88

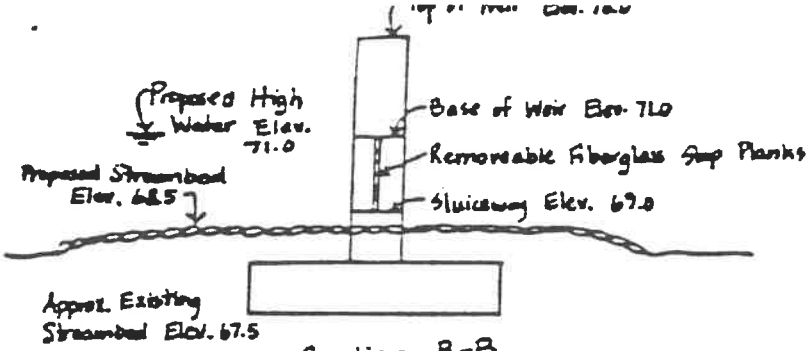
Sheet 2 of 3

C-Corps-9

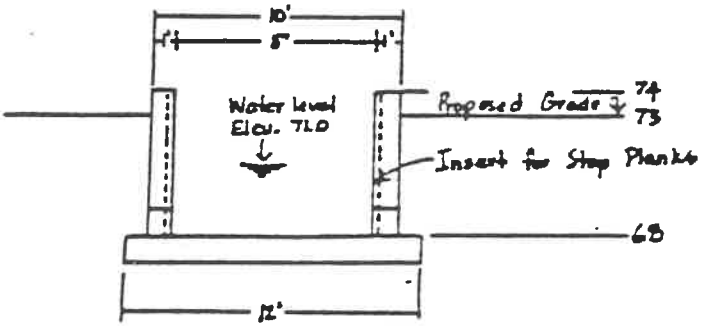
85-338

and Sluiceway in
Sediment / Nutrient Uptake
Pond Project, Old Swamp
River, Weymouth, MA

JAN 15 1988



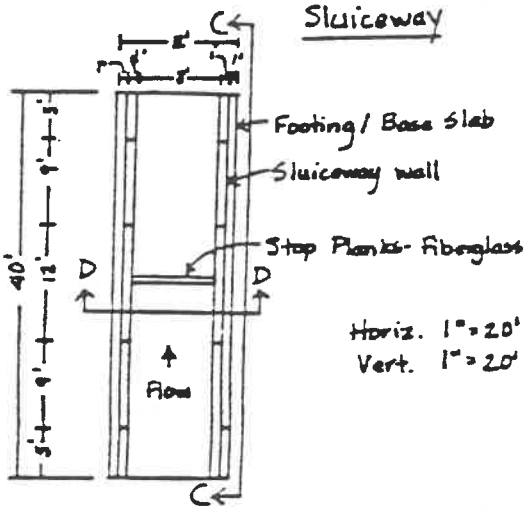
Section B-B



Horiz. 1" = 8'
Vert. 1" = 8'

Section D-D

Plan View
Sluiceway



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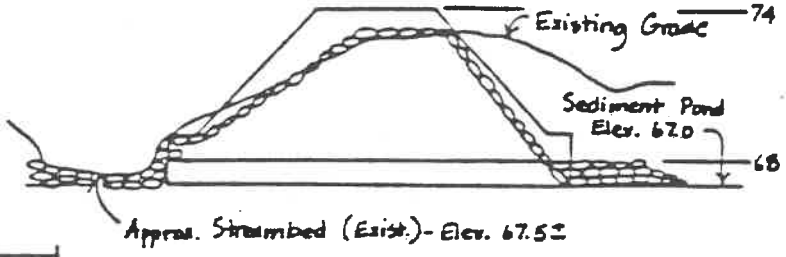
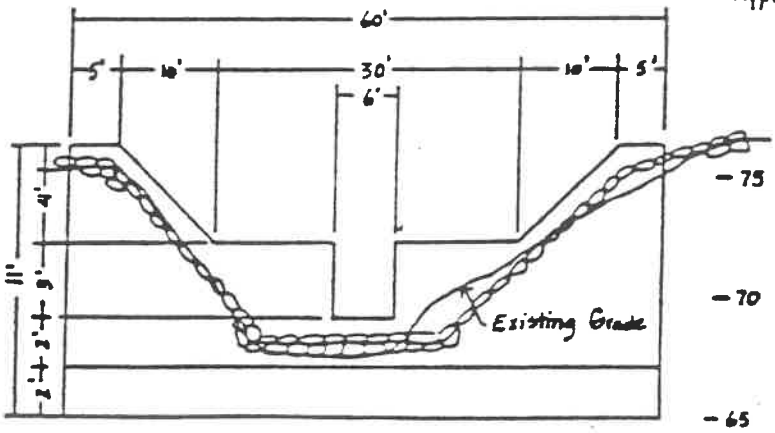
Vert. 1" = 20'



Horiz. 1" = 8'
Vert. 1" = 8'

Section C-C

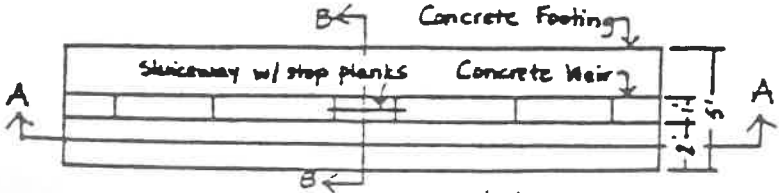


Section A-A

Horiz. 1" = 20'
Vert. 1" = 8'

Volume of concrete in stream below ordinary high water = 5.5 cu. yd.

Volume of rip-rap in stream below ordinary high water = 20.0 cu. yd.

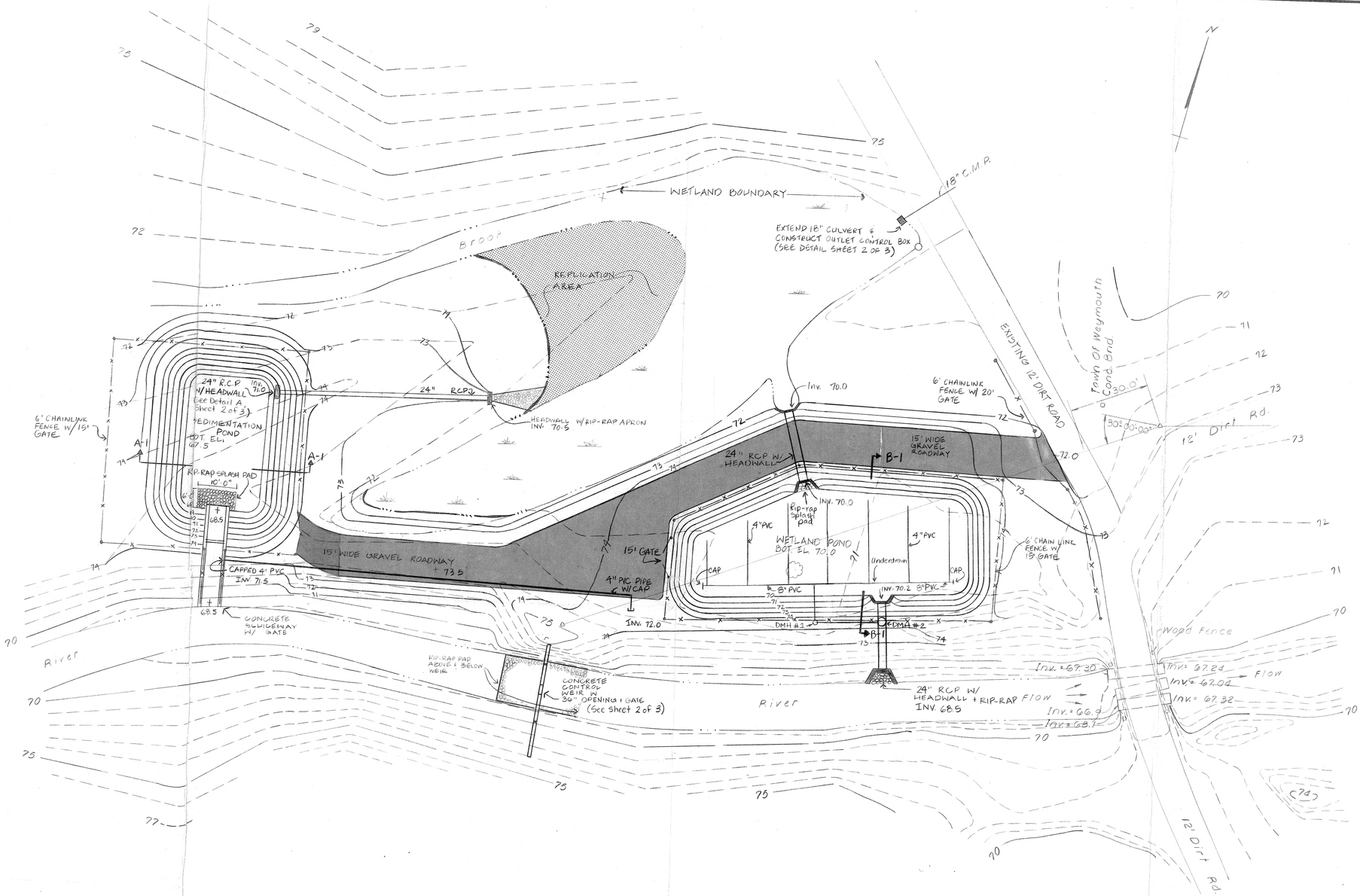


Plan View Weir

Horiz. 1" = 20'
Vert. 1" = 8'

rev 1/5/88

(IHC-18)



81-341
BLK 432 L-4

THESE PLANS/SPECIFICATIONS DATED 2/10/88 ARE NOT TO BE ISSUED FOR BIDDING OR CONSTRUCTION PURPOSES UNTIL REVIEWED BY THE MANAGER OF QUALITY ASSURANCE.

NO.	DESCRIPTION	DATE
1	REVISED	1/88

REVISIONS

WHITMAN & HOWARD, INC.
45 WILLIAM STREET, WELLESLEY, MASS.

ORIGINAL FULL SIZE DRAWING = 4"
REPRODUCTIONS MAY BE REDUCED SIZE

APPROVED

DESIGNED	DRAWN	CHECKED	SCALE	DATE
			1" = 20'	NOV. 1986

DRAWING NO.
JOB NO. 85-338
CONTRACT NO.
SHEET 1 OF 3 SHEETS

PROPOSED
SEDIMENT, NUTRIENT UPTAKE POND
WEYMOUTH, MASS.
SITE PLAN

FOTOBEAM/BROOKSIDE 267-24x36

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
STRUCTURES INSPECTION FIELD REPORT
CULVERT INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
06	8L5	W-32-032

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
WEYMOUTH	W32032-8L5-DOT-BRI	000.000	A:OPEN	JUL 29, 2022

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
US 3 NB		1957	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
WATER SWAMP RIVER	Freeway/Expressway	J. O'Connor

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER
119 : Concrete Culvert	State Highway Agency	State Highway Agency	T. Bendaravicius

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
N : Not applicable	Sunny	30°C	M. HAILU, A. DATISH

TYPE OF CULVERT:

SHAPE:	RECTANGULAR
MATERIAL:	REINFORCED CONCRETE
COATING:	NONE

BARRELS: (In Meters)

SIZE:	*NUMBER:*
3.00Wx5.00H	1

DEPTH OF COVER (To the nearest tenth of a meter) E: 2.0 W: 2.0

CURB REVEAL (In millimeters) N N

ITEM 62 *CULVERT & RETAINING WALLS* — 6 — I62 (Dive Report): N — I62 (This Report): 6

	Dive Rpt.	This Rpt.	DEF		Dive Rpt.	This Rpt.	DEF		Dive Rpt.	This Rpt.	DEF
1. Roof	N	6	M-P	7.Protective Coating	N	N	-	13.Member Alignment	N	7	-
2. Floor	N	H	-	8.Embankment	N	7	-	14.Deformation	N	N	-
3. Walls	N	7	M-P	9.Wearing Surface	N	7	-	15.Scour	N	7	-
4. Headwall	N	7	-	10.Railing	N	7	-	16.Settlement	N	7	-
5. Wingwall	N	7	M-P	11.Sidewalks	N	N	-	17.	N	N	-
6. Pipe	N	N	-	12.Utilities	N	N	-	18.	N	N	-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 61 *CHANNEL & CHANNEL PROTECTION* — 7

	Dive Rpt.	This Rpt.	DEF		Dive Rpt.	This Rpt.	DEF
1.Channel Scour	N	7	-	5. Utilities	N	N	-
2.Embankment Erosion	N	7	M	6. Rip-Rap/Slope Protection	N	7	-
3.Debris	N	6	M-P	7. Aggradation	N	5	M-P
4.Vegetation	N	6	M-P				

STREAM FLOW VELOCITY: Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 (Dive Report): N

ITEM 61 (This Report): 7

93b-U/W INSP DATE: 00/00/0000

APPROACH CONDITION

		DEF
a. Appr. pavement condition	7	-
b. Appr. Roadway Settlement	7	-
c. Appr. Sidewalk Settlement	N	-
d.	N	-

WEIGHT POSTING

Not Applicable X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 00/00/0000 EJDMT Date: 00/00/0000

Signs In Place (Y=Yes,N=No, NR=NotRequired)

Legibility/ Visibility

At bridge N	At bridge S	Advance N	Advance S

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
A. Bridge Railing	1	7	-
B. Transitions	1	7	-
C. Approach Guardrail	1	7	-
D. Approach Guardrail Ends	1	7	-

ACCESSIBILITY (Y/N/P):

	Needed	Used		Needed	Used
Ladder	N	N	Other:		
Boat	N	N		N	N
Waders	Y	Y			

TOTAL HOURS 12

PLANS (Y/N): Y

(V.C.R.) (Y/N): N

TAPE#:

RATING

Rating Report (Y/N): Y

Date: 09/01/2004

Inspection data at time of existing rating

I 62: 7 Date : 09/15/2003

Recommend for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON:

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

REMARKS, PHOTOS & SKETCHES

BRIDGE ORIENTATION

For this report the approaches are south and north and the elevations are west and east. This is a single span structure. The river flows from west to east. **See sketch #1.**

ITEM 62 - CULVERT

Item 62.1 - Roof

There are a few random hairline cracks and a few delaminated areas throughout the roof.
At west end by the north breastwall there is a moderate spall, 2' long x 5" wide x 1" deep, with exposed rusted rebar (with insignificant section loss). Just east, there are 8 pop-outs with rebar. **See photo #1**. In addition, same location, adjacent to the south wall there is a minor spall, 7" long x 4" wide x 1" deep, with exposed rusted rebar (with insignificant section loss). West end of roof, 7', 13', and 18' in, there are three pairs of exposed metal plates, (2"W x 10"L x 1/2" D), left side, center, and right side of roof. **See photo #2.** Roof joint 25' from the west end, cracking with efflorescence and stalactites full width. **See photo #3.** Roof joint 25' from the east end, hairline cracking with efflorescence, rust staining, and water staining adjacent to the south wall. **See photo #4.** East end of roof, two 2" x 10" exposed metal plates, one with delamination and minor spall just south of exposed metal at midspan. **See photo #5.** On the north side of the east end there is minor spalling and delamination with exposed metal plates. **See photo #6.**

Item 62.2 - Floor

See Item 61.7.

CONDITION RATING GUIDE

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	Use if structure is not a culvert.
G	9	EXCELLENT	No deficiencies.
G	8	VERY GOOD	No noticeable or noteworthy differences which affect the condition of the culvert. Insignificant scrape marks caused by drift.
G	7	GOOD	Shrinkage cracks, light scaling, and insignificant spalling, which does not expose reinforcing steel. Insignificant damage caused by drift with not misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls, or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.
F	6	SATISFACTORY	Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls, or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion or moderate pitting.
F	5	FAIR	Moderate to major deterioration, or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion or deep pitting.
P	4	POOR	Large spalls, heavy scaling, wide cracks, considerable efforescence, or opened construction joints permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.
P	3	SERIOUS	Any condition described in Code 4 but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls, nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls, or pipes. Metal culverts have extreme distortion and deflection in one section, extensive corrosion, or deep pitting with scattered perforations.
C	2	CRITICAL	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Bridge closed. Corrective action may put back in light service.
	0	FAILED	Bridge closed. Replacement necessary.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency (Examples include but are not limited to: Spalled concrete, minor to moderate corrosion to steel culverts, minor settlement or misalignment, minor scouring, minor damage to guardrail, etc.)

S= Severe/Major Deficiency (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, considerable settlement, considerable scouring or undermining, extensive corrosion and deflection in steel culverts, etc.)

C-S= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condition to the public. (Follow-up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) stay at the bridge until the District Maintenance crew or the responsible Agency crew(if not a State bridge) show up and corrective action is taken.]

A = ASAP- [Action will be taken by the District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

REMARKS

Item 62.3 - Walls
There is abrasion along both walls 5' down from the top of culvert. There is random hairline cracking along both walls. South wall 25' from the east end, full height moderate crack, rust, efflorescence, and water staining, same at opposite wall. **See photo #7.** At the east end of the north wall there is ratholing which extends the last 25' of the culvert. **See photo #8**.

Item 62.5 - Wingwall
Northwest
There is a moderate spall 12' from headwall 5' from the top of wall (8" wide x 3" high x 4" deep).
There is also a moderate spall with exposed rusted rebar at the top of the wingwall adjacent to the headwall (8" high x 3" wide x 1" deep).

Southwest
There is a moderate spall 12' from the headwall 5' from the top of wall with hairline cracking and efflorescence (1.5" wide x 1" high x 1" deep).

Item 62.9 - Wearing Surface
There are minor transverse and longitudinal cracks in the right travel lane.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.3 - Debris
There is minor debris throughout the channel in both the upstream and downstream ends.

Item 61.4 - Vegetation
See Item 61.7.

Item 61.7 - Aggradation
There is moderate aggradation throughout the center of the culvert at the upstream end. **See photo #9**. There is aggradation and vegetation at the upstream end of the culvert along the south bank which is restricting flow through channel. **See photo #10**. There is aggradation with vegetation on the downstream, south side of the culvert . **See photo #11**.

TRAFFIC SAFETY

Item 36a - Bridge Railing
West railing is thrie-beam guardrail. East railing is type "ss" guardrail.

Item 36b - Transitions
Continuation of the bridge railing at all transitions.

Item 36c - Approach Guardrail
Continuation of the bridge railing at all approaches.

Item 36d - Approach Guardrail Ends
The southwest terminal is buried. The southeast terminal is buried and flared away from the roadway. The northwest terminal is a boxing glove end. The northeast terminal is well beyond the bridge.

Sketch / Photo Log
Sketch 1 : Location Map

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

REMARKS

Photo 1 : West end of the roof by the north breastwall, spall with exposed rusted rebar with insignificant section loss. Just east, 8 pop-outs with rebar

Photo 2 : West end of roof, 7', 13' and 18' in, there are three pairs of exposed metal plates, left side, center, and right side of roof

Photo 3 : Underside of roof 25' from the west end, cracking with efflorescence and stalactites full width

Photo 4 : Roof joint 25' from the east end, hairline cracking with efflorescence, rust staining and water staining adjacent to the south wall

Photo 5 : East end of roof, two 2" x 10" exposed metal, one with delamination and minor spall just south of exposed metal at midspan

Photo 6 : East end of the roof, minor spalling and delamination with exposed metal plates on the north side

Photo 7 : South wall 25' from east end, full height moderate crack, rust, efflorescence, and water staining, same at opposite wall

Photo 8 : Ratholing at the waterline along the north wall by the east end

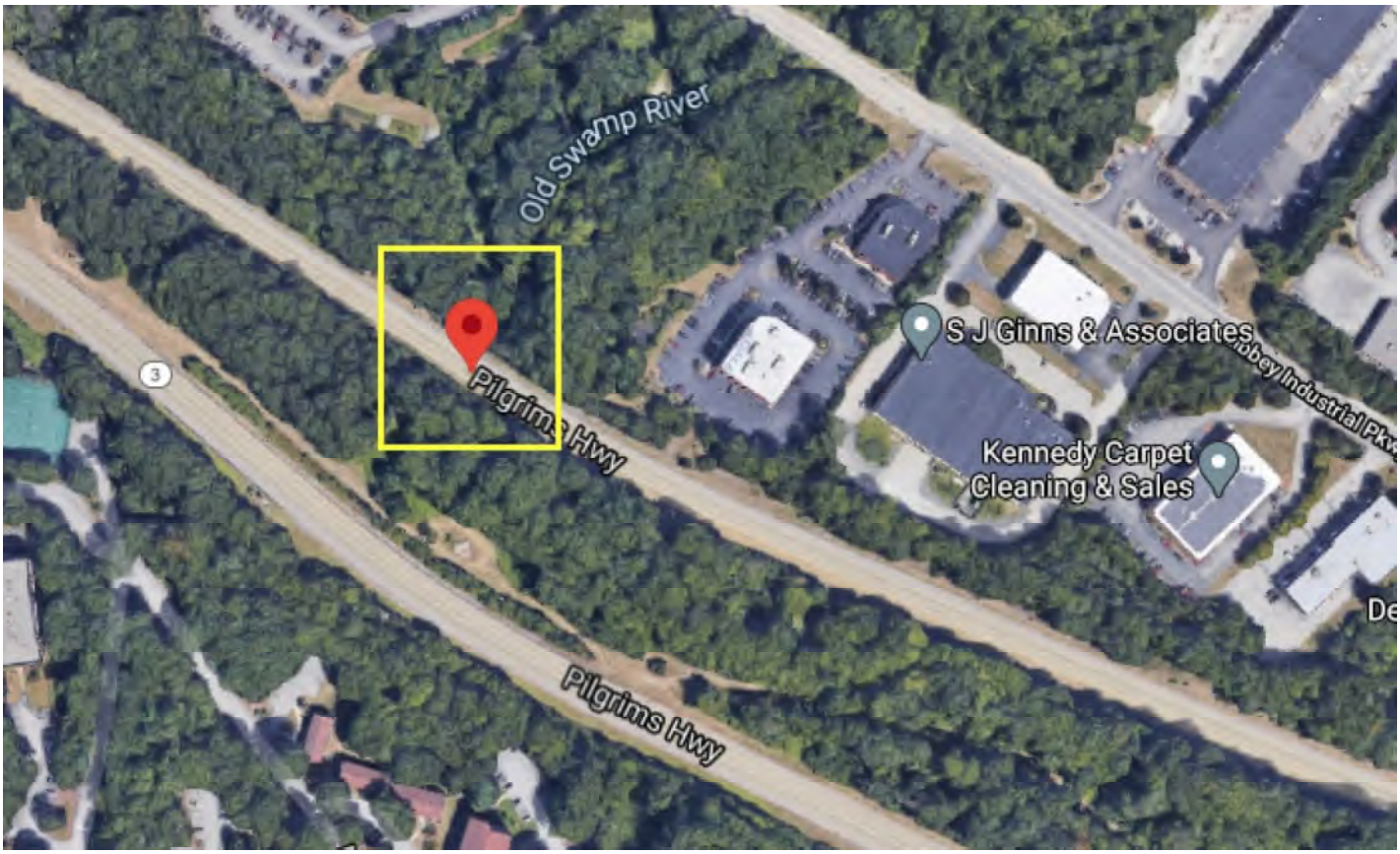
Photo 9 : Moderate aggradation at the upstream end in the center of the culvert

Photo 10 : Aggradation upstream (west end) of river restricting channel

Photo 11 : Downstream (east end) of culvert, aggradation, debris and vegetation along banks

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

SKETCHES



Sketch 1: Location Map

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

PHOTOS

Photo 1: **West end of the roof by the north breastwall, spall with exposed rusted rebar with insignificant section loss. Just east, 8 pop-outs with rebar**

Photo 2: **West end of roof, 7', 13' and 18' in, there are three pairs of exposed metal plates, left side, center, and right side of roof**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

PHOTOS

Photo 3: **Underside of roof 25' from the west end, cracking with efflorescence and stalactites full width**

Photo 4: **Roof joint 25' from the east end, hairline cracking with efflorescence, rust staining and water staining adjacent to the south wall**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

PHOTOS

Photo 5: **East end of roof, two 2" x 10" exposed metal, one with delamination and minor spall just south of exposed metal at midspan**

Photo 6: **East end of the roof, minor spalling and delamination with exposed metal plates on the north side**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

PHOTOS

Photo 7: **South wall 25' from east end, full height moderate crack, rust, efflorescence, and water staining, same at opposite wall**

Photo 8: **Ratholing at the waterline along the north wall by the east end**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

PHOTOS

Photo 9: Moderate aggradation at the upstream end in the center of the culvert

Photo 10: Aggradation upstream (west end) of river restricting channel

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 29, 2022**

PHOTOS

Photo 11: Downstream (east end) of culvert, aggradation, debris and vegetation along banks

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
STRUCTURES INSPECTION FIELD REPORT
CULVERT INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
06	8L5	W-32-032

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
WEYMOUTH	W32032-8L5-DOT-BRI	000.000	A:OPEN	JUL 23, 2020

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
US 3 NB		1957	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
WATER SWAMP RIVER	Freeway/Expressway	J. O'Connor

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER
119 : Concrete Culvert	State Highway Agency	State Highway Agency	M. R. Hart

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
N : Not applicable	Sunny	32°C	T. BENDARAVICIUS

TYPE OF CULVERT:

SHAPE:	RECTANGULAR
MATERIAL:	REINFORCED CONCRETE
COATING:	NONE

BARRELS: (In Meters)

SIZE:	*NUMBER:*
3.00Wx5.00H	1

DEPTH OF COVER (To the nearest tenth of a meter) — E: 2.0, W: 2.0

CURB REVEAL (In millimeters) — N, N

ITEM 62 *CULVERT & RETAINING WALLS* — 7

I62 (Dive Report): N — I62 (This Report): 7

	Dive Rpt.	This Rpt.	DEF		Dive Rpt.	This Rpt.	DEF		Dive Rpt.	This Rpt.	DEF
1. Roof	N	6	M-P	7.Protective Coating	N	N	-	13.Member Alignment	N	7	-
2. Floor	N	H	-	8.Embankment	N	7	-	14.Deformation	N	N	-
3. Walls	N	7	M-P	9.Wearing Surface	N	7	-	15.Scour	N	7	-
4. Headwall	N	7	-	10.Railing	N	7	-	16.Settlement	N	7	-
5. Wingwall	N	7	M-P	11.Sidewalks	N	N	-	17.	N	N	-
6. Pipe	N	N	-	12.Utilities	N	N	-	18.	N	N	-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 61 *CHANNEL & CHANNEL PROTECTION* — 7

	Dive Rpt.	This Rpt.	DEF		Dive Rpt.	This Rpt.	DEF
1.Channel Scour	N	7	-	5. Utilities	N	N	-
2.Embankment Erosion	N	7	M	6. Rip-Rap/Slope Protection	N	7	-
3.Debris	N	6	M-P	7. Aggradation	N	5	M-P
4.Vegetation	N	6	M-P				

STREAM FLOW VELOCITY: Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 (Dive Report): N

ITEM 61 (This Report): 7

93b-U/W INSP DATE: 00/00/0000

APPROACH CONDITION

		DEF
a. Appr. pavement condition	7	-
b. Appr. Roadway Settlement	7	-
c. Appr. Sidewalk Settlement	N	-
d.	N	-

WEIGHT POSTING

Not Applicable X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 00/00/0000 EJDMT Date: 00/00/0000

Signs In Place (Y=Yes,N=No, NR=NotRequired)

Legibility/ Visibility

At bridge		Advance	
N	S	N	S

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
A. Bridge Railing	1	7	-
B. Transitions	1	7	-
C. Approach Guardrail	1	7	-
D. Approach Guardrail Ends	1	7	-

ACCESSIBILITY (Y/N/P):

	Needed	Used		Needed	Used
Ladder	N	N	Other:		
Boat	N	N		N	N
Waders	Y	Y			

TOTAL HOURS 12

PLANS (Y/N): Y

(V.C.R.) (Y/N): N

TAPE#:

RATING

Rating Report (Y/N): Y

Date: 09/01/2004

Inspection data at time of existing rating

I 62: 7 Date : 09/15/2003

Recommend for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON:

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

REMARKS, PHOTOS & SKETCHES

BRIDGE ORIENTATION

For this report the approaches are south and north and the elevations are west and east. This is a single span structure. The river flows from west to east. **See sketch #1.**

ITEM 62 - CULVERT

Item 62.1 - Roof

There are a few random hairline cracks and a few delaminated areas throughout the roof.
At west end by the north breastwall there is a moderate spall, 2' long x 5" wide x 1" deep, with exposed rusted rebar (with insignificant section loss). Just east, there are 8 pop-outs with rebar. **See photo #1**. In addition, same location at the south wall there is a minor spall, 7" long x 4" wide x 1" deep, with exposed rusted rebar (with insignificant section loss). West end of roof, 7', 13', and 18' in, there are three pairs of exposed metal plates, (2"W x 10"L x 1/2" D), left side, center, and right side of roof. **See photo #2.** Roof joint 1/4 way in from the west end, cracking with efflorescence and stalactites full width. **See photo #3.** Roof joint 1/4 way in from the east end, hairline cracking with efflorescence, rust staining, and water staining at south wall. **See photo #4.** East end of roof, two 2" x 10" exposed metal plates, one with delamination and minor spall just south of exposed metal at midspan. **See photo #5.** On the north side of the east end there is minor spalling and delamination with exposed metal plates. **See photo #6.**

Item 62.2 - Floor

See Item 61.7.

CONDITION RATING GUIDE

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	Use if structure is not a culvert.
G	9	EXCELLENT	No deficiencies.
G	8	VERY GOOD	No noticeable or noteworthy differences which affect the condition of the culvert. Insignificant scrape marks caused by drift.
G	7	GOOD	Shrinkage cracks, light scaling, and insignificant spalling, which does not expose reinforcing steel. Insignificant damage caused by drift with not misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls, or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.
F	6	SATISFACTORY	Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls, or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion or moderate pitting.
F	5	FAIR	Moderate to major deterioration, or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion or deep pitting.
P	4	POOR	Large spalls, heavy scaling, wide cracks, considerable efforescence, or opened construction joints permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.
P	3	SERIOUS	Any condition described in Code 4 but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls, nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls, or pipes. Metal culverts have extreme distortion and deflection in one section, extensive corrosion, or deep pitting with scattered perforations.
C	2	CRITICAL	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Bridge closed. Corrective action may put back in light service.
	0	FAILED	Bridge closed. Replacement necessary.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency (Examples include but are not limited to: Spalled concrete, minor to moderate corrosion to steel culverts, minor settlement or misalignment, minor scouring, minor damage to guardrail, etc.)

S= Severe/Major Deficiency (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, considerable settlement, considerable scouring or undermining, extensive corrosion and deflection in steel culverts, etc.)

C-S= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condition to the public. (Follow-up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) stay at the bridge until the District Maintenance crew or the responsible Agency crew(if not a State bridge) show up and corrective action is taken.]

A = ASAP- [Action will be taken by the District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

REMARKS

Item 62.3 - Walls
There is abrasion along both walls 5' down from the top of culvert. There is random hairline cracking along both walls. South wall 1/4 way in from the east end, full height moderate crack, rust, efflorescence, and water staining, same at opposite wall. **See photo #7.** At the east end of the north wall there is ratholing which extends the last 25' of the culvert. **See photo #8**.

Item 62.5 - Wingwall
Northwest
There is a moderate spall 12' from headwall 5' from the top of wall (8" wide x 3" high x 4" deep).
There is also a moderate spall with exposed rusted rebar at the top of the wingwall adjacent to the headwall (8" high x 3" wide x 1" deep).

Southwest
There is a moderate spall 12" from the headwall 5' from the top of wall with hairline cracking and efflorescence (1.5" wide x 1" high x 1" deep).

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.3 - Debris
There is minor debris throughout the channel in both the upstream and downstream ends.

Item 61.4 - Vegetation
See Item 61.7.

Item 61.7 - Aggradation
There is moderate aggradation throughout the center of the culvert at the upstream end. **See photo #9**. There is aggradation and vegetation at the upstream end of the culvert along the south bank which is restricting flow through channel. **See photo #10**. There is aggradation with vegetation on the downstream, south side of the culvert . **See photo #11**.

TRAFFIC SAFETY

Item 36a - Bridge Railing
West railing is thrie-beam guardrail. East railing is type "ss" guardrail.

Item 36b - Transitions
Continuation of the bridge railing at all transitions.

Item 36c - Approach Guardrail
Continuation of the bridge railing at all approaches.

Item 36d - Approach Guardrail Ends
The southwest terminal is buried. The southeast terminal is buried and flared away from the roadway. The northwest terminal is a boxing glove end. The northeast terminal is well beyond the bridge.

Sketch / Photo Log
Sketch 1 : Location Map
Photo 1 : West end of the roof by the north breastwall, spall with exposed rusted rebar with insignificant section loss. Just east, 8 pop-outs with rebar
Photo 2 : West end of roof, 7', 13' and 18' in, there are three pairs of exposed metal plates, left side, center, and right side of roof

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

REMARKS

Photo 3 : Underside of roof 1/4 way in from the west end, cracking with efflorescence and stalactites full width

Photo 4 : Roof joint 1/4 way in from the east end, hairline cracking with efflorescence, rust staining and water staining at south wall

Photo 5 : East end of roof, two 2" x 10" exposed metal, one with delamination and minor spall just south of exposed metal at midspan

Photo 6 : East end of the roof, minor spalling and delamination with exposed metal plates on the north side

Photo 7 : South wall 1/4 way in from east end, full height moderate crack, rust, efflorescence, and water staining, same at opposite wall

Photo 8 : Ratholing at the waterline along the north wall by the east end

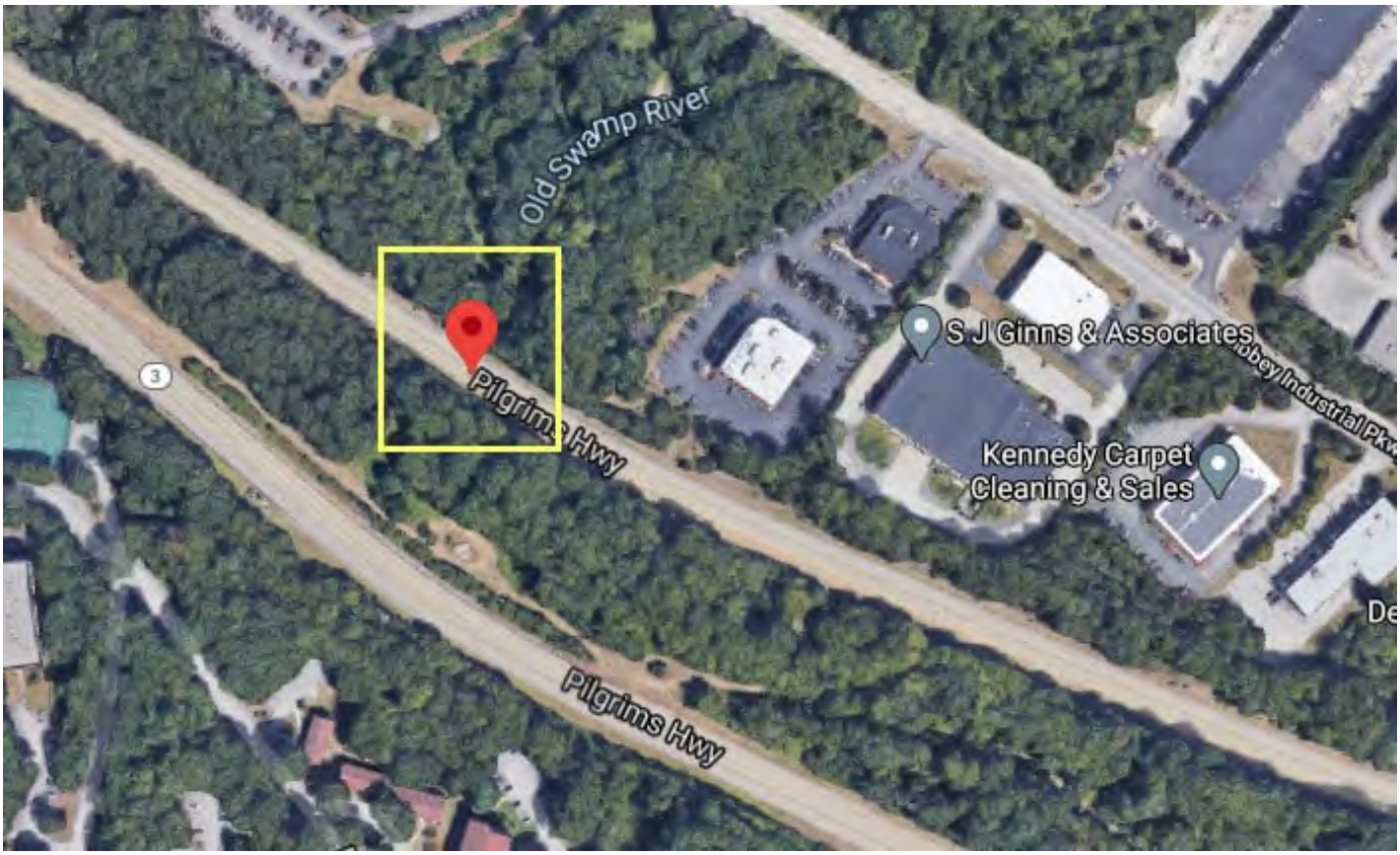
Photo 9 : Moderate aggradation at the upstream end in the center of the culvert

Photo 10 : Aggradation upstream (west end) of river restricting channel

Photo 11 : Downstream (east end) of culvert, aggradation, debris and vegetation along banks

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

SKETCHES



Sketch 1: Location Map

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

PHOTOS

Photo 1: **West end of the roof by the north breastwall, spall with exposed rusted rebar with insignificant section loss. Just east, 8 pop-outs with rebar**

Photo 2: **West end of roof, 7', 13' and 18' in, there are three pairs of exposed metal plates, left side, center, and right side of roof**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

PHOTOS

Photo 3: **Underside of roof 1/4 way in from the west end, cracking with efflorescence and stalactites full width**

Photo 4: **Roof joint 1/4 way in from the east end, hairline cracking with efflorescence, rust staining and water staining at south wall**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

PHOTOS

Photo 5: **East end of roof, two 2" x 10" exposed metal, one with delamination and minor spall just south of exposed metal at midspan**

Photo 6: **East end of the roof, minor spalling and delamination with exposed metal plates on the north side**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

PHOTOS

Photo 7: **South wall 1/4 way in from east end, full height moderate crack, rust, efflorescence, and water staining, same at opposite wall**

Photo 8: **Ratholing at the waterline along the north wall by the east end**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

PHOTOS

Photo 9: Moderate aggradation at the upstream end in the center of the culvert

Photo 10: Aggradation upstream (west end) of river restricting channel

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**8L5**	**W-32-032**	**W32032-8L5-DOT-BRI**	**JUL 23, 2020**

PHOTOS

Photo 11: Downstream (east end) of culvert, aggradation, debris and vegetation along banks

Report Date: December 7, 2022

State Information

BDEPT#= W32032 Agency Br.No.

Town= Weymouth L.O. MHD

B.I.N= 8L5 AASHTO= 086.8

RANK= 0 H.I.= 100.0 % FHWA Select List= N (6/21/2017)

Identification

(8) Structure Number W320328L5DOTBRI

(5) Inventory Route

(2) State Highway Department District 06

(3) County Code 021 (4) Place code 78865

(6) Features Intersected **WATER SWAMP RIVER**

(7) Facility Carried **US 3 NB**

(9) Location

(11) Kilometerpoint 0000.000

(12) Base Highway Network N

(13) LRS Inventory Route & Subroute 000000000000

(16) Latitude 42 DEG 11 MIN 28.53 SEC

(17) Longitude 70 DEG 56 MIN 42.44 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Concrete Code 119

Culvert Jointless bridge type: Not applicable

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 001

(46) Number of approach spans 0000

(107) Deck Structure Type - Not applicable Code N

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Not applicable=no deck Code N

B) Type of membrane - Not applicable=no deck Code N

C) Type of deck protection - Not applicable=no deck Code N

Age and Service

(27) Year Built 1957

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway

Under - Waterway Code 15

(28) Lanes: On Structure 02 Under structure 00

(29) Average Daily Traffic 047982

(30) Year of ADT 2021 (109) Truck ADT 05 %

(19) Bypass, detour length 005 KM

Geometric Data

(48) Length of maximum span 0004.9 M

(49) Structure Length 00005.6 M

(50) Curb or sidewalk: Left 00.0 M Right 00.0 M

(51) Bridge Roadway Width Curb to Curb 011.9 M

(52) Deck Width Out to Out 023.8 M

(32) Approach Roadway Width (w/shoulders) 011.9 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 11.9 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

	Code
(112) NBIS Bridge Length	N
(104) Highway System	Y
(26) Functional Class - Freeway/Expressway	12
(100) Defense Highway	1
(101) Parallel Structure	N
(102) Direction of Traffic - 1-way traffic	1
(103) Temporary Structure	N
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll - On free road	3
(21) Maintain - State Highway Agency	01
(22) Owner - State Highway Agency	01
(37) Historical Significance undetermined	

Condition

	Code
(58) Deck	N
(59) Superstructure	N
(60) Substructure	N
(61) Channel & Channel Protection	7
(62) Culverts	6

Load Rating and Posting

	Code
(31) Design Load - H 20=M 18	4
(63) Operating Rating Method - Load Factor (LF)	1
(64) Operating Rating	99.9
(65) Inventory Rating Method - Load Factor (LF)	1
(66) Inventory Rating	61.6
(70) Bridge Posting	5
(41) Structure - Open	A

Appraisal

	Code
(67) Structural Evaluation	6
(68) Deck Geometry	6
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	7
(36) Traffic Safety Features	1 1 1 1
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 07/29/22 (91) Frequency 24 MO

(92) Critical Feature Inspection: (93) CFI DATE

(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection ()	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Rating Loads

Report Date 09/01/04	H20	Type 3	Type 3S2	Type HS
Operating	74.0	88.0	99.0	99.0
Inventory	44.0	53.0	86.0	68.0

Field Posting

Status LEGAL Posting Date 09/12/07

	2 Axle	3 Axle	5 Axle	Single
Actual				
Recommended				

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Freeze/Thaw N : Not Applicable

Stairs On/Adjacent 0 Stair Owner(s)

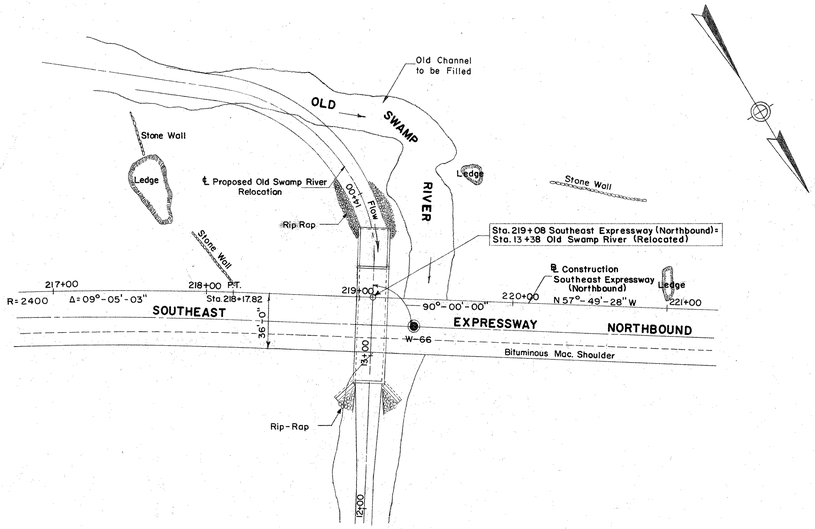
Accessibility (Needed/Used)

N / N	Liftbucket	N / N	Rigging	N / N	Other
N / N	Ladder	N / N	Staging		
N / N	Boat	N / N	Traffic Control		
Y / Y	Wader	N / N	RR Flagperson		
N / N	Inspector 50	N / N	Police		

Inspection Hours: 012

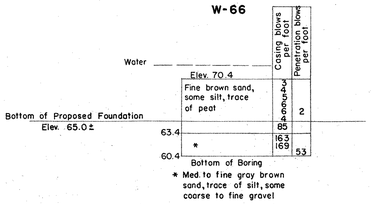
PUB. RD. DIV. NO.	STATE	FED. AID PROJECT	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
1	MASS.	U-355(3)		54	186

PLAN, PROFILES & BORING DATA



KEY PLAN

SCALE: 1"= 40'-0"



* Med. to fine gray brown sand, trace of silt, some coarse to fine gravel

BORING LOG

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

Notes:

1. Location of Borings shown on Key Plan thus: ◉ W-66
2. Borings taken for purpose of design and show condition at boring points only, but do not necessarily show nature of materials to be encountered in connection with the construction of the bridge.
3. Penetration blows per ft. are produced by a 1" ø pipe with a 30" drop of a 140# hammer. Casing blows per ft. are produced by a 2½" ø pipe with a 24" drop of a 300# hammer.
4. Boring Samples may be seen at the Department's Laboratory in the Maintenance Building on Route 9 in Wellesley. On advanced notice.
5. Borings taken December, 1955.
6. Borings taken by Geo. J. Geisser & Assoc., Inc., Providence, R.I.

GENERAL NOTES

FOUNDATIONS:
Foundations may be altered, if necessary, to suit conditions encountered in construction.

DATE:
To be located as shown on Sheet No. 2

DESIGN:
In accordance with the specifications of The American Association Of State Highway Officials for H-20-44 loading (1953 Edition)

Design Stresses:

Intermediate Grade Reinforcing Steel	20,000	P.S.I.
Reinforced Concrete	1,200	P.S.I.

REINFORCEMENT:
All bars shall have deformations conforming to A.S.T.M. Designation A 305. Unless otherwise shown on the plans, reinforcing bars shall be lapped 20 diameters to make a splice, except that main reinforcing bars near the top of slabs and beams having more than 12 inches of concrete under the bars shall be lapped 35 diameters to make a splice.

BENCH MARK:
#12 Elev. 83.300 Sta. 211+50 S.B. 210' LT.
Chisel a Cut on Ledge outcrop.

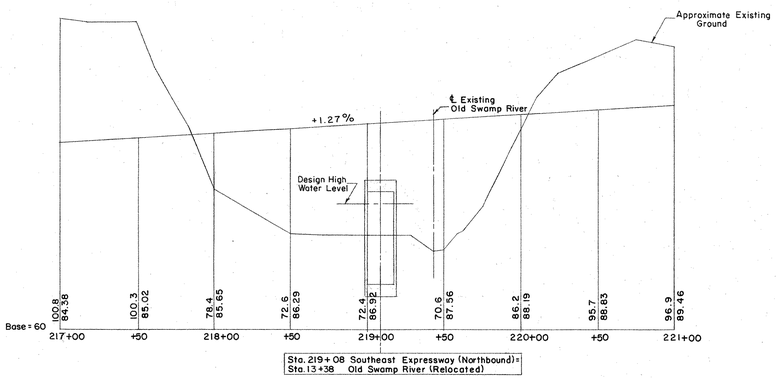
HYDRAULIC DATA:

DRAINAGE AREA:	2856 Acres
DESIGN FLOOD:	KINNISON COLBY RARE FLOOD
ESTIMATED DISCHARGE:	950 c.f.s.
VELOCITY of FLOOD FLOW:	7.3 Ft. Per Sec.
AMOUNT of SCOUR, DRIFT, or ICE:	Normal

ESTIMATED QUANTITIES

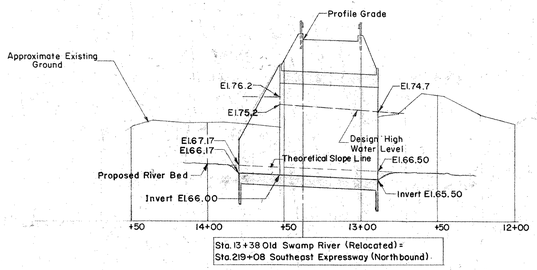
(NOT GUARANTEED)

BRIDGE EXCAVATION	240	CU. YDS.
CLASS B ROCK EXCAVATION	30	CU. YDS.
GRAVEL BORROW	700	CU. YDS.
RIP-RAP	40	CU. YDS.
BRIDGE STRUCTURE ... (W-32-32)	1	LUMP SUM



PROFILE ALONG BASE LINE OF S.E. EXPRESSWAY (NORTHBOUND)

SCALES: Hor. 1"= 40'-0"
Vert. 1"= 8'-0"



PROFILE ALONG ℄ OF OLD SWAMP RIVER (RELOCATED)

SCALES: Hor. 1"= 40'-0"
Vert. 1"= 8'-0"

DRAWN BY - H.L.
CHECKED BY - J.J.B.
APPROVED BY - W.A.H. & C.J.M.

CONSULTING ENGINEERS
MAURICE A. REIDY AND CLARKESON ENGINEERING CO., INC.
CO-VENTURERS
BOSTON MASS.
John Clarkeson
7-1-57
DATE

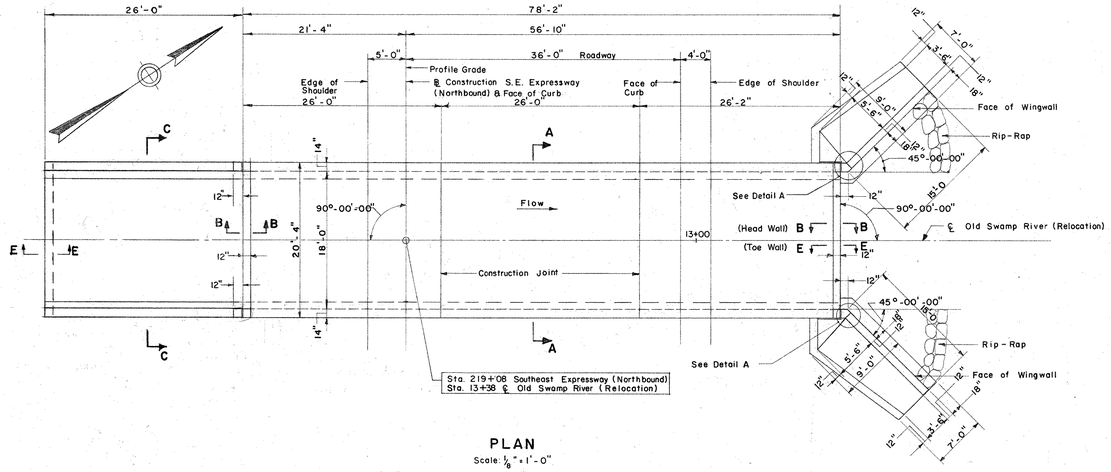
SEPT. 14, 1957	ISSUED FOR CONSTRUCTION

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS
BOSTON MASS.
SOUTHEAST EXPRESSWAY
NORTHBOUND
OVER OLD SWAMP RIVER (RELOCATED)
WEYMOUTH
STA. 219+08
SCALES AS NOTED
SEPT. 1957

S. Kirschen — BRIDGE ENGINEER
F. J. McCarthy — CHIEF ENGINEER

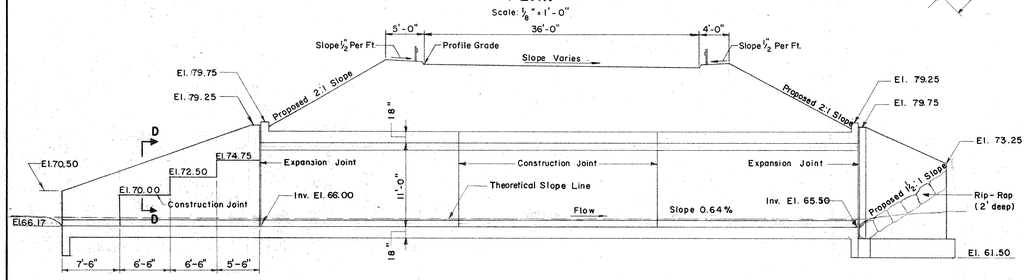
BRIDGE NO. W-32-32
SHEET 1 OF 2 SHEETS

PUB. RD. DIV. NO.	STATE	FED. AID PROJECT	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
1	MASS.	U-355 (3)		55	186



PLAN

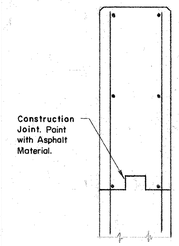
Scale: 1/8" = 1'-0"



LONGITUDINAL SECTION

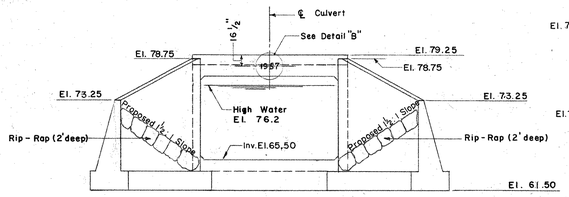
Scale: 1/8" = 1'-0

Note: All Unsuitable Material to be Excavated And Backfilled With Compacted Gravel Borrow as Directed by the Engineer.



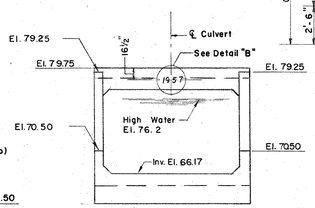
SECTION D-D

Scale: 1" = 1'-0"



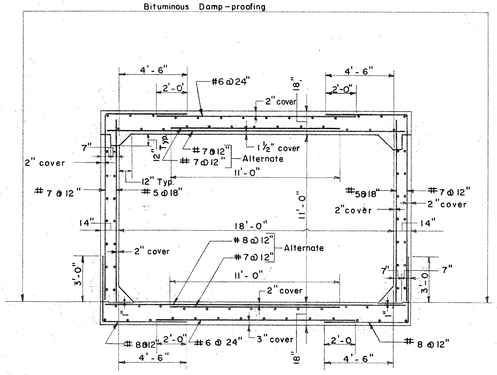
NORTHERLY ELEVATION

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



SOUTHERLY ELEVATION

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

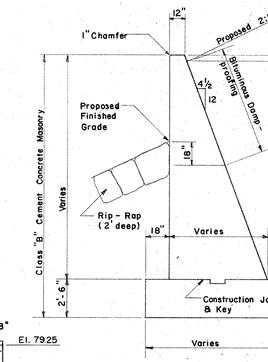


MAXIMUM SOIL PRESSURE 1,200 LBS. PER SQ. FT.

SECTION A-A

Scale: 1/4" = 1'-0"

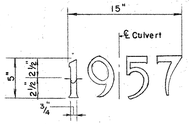
Notes: 1. All concrete in box to be Class "A" Cement Concrete Masonry.
2. Bars rolled from rail-steel or hard grade billet-steel will not be accepted for bent bars of the main reinforcing.
3. All Longitudinal Bars to be #4@18"



MAXIMUM SOIL PRESSURE 4300 LBS. PER SQ. FT.

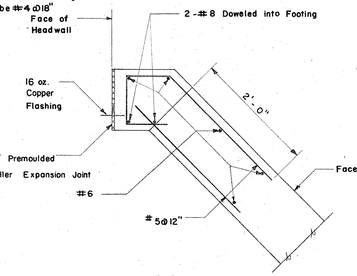
TYPICAL WINGWALL SECTION

Scale: 1/4" = 1'-0"



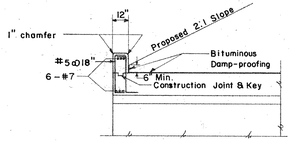
DETAIL "B"

Scale: 1½" = 1'-0"



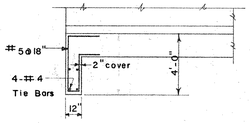
DETAIL "A"

Scale: 1" = 1'-0"



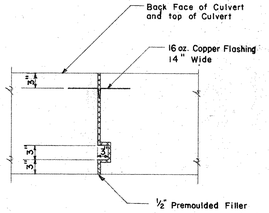
SECTION B-B

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



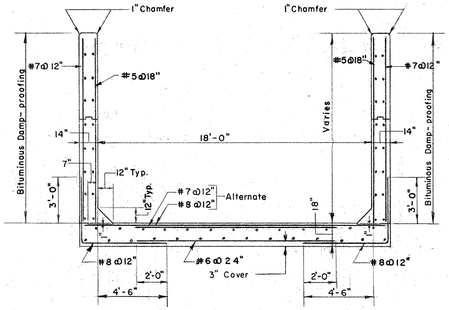
SECTION E-E

Scale: 1/4" = 1'-0"



DETAIL OF EXPANSION JOINT CONSTRUCTION JOINT SIMILAR

Scale: 1" = 1'-0"



SECTION C-C

Scale: 1/4" = 1'-0"

Note: 1. Cover for reinforcing to be 2" except as noted.
2. All longitudinal Bars to be #4@18"

SEPT. 14, 1957	ISSUED FOR CONSTRUCTION

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS
BOSTON MASS.

SOUTHEAST EXPRESSWAY

CONSULTING ENGINEERS
MAURICE A. REIDY AND CLARKESON ENGINEERING CO., INC.
CO-VENTURERS
BOSTON MASS.

SHEET NO. 2 of 2 SHEETS BRIDGE NO. W-32-32

DRAWN BY H.L.
CHECKED BY J.V.B.
APPROVED BY W.A.H.

MICHAEL T. FLIBOTTE
PROP. CB STA. 18+37 LT. RIM 81.38 INV. EL. 78.42 LT. 12" IN INV. EL. 78.32 12" OUT
GRADE GRAVEL DRIVE TO MEET EXISTING
PROPOSED TROUT POOL
TEMPORARY SILTATION BASIN
ROCK FILL
BORDERING VEGETATED WETLAND
TOWN OF WEYMOUTH
PROP. CB RIM=80.20 INV OUT 77.96
GRADE GRAVEL DRIVE TO MEET EXISTING
EXIST. 12" WATER MAIN
Δ = 1° 52' 19" L = 100.26 L = 203.24
QUINCY STEEL
Δ = 1°55'22" L = 102.98 R = 3068.66
12" RCP
EXISTING CB RIM 79.15
EXISTING EDGE OF PVMT.
EXISTING CB RIM 79.14
PROPOSED 10" WATER MAIN (BY OTHERS)
Δ = 6°52'44" R = 709.24 L = 85.15
R = 664.24
R = 659.24 Δ = 8°56'04" L = 102.80
LIMIT OF PAVEMENT
(3) 42" CMP
BIT. CONC. RD.
R = 3043.66
R = 3018.86 L = 85.00 Δ = 1°36'48"
L = 114.93 Δ = 2°10'53"
LIMIT FULL DEPTH CONSTRUCTION
MEET EXIST. PAVEMENT
N/F B.E. REALTY CORP.
MATCH EXIST RD.
HAY BALES W/ SILT FENCE
PROP. CB RIM = 80.20 INV IN 77.80 INV OUT 77.70
CONC. FLARED END INV. = 77.60
STONE RIP RAP
100' BUFFER ZONE
JOHN R. LAMBIASE
TEMPORARY SILTATION BASIN
BORDERING VEGETATED WETLANDS
PROP. CB STA. 18+37 RT. RIM 81.38 INV. 78.62 12" IN
PROP. TWIN 7'x12' PRECAST BOX CULVERTS
ROCK FILL
HAY BALES W/ SILT FENCE
ISOLATED WETLANDS
NOTES:
1. SEE SHEET 8 FOR BORING LOGS
BORING LOCATION
LIMITS OF ROCK FILL
APPROX. ℄ RIVER
SWAMP
RIVER FLOW
PLAN
SCALE 1" = 20'
100' VERTICAL CURVE
-0.5%
CB STA 18+37 LT & RT
BIT CONC SURFACE
BIT. CONC. SURFACE
-0.5%
CB STA 20+64.70 LT + RT
PROPOSED ℄ GRADE
LIMIT FULL DEPTH CONSTRUCTION MEET EXISTING STA. 22+73±
EXIST. RIGHT GUTTER LINE
APPROACH SLAB
12" RCP
EXIST. ℄
EXIST LEFT GUTTER LINE
EXISTING BIT. CONC.
INVERT IN 72.97 INVERT OUT 72.83
PROPOSED TWIN 7'x12' BOX CULVERTS
(3) 42" CM PIPE (REMOVE)
INV. AS NOTED ABOVE
EXIST CBS LT & RT RIM 79.14
PEAR SHAPED 4 LARGE ANGULAR BOULDERS, 3-4 FEET 1 AT EACH CORNER
END ROCK FILL
DETAIL
EXIST. RIVER BOTTOM
TROUT POOL SCALE 3/16" = 1'
SECTION A
PROFILE
SCALE HOR: 1" = 20' VERT: 1" = 2'
NOTE: BENCH MARK - TOP SPINDLE HYDRANT ELEV 83.86 TOWN OF WEYMOUTH DATUM

NO.	DATE	REVISION	DATE					DWG. NO.
			DEC. 1987		LIBBEY INDUSTRIAL PARKWAY EXTENSION TOWN OF WEYMOUTH, MASS.	DEFINITIVE PLAN & PROFILE	DRWN S.K. DES R.T. CHKD CJO	**Rizzo Associates, Inc.** *Engineers and Environmental Scientists*
			SCALE					SHEET NO. 7

4649B

NO. OF BLOWS REQUIRED TO DRIVE TWO-INCH SPLIT SAMPLER 6 INCHES USING 140 LB. WEIGHT FALLING 30 INCHES *

BORING LI - 1

GROUND SURFACE ELEVATION 26.6

LOAM, LITTLE SAND, GRAVEL	5 7 11 25	SP1, FROM G.S. TO 1'6" RECOVERED 6"
FINE SAND, GRAVEL, TRACE OF SILT		SP1A, FROM 1'6" TO 3'0" REC. 5"
LOOSE FINE SAND & ORGANIC SILT	3 3 2 4	SP2, FROM 5'0" TO 7'0" RECOVERED 18"
MEDIUM DENSE FINE SAND, SOME ORGANIC SILT, LITTLE GRAVEL	5 5 6 7	SP3, FROM 10'0" TO 12'0" RECOVERED 14"
MEDIUM DENSE FINE TO MEDIUM SAND, TRACE OF GRAVEL	8 9 11 12	SP4, FROM 15'0" TO 17'0" RECOVERED 12"
	6 9 14 16	SP5, FROM 20'0" TO 22'0" RECOVERED 7"

WATER LEVEL: 1'6"
SIZE OF AUGER 3-1/4" I.D., LENGTH: 5'0"
SIZE OF CASING 4", LENGTH: 20'0"
DRILLER: S. TRIGLIO
DATE STARTED & COMPLETED: 11-19-87

BORING LI - 2

GROUND SURFACE ELEVATION 25.1

FILL LOOSE SAND, GRAVEL	1 1 2 15	SP1, FROM G.S. TO 2'0" RECOVERED 13"
MEDIUM DENSE TO LOOSE SAND, GRAVEL, SLIGHT TRACE OF ORGANIC SILT	7 8 9 10	SP2, FROM 5'0" TO 7'0" RECOVERED 14"
MEDIUM DENSE MEDIUM SAND, TRACE OF GRAVEL	5 6 6 7	SP3, FROM 10'0" TO 12'0" RECOVERED 7"
	8 9 10 10	SP4, FROM 15'0" TO 17'0" RECOVERED 10"
MEDIUM DENSE LOOSE MEDIUM SAND, LITTLE GRAVEL	9 11 11 16	SP5, FROM 20'0" TO 22'0" RECOVERED 10"
MEDIUM DENSE FINE SAND, SOME ORGANIC SILT	11 12 13 13	SP6, FROM 25'0" TO 27'0" RECOVERED 7"

WATER LEVEL: 1'0"
SIZE OF AUGER 3-1/4" I.D., LENGTH: 5'0"
SIZE OF CASING 4", LENGTH: 25'0"
DRILLER: S. TRIGLIO
DATE STARTED & COMPLETED: 11-19-87, 11-20-87

BORING LI - 3

GROUND SURFACE ELEVATION 25.2

FILL LOOSE SAND, GRAVEL	2 3 3 7	SP1, FROM G.S. TO 2'0" RECOVERED 8"
MEDIUM DENSE FINE SAND, GRAVEL, LITTLE ORGANIC SILT	12 15 12 11	SP2, FROM 5'0" TO 7'0" RECOVERED 16"
MEDIUM DENSE MEDIUM & COARSE SAND, GRAVEL	6 9 9 11	SP3, FROM 10'0" TO 12'0" RECOVERED 6"
	8 8 9 11	SP4, FROM 15'0" TO 17'0" RECOVERED 8"
MEDIUM DENSE MEDIUM SAND	9 10 12 16	SP5, FROM 20'0" TO 22'0" RECOVERED 12"

WATER LEVEL: 1'0"
SIZE OF CASING 4", LENGTH: 15'0"
DRILLER: S. TRIGLIO
DATE STARTED & COMPLETED: 11-20-87

BORING LI - 4

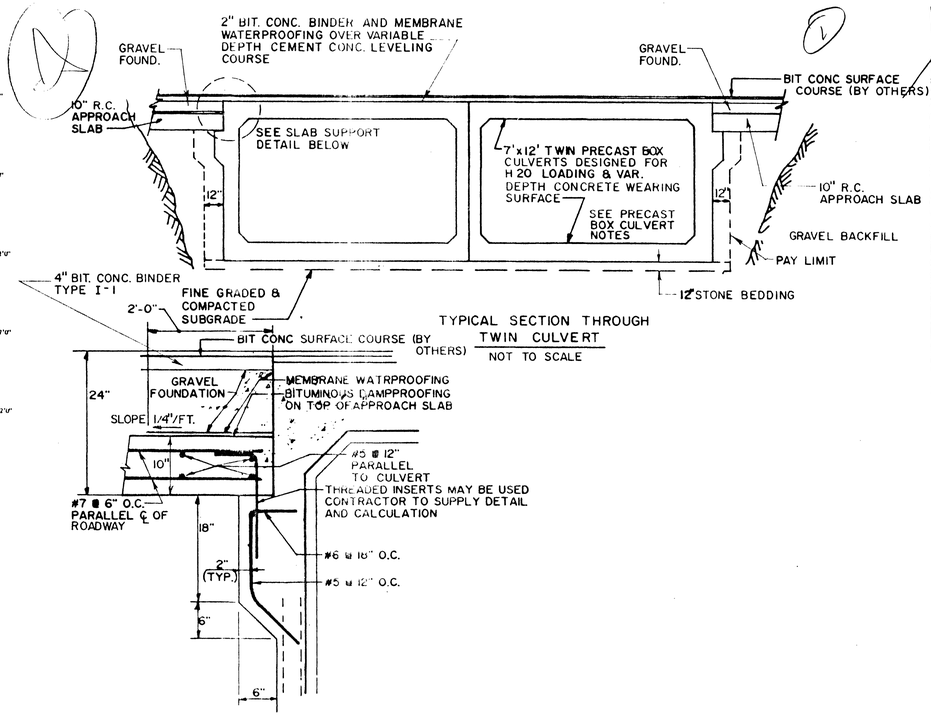
GROUND SURFACE ELEVATION 25.5

LOAM, LITTLE GRAVEL	3 4 29 31	SP1, FROM G.S. TO 1'0" RECOVERED 6"
		SP1A, FROM 1'0" TO 3'0" RECOVERED 7"
VERY DENSE FINE SAND, GRAVEL, LITTLE ORGANIC SILT	26 31 35 39	SP2, FROM 5'0" TO 7'0" RECOVERED 18"
MEDIUM DENSE MEDIUM SAND, TRACE OF GRAVEL	6 6 7 8	SP3, FROM 10'0" TO 12'0" RECOVERED 8"
MEDIUM DENSE MEDIUM SAND, GRAVEL	12 13 13 14	SP4, FROM 15'0" TO 17'0" RECOVERED 10"
	10 13 14 16	SP5, FROM 20'0" TO 22'0" RECOVERED 12"

WATER LEVEL: 1'0"
SIZE OF CASING 4", LENGTH: 20'0"
DRILLER: S. TRIGLIO
DATE STARTED & COMPLETED: 11-20-87

NOTE: SEE SHEETS 4 AND 7 FOR BORING LOCATIONS

BORING LOGS LI-1 THROUGH LI-4



TYPICAL SECTION THROUGH TWIN CULVERT
NOT TO SCALE

SLAB SUPPORT DETAIL
NOT TO SCALE

NOTE: APPROACH SLAB SHALL BE CLASS A CEMENT CONCRETE MASONRY (4000 PSI)

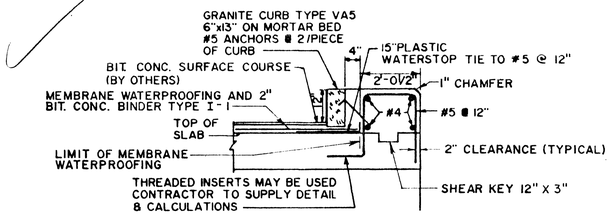
PRECAST BOX CULVERT NOTES:

1. Precast Concrete Box Culvert: Shall be as manufactured by A. Rolando and Sons, Inc., Avon, Connecticut, or equal.
2. Shape: The section is a four sided box section with open ends to be monolithically cast of reinforced concrete. The inside surfaces shall be smooth so as not to restrict flow through the completed installation. Chamfered 45° x 8" fillets shall be monolithically cast in all four inside corners. Each section shall have approach slab support shelves, as shown on the Drawings, monolithically cast. End sections shall be provided with a key way slot shear connection to accept Field cast copings. The end units shall also be provided with curtain walls monolithically cast of reinforced concrete. End sections shall be skewed so that the ends will be parallel to the roadway centerline.
3. Size: Internal dimensions of 12'-0" width by 7'-0" height shall be maintained. The length of each section shall be 6'-0".
4. Joints: Each section shall have a male and female end with not less than 1 1/2" concrete overlap. Each section shall have one prepared 1" diameter neoprene gasket cemented to the joint surface.
5. Submittals: Shop drawings shall be submitted for approval showing reinforcement size and location. Drawings and design calculations shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.
6. Inspection: The quality of materials, the process of manufacture, and the finished box sections shall be subject to inspection by the engineer and purchaser.

DESIGN CRITERIA

1. Design Specification: ACI 318-77 & AASHTO Load Factor design method.
2. Material Properties: Steel Reinforcement - ASTM A-615-78, Grade 60. Concrete minimum compressive strength - 5000 PSI @ 28 days.
3. Soil Data: Unit Weight - 120 lb/ft³. Ratio of lateral to vertical pressure - 0.33. External water table - Below box section invert. Effective weight coefficient - 1.0.
4. Capacity reduction factors (from ACI 318-71): Shear - 0.85, Bending - 0.90.
5. Loading Data: Load factor, dead load - 1.5, live load - 2.2. Truck axle load, HS20-36000 LBF. Earth cover - 0 ft. min. to 8 ft. max. Impact (variable with depth) see AASHTO bridge specifications 1988 - 0% 30%. Uniform lateral pressure - 0.0# Depth of water in box section - Equal to inside height. External ground water pressure - 0.0%
6. Structural requirements: Concrete cover over steel-1 1/2". ASTM C 789-79 Table XI

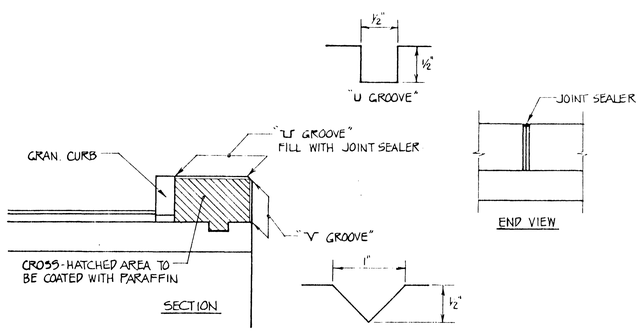
NOTE: SIDEWALK SLAB & CURB SHALL SLOPE 1/4"/FT. TOWARDS ROADWAY



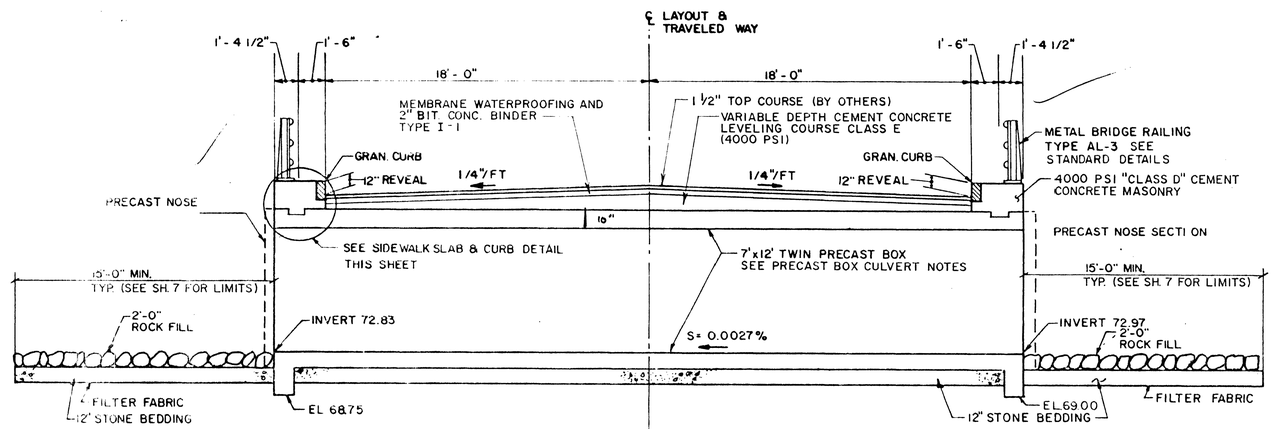
SIDEWALK SLAB & CURB
NOT TO SCALE

NOTES:

1. SEE SHEET 9 FOR PARAFFIN JOINT LOCATIONS
2. A MORTARED JOINT IN THE GRAN CURB SHALL BE PLACED AT EACH PARAFFIN JOINT
3. LONGITUDINAL BARS SHALL NOT BE CARRIED THROUGH THE PARAFFIN JOINT
4. END BARS SHALL BE 2" CLEAR OF THE PARAFFIN JOINTS.
5. JOINT SEALER SHALL BE SAME COLOR AS CONCRETE.
6. JOINTS SHALL BE PARALLEL TO AXIS OF THE CULVERTS.



PARAFFIN JOINT DETAIL
NOT TO SCALE



TYPICAL LONGITUDINAL SECTION
(NOT TO SCALE)

NO.	DATE	REVISION

DATE: DEC 1987
SCALE: AS NOTED

LIBBEY INDUSTRIAL PARKWAY EXTENSION
TOWN OF WEYMOUTH

DEFINITIVE PLAN
MISCELLANEOUS DETAILS
BRIDGE NO. W-32-36

DRWN S.K.
DES R.T.
CHKD C.J.O.
APRVD B.N.Y.

Rizzo Associates, Inc.
Engineers and Environmental Scientists

DWG. NO. 4849B

STRUCTURES INSPECTION FIELD REPORT

CULVERT INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
06	AV6	W-32-036

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
WEYMOUTH	W32036-AV6-MUN-NBI	000.000	A:OPEN	AUG 31, 2021

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
HWY LIB IND PKWY		1992	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER	J. O'Connor
WATER SWAMP RIVER	Urban Local		

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER E. Hogan
119 : Concrete Culvert	Town Agency	Town Agency	

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
N : Not applicable	Clear	27°C	M. ZEROUAL

TYPE OF CULVERT:

SHAPE:	RECTANGULAR
MATERIAL:	REINFORCED CONCRETE
COATING:	NONE

BARRELS: (In Meters)

SIZE:	*NUMBER:*
4.00Wx2.00H	2

	N	S
DEPTH OF COVER (To the nearest tenth of a meter)	0.5	0.5
CURB REVEAL (In millimeters)	200	250

ITEM 62 *CULVERT & RETAINING WALLS* — 6

I62 (Dive Report): N — I62 (This Report): 6

	Dive Rpt.	This Rpt.	DEF
1. Roof	N	6	M-P
2. Floor	N	7	-
3. Walls	N	7	M-P
4. Headwall	N	6	M-P
5. Wingwall	N	8	-
6. Pipe	N	N	-
7.Protective Coating	N	N	-
8.Embankment	N	7	-
9.Wearing Surface	N	5	S-P
10.Railing	N	7	-
11.Sidewalks	N	7	M-P
12.Utilities	N	6	M-P
13.Member Alignment	N	6	M-P
14.Deformation	N	N	-
15.Scour	N	7	-
16.Settlement	N	6	M-P
17.	N	N	-
18.	N	N	-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE: *Please explain* None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain* None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 61 *CHANNEL & CHANNEL PROTECTION* — 6

	Dive Rpt.	This Rpt.	DEF
1.Channel Scour	N	6	M-P
2.Embankment Erosion	N	7	-
3.Debris	N	7	-
4.Vegetation	N	5	M-P
5. Utilities	N	N	-
6. Rip-Rap/Slope Protection	N	7	-
7. Aggradation	N	5	S-A

STREAM FLOW VELOCITY: Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 (Dive Report): N

ITEM 61 (This Report): 6

93b-U/W INSP DATE: 00/00/0000

APPROACH CONDITION

		DEF
a. Appr. pavement condition	5	S-P
b. Appr. Roadway Settlement	6	M-P
c. Appr. Sidewalk Settlement	6	M-P
d.	N	-

WEIGHT POSTING

Not Applicable X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 00/00/0000 EJDMT Date: 00/00/0000

Signs In Place (Y=Yes,N=No, NR=NotRequired)

Legibility/ Visibility

At bridge E	At bridge W	Advance E	Advance W

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
A. Bridge Railing	0	7	-
B. Transitions	0	7	-
C. Approach Guardrail	1	7	-
D. Approach Guardrail Ends	0	4	S-A

ACCESSIBILITY (Y/N/P):

	Needed	Used		Needed	Used
Ladder	N	N	Other:		
Boat	N	N		N	N
Waders	Y	Y			

TOTAL HOURS 16

PLANS (Y/N): Y

(V.C.R.) (Y/N): N

TAPE#:

RATING

Rating Report (Y/N): Y

Date: 12/01/2011

Inspection data at time of existing rating

I 62: 6 Date : 05/07/2010

Recommend for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON:

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

REMARKS, PHOTOS & SKETCHES

BRIDGE ORIENTATION

For this report the approaches are east and west and the elevations are south and north. This structure is a twin box culvert with spans numbered from east to west. The six wall and roof joints are labeled south to north in each span. The river flows from south to north. **See sketch #1.**

ITEM 62 - CULVERT

Item 62.1 - Roof

Spans #1 and #2

There is minor misalignment of the roof joints. **See photo #1 (typical)**. There is minor leakage at joints. There are random hairline transverse (to roadway) cracks on either side of the joints (most by center of roof). At the north edge there are two minor spalls (in each span).

Span #1

There is minor spalling at the south edge of joint #1. **See photo #2.** There is a 2" gap between sections at joint #2. **See photo #3.**

Span #2

There are five minor popouts at the south edge. Just north of joint #6 and at joint #6 there is minor spalling. **See photo #4**. There is minor spalling 5' from the north end.

Item 62.2 - Floor

The floor has a build-up of sediment in span #2.

CONDITION RATING GUIDE

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	Use if structure is not a culvert.
G	9	EXCELLENT	No deficiencies.
G	8	VERY GOOD	No noticeable or noteworthy differences which affect the condition of the culvert. Insignificant scrape marks caused by drift.
G	7	GOOD	Shrinkage cracks, light scaling, and insignificant spalling, which does not expose reinforcing steel. Insignificant damage caused by drift with not misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls, or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.
F	6	SATISFACTORY	Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls, or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion or moderate pitting.
F	5	FAIR	Moderate to major deterioration, or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion or deep pitting.
P	4	POOR	Large spalls, heavy scaling, wide cracks, considerable efforescence, or opened construction joints permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.
P	3	SERIOUS	Any condition described in Code 4 but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls, nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls, or pipes. Metal culverts have extreme distortion and deflection in one section, extensive corrosion, or deep pitting with scattered perforations.
C	2	CRITICAL	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Bridge closed. Corrective action may put back in light service.
	0	FAILED	Bridge closed. Replacement necessary.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - (Examples include but are not limited to: Spalled concrete, minor to moderate corrosion to steel culverts, minor settlement or misalignment, minor scouring, minor damage to guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, considerable settlement, considerable scouring or undermining, extensive corrosion and deflection in steel culverts, etc.)

C-S= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condition to the public. (Follow-up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) stay at the bridge until the District Maintenance crew or the responsible Agency crew(if not a State bridge) show up and corrective action is taken.]

A = ASAP- [Action will be taken by the District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

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WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

REMARKS

Item 62.3 - Walls
There are hairline horizontal cracks just below the fillets of the walls. **See photo #5 (typical).**
Span #1
At the first joint there is heavy efflorescence. **See photo #6**. There is gap between sections at the top of joint #2 in the south wall measuring 1-3/4" at the top and 3/4" at the waterline. There are three hairline vertical cracks with efflorescence at the west wall; 9'-6" from the south end, 15'-6" from the north end, and 8' from the north end. **See photo #6** (typical).
Span #2
There are typical vertical cracks with efflorescence throughout the west wall. **See photo #7.** There are three hairline vertical cracks with efflorescence in the east wall; 7'-4" from the south end, 10'-4" from the north end, and 2'-2" from the north end. There are also five popouts at the north end.

Item 62.4 - Headwall
South Headwall
There are two minor spalls at the bottom corner in span #2. **See photo #8**.
North Headwall
In both spans there are two minor spalls at the bottom corner. There is one hairline vertical crack over span #1.

Item 62.9 - Wearing Surface
There is moderate transverse cracking and bituminous patching over both abutments. At the west abutment there is a pothole in the bituminous patching. **See photos #9 and #10.** There are random minor to moderate cracks throughout, with one 6" long x 18" wide x 3" deep pothole near mid span in the eastbound travel lane. **See photo #11**.

Item 62.11 - Sidewalks
The south safetywalk and north sidewalk are covered with sand. The north sidewalk has a light transverse crack 8' from east end, full width.

Item 62.12 - Utilities
There are conduit lines just outside the south edge of the bridge. The concrete endpost at the east end has a moderate longitudinal crack down the center. The concrete encasement at the west end has cracking and scaling. **See photo #12**. The support steel beam below the conduits has heavy rusting with lamination at the edges. **See photo #13**.

Item 62.13 - Member Alignment
The precast sections of the culvert have minor misalignment at joint areas up to 1" +/- throughout both spans. **See photo #1**.

Item 62.16 - Settlement
There is minor tipping (inward or outward), less than 1/2", at the top of the wings.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour
The lower lip of the floor at the downstream end (north end) is exposed for a maximum height of 3 inches across span #1. **See photo #14.**

Item 61.4 - Vegetation
See Item 61.7, Aggradation.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

REMARKS

Item 61.6 - Rip-Rap/Slope Protection
There is rip-rap placed in the channel along the upstream end of the floor of span 1.

Item 61.7 - Aggradation
There is heavy vegetation/aggradation at the upstream end (south end) of the bridge across span #2 blocking the span and forcing virtually all flow through span #1. **See photo #15**. There is moderate vegetation/aggradation at the downstream end (north end) of bridge in span #2. **See photo #16**.

APPROACHES

Approaches a - Appr. pavement condition
There are numerous moderate to heavy map cracks throughout both approaches in the eastbound roadway. **See photo #17** (eastbound roadway in east approach). Adjacent to both edges of the bridge there is transverse cracking with bituminous patching extending into both roadways. **See photos #9 and #10.**

Approaches b - Appr. Roadway Settlement
There is minor settlement, up to 1", at the east approach, heavier by the roadway edges. There is minor settlement, less than 1/2", at the west approach by the north curb.

Approaches c - Appr. Sidewalk Settlement
All four approach curbs have minor settlement. Settlement ranges between 1/4" and 1" between approach and bridge.

TRAFFIC SAFETY

Item 36a - Bridge Railing
AL-3 with pales, non-standard.

Item 36b - Transitions
The AL-3 railing transitions into a two-rail system at all four transitions, non-standard.

Item 36c - Approach Guardrail
The AL-3 railing transitions into a two-rail system at all four transitions. The two-rail system then becomes type "ss" guardrail at all four approaches, standard.

Item 36d - Approach Guardrail Ends
The southeast, southwest, and northeast terminals are buried and are slightly flared from the roadway, standard. At the northwest end there is moderate collision damage which has pulled the railing out of the ground leaving no end treatment, non-standard. **See photo #18.**

Sketch / Photo Log
Sketch 1 : Framing Plan
Photo 1 : Typical misalignment of roof joints (span #1 at joint #1 shown)
Photo 2 : Minor spall in the roof at the south edge of joint #1 in span #1
Photo 3 : There is a 2" gap between sections in the roof at joint #2 in span #1
Photo 4 : Minor spalling in the roof in span #2 at joint #6 and just north of joint #6
Photo 5 : Typical hairline horizontal cracking just below the fillets at the top of walls
Photo 6 : Heavy efflorescence at joint #1 of the west wall in span #1 and typical vertical crack with efflorescence
Photo 7 : Typical vertical cracks with efflorescence in span #2 at the south end of the west wall
Photo 8 : Two minor spalls at the bottom of the south headwall in span #2

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	**AV6**	**W-32-036**	**W32036-AV6-MUN-NBI**	**AUG 31, 2021**

REMARKS

Sketch / Photo Log (Cont'd)

Photo 9 : Transverse cracking over the west abutment with bituminous patching and a pothole in the eastbound approach roadway

Photo 10 : Moderate cracking over the east abutment with bituminous patching in the eastbound roadway extending into the east approach

Photo 11 : Typical moderate cracking with bituminous breaking up in the wearing surface, note pothole near midspan of eastbound travel lane

Photo 12 : Cracking and scaling of the concrete encasement at the southwest end of utilities

Photo 13 : Typical heavy rusting with lamination at the edges of the steel support (below utilities)

Photo 14 : Downstream lip of the floor is exposed up to 3" high across span #1

Photo 15 : Heavy vegetation and aggradation in front of span #2, upstream end (south end)

Photo 16 : Vegetation and aggradation outside of span #2, downstream end (north end)

Photo 17 : Moderate to heavy map, longitudinal, and transverse cracking in the eastbound roadway at the east approach

Photo 18 : Northwest approach guardrail collision damage has pulled the buried railing out of the ground leaving no end treatment

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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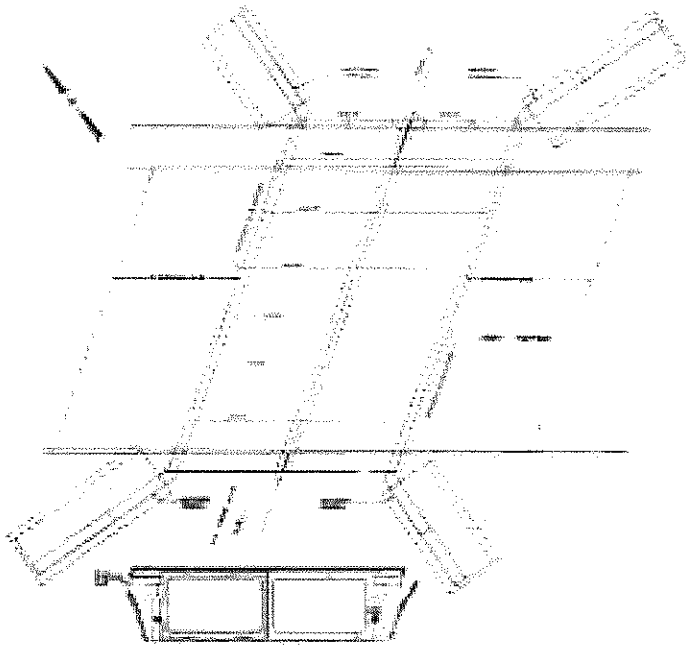
SKETCHES



Sketch 1: Framing Plan

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 1: Typical misalignment of roof joints (span #1 at joint #1 shown)

Photo 2: Minor spall in the roof at the south edge of joint #1 in span #1

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

Photo 3: There is a 2" gap between sections in the roof at joint #2 in span #1

Photo 4: Minor spalling in the roof in span #2 at joint #6 and just north of joint #6

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

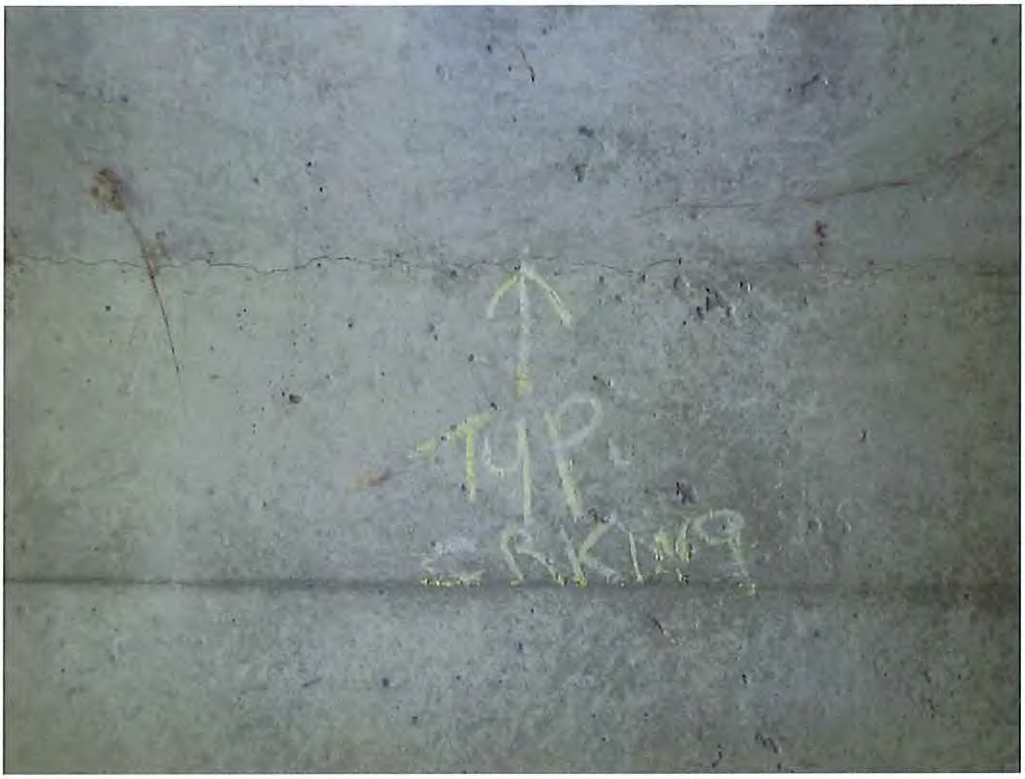

Photo 5: **Typical hairline horizontal cracking just below the fillets at the top of walls**

Photo 6: **Heavy efflorescence at joint #1 of the west wall in span #1 and typical vertical crack with efflorescence**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

Photo 7: Typical vertical cracks with efflorescence in span #2 at the south end of the west wall

Photo 8: Two minor spalls at the bottom of the south headwall in span #2

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 9: Transverse cracking over the west abutment with bituminous patching and a pothole in the eastbound approach roadway

Photo 10: Moderate cracking over the east abutment with bituminous patching in the eastbound roadway extending into the east approach

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

Photo 11: Typical moderate cracking with bituminous breaking up in the wearing surface, note pothole near midspan of eastbound travel lane

Photo 12: Cracking and scaling of the concrete encasement at the southwest end of utilities

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

Photo 13: Typical heavy rusting with lamination at the edges of the steel support (below utilities)

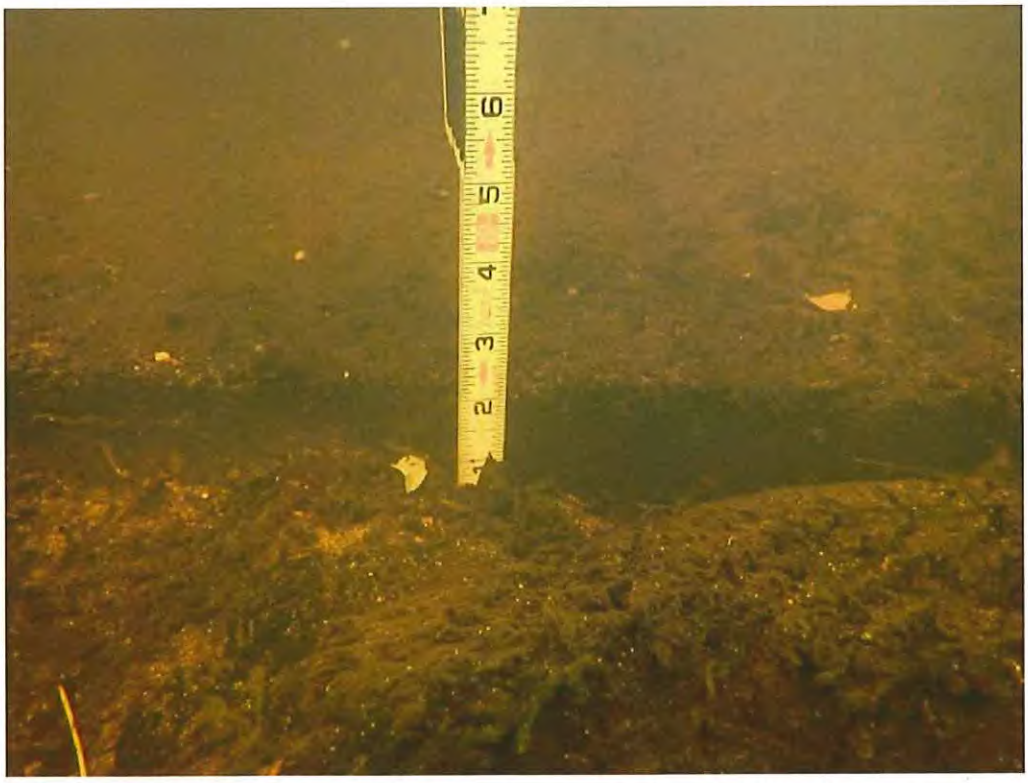

Photo 14: Downstream lip of the floor is exposed up to 3" high across span #1

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

Photo 15: Heavy vegetation and aggradation in front of span #2, upstream end (south end)

Photo 16: Vegetation and aggradation outside of span #2, downstream end (north end)

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
WEYMOUTH	AV6	W-32-036	W32036-AV6-MUN-NBI	AUG 31, 2021

PHOTOS

Photo 17: Moderate to heavy map, longitudinal, and transverse cracking in the eastbound roadway at the east approach

Photo 18: Northwest approach guardrail collision damage has pulled the buried railing out of the ground leaving no end treatment

National Bridge Element Inspection

BDEPT#	**W-32-036**	Date	**08/31/2021**
B.I.N.	**AV6**	District Bridge Inspection Eng'r	**Jerry O'Connor**
Item 8	**W32036-AV6-MUN-NBI**	Inspecting Agency	**Mass. Highway Dept.**
Span Group	**1**	Team Leader	**Eric Hogan**
Town	**Weymouth**	Team Member(s)	**Mohammed Zeroual**
District	**6**		

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4
241	**Re Conc Culvert**	feet	2	99.737	☐ %	89.737	10.000		
Notes :	The precast sections of the culvert have minor misalignment at joint areas.								
> 1080	*Delamination/Spall/Patched Area*	feet	2	4.000	☐ %		4.000		
Notes :									
> 1130	*Cracking (RC and Other)*	feet	2	6.000	☐ %		6.000		
Notes :									
330	**Metal Bridge Railing**	feet	2	62.000	☐ %	62.000			
Notes :									

Report Date: August 23, 2021

State Information

BDEPT#= W32036 Agency Br.No.

Town= Weymouth L.O.

B.I.N= AV6 AASHTO= 094.3

RANK= 3658 H.I.= 97.0 % FHWA Select List= N (6/21/17)

Identification

(8) Structure Number	W32036AV6MUNNBI
(5) Inventory Route	151000000
(2) State Highway Department District	06
(3) County Code 021 (4) Place code	78865
(6) Features Intersected	**WATER SWAMP RIVER**
(7) Facility Carried	**HWY LIB IND PKWY**
(9) Location	OFF MIDDLE ST
(11) Kilometerpoint	0000.000
(12) Base Highway Network	N
(13) LRS Inventory Route & Subroute	
(16) Latitude	42 DEG 11 MIN 33.28 SEC
(17) Longitude	70 DEG 56 MIN 35.77 SEC
(98) Border Bridge State Code	Share %
(99) Border Bridge Structure No. #	

Structure Type and Material

(43) Structure Type Main: Concrete Code 119

Culvert Jointless bridge type: Not applicable

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 002

(46) Number of approach spans 0000

(107) Deck Structure Type - Not applicable Code N

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - Not applicable=no deck Code N

C) Type of deck protection - Not applicable=no deck Code N

Age and Service

(27) Year Built 1992

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 02 Under structure 00

(29) Average Daily Traffic 018750

(30) Year of ADT 2019 (109) Truck ADT 07 %

(19) Bypass, detour length 003 KM

Geometric Data

(48) Length of maximum span 0003.7 M

(49) Structure Length 00007.8 M

(50) Curb or sidewalk: Left 00.4 M Right 01.5 M

(51) Bridge Roadway Width Curb to Curb 011.0 M

(52) Deck Width Out to Out 013.8 M

(32) Approach Roadway Width (w/shoulders) 011.0 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 11.0 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

NO ADT - Corona virus

Classification

		Code
(112) NBIS Bridge Length		Y
(104) Highway System		N
(26) Functional Class -	Urban Local	19 ✓
(100) Defense Highway		0
(101) Parallel Structure		N
(102) Direction of Traffic -	2-way traffic	2 ✓
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Town Agency	03
(22) Owner -	Town Agency	03
(37) Historical Significance		

Condition

	Code
(58) Deck	N
(59) Superstructure	N
(60) Substructure	N
(61) Channel & Channel Protection	7 6
(62) Culverts	6 ✓

Load Rating and Posting

		Code
(31) Design Load -	H 20=M 18	4
(63) Operating Rating Method -	Load Factor (LF)	1
(64) Operating Rating		95.6
(65) Inventory Rating Method -	Load Factor (LF)	1
(66) Inventory Rating		60.4
(70) Bridge Posting		5 ✓
(41) Structure -	Open	A

Appraisal

	Code
(67) Structural Evaluation	6
(68) Deck Geometry	4
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	8
(72) Approach Roadway Alignment	7
(36) Traffic Safety Features	0 0 1 1 0
(113) Scour Critical Bridges	8

Inspections

(90) Inspection Date 08/26/19 8/31/21 (91) Frequency 24 MO

(92) Critical Feature Inspection: (93) CFI DATE

(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection (Flood)	N	00	MO *)	05/22/06
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Rating Loads

Report Date 12/01/11	H20	Type 3	Type 3S2	Type HS
Operating	50.0	78.0	99.0	89.0
Inventory	32.0	50.0	79.0	58.0

Field Posting

Status LEGAL Posting Date 09/12/12

	2 Axle	3 Axle	5 Axle	Single
Actual				
Recommended				

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Freeze/Thaw N : Not Applicable

Accessibility (Needed/Used)

N / N	Liftbucket	N / N	Rigging	N / N	Other
N / N	Ladder	N / N	Staging		
N / N	Boat	N / N	Traffic Control		
Y / Y	Wader	N / N	RR Flagperson		
N / N	Inspector 50	N / N	Police		

Inspection Hours: 016 ✓

Report Date: September 20, 2021

State Information

BDEPT#= W32036 Agency Br.No.

Town= Weymouth L.O.

B.I.N= AV6 AASHTO= 094.3

RANK= 3658 H.I.= 97.0 % FHWA Select List= N (6/21/17)

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(11) Kilometerpoint	0000.000
(12) Base Highway Network	N
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Culvert	Jointless bridge type: Not applicable
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Other	Code 000
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(108) Wearing Surface / Protective System:	
A) Type of wearing surface - Bituminous	Code 6
B) Type of membrane - Not applicable=no deck	Code N
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(106) Year Reconstructed	0000
(42) Type of Service: On - Highway-Ped	
Under - Waterway	Code 55
(28) Lanes: On Structure 02	Under structure 00
(29) Average Daily Traffic	018750
(30) Year of ADT 2019 (109) Truck ADT	07 %
(19) Bypass, detour length	003 KM

Geometric Data

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(49) Structure Length	00007.8 M
(50) Curb or sidewalk: Left 00.4 M	Right 01.5 M
(51) Bridge Roadway Width Curb to Curb	011.0 M
(52) Deck Width Out to Out	013.8 M
(32) Approach Roadway Width (w/shoulders)	011.0 M
(33) Bridge Median - No median	Code 0
(34) Skew 00 DEG (35) Structure Flared	N
(10) Inventory Route MIN Vert Clear	99.99 M
(47) Inventory Route Total Horiz Clear	11.0 M
(53) Min Vert Clear Over Bridge Rdwy	99.99 M
(54) Min Vert Underclear ref N	00.00 M
(55) Min Lat Underclear RT ref N	00.0 M
(56) Min Lat Underclear LT	00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway	Code 0
(111) Pier Protection	Code
(39) Navigation Vertical Clearance	000.0 M
(116) Vert-lift Bridge Nav Min Vert Clear	M
(40) Navigation Horizontal Clearance	0000.0 M

Classification

	Code
(112) NBIS Bridge Length	Y
(104) Highway System	N
(26) Functional Class - Urban Local	19
(100) Defense Highway	0
(101) Parallel Structure	N
(102) Direction of Traffic - 2-way traffic	2
(103) Temporary Structure	N
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll - On free road	3
(21) Maintain - Town Agency	03
(22) Owner - Town Agency	03
(37) Historical Significance	

Condition

	Code
(58) Deck	N
(59) Superstructure	N
(60) Substructure	N
(61) Channel & Channel Protection	6
(62) Culverts	6

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	Code
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(63) Operating Rating Method - Load Factor (LF)	1
(64) Operating Rating	95.6
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(66) Inventory Rating	60.4
(70) Bridge Posting	5
(41) Structure - Open	A

Appraisal

	Code
(67) Structural Evaluation	6
(68) Deck Geometry	4
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(90) Inspection Date 08/31/21 (91) Frequency 24 MO

(92) Critical Feature Inspection: (93) CFI DATE

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(*) UW Special Inspection	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Rating Loads

Report Date 12/01/11	H20	Type 3	Type 3S2	Type HS
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Status LEGAL Posting Date 09/12/12

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Actual				
Recommended				

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Freeze/Thaw N : Not Applicable

Accessibility (Needed/Used)

N / N Liftbucket	N / N Rigging	N / N Other
N / N Ladder	N / N Staging	
N / N Boat	N / N Traffic Control	
Y / Y Wader	N / N RR Flagperson	Inspection Hours: 016
N / N Inspector 50	N / N Police	

Appendix B Sediment Sampling Results

Memorandum

To:	Chris Hirsch, Division of Ecological Restoration
Author:	Inter-Fluve: Sarah Widing, Nick Nelson. BSC Group: Tiffany Capobianco
Date:	May 19, 2022
Re:	Sediment Sampling Plan for the Impoundment and Sediment Nutrient Uptake Ponds (SNUPs) on Old Swamp River, Weymouth Reconnaissance

In 2022, the Massachusetts Division of Ecological Restoration awarded priority project status to the removal of the low-head concrete dam associated with the Sediment Nutrient Uptake Pond (SNUP) treatment system located on Old Swamp River in Weymouth, Massachusetts. The SNUP system is currently owned by the Town of Weymouth.

The SNUP system was intended to divert flow from the Old Swamp River into a series of treatment ponds. The treatment ponds were intended to remove nutrients via deposition and vegetative uptake. The system does not function as intended and the dam provides a barrier to the herring migration within Old Swamp River.

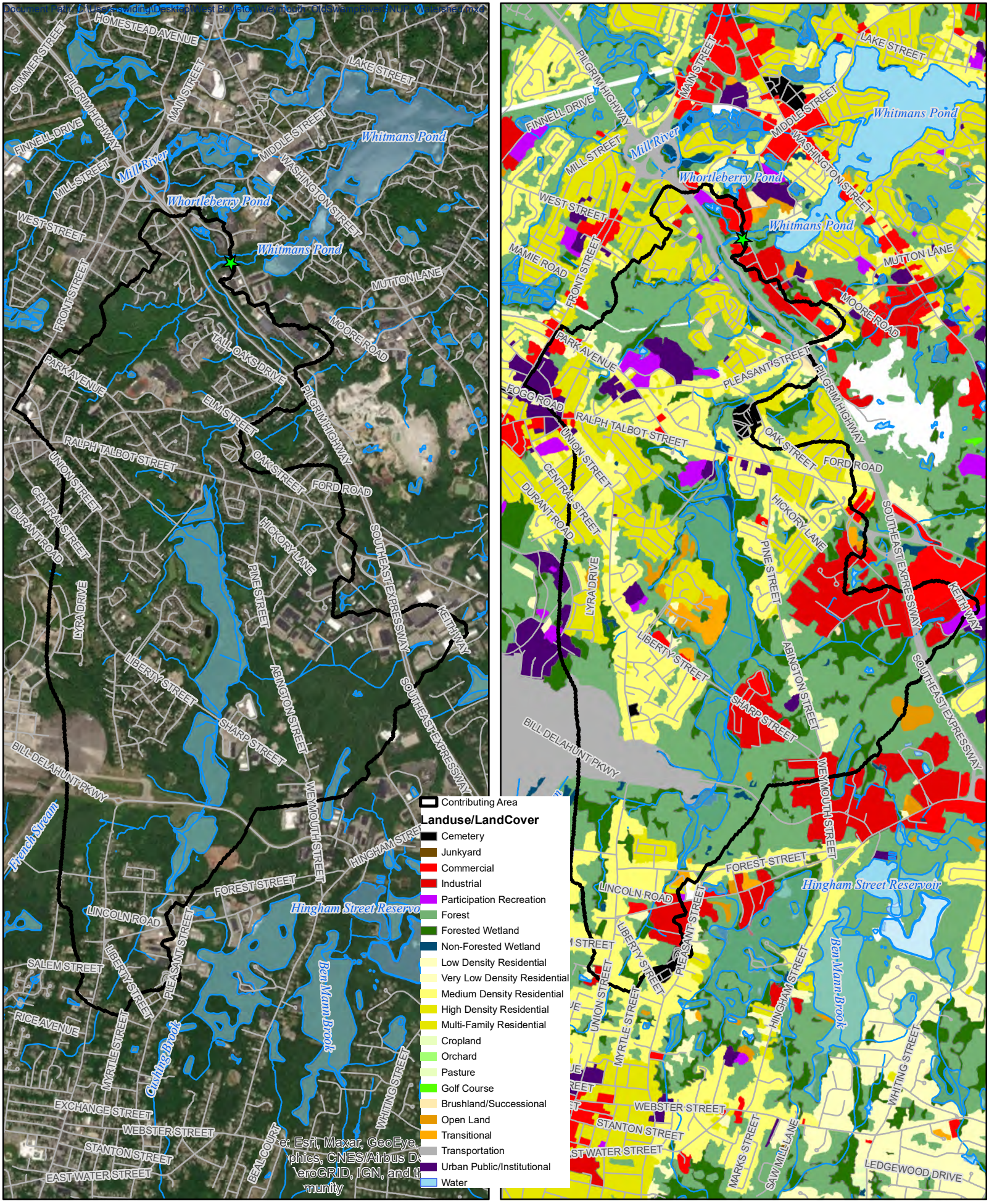
The reconnaissance study included funding for sediment sampling. This technical memorandum describes a sediment sampling plan for the SNUP system on Old Swamp River. This sediment sampling effort is intended to provide sediment quality data and a basis for comparison of sediments within the SNUP system and dam impoundment as compared to background levels upstream and downstream.

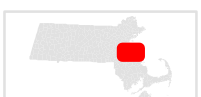
The SNUP system is located approximately ¼ mile upstream of Whitman's Pond, which is a critical resource in the municipal water supply for Weymouth.

The contributing area to the SNUP Complex is approximately 4.6 square miles of developed urban/suburban land. Approximately 70% of the watershed is considered urban. Approximately 30% of the urban area is impervious.

Figure 1 summarizes the characteristics of the contributing area. Given the watershed land use composition, we anticipate pollutants typical to urban and suburban land uses. Historical land uses should be also be considered.

Offices Nationwide
220 Concord Ave. 2nd floor Cambridge MA 02138
617.714.5537 www.interfluve.com




Massachusetts


Weymouth

0 1,000 2,000
Feet

Sediment Sampling Plan
Old Swamp River
and
SNUP

Old Swamp River
Libbey Industrial Parkway
Weymouth, MA

Date: 5/4/2022

inter·fluve

DUE DILIGENCE SUMMARY

As part of this work, we queried several state and federal agency resources for information relating to contaminants in the contributing watershed. Table 1 summarizes the findings.

Table 1 Summary of Due Diligence Findings

Resource	Finding	Impacts
National Priorities List (NPL)	No NPL sites were identified within one and one-half miles of the project area.	No impacts to project area.
Comprehensive Environmental Response, Compensation and Liability Information System/No Further Remedial Action Planned (CERCLIS/NFRAP)	No CERCLIS/NFRAP sites are identified within one (1) mile of the project area.	No impacts to project area.
Underground Storage Tanks (USTs)	Seven (7) UST sites are listed between one half and one mile of the project area.	Six UST sites appear to have groundwater contamination associated with them. Based on groundwater flow direction relative to the study area and the location of these sites with regard to the contribution area to Old Swamp River, it is unlikely that contaminants associated with these sites could affect sediment conditions in Old Swamp River.
Leaking Underground Storage Tanks (LUST)	Fourteen (14) LUST sites are listed within one mile of the project area.	Of these fourteen LUST sites, six sites appear to have groundwater contamination associated with them. Based on groundwater flow direction relative to the study area and the location of these sites with regard to the contribution area to Old Swamp River, it is unlikely that contaminants associated with these sites could affect sediment conditions in Old Swamp River.

Resource	Finding	Impacts
Massachusetts Aboveground Storage Tanks (MA AST)	Seven (7) MA AST sites are listed between one half and one mile of the project area.	Five AST sites appear to have groundwater contamination associated with them. Based on groundwater flow direction relative to the study area and the location of these sites with regard to the contribution area to Old Swamp River, it is unlikely that contaminants associated with these sites could affect sediment conditions in Old Swamp River.
Leaking Aboveground Storage Tanks (LAST)	Four (4) LAST sites are listed greater than one-half mile from the project area.	One LAST site appears to have groundwater contamination associated with it. Based on the location of this site outside the contribution area to Old Swamp River, it is unlikely that contaminants associated with this site could affect sediment conditions in Old Swamp River.
State Hazardous Waste Sites (SHWS)	Four (4) SHWS are listed within one-half mile of the project area and an additional sixty-eight (68) SHWS are identified greater than one-half mile from the project area.	A number of these SHWS sites have groundwater contamination associated with them, identified as either petroleum constituents or hazardous materials. However, based on groundwater flow direction relative to the study area and the location of these sites with regard to the contribution area to Old Swamp River, it is unlikely that contaminants associated with the majority of these sites could affect sediment conditions in Old Swamp River. One site is located approximately 1,500 feet southeast of the project area and is the location of a fuel oil release. Contamination from this site could potentially impact sediment within Old Swamp River.

Resource	Finding	Impacts
Solid Waste Facility/Landfills (SWF/LF)	No SWF/LF are located within one mile of the project area.	No impacts to project area.
Per- and Polyfluoroalkyl Substances (PFAS)	One (1) PFAS site is listed greater than one-half mile from the project area.	The Weymouth Water Department has identified PFAS in the Whitmans Pond Washington Pump Station. However, this area is located outside the contribution area to Old Swamp River, and it is unlikely that PFAS identified at this location could affect sediment conditions in Old Swamp River.
SPILLS	Three (3) SPILLS sites are identified as being located between one-quarter mile and one-half mile from the project area.	Three SPILLS appear to have groundwater contamination associated with them. Based on groundwater flow direction relative to the study area and the location of these sites with regard to the contribution area to Old Swamp River, it is unlikely that contaminants associated with these sites could affect sediment conditions in Old Swamp River.
MA RELEASE	Six (6) RELEASE sites are identified as being located within one-half mile from the project area.	Contamination associated with one of these RELEASE sites could potentially affect sediment conditions in the Old Swamp River based on the apparent groundwater flow direction relative to the study area. This site is located approximately 1,500 feet southeast of the project area and is the location of a fuel oil release.

Resource	Finding	Impacts
MA ASBESTOS	Twenty-two (22) MA ASBESTOS sites are listed as being located within one-half mile from the project area.	In general, the asbestos sites were identified as being located indoors and would therefore, not impact the project area. For those asbestos sites identified as being located outdoors, the project team does not anticipate any impacts to the project area as asbestos is not typically found dissolved in groundwater that would then be transported to the sediment in Old Swamp River.

SAMPLING PLAN

This sediment sampling plan proposes collecting ten (10) sediment samples. Four (4) in the impoundment on Old Swamp River, two (2) in the SNUP ponds (one from each pond), and two (2) upstream and two (2) downstream of the impoundment (Table 2, Figure 2).

There are several outfalls within the sampling area. From upstream to downstream, they include:

- Stormwater outfall from Route 3 drainage system (north/west bound)
- Stormwater outfall from the office park to the east (169 Libbey Industrial Parkway)
- Stormwater outfall from the office park to the west (### Libbey Industrial Parkway)
- Outfall from the SNUP treatment system
- Stormwater outfall from Libbey Industrial Parkway

The two samples collected from upstream (OSR-2022-US # 1, 2) are proposed to be collected from the median area between the east/southbound lanes of Route 3 and the west/northbound lanes of Route 3.

The most upstream sample in the impoundment (IMP-2002-1) is proposed to be collected from a location between the Route 3 outfall and the outfall from the office park to the east. The second sample (IMP-2002-2) is proposed to be collected from a point between the two office park outfalls. The third (IMP-2002-3) is proposed to be collected from a point downstream of the office park outfalls, but upstream of the intake to the SNUP complex. The fourth (IMP-2002-4) is to be collected immediately upstream of the dam itself.

The samples collected from downstream of the dam (OSR-2002-DS #1,2) are proposed to occur upstream of the outfall from the SNUP complex and downstream of the outfall from the SNUP complex, respectively.

Inter-Fluve will collect sediment core samples on foot by wading or via small boat (canoe) using a custom-made manual coring device. Sample collection will be in accordance with the standard protocols described in US-EPA-823-B-01-02, 2001, Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual, adapted to site conditions and/or to specific instruction provided by the laboratory.

Table 2 Proposed sediment sample locations for chemical analysis

Sample description	**Number of samples submitted to the laboratory**
Downstream from dam	2
Impoundment SNUP Pond 1 SNUP Pond 2	4 1 1
Upstream of impoundment	2
Total	10


Document Path: C:\Projects\Swiding\Design\Final Boylston\Weymouth_OldSwampRiverSNUP_SamplingLocus.mxd
LIBBEY INDUSTRIAL PARKWAY
PILGRIM HIGHWAY
Outfall from SNUP system to Old Swamp River.
Intake from Old Swamp River to SNUP system.
Dam
Impoundment
OSR-2022-DS2
SNUP-2022-2
OSR-2022-DS1
IMP-2022-4
SNUP-2022-1
IMP-2022-3
IMP-2022-2
IMP-2022-1
OSR-2022-US-1
OSR-2022-US-2
Old Swamp River
Michael A Goldberg
169 Libbey Industrial Parkway
Weymouth, MA 02189
and
Libbey Industrial Parkway LLC
15 Scotland Blvd
Bridgewater, MA 02324
Foxrock Weymouth at Realty LLC
PO Box 690528
Quincy, MA 02169
2022 Actual Sediment Sampling Locations (May 27, 2022)
Proposed Sediment Sampling Locations
Parcel Boundaries
Massachusetts
Weymouth
N
0
50
100
Feet
1 inch = 100 feet
Sediment Sampling Plan
Old Swamp River
and
SNUP
Old Swamp River
Libbey Industrial Parkway
Weymouth, MA
Date: 6/15/2022
inter·fluve

QUALITY CONTROL PLAN

Inter-Fluve follows quality control and quality assurance procedures described in:

- (Inter-Fluve, 2007). "Sediment Sampling for Dam Removal Projects: General sample collection guidelines for contaminant testing", April 25, 2007 and
- (USEPA, 2001). US-EPA-823-B-01-02, 2001, "Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual."

Quality control measures described in Inter-Fluve, 2007 include:

- Unique considerations for specific equipment used to collect the samples
- The order that samples are collected
- Procedures and materials for decontaminating equipment between sample collection events
- Proper containers used to store the samples, appropriate for the intended analytes
- Methods for preserving the samples for storage and shipment samples
- Labeling the samples properly and delivering them to the laboratory

As part of this sediment sampling excursion, Inter-Fluve will perform the following work.

Inter-Fluve will coordinate with the analytical laboratory, Absolute Resource Associates, prior to performing the sediment data collection task to obtain the appropriate containers, preservatives, and documentation.

Inter-Fluve will collect the samples from the reference sites first. Sample collection will proceed in the following order: (1) upstream, (2) downstream, (3) impoundment, (4) SNUP ponds.

Inter-Fluve will clean the sampling equipment using the methods described in Inter-Fluve, 2017. The cleaning procedure includes washing the equipment with scrub brushes using a non-phosphate detergent that leaves no residue when rinsed and rinsing the equipment several times with water. The final rinse is always performed with site water.

Inter-Fluve will store the samples in a temperature-controlled container (a cooler with ice) and will arrange for a courier to deliver the samples to the analytical laboratory (Portsmouth, New Hampshire) on the day that the samples are collected.

LABORATORY ANALYSIS

The sediment samples will be sent to a state-approved laboratory for analyses of a range of parameters required by the MassDEP 401 Water Quality Certification[1] (Table 3).

Table 3 Parameters to be analyzed in sediment samples.

Parameter	Reporting Limit mg/kg (dry weight)*
Arsenic	0.5
Cadmium	0.1
Chromium	1.0
Copper	1.0
Lead	1.0
Mercury	0.02
Nickel	1.0
Zinc	1.0
Polychlorinated Biphenyls (PCBs)-by NOAA Summation of Cogeners	0.01
Polycyclic Aromatic Hydrocarbons (PAHs)	0.02
Volatile Organic Compounds (VOCs)	0.1
Organochlorine Pesticides	0.0014
Total Organic Carbon	0.1%
Percent Water	1.0%
Grain Size Distribution-wet sieve (ASTM D422)	Sieve numbers 4, 10, 40, 60, 200

*unless otherwise noted.

[1] 314 CMR 9.07 (2) (b) (6)

Sarah Widing <swiding@interfluve.com>

RE: Sediment Sampling Plan - SNUP ponds and impoundment on Old Swamp River, Weymouth

1 message

Wong, David W (DEP) <david.w.wong@state.ma.us> Fri, May 20, 2022 at 7:57 PM
To: "swiding@interfluve.com" <swiding@interfluve.com>
Cc: Nick Nelson <nnelson@interfluve.com>, "Hirsch, Chris (FWE)" <chris.hirsch@state.ma.us>

Hi Sarah,

Thanks for your modified SAP. As a result, it is approved.

You have a great weekend too.

Sincerely,

David

David WH Wong, Ph.D.

401 Water Quality Certification Program

Division of Wetlands and Waterways

Bureau of Water Resources

Massachusetts Department of Environmental Protection

Phone: 617-874-7155

David.W.Wong@mass.gov

From: swiding@interfluve.com <swiding@interfluve.com>
Sent: Friday, May 20, 2022 4:04 PM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Cc: 'Nick Nelson' <nnelson@interfluve.com>; Hirsch, Chris (FWE) <Chris.Hirsch@mass.gov>
Subject: RE: Sediment Sampling Plan - SNUP ponds and impoundment on Old Swamp River, Weymouth

Hi David,

Thank you for your helpful feedback.

I've moved the proposed sampling location for IMP-2022-3 approximately 25 feet to the north to illustrate intended proximity to the connection with the SNUP treatment system. I've attached our full plan with the revised figure (see PDF sheet 8).

Have a wonderful weekend!

Best regards,

Sarah Widing, PE (MA, ME)

Senior Water Resources Engineer
swiding@interfluve.com | Mobile: 617-803-7130
220 Concord Avenue, 2nd Floor | Cambridge, MA 02138
Main 617-714-5537 | Fax 541-201-2919 |

From: Wong, David W (DEP) <david.w.wong@state.ma.us>
Sent: Thursday, May 19, 2022 5:25 PM
To: swiding@interfluve.com
Cc: 'Nick Nelson' <nnelson@interfluve.com>; Hirsch, Chris (FWE) <chris.hirsch@state.ma.us>
Subject: RE: Sediment Sampling Plan - SNUP ponds and impoundment on Old Swamp River, Weymouth

Hi Sarah,

This is to confirm that MassDEP received your sediment Sampling and Analysis Plan (SAP) for this project. The due diligence review is comprehensive, and the SAP is written clearly. I also appreciate that outfalls are also displayed in the SAP. Everything is fine to present the sediment properties except one minor modification is needed: IMP-2022-3 needs to be collected immediately downstream of the Outfall from the SNUP treatment system to meet the requirement of 314 CMR 9.07(2)(b).

After the SAP is updated, please send the final SAP to me for final approval.

Thanks for your good work.

Sincerely,

David

David WH Wong, Ph.D.

401 Water Quality Certification Program

Division of Wetlands and Waterways

Bureau of Water Resources

Massachusetts Department of Environmental Protection

Phone: 617-874-7155

David.W.Wong@mass.gov

From: swiding@interfluve.com <swiding@interfluve.com>
Sent: Thursday, May 19, 2022 3:28 PM
To: Wong, David W (DEP) <david.w.wong@mass.gov>
Cc: 'Nick Nelson' <nnelson@interfluve.com>; Hirsch, Chris (FWE) <Chris.Hirsch@mass.gov>
Subject: Sediment Sampling Plan - SNUP ponds and impoundment on Old Swamp River, Weymouth

Hi David,

On behalf of the Town of Weymouth, and under contract to MassDER, Inter-Fluve intends to collect sediment samples from Old Swamp River and the adjacent Sediment Nutrient Uptake Ponds (SNUPs), near the crossing of Libbey Industrial Parkway and Old Swamp River, Weymouth.
Sample collection is proposed to occur in areas that are currently underwater or on property owned by the Town of Weymouth.

We've attached our sampling plan for your review. Ultimately, the data generated by this excursion will be used to inform the project plans for removal of the dam and potential decommissioning of the SNUP ponds.

We are hoping to collect the samples before the end of May. If you have any questions or comments about this submittal, we will be happy to consider/respond.

Best regards,

Sarah Widing, PE (MA, ME)

Senior Water Resources Engineer
swiding@interfluve.com | Mobile: 617-803-7130
220 Concord Avenue, 2nd Floor | Cambridge, MA 02138
Main 617-714-5537 | Fax 541-201-2919 |

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MEMORANDUM

To:	Chris Hirsch, MA Division of Ecological Restoration
From:	Sarah Widing, Inter-Fluve
Date:	June 29, 2022. REVISED 3/30/2023
Re:	Sediment Sampling Results for Old Swamp River and the Sediment and Nutrient Uptake Ponds (SNUP), Weymouth - Reconnaissance

Introduction

This memorandum provides a brief qualitative description of the results of the sediment sampling data collection effort conducted at the Old Swamp River and SNUP in May 2022. This document is supplemental to the Sediment Sampling Plan issued by Inter-Fluve on May 19, 2022[1].

In May, 2022, Inter-Fluve personnel conducted a data-collection effort to quantify the volume of sediment and to characterize the physical and chemical properties of the sediment within the Old Swamp River and Sediment and Nutrient Uptake Ponds (SNUPs). The results of this data-collection effort will inform future project development to remove the dam associated with the SNUP system. Refer to the Base Mapping and Field Data Collection Planset[2] produced jointly by BSC Group and Inter-Fluve for detailed mapping associated with this work.

Figure 1. Old Swamp River, 180˚ panorama looking downstream (left) and upstream(right) at the SNUP complex dam feature.

Results

SEDIMENT VOLUME

In May 2022, Inter-Fluve conducted a bathymetric survey of the Old Swamp River and SNUP ponds. During this survey, we used Total Station equipment to measure the elevation of the water surface,

[1] Inter-Fluve, 2022. Sediment Sampling Plan for the Impoundment and Sediment Nutrient Uptake Ponds (SNUPs) on Old Swamp River, Weymouth – Reconnaissance.

[2] BSC Group & Inter-Fluve, 2022. Base Mapping and Field Data Collection. Old Swamp River and SNUP, Libbey Industrial Parkway, Weymouth, MA. June 30, 2022.

the elevation of the pond bed (top of sediment), and the elevation of the refusal layer (bottom of sediment).

The sediment thickness within the impounded areas is mapped on the Basemap (BSC Group & Inter-Fluve, 2022).

The total estimated volume of sediment (based on these data) is approximately **180 cubic yards within the Old Swamp River impoundment, 40 cubic yards in the Sediment Pond (Pond 1), and 51 cubic yards in the Nutrient Uptake Pond (Pond 2).**

SEDIMENT TESTING

This section of the memorandum summarizes the findings for standard analyte groups including metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides and herbicides, total and extractible petroleum hydrocarbons (TPH and EPH), and assorted physical characteristics.

Laboratory analyses were overseen by Absolute Resource Associates. Refer to the Attachments.

Refer to Figure 2 for sediment sampling locations. Refer to Table 1 for a summary of analytical results.

Metals

- **Cadmium:** One sample within the SNUP Ponds (1) contained measurable concentrations of cadmium (2.4 mg/kg) below **natural** soil background levels. The most downstream sample within the Old Swamp River (OSR-2022-DS2) contained measurable concentrations of cadmium (3.0 mg/kg) below **urban** soil background levels.
- **Chromium:** Ten out of ten samples contained measurable chromium concentrations. Six out of ten samples contained concentrations at or below **natural** soil background concentrations.
    - Two samples (SNUP-2022-01 and OSR-2022-DS2) contained concentrations that **exceed the Cleanup Standards (S-1/GW-1).**
- **Copper:** Seven out of ten samples contained measurable copper concentrations. Five out of ten samples contained concentrations at or below natural soil background concentrations.
    - Two samples (SNUP-2022-01 and OSR 2022 DS2) contained copper concentrations that exceed **natural** soil background levels.
- **Lead:** All samples contained measurable lead concentrations.
    - Two samples (SNUP-2022-01 and OSR 2022 DS2) contained lead concentrations that exceed **natural** soil background levels and the **Freshwater PEC.**
- **Mercury:** One sample (SNUP-2022-1) contained a measurable amount of mercury. The concentration did not exceed the **urban** soil background levels.

- **Nickel:** Three samples contained measurable nickel concentrations. All samples contained concentrations at or below natural soil background levels.
- **Zinc:** All samples contained measurable zinc concentrations. Eight of ten samples contained concentrations at or below natural soil background levels.
    - Two samples (SNUP-2022-01 and OSR-2022-DS2) contained zinc concentrations that did not exceed **urban** soil background levels**.**

With respect to metals, sediment within the Old Swamp River impoundment is consistent with natural soil background levels. Analytical results indicate that the sediment pond (SNUP Pond 1) and the Old Swamp River at the most downstream limit of the study area contained the highest concentrations. This may indicate that the sediment pond has functioned effectively to trap and retain fine material (which often attracts and binds to contaminants) throughout its operational life.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs were detected in ten out of ten samples.

- The highest concentrations were detected upstream of the impoundment within the Route 3 median (OSR-2022-US2), concentrations exceeded the **urban** soil background levels and the **Freshwater PEC** levels.
- the lowest concentrations were detected within the impoundment.

The data suggest a source of PAHs to the Old Swamp River in or near the Route 3 median between sediment samples OSR-2022-US1 and OSR-2002-US2. The sediment within the impoundment does not appear to be affected.

Polychlorinated Biphenyls (PCBs)

PCBs were detected in seven out of ten samples. However, none of the samples contained concentrations that exceeded the screening levels.

- The highest concentration of PCBs was detected in the most downstream sample OSR-2022-DS2.
- PCBs were detected upstream in both samples OSR-2022-US1 and OSR-2022-US2.
- PCBs were detected in both SNUP Ponds (Pond 1 and Pond 2).
- PCBs were detected in the two upstream impoundment samples (IMP-2022-1 and IMP-2022-2), but were not detected in the two downstream impoundment samples (IMP-2022-3 and IMP-2022-4).

PCBs are present in the study area. However, PCBs appear to be most prevalent in sediment upstream, downstream, and within the SNUP ponds. Impounded sediment appears to be relatively clean.

Pesticides

No samples contained concentrations of pesticides that exceeded the reporting limits of the laboratory analyses.

Total and Estimated Petroleum Extractible Hydrocarbons (TPH and EPH)

One sample upstream of the impoundment, both samples downstream of the impoundment, both the sediment and nutrient uptake ponds, and the most upstream sample within the impoundment contained measurable concentrations of TPH and EPHs. The measured concentrations are significantly lower than the Cleanup Standard (S-1/GW-1).

Summary

This sediment analysis appears to indicate that the sediment impounded behind the Old Swamp River dam is relatively clean.

Sediment found within the SNUP ponds, especially the Sediment Pond (Pond 1) contains relatively high concentrations of metals.

Sediment upstream of the impoundment contains relatively high concentrations of PAHs, which suggests a potential source upstream of the study area.

Sediment downstream of the impoundment contains relatively high concentrations of metals.

Attachments

1. Absolute Resource Associates Laboratory Report. Job ID 61334.
   61334 FinalRpt 061722.pdf
2. Grain Size Report by John Turner Consulting.
   61334 Sub Grainsize Report 062022.pdf
3. Eurofins Pittsburg Analytical Report 180-139015-1.
   61334 Sub Report J139010-1 UDS Level 2 Report Rev(1) Final Report
4. Electronic Data Deliverable, *61334 Standard EDD 062022.xls*


Document Path: C:\Projects\Swiding\Design\Final Boylston\Weymouth_OldSwampRiverSNUP_SamplingLocus.mxd
LIBBEY INDUSTRIAL PARKWAY
PILGRIM HIGHWAY
Outfall from SNUP system to Old Swamp River.
Intake from Old Swamp River to SNUP system.
Dam
Impoundment
OSR-2022-DS2
SNUP-2022-2
OSR-2022-DS1
IMP-2022-4
SNUP-2022-1
IMP-2022-3
IMP-2022-2
IMP-2022-1
OSR-2022-US-1
OSR-2022-US-2
Old Swamp River
Michael A Goldberg
169 Libbey Industrial Parkway
Weymouth, MA 02189
and
Libbey Industrial Parkway LLC
15 Scotland Blvd
Bridgewater, MA 02324
Foxrock Weymouth at Realty LLC
PO Box 690528
Quincy, MA 02169
2022 Actual Sediment Sampling Locations (May 27, 2022)
Proposed Sediment Sampling Locations
Parcel Boundaries
Massachusetts
Weymouth
N
0
50
100
Feet
1 inch = 100 feet
Sediment Sampling Plan
Old Swamp River
and
SNUP
Old Swamp River
Libbey Industrial Parkway
Weymouth, MA
Date: 6/15/2022
inter·fluve

Sediment Sampling Results
Old Swamp River Dam - and SNUP Ponds
Weymouth, MA

	Screening Levels					Dam Impoundment						Downstream		Upstream		Summary Calculations				
	Cleanup Standard (S-1/GW-1)	"Natural Soil" Background	"Urban Soil" Background	Upper Concentration Limit (UCL)	Freshwater PEC	IMP-2022-1	IMP-2022-2	IMP-2022-3	IMP-2022-4	SNUP-2022-1	SNUP-2022-2	OSR-2022-DS1	OSR-2022-DS2	OSR-2022-US1	OSR-2022-US2	Impoundment (Summary calculation includes SNUP Ponds)			Downstream	Upstream
						27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	Min	Max	Mean	Mean	Mean
Metals, Total [mg/kg]																				
Arsenic	20	20	20	500	33	1.4	1.4	2.8	1.6	5.0	8.8	2.1	19.0	1.5	1.4	1.4	8.8	3.5	10.5	1.4
Cadmium	70	2	3	1,000	4.98	0.3	0.3	0.3	0.3	2.4	0.3	0.4	3.0	0.3	0.3	0.3	2.4	0.6	1.7	0.3
Chromium	100	30	40	2,000	111	11.0	8.3	14.0	11.0	130.0	35.0	38.0	100.0	11.0	9.5	8.3	130.0	34.9	69.0	10.3
Copper		40	200		149	2.9	9.6	5.5	11.0	83.0	23.0	21.0	70.0	2.9	7.4	2.9	83.0	22.5	45.5	5.1
Lead	200	100	600	6,000	128	14.0	25.0	17.0	19.0	170.0	79.0	55.0	150.0	13.0	11.0	14.0	170.0	54.0	102.5	12.0
Mercury	20	0.3	1	300	1.06	0.1	0.1	0.1	0.1	0.7	0.1	0.2	0.4	0.1	0.1	0.1	0.7	0.2	0.3	0.1
Nickel	600	20	30	10,000	48.6	2.9	6.0	5.5	3.1	10.0	7.2	9.9	13.5	2.9	2.9	2.9	10.0	5.8	11.7	2.9
Zinc	1,000	100	300	10,000	459	31.0	28.0	37.0	55.0	270.0	84.0	83.0	270.0	23.0	29.0	28.0	270.0	84.2	176.5	26.0
PAHs (ug/kg)																				
Anthracene	1,000,000	1,000	4,000	10,000,000	845	6.0	6.0	42	7.5	22.5	33	64	32.0	110	4,100	6	42	20	48	2,105
Benzo(A)Anthracene	7,000	2,000	9,000	3,000,000	1,050	88	53	230	44	380	290	750	630	740	7,000	44	380	181	690	3,870
Benzo(A)Pyrene	2,000	2,000	7,000	300,000	1,450	120	63	240	60	640	460	980	910	710	5,700	60	640	264	945	3,205
Benzo(B)Fluoranthene	7,000	2,000	8,000	3,000,000	13,400	130	59	240	79	860	650	1,200	1,200	780	6,000	59	860	336	1,200	3,390
Chrysene	70,000	2,000	7,000	10,000,000	1,290	140	77	320	87	860	620	1,200	1,200	940	7,700	77	860	351	1,200	4,320
Dibenzo(A,H)Anthracene	700	500	1,000	300,000	260	20	6.0	40	7.5	130	110	210	180	140	840	6	130	52	195	490
Fluoranthene	1,000,000	4,000	10,000	10,000,000	2,230	320	200	1,000	200	1,600	1,200	2,700	2,600	2,300	28,000	200	1,600	753	2,650	15,150
Fluorene	1,000,000	1,000	2,000	10,000,000	536	6.0	6.0	6.5	7.5	22.5	6.5	19	32.0	21	1,400	6	23	9	26	711
Naphthalene	4,000	500	1,000	10,000,000	561	6.0	6.0	6.5	7.5	22.5	13	19	32.0	23	60.0	6	23	10	26	42
Phenanthrene	10,000	3,000	20,000	10,000,000	1,170	130	110	420	52	400	360	840	790	830	21,000	52	420	245	815	10,915
Pyrene	1,000,000	4,000	20,000	10,000,000	1,520	200	130	580	100	950	680	1,700	1,700	1,400	19,000	100	950	440	1,700	10,200
2-Methylnaphthalene						6.0	6.0	6.5	7.5	22.5	6.5	9.0	32.0	6.5	60.0	6	23	9	21	33
Acenaphthylene						6.0	6.0	6.5	7.5	22.5	6.5	23	32.0	25	60.0	6	23	9	28	43
Acenaphthene						6.0	6.0	6.5	7.5	22.5	6.5	9.0	32.0	6.5	1,000	6	23	9	21	503
Dibenzofuran						--	--	--	--	--	--	--	--	--	--	-	-	-	-	-
Benzo(K)Fluoranthene						130	65	260	70	700	640	1,100	1,000	760	7,100	65	700	311	1,050	3,930
Indeno(1,2,3-Cd)Pyrene						77	36	150	44	470	390	750	660	420	3,100	36	470	195	705	1,760
Benzo(G,H,I)Perylene						98	48	190	56	610	470	870	830	480	3,700	48	610	245	850	2,090
Total PAHs	4,100,700	22,000	89,000	76,600,000	24,312	1,489	883	3,745	845	7,735	5,942	12,443	11,892	9,692	115,820	845	7,735	3,440	12,168	62,756
PCBs (mg/kg)																				
PCB-8						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-18						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-28						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-44						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-52						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-66						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-77						0.0026	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0026	0.0026	0.0004	-	-
PCB-101						ND	0.0007	ND	ND	0.0024	0.0011	ND	0.0027	0.0005	0.0011	0.0007	0.0024	0.0007	0.0014	0.0008
PCB-105						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-118						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-128						ND	ND	ND	ND	ND	ND	ND	0.0028	ND	ND	-	-	-	0.0014	-
PCB-138						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-153						ND	ND	ND	ND	0.0048	0.0019	ND	0.0048	ND	0.0014	0.0019	0.0048	0.0011	0.0024	0.0007
PCB-170						ND	ND	ND	ND	ND	0.0014	ND	0.0034	ND	ND	0.0014	0.0014	0.0002	0.0017	-
PCB-180						ND	ND	ND	ND	ND	0.0021	ND	0.0044	ND	ND	0.0021	0.0021	0.0004	0.0022	-
PCB-187						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-195						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
PCB-206						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
DCB Decachlorobiphenyl						ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
Total PCBs	1			100	1	0.0026	0.0007	-	-	0.0072	0.0065	-	0.0181	0.0005	0.0025	0.0087	0.0133	0.0028	0.0091	0.0015

Results are colored according to the highest screening level exceeded.

"<": concentration was below the indicated detection limit

"--": sample was not tested for analyte

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	Screening Levels					Dam Impoundment						Downstream		Upstream		Summary Calculations				
	Cleanup Standard (S-1/GW-1)	"Natural Soil" Background	"Urban Soil" Background	Upper Concentration Limit (UCL)	Freshwater PEC	IMP-2022-1	IMP-2022-2	IMP-2022-3	IMP-2022-4	SNUP-2022-1	SNUP-2022-2	OSR-2022-DS1	OSR-2022-DS2	OSR-2022-US1	OSR-2022-US2	Impoundment (Summary calculation includes SNUP Ponds)			Downstream	Upstream
						27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	27-May-22	Min	Max	Mean	Mean	Mean
Pesticides (ug/kg)																				
2-4' DDT						--	--	--	--	--	--	--	--	--	--	-	-	-	-	-
4,4'-DDT	6,000			600,000		25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Sum DDT					62.9	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Total DDTs					572	--	--	--	--	--	--	--	--	--	--	-	-	-	-	-
4,4'-DDD						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Sum DDD					28	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
2-4' DDE						--	--	--	--	--	--	--	--	--	--		-	-	-	-
4,4'-DDE	6,000			600,000		25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Sum DDE					31.3	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Aldrin						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
alpha-BHC						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
alpha-Chlordane						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
beta-BHC						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Chlordane	5,000			600,000	17.6	--	--	--	--	--	--	--	--	--	--	-	-	-	-	-
delta-BHC						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Dieldrin	80			30,000	61.8	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Endosulfan I						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Endosulfan II						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Endosulfan Sulfate						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Endrin	10,000			200,000	207	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Endrin Aldehyde						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Endrin Ketone						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
gamma-BHC (Lindane)					4.99	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
gamma-Chlordane						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Heptachlor						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Heptachlor Epoxide	100			10,000	16	25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Methoxychlor						25	25	26	29	90	28	35	115	24	25	25	90	37	75	24
Toxaphene						125	125	130	145	445	135	170	600	120	125	125	445	184	385	123
TPH and EPH (mg/kg)																				
TPH (ppm)	1,000			10,000		78	36	39	44	209	125	185	415	55	171	36	209	88	300	113
C9-C18 Aliphatics	1,000			20,000		13	12	13	15	45	13	18	65	13	13	12	45	18	42	13
C19-C36 Aliphatics	3,000			20,000		33	12	13	15	120	67	97	200	13	28	12	120	43	149	20
C11-C22 Aromatics	1,000			10,000		32	12	13	15	45	45	70	150	30	130	12	45	27	110	80
Physical Characteristics																				
Total Organic Carbon (mg/kg)						12,000	2,600	21,000	34,000	170,000	46,000	59,000	180,000	8,900	14,000	2,600	170,000	47,600	119,500	11,450
Percent Dry Matter (Solids)						58.6	74.8	55.1	41.9	19.9	70.3	42.3	20.1	70.9	70.9	19.9	74.8	53.4	31.2	70.9
Sieve No. 4 (% passing)						99.0	97.6	91.0	75.4	98.1	93.4	94.2	95.4	98.2	95.9	75.4	99.0	92.4	94.8	97.1
Sieve No. 10 (% passing)						95.3	88.7	87.9	69.8	91.5	88.2	92.5	89.3	96.7	85.0	69.8	95.3	86.9	90.9	90.9
Sieve No. 20 (% passing)						73.8	58.3	75.0	52.9	81.7	76.9	88.4	80.5	90.0	52.9	52.9	81.7	69.8	84.5	71.5
Sieve No. 40 (% passing)						33.1	15.8	40.9	27.7	71.3	55.9	74.0	70.2	54.7	30.3	15.8	71.3	40.8	72.1	42.5
Sieve No. 60 (% passing)						14.6	3.6	21.2	13.0	64.6	37.9	56.2	58.2	25.9	16.4	3.6	64.6	25.8	57.2	21.2
Sieve No. 100 (% passing)						6.3	2.3	13.8	7.7	58.1	27.0	38.7	42.2	12.7	8.0	2.3	58.1	19.2	40.5	10.4
Sieve No. 200 (% passing)						3.1	1.7	6.9	4.4	47.7	18.6	20.5	25.0	5.3	3.3	1.7	47.7	13.7	22.8	4.3

OSR-2022-DS2 TCLP Chromium <0.10 mg/L ; TCLP Lead < 0.05 mg/L

SNUP-2022-1 TCLP Chromium < 0.10 mg/L; TCLP Lead < 0.05 mg/L

SNUP-2022-1 For some MA EPH results, the Surrogate showed recovery outside the acceptance limits as a result of matrix interference.

Results in green text were below the laboratory detection limit. The values reported in this table are 1/2 of the detection limit for the corresponding lab test in accordance with the instructions associated with this reporting template.

TPH (ppm) reported in this worksheet is the sum of C9-C18, C19-C36, and C11-C22 values.

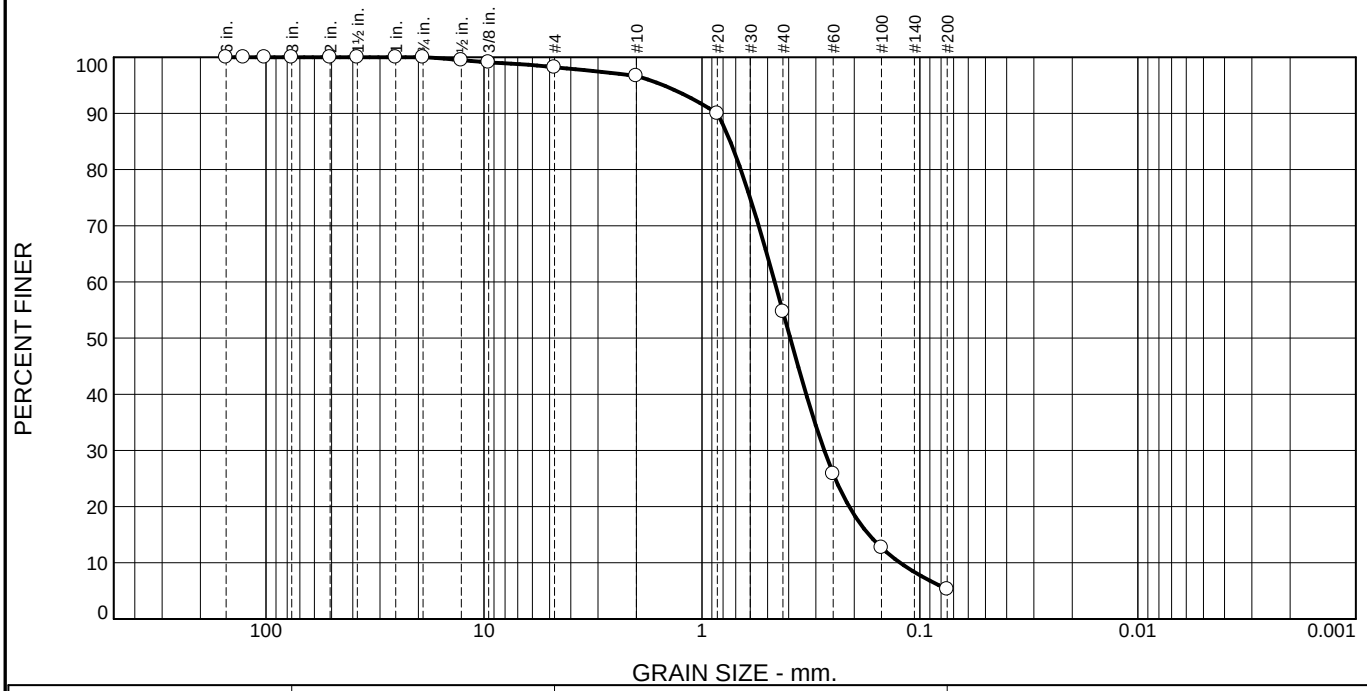
Results are colored according to the highest screening level exceeded.

"<": concentration was below the indicated detection limit

"--": sample was not tested for analyte

inter·fluve

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	1.5	42.0	49.4	5.3	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	99.5		
3/8	99.1		
#4	98.2		
#10	96.7		
#20	90.0		
#40	54.7		
#60	25.9		
#100	12.7		
#200	5.3		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 0.8512 D_{85}= 0.7411 D_{60}= 0.4637
D_{50}= 0.3935 D_{30}= 0.2746 D_{15}= 0.1714
D_{10}= 0.1232 C_u= 3.76 C_c= 1.32

Remarks

Received Moisture Content: 31.5%

Date Received: 6/01/2022 **Date Tested:** 6-7-2022

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: OSR-2022-US1
Sample Number: 22-219

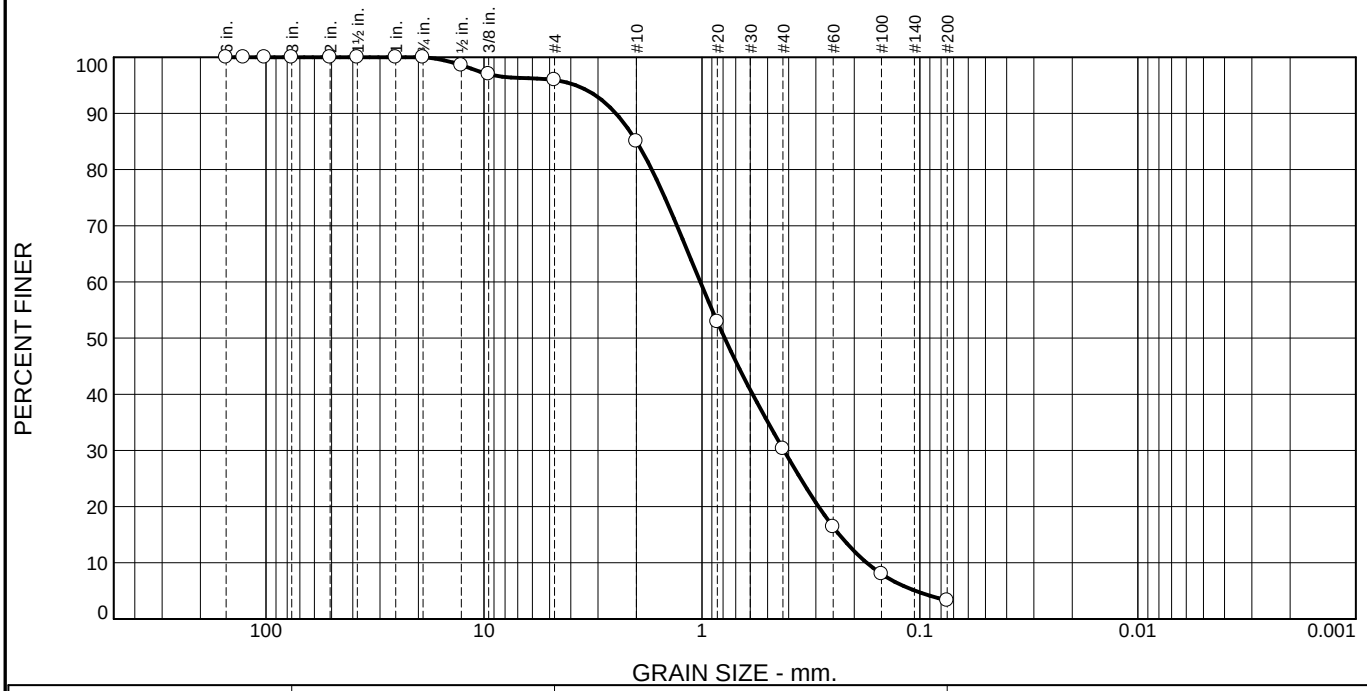
Date Sampled: 5/27/2022

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.1	10.9	54.7	27.0	3.3	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	98.6		
3/8	97.0		
#4	95.9		
#10	85.0		
#20	52.9		
#40	30.3		
#60	16.4		
#100	8.0		
#200	3.3		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 2.4820 D_{85}= 1.9971 D_{60}= 1.0177
D_{50}= 0.7865 D_{30}= 0.4204 D_{15}= 0.2342
D_{10}= 0.1754 C_u= 5.80 C_c= 0.99

Remarks

Received Moisture Content: 24.1%

Date Received: 6/1/22 **Date Tested:** 6-6-22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: OSR-2022-US2
Sample Number: 22-220

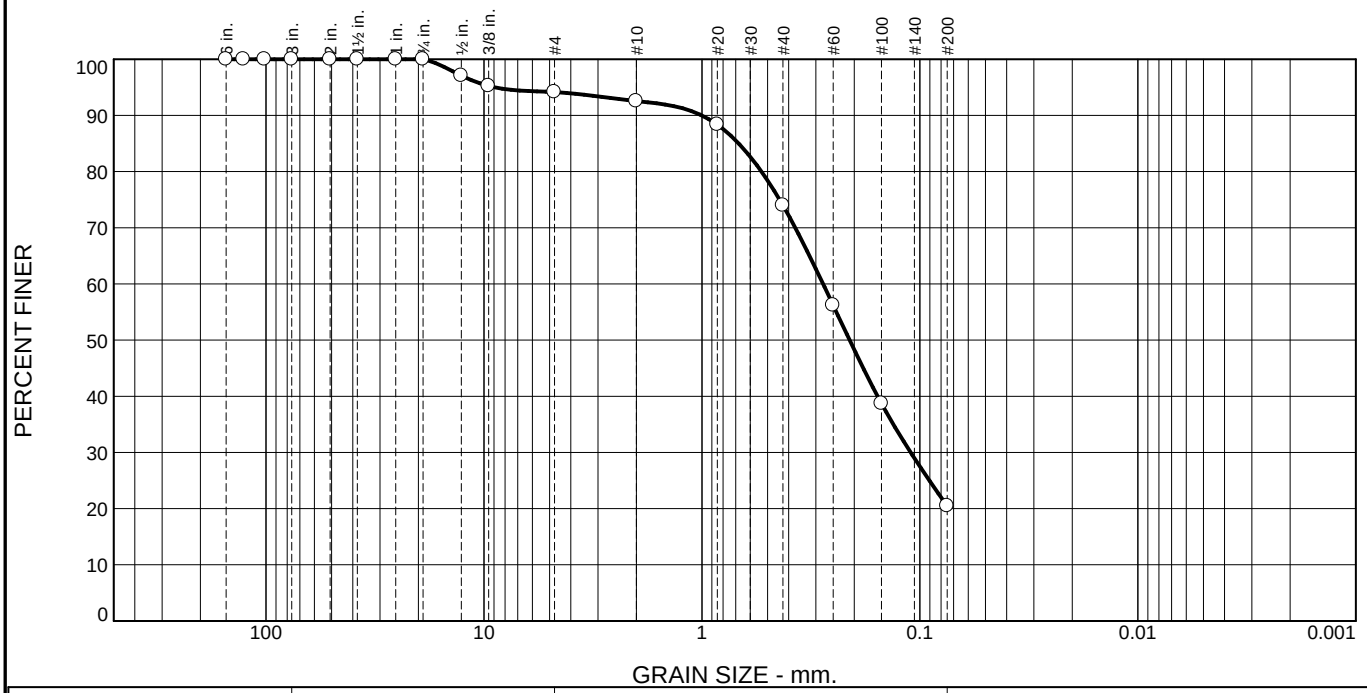
Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.8	1.7	18.5	53.5	20.5	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	97.1		
3/8	95.3		
#4	94.2		
#10	92.5		
#20	88.4		
#40	74.0		
#60	56.2		
#100	38.7		
#200	20.5		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 1.0022 D_{85}= 0.6786 D_{60}= 0.2781
D_{50}= 0.2101 D_{30}= 0.1103 D_{15}=
D_{10}= C_u= C_c=

Remarks

Received Moisture Content: 38.7%

Date Received: 6-6-22 **Date Tested:** 6-6-22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: OSR-2022-DS-1
Sample Number: 22-221

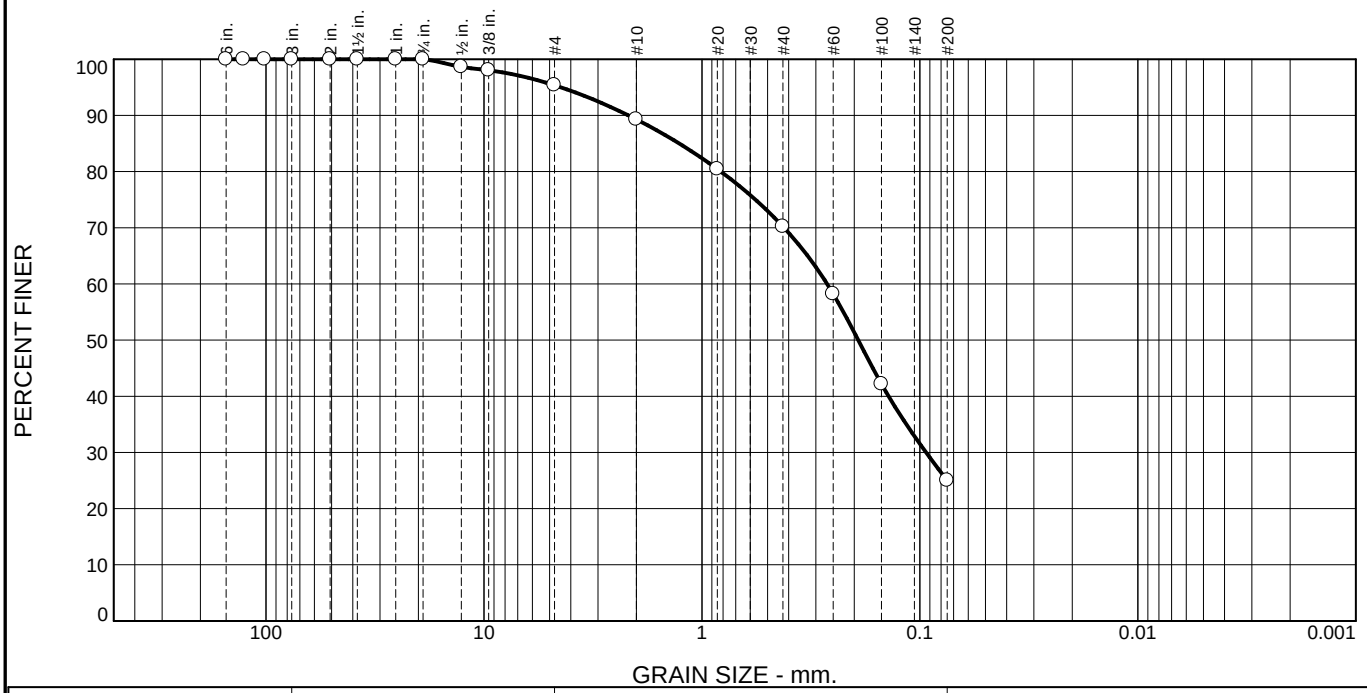
Date Sampled: 5-27-22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.6	6.1	19.1	45.2	25.0	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	98.6		
3/8	98.0		
#4	95.4		
#10	89.3		
#20	80.5		
#40	70.2		
#60	58.2		
#100	42.2		
#200	25.0		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 2.1737 D_{85}= 1.2707 D_{60}= 0.2665
D_{50}= 0.1919 D_{30}= 0.0937 D_{15}=
D_{10}= C_u= C_c=

Remarks

recieved moisture content: 166.9%

Date Received: 6/01/22 **Date Tested:** 6/06/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: OSR-2022-DS2
Sample Number: 22-222

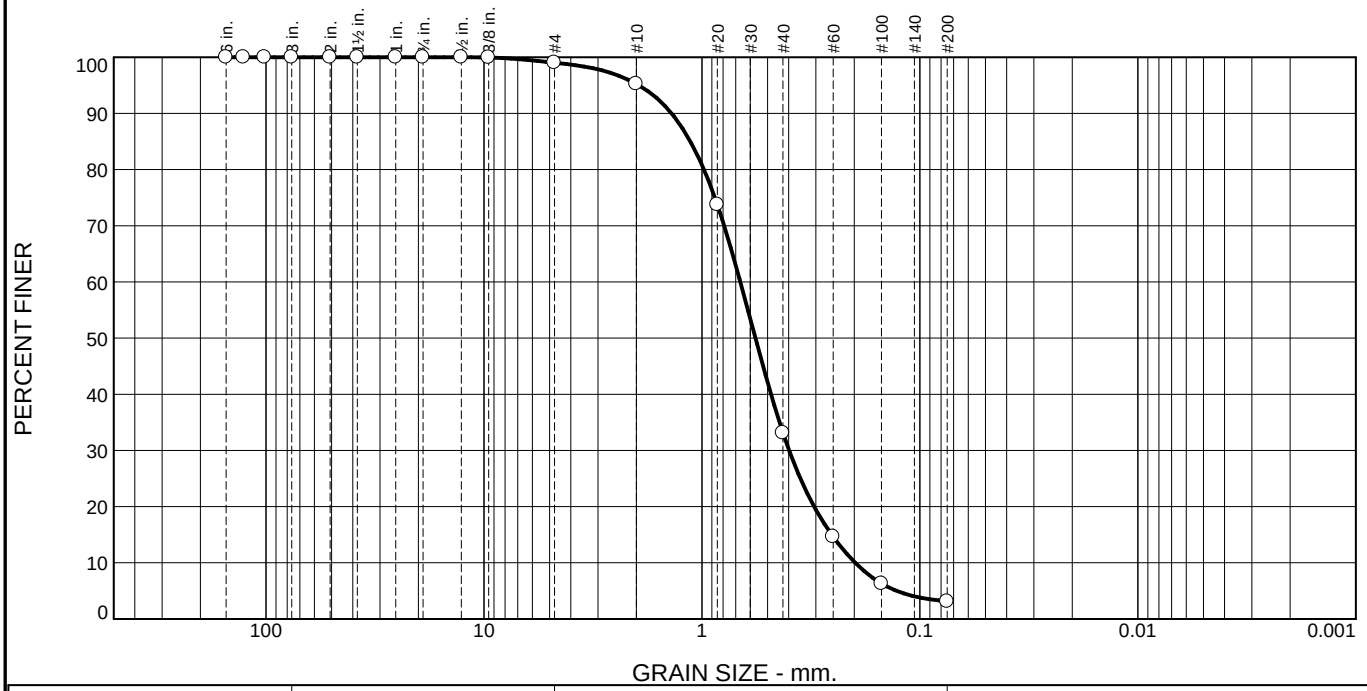
Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	3.7	62.2	30.0	3.1	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	99.0		
#10	95.3		
#20	73.8		
#40	33.1		
#60	14.6		
#100	6.3		
#200	3.1		

* (no specification provided)

Material Description

Organic soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 1.3780 D_{85}= 1.1302 D_{60}= 0.6666
D_{50}= 0.5682 D_{30}= 0.3983 D_{15}= 0.2539
D_{10}= 0.1981 C_u= 3.36 C_c= 1.20

Remarks

Retained Moisture Content: 30.5%

Date Received: 6/01/2022 **Date Tested:** 6/06/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: IMP-2022-1
Sample Number: 22-223

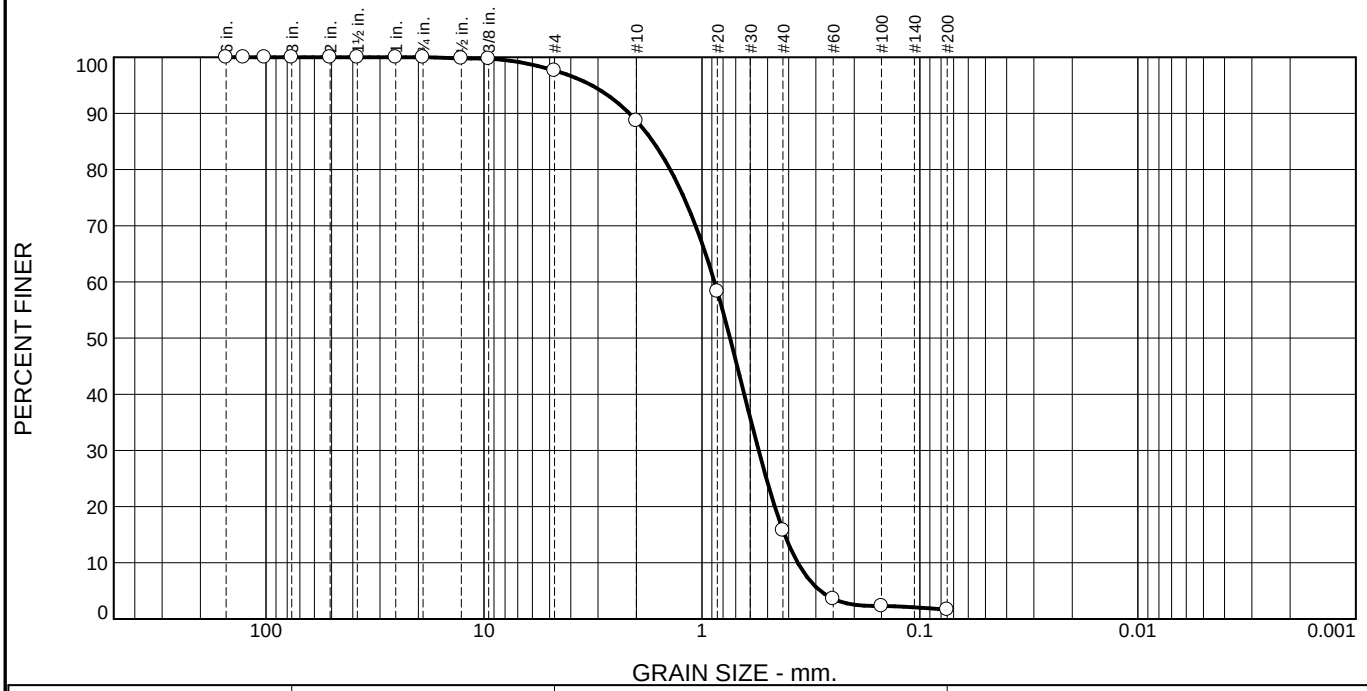
Date Sampled: 5/27/2022

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	8.9	72.9	14.1	1.7	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	99.8		
3/8	99.7		
#4	97.6		
#10	88.7		
#20	58.3		
#40	15.8		
#60	3.6		
#100	2.3		
#200	1.7		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 2.1523 D_{85}= 1.6783 D_{60}= 0.8754
D_{50}= 0.7433 D_{30}= 0.5493 D_{15}= 0.4176
D_{10}= 0.3634 C_u= 2.41 C_c= 0.95

Remarks

Retained Moisture Content: 21.2%

Date Received: 6/1/22 **Date Tested:** 6/6/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: IMP-2022-2
Sample Number: 22-224

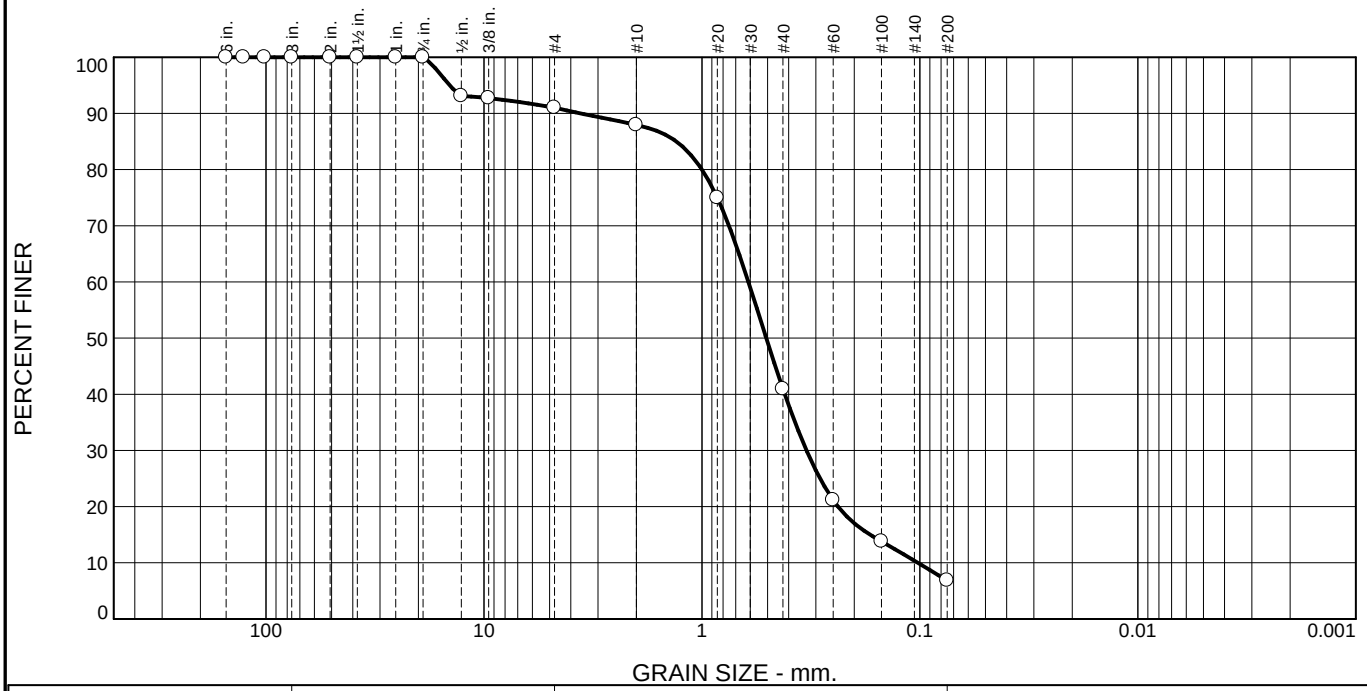
Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.0	3.1	47.0	34.0	6.9	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	93.1		
3/8	92.7		
#4	91.0		
#10	87.9		
#20	75.0		
#40	40.9		
#60	21.2		
#100	13.8		
#200	6.9		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 3.6013 D_{85}= 1.3091 D_{60}= 0.6122
D_{50}= 0.5069 D_{30}= 0.3312 D_{15}= 0.1690
D_{10}= 0.1023 C_u= 5.98 C_c= 1.75

Remarks

Retained Moisture Content: 34.9%

Date Received: 6/01/22 **Date Tested:** 6/6/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: IMP-2022-3
Sample Number: 22-225

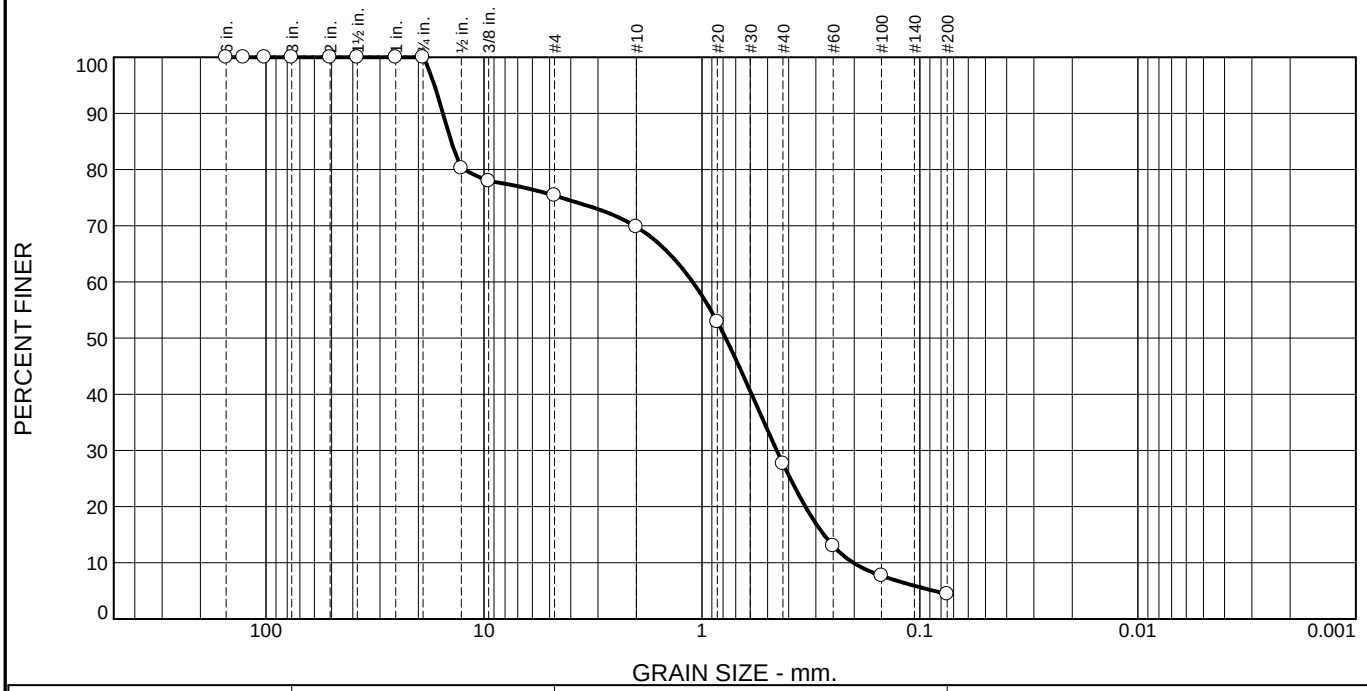
Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	24.6	5.6	42.1	23.3	4.4	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	80.2		
3/8	78.0		
#4	75.4		
#10	69.8		
#20	52.9		
#40	27.7		
#60	13.0		
#100	7.7		
#200	4.4		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 15.4314 D_{85}= 14.1343 D_{60}= 1.1023
D_{50}= 0.7783 D_{30}= 0.4536 D_{15}= 0.2760
D_{10}= 0.2022 C_u= 5.45 C_c= 0.92

Remarks

Retained Moisture Content: 41.3%

Date Received: 6/01/22 **Date Tested:** 6/6/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: IMP-2022-4
Sample Number: 22-226

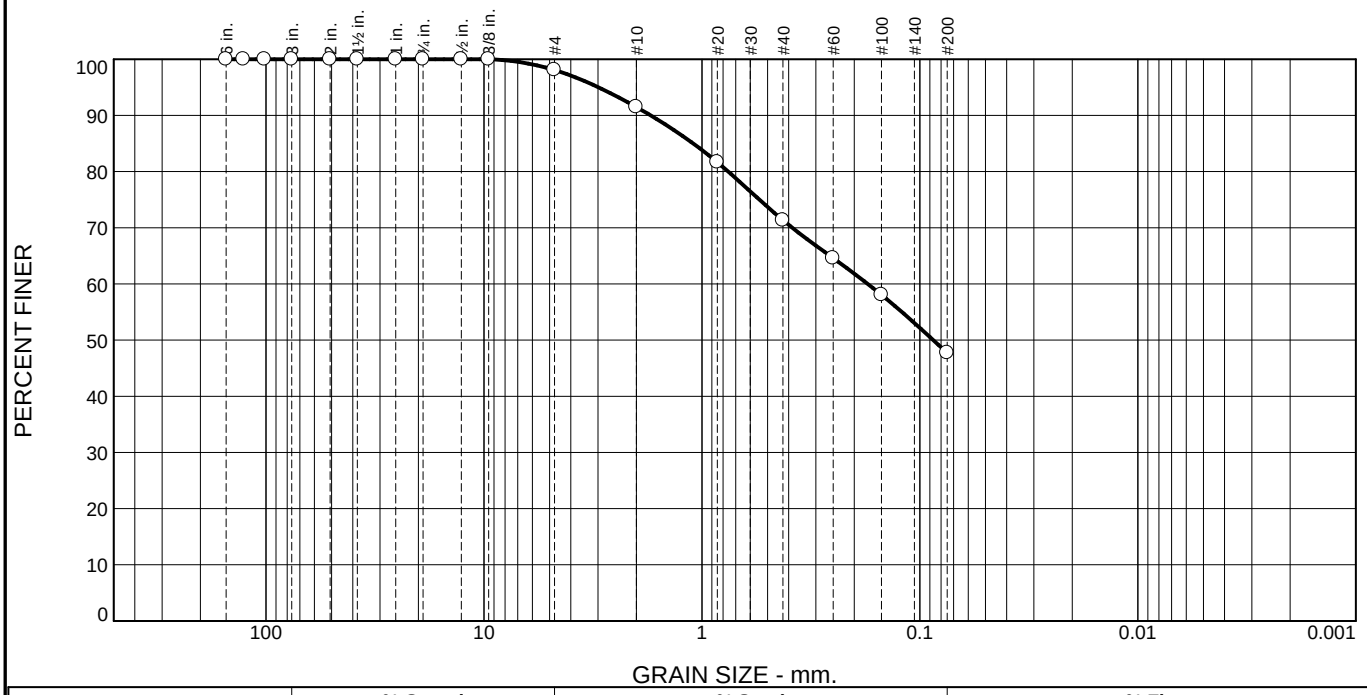
Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.9	6.6	20.2	23.6	47.7	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	98.1		
#10	91.5		
#20	81.7		
#40	71.3		
#60	64.6		
#100	58.1		
#200	47.7		

* (no specification provided)

Material Description

Organic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 1.7193 D_{85}= 1.0958 D_{60}= 0.1735
D_{50}= 0.0868 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Reatined Moisture Content: 186.5%

Date Received: 6/1/22 **Date Tested:** 6/6/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: SNUP-2022-1
Sample Number: 22-227

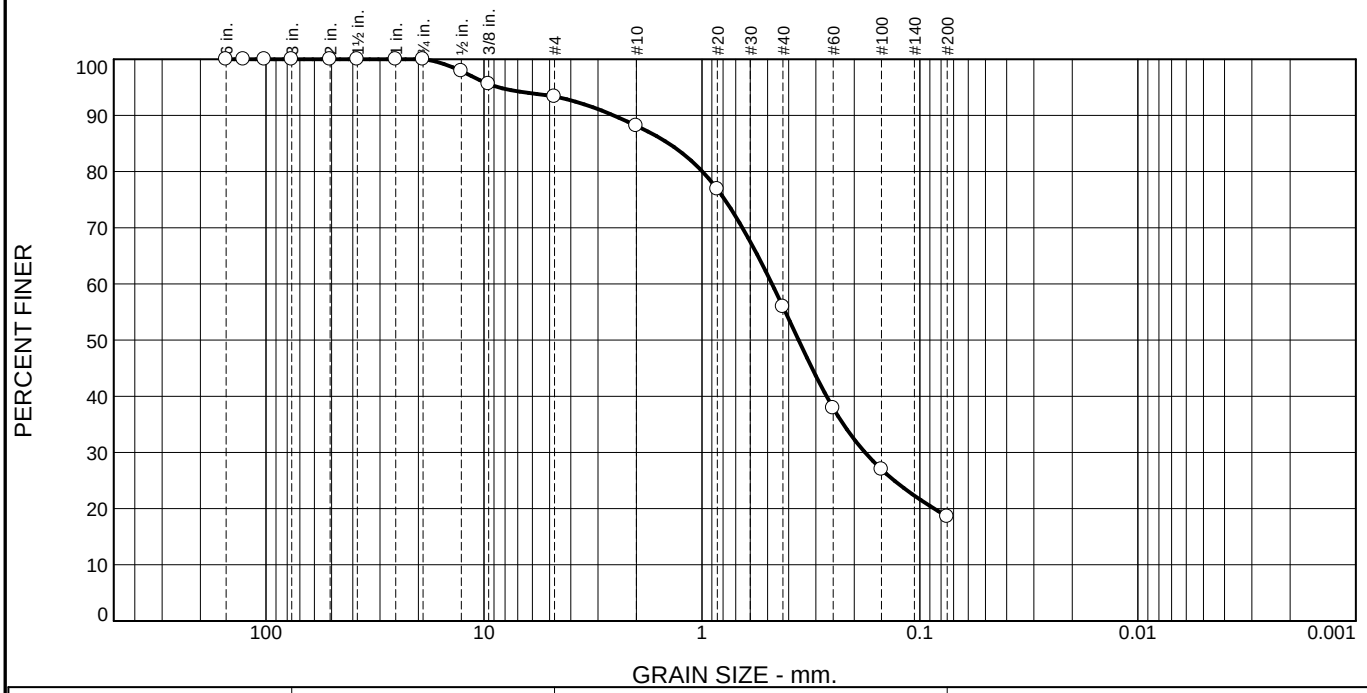
Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.6	5.2	32.3	37.3	18.6	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
6	100.0		
5	100.0		
4	100.0		
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
3/4	100.0		
1/2	97.9		
3/8	95.6		
#4	93.4		
#10	88.2		
#20	76.9		
#40	55.9		
#60	37.9		
#100	27.0		
#200	18.6		

* (no specification provided)

Material Description

Oraganic Soil With Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 2.5448 D_{85}= 1.4194 D_{60}= 0.4773
D_{50}= 0.3602 D_{30}= 0.1786 D_{15}=
D_{10}= C_u= C_c=

Remarks

Reatained Moisture Content: 41.6%

Date Received: 6/1/22 **Date Tested:** 6/6/22

Tested By: Trinity Smith

Checked By: Mike Bronstein

Title: Branch Manager

Location: SNUP-2022-2
Sample Number: 22-228

Date Sampled: 5/27/22

JOHN TURNER CONSULTING

Client: Absolute Resource Associates
Project: Miscellaneous Materials Testing

Project No: 17-25-014 **Figure**

APPENDIX C

HYDROLOGIC COMPUTATIONS

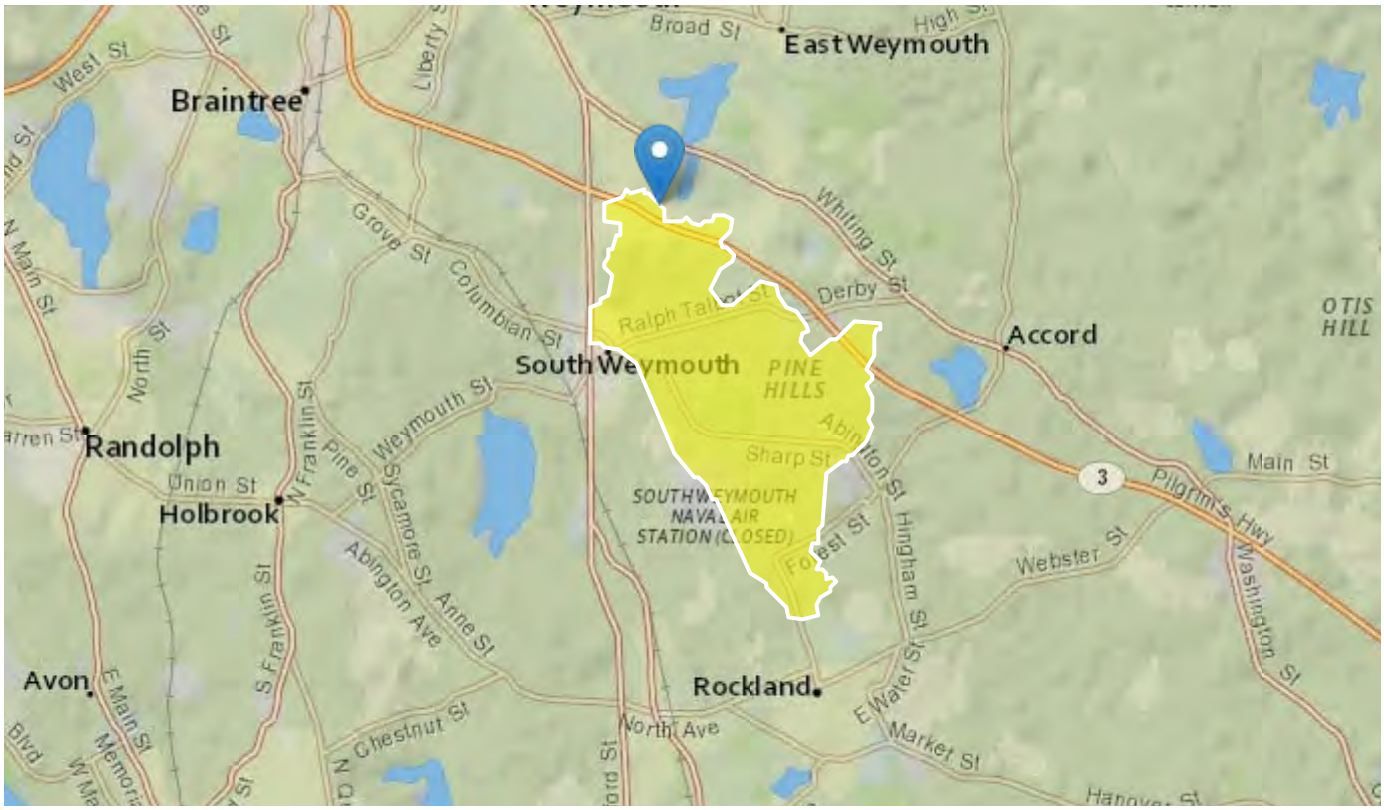
Basis of Design Report

Massachusetts Division of Ecological Restoration 251 Causeway Street, Suite 400 Boston, MA 02114

May 2023

SNUP Dam Weymouth MA

Region ID: MA
Workspace ID: MA20221201201940087000
Clicked Point (Latitude, Longitude): 42.19265, -70.94338
Time: 2022-12-01 15:20:02 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	3.453	percent
BSLDEM250	Mean basin slope computed from 1:250K DEM	0.494	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.18	square mile per mile
DRNAREA	Area that drains to a point on a stream	4.61	square miles
ELEV	Mean Basin Elevation	141	feet

Parameter Code	Parameter Description	Value	Unit
FOREST	Percentage of area covered by forest	29.59	percent
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	12.01	percent
LFPLENGTH	Length of longest flow path		miles
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	29.53	percent
WETLAND	Percentage of Wetlands	16.55	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	0.16	512
ELEV	Mean Basin Elevation	141	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	12.01	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	ASEp
50-percent AEP flood	113	ft^3/s	57.8	221	42.3
20-percent AEP flood	185	ft^3/s	93.3	367	43.4
10-percent AEP flood	241	ft^3/s	119	489	44.7
4-percent AEP flood	322	ft^3/s	153	676	47.1
2-percent AEP flood	389	ft^3/s	179	844	49.4
1-percent AEP flood	460	ft^3/s	206	1030	51.8

Statistic	Value	Unit	PIl	Plu	ASEp
0.5-percent AEP flood	536	ft^3/s	233	1230	54.1
0.2-percent AEP flood	645	ft^3/s	267	1560	57.6

Peak-Flow Statistics Citations

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. (https://dx.doi.org/10.3133/sir20165156)

Low-Flow Statistics

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	0.494	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.18	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PIl: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	Plu	SE	ASEp
7 Day 2 Year Low Flow	0.269	ft^3/s	0.059	1.18	49.5	49.5
7 Day 10 Year Low Flow	0.0741	ft^3/s	0.0127	0.402	70.8	70.8

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Flow-Duration Statistics

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.18	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	0.494	percent	0.32	24.6

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SE	ASEp
50 Percent Duration	4.54	ft^3/s	2.2	9.3	17.6	17.6
60 Percent Duration	3.25	ft^3/s	1.57	6.69	19.8	19.8
70 Percent Duration	1.98	ft^3/s	0.958	4.05	23.5	23.5
75 Percent Duration	1.53	ft^3/s	0.737	3.14	25.8	25.8
80 Percent Duration	0.927	ft^3/s	0.259	3.28	28.4	28.4
85 Percent Duration	0.615	ft^3/s	0.16	2.33	31.9	31.9
90 Percent Duration	0.37	ft^3/s	0.0934	1.43	36.6	36.6
95 Percent Duration	0.192	ft^3/s	0.0437	0.816	45.6	45.6
98 Percent Duration	0.131	ft^3/s	0.0267	0.608	60.3	60.3
99 Percent Duration	0.0939	ft^3/s	0.0172	0.482	65.1	65.1

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Bankfull Statistics

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	3.453	percent	2.2	23.9

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	0.07722	940.1535

Bankfull Statistics Parameters [New England P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	3.799224	138.999861

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
Bankfull Width	24.2	ft	21.3
Bankfull Depth	1.34	ft	19.8
Bankfull Area	32.1	ft^2	29
Bankfull Streamflow	67.5	ft^3/s	55

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	28.6	ft
Bieger_D_channel_depth	1.74	ft
Bieger_D_channel_cross_sectional_area	50.6	ft^2

Bankfull Statistics Flow Report [New England P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	38.8	ft
Bieger_P_channel_depth	1.92	ft
Bieger_P_channel_cross_sectional_area	75.5	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	21.2	ft
Bieger_USA_channel_depth	1.67	ft
Bieger_USA_channel_cross_sectional_area	39	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
Bankfull Width	24.2	ft	21.3
Bankfull Depth	1.34	ft	19.8
Bankfull Area	32.1	ft^2	29
Bankfull Streamflow	67.5	ft^3/s	55
Bieger_D_channel_width	28.6	ft	
Bieger_D_channel_depth	1.74	ft	
Bieger_D_channel_cross_sectional_area	50.6	ft^2	
Bieger_P_channel_width	38.8	ft	
Bieger_P_channel_depth	1.92	ft	
Bieger_P_channel_cross_sectional_area	75.5	ft^2	
Bieger_USA_channel_width	21.2	ft	
Bieger_USA_channel_depth	1.67	ft	
Bieger_USA_channel_cross_sectional_area	39	ft^2	

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_

August Flow-Duration Statistics

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	0.494	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.18	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SE	ASEp
August 50 Percent Duration	0.746	ft^3/s	0.192	2.84	33.2	33.2

August Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Probability Statistics

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.61	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	29.53	percent	0	100
FOREST	Percent Forest	29.59	percent	0	100
MAREGION	Massachusetts Region	0	dimensionless	0	1

Probability Statistics Disclaimers [Perennial Flow Probability]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Probability Statistics Flow Report [Perennial Flow Probability]

Statistic	Value	Unit
Probability Stream Flowing Perennially	0.981	dim

Probability Statistics Citations

Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

Application Version: 4.11.1

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	70.941 degrees West
Latitude	42.192 degrees North
Elevation	0 feet
Date/Time	Fri, 16 Dec 2022 14:52:52 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.44	0.54	0.71	0.89	1.12	**1yr**	0.77	1.06	1.30	1.66	2.12	2.73	3.07	**1yr**	2.41	2.95	3.43	4.03	4.80	**1yr**
2yr	0.36	0.55	0.68	0.90	1.13	1.43	**2yr**	0.98	1.31	1.65	2.08	2.63	3.32	3.69	**2yr**	2.93	3.55	4.08	4.84	5.47	**2yr**
5yr	0.43	0.67	0.83	1.12	1.43	1.82	**5yr**	1.23	1.65	2.11	2.65	3.32	4.15	4.70	**5yr**	3.67	4.52	5.16	6.11	6.81	**5yr**
10yr	0.49	0.76	0.97	1.31	1.70	2.18	**10yr**	1.47	1.96	2.54	3.19	3.97	4.91	5.64	**10yr**	4.35	5.42	6.18	7.29	8.03	**10yr**
25yr	0.58	0.92	1.17	1.62	2.15	2.78	**25yr**	1.86	2.47	3.25	4.06	5.02	6.15	7.18	**25yr**	5.44	6.91	7.85	9.21	10.00	**25yr**
50yr	0.66	1.07	1.37	1.92	2.58	3.35	**50yr**	2.23	2.93	3.91	4.87	5.99	7.30	8.63	**50yr**	6.46	8.30	9.40	11.01	11.81	**50yr**
100yr	0.76	1.24	1.60	2.26	3.09	4.03	**100yr**	2.66	3.49	4.70	5.85	7.17	8.66	10.38	**100yr**	7.67	9.98	11.27	13.15	13.95	**100yr**
200yr	0.88	1.44	1.87	2.68	3.70	4.84	**200yr**	3.19	4.15	5.66	7.03	8.56	10.29	12.49	**200yr**	9.10	12.01	13.51	15.72	16.49	**200yr**
500yr	1.08	1.78	2.31	3.36	4.70	6.18	**500yr**	4.06	5.23	7.22	8.94	10.84	12.93	15.96	**500yr**	11.44	15.34	17.19	19.90	20.58	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.48	0.64	0.79	0.88	**1yr**	0.68	0.86	1.15	1.44	1.84	2.53	2.84	**1yr**	2.24	2.73	2.98	3.58	4.33	**1yr**
2yr	0.34	0.52	0.64	0.87	1.08	1.29	**2yr**	0.93	1.26	1.49	1.97	2.55	3.19	3.58	**2yr**	2.82	3.45	3.95	4.68	5.30	**2yr**
5yr	0.40	0.62	0.77	1.05	1.34	1.54	**5yr**	1.15	1.51	1.76	2.30	2.96	3.88	4.36	**5yr**	3.44	4.19	4.77	5.60	6.31	**5yr**
10yr	0.45	0.69	0.85	1.19	1.54	1.77	**10yr**	1.33	1.73	2.00	2.59	3.31	4.48	5.04	**10yr**	3.96	4.85	5.49	6.40	7.21	**10yr**
25yr	0.52	0.79	0.99	1.41	1.85	2.10	**25yr**	1.60	2.05	2.35	3.02	3.84	5.39	6.13	**25yr**	4.77	5.89	6.60	7.65	8.62	**25yr**
50yr	0.58	0.89	1.10	1.59	2.14	2.39	**50yr**	1.84	2.34	2.65	3.39	4.30	6.22	7.11	**50yr**	5.51	6.84	7.59	8.74	9.89	**50yr**
100yr	0.66	1.00	1.25	1.80	2.48	2.71	**100yr**	2.14	2.65	2.98	3.82	4.80	7.19	8.26	**100yr**	6.36	7.94	8.77	9.97	11.37	**100yr**
200yr	0.75	1.13	1.43	2.07	2.88	3.09	**200yr**	2.49	3.02	3.36	4.28	5.37	8.33	9.63	**200yr**	7.37	9.26	10.18	11.40	13.08	**200yr**
500yr	0.89	1.32	1.70	2.47	3.51	3.66	**500yr**	3.03	3.57	3.92	4.99	6.23	10.19	11.83	**500yr**	9.02	11.38	12.34	13.64	15.81	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.59	0.79	0.97	1.15	**1yr**	0.84	1.12	1.36	1.82	2.33	2.93	3.39	**1yr**	2.59	3.26	3.69	4.40	5.17	**1yr**
2yr	0.37	0.57	0.70	0.95	1.17	1.39	**2yr**	1.01	1.36	1.61	2.12	2.74	3.44	3.86	**2yr**	3.05	3.71	4.27	5.04	5.67	**2yr**
5yr	0.47	0.72	0.89	1.22	1.56	1.83	**5yr**	1.34	1.79	2.12	2.74	3.48	4.44	5.05	**5yr**	3.93	4.86	5.56	6.58	7.32	**5yr**
10yr	0.57	0.88	1.09	1.52	1.97	2.26	**10yr**	1.70	2.21	2.61	3.34	4.19	5.47	6.23	**10yr**	4.84	5.99	6.83	8.09	8.89	**10yr**
25yr	0.75	1.14	1.42	2.03	2.67	2.99	**25yr**	2.31	2.93	3.48	4.34	5.36	7.18	8.21	**25yr**	6.35	7.89	9.00	10.62	11.45	**25yr**
50yr	0.92	1.40	1.74	2.50	3.37	3.71	**50yr**	2.90	3.63	4.32	5.29	6.46	8.81	10.12	**50yr**	7.80	9.73	11.10	13.03	13.87	**50yr**
100yr	1.13	1.71	2.14	3.10	4.25	4.59	**100yr**	3.67	4.49	5.37	6.46	7.80	10.79	12.46	**100yr**	9.55	11.99	13.67	16.00	16.79	**100yr**
200yr	1.39	2.09	2.65	3.84	5.35	5.69	**200yr**	4.62	5.57	6.69	7.87	9.41	13.22	15.36	**200yr**	11.70	14.77	16.80	19.66	20.33	**200yr**
500yr	1.83	2.73	3.51	5.10	7.26	7.56	**500yr**	6.26	7.39	8.96	10.26	12.09	17.25	20.22	**500yr**	15.26	19.44	22.04	25.77	26.16	**500yr**

Old Swamp River Dam Removal

Summary of Hydrology Data

12/12/2022

Weymouth, MA

SLR No. 12688.00058

USGS Streamstats

Flooding Source and Location	Drainage Area (SM)	50%	20%	10%	4%	2%	1%	0.20%
Old Swamp River (USGS Gage 01105600)	4.6	113	185	241	322	389	460	645

Stream Gages

				Peak Discharges (CFS) from HEC-SSP Bulletin 17C						
Location	Gage Number	Drainage Area (SM)	Years of Record	50%	20%	10%	4%	2%	1%	0.20%
Old Swamp River near South Weymouth, MA (Rte 3)	01105600	4.5	55	181.4	299.1	389.1	516.1	620	731.6	1024.6

Note: Gauge data was not adjusted based on drainage area due to the gauge's close proximity to the project site.

FEMA FIS Discharges

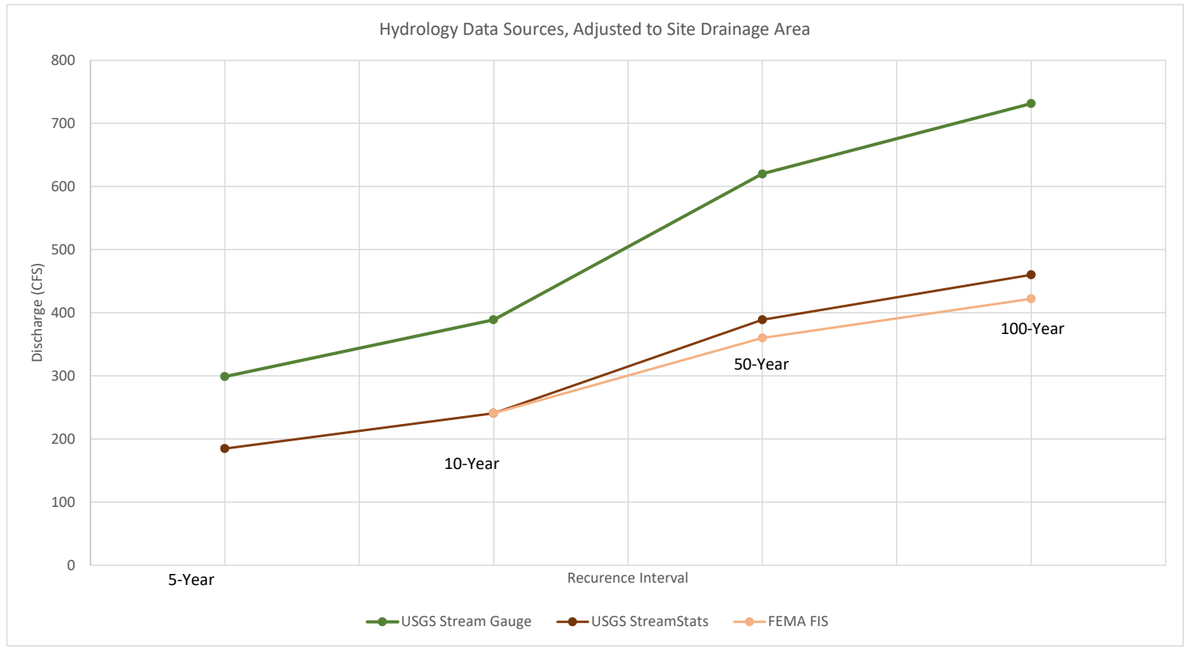
Location	Drainage Area (SM)	50%	20%	10%	4%	2%	1%	0.20%
At Libbey Industrial Parkway	4.9			241		360	422	657

Note: FEMA used regression equations (Johnson and Tasker 1974)

Summary Table

	5-Yr	10-Yr	50-Yr	100-Yr
Good Match to Local Watershed				
USGS Stream Gage	299	389	620	732
Moderate Match to Local Watershed				
USGS StreamStats	185	241	389	460
FEMA FIS		241	360	422
Poor Match to Local Watershed				

* Flows from these stream gages were adjusted based on drainage area.



Duration Analysis
   03 Mar 2023   11:38 AM

--- Input Data ---

Analysis Name: Monthly Exceedance
Description:

Data Set Name: OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW
DSS File Name:
W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River\Old_Swamp_River.ds
s
DSS Pathname: /OLD SWAMP RIVER/SOUTH WEYMOUTH, MA/FLOW//1DAY/USGS/

Project Path: W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River
Report File Name:
W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River\DurationAnalysisRe
sults\Monthly_Exceedance\Monthly_Exceedance.rpt
Result File Name:
W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River\DurationAnalysisRe
sults\Monthly_Exceedance\Monthly_Exceedance.xml

Duration Analysis Method: Standard

Duration Plot Position Method: Rank/(N+1)

X-Axis Scale: Linear

Y-Axis Scale: Linear

Duration Period: Monthly

Use User-Specified Percent Exceedance
Percent Exceedance: 95.0
Percent Exceedance: 50.0
Percent Exceedance: 5.0

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---

January Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Jan - 31Jan

Number Valid Values:	1736
Number Missing Values:	0
Minimum Value:	1.5
Maximum Value:	209.0

Percent of Time Exceeded	FLOW CFS
95.0	3.0
50.0	7.4
5.0	33.7

February Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Feb - 29Feb

Number Valid Values:	1582
Number Missing Values:	0
Minimum Value:	1.7
Maximum Value:	153.0

Percent of Time Exceeded	FLOW CFS
95.0	3.3
50.0	8.4
5.0	36.4

March Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Mar - 31Mar

Number Valid Values:	1736

Number Missing Values: 0

Minimum Value: 2.5
Maximum Value: 361.0

Percent of Time Exceeded	FLOW CFS
95.0	4.3
50.0	10.0
5.0	47.0

April Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Apr - 30Apr

Number Valid Values: 1680
Number Missing Values: 0

Minimum Value: 1.4
Maximum Value: 199.0

Percent of Time Exceeded	FLOW CFS
95.0	3.7
50.0	9.0
5.0	40.0

May Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01May - 31May

Number Valid Values: 1748
Number Missing Values: 0

Minimum Value: 1.3
Maximum Value: 271.0

Percent of Time Exceeded	FLOW CFS
95.0	2.6
50.0	6.2
5.0	26.5

June Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Jun - 30Jun

Number Valid Values: 1710
Number Missing Values: 0

Minimum Value: 0.3
Maximum Value: 322.0

Percent of Time Exceeded	FLOW CFS
95.0	0.8
50.0	3.3
5.0	21.2

July Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Jul - 31Jul

Number Valid Values: 1767
Number Missing Values: 0

Minimum Value: 0.1
Maximum Value: 93.0

Percent of	FLOW

Time Exceeded	CFS
95.0	0.2
50.0	1.4
5.0	12.0

August Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Aug - 31Aug

Number Valid Values: 1767
Number Missing Values: 0

Minimum Value: 0.0
Maximum Value: 83.1

Percent of Time Exceeded	FLOW CFS
95.0	0.2
50.0	1.2
5.0	11.1

September Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Sep - 30Sep

Number Valid Values: 1710
Number Missing Values: 0

Minimum Value: 0.1
Maximum Value: 150.0

Percent of Time Exceeded	FLOW CFS
95.0	0.1
50.0	1.2

5.0	13.0

October Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Oct - 31Oct

Number Valid Values: 1767
Number Missing Values: 0

Minimum Value: 0.1
Maximum Value: 307.0

Percent of Time Exceeded	FLOW CFS
95.0	0.5
50.0	2.7
5.0	21.0

November Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Nov - 30Nov

Number Valid Values: 1710
Number Missing Values: 0

Minimum Value: 0.5
Maximum Value: 144.0

Percent of Time Exceeded	FLOW CFS
95.0	1.4
50.0	5.7
5.0	28.0

December Duration Analysis
OLD SWAMP RIVER-SOUTH WEYMOUTH, MA-FLOW

Time Period: 01Dec - 31Dec

Number Valid Values:	1757
Number Missing Values:	0
Minimum Value:	1.0
Maximum Value:	308.0

Percent of Time Exceeded	FLOW CFS
95.0	2.6
50.0	7.4
5.0	37.1

```
------------------------------
Bulletin 17C (Java) Frequency Analysis
    11 Jan 2023   04:17 PM
------------------------------


--- Input Data ---

Analysis Name: Old Swamp River 17C
Description:

Data Set Name: Old Swamp River Gauge-SOUTH WEYMOUTH, MA-FLOW-ANNUAL PEAK
DSS File Name:
W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River\Old_Swamp_River.ds
s
DSS Pathname: /OLD SWAMP RIVER/SOUTH WEYMOUTH, MA/FLOW-ANNUAL
PEAK/01jan1900/IR-CENTURY/USGS/

Report File Name:
W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River\Bulletin17Results\
Old_Swamp_River_17C\Old_Swamp_River_17C.rpt
XML File Name:
W:\Design\12688.00058-DE\Comps\Hydrology\HEC-SSP\Old_Swamp_River\Bulletin17Results\
Old_Swamp_River_17C\Old_Swamp_River_17C.xml

Start Date:
End Date:

Skew Option: Use Station Skew
Regional Skew: -Infinity
Regional Skew MSE: -Infinity

Plotting Position Type: Hirsch-Stedinger

Upper Confidence Level: 0.05
Lower Confidence Level: 0.95

Use non-standard frequencies
Frequency: 0.2
Frequency: 0.5
Frequency: 1.0
Frequency: 2.0
Frequency: 4.0
Frequency: 10.0
Frequency: 20.0
Frequency: 50.0
Frequency: 66.66
Frequency: 90.0
Frequency: 95.0
Frequency: 99.0
```

Display ordinate values using 1 digits in fraction part of value

--- End of Input Data ---

<< EMA Representation of Data >>
Old Swamp River Gauge-SOUTH WEYMOUTH, MA-FLOW-ANNUAL PEAK

		Value		Threshold		
Year	Peak	Low	High	Low	High	Type
1967	207.0	207.0	207.0	1.0E-99	1.0E99	Syst
1968	566.0	566.0	566.0	1.0E-99	1.0E99	Syst
1969	305.0	305.0	305.0	1.0E-99	1.0E99	Syst
1970	470.0	470.0	470.0	1.0E-99	1.0E99	Syst
1971	103.0	103.0	103.0	1.0E-99	1.0E99	Syst
1972	137.0	137.0	137.0	1.0E-99	1.0E99	Syst
1973	111.0	111.0	111.0	1.0E-99	1.0E99	Syst
1974	300.0	300.0	300.0	1.0E-99	1.0E99	Syst
1975	81.0	81.0	81.0	1.0E-99	1.0E99	Syst
1976	229.0	229.0	229.0	1.0E-99	1.0E99	Syst
1977	130.0	130.0	130.0	1.0E-99	1.0E99	Syst
1978	358.0	358.0	358.0	1.0E-99	1.0E99	Syst
1979	175.0	175.0	175.0	1.0E-99	1.0E99	Syst
1980	93.0	93.0	93.0	1.0E-99	1.0E99	Syst
1981	144.0	144.0	144.0	1.0E-99	1.0E99	Syst
1982	468.0	468.0	468.0	1.0E-99	1.0E99	Syst
1983	323.0	323.0	323.0	1.0E-99	1.0E99	Syst
1984	590.0	590.0	590.0	1.0E-99	1.0E99	Syst
1985	38.0	38.0	38.0	1.0E-99	1.0E99	Syst
1986	89.0	89.0	89.0	1.0E-99	1.0E99	Syst
1987	150.0	150.0	150.0	1.0E-99	1.0E99	Syst
1988	118.0	118.0	118.0	1.0E-99	1.0E99	Syst
1989	75.0	75.0	75.0	1.0E-99	1.0E99	Syst
1990	116.0	116.0	116.0	1.0E-99	1.0E99	Syst
1991	127.0	127.0	127.0	1.0E-99	1.0E99	Syst
1992	157.0	157.0	157.0	1.0E-99	1.0E99	Syst
1993	286.0	286.0	286.0	1.0E-99	1.0E99	Syst
1994	335.0	335.0	335.0	1.0E-99	1.0E99	Syst
1995	178.0	178.0	178.0	1.0E-99	1.0E99	Syst
1996	304.0	304.0	304.0	1.0E-99	1.0E99	Syst
1997	303.0	303.0	303.0	1.0E-99	1.0E99	Syst
1998	224.0	224.0	224.0	1.0E-99	1.0E99	Syst
1999	171.0	171.0	171.0	1.0E-99	1.0E99	Syst
2000	133.0	133.0	133.0	1.0E-99	1.0E99	Syst
2001	290.0	290.0	290.0	1.0E-99	1.0E99	Syst
2002	83.0	83.0	83.0	1.0E-99	1.0E99	Syst
2003	127.0	127.0	127.0	1.0E-99	1.0E99	Syst

2004	171.0	171.0	171.0	1.0E-99	1.0E99	Syst
2005	402.0	402.0	402.0	1.0E-99	1.0E99	Syst
2006	458.0	458.0	458.0	1.0E-99	1.0E99	Syst
2007	193.0	193.0	193.0	1.0E-99	1.0E99	Syst
2008	226.0	226.0	226.0	1.0E-99	1.0E99	Syst
2009	197.0	197.0	197.0	1.0E-99	1.0E99	Syst
2010	399.0	399.0	399.0	1.0E-99	1.0E99	Syst
2011	85.0	85.0	85.0	1.0E-99	1.0E99	Syst
2012	164.0	164.0	164.0	1.0E-99	1.0E99	Syst
2013	146.0	146.0	146.0	1.0E-99	1.0E99	Syst
2014	106.0	106.0	106.0	1.0E-99	1.0E99	Syst
2015	153.0	153.0	153.0	1.0E-99	1.0E99	Syst
2016	94.0	94.0	94.0	1.0E-99	1.0E99	Syst
2017	388.0	388.0	388.0	1.0E-99	1.0E99	Syst
2018	194.0	194.0	194.0	1.0E-99	1.0E99	Syst
2019	142.0	142.0	142.0	1.0E-99	1.0E99	Syst
2020	104.0	104.0	104.0	1.0E-99	1.0E99	Syst
2021	156.0	156.0	156.0	1.0E-99	1.0E99	Syst

Fitted log10 Moments	Mean	Variance	Std Dev	Skew
EMA at-site data w/o regional info	2.260408	0.065766	0.256449	0.038709
EMA w/ regional info and B17b MSE(G)	2.260408	0.065766	0.256449	0.038709
EMA w/ regional info and specified MSE(G)	2.260408	0.065766	0.256449	0.038709

EMA Estimate of MSE[G at-site]	0.096518
MSE[G at-site systematic]	0.096518
Equivalent Record Length [G at-site]	55.000000
Equivalent Record Length [Syst+Hist-LowOutl]	55.000000
Grubbs-Beck Critical Value	0.000000

--- Final Results ---

<< Plotting Positions >>
Old Swamp River Gauge-SOUTH WEYMOUTH, MA-FLOW-ANNUAL PEAK

Events Analyzed		Ordered Events			
Day Mon Year	FLOW CFS	Rank	Water Year	FLOW CFS	H-S Plot Pos
26 May 1967	207.0	1	1984	590.0	1.79
18 Mar 1968	566.0	2	1968	566.0	3.57
25 Mar 1969	305.0	3	1970	470.0	5.36
27 Dec 1969	470.0	4	1982	468.0	7.14
14 Feb 1971	103.0	5	2006	458.0	8.93
03 Mar 1972	137.0	6	2005	402.0	10.71
02 Feb 1973	111.0	7	2010	399.0	12.50
17 Dec 1973	300.0	8	2017	388.0	14.29
03 Apr 1975	81.0	9	1978	358.0	16.07
28 Jan 1976	229.0	10	1994	335.0	17.86
23 Mar 1977	130.0	11	1983	323.0	19.64
26 Jan 1978	358.0	12	1969	305.0	21.43
25 Jan 1979	175.0	13	1996	304.0	23.21
03 Oct 1979	93.0	14	1997	303.0	25.00
26 Feb 1981	144.0	15	1974	300.0	26.79
07 Jun 1982	468.0	16	2001	290.0	28.57
02 Mar 1983	323.0	17	1993	286.0	30.36
31 May 1984	590.0	18	1976	229.0	32.14
03 May 1985	38.0	19	2008	226.0	33.93
27 Jan 1986	89.0	20	1998	224.0	35.71
05 Apr 1987	150.0	21	1967	207.0	37.50
27 Mar 1988	118.0	22	2009	197.0	39.29
12 May 1989	75.0	23	2018	194.0	41.07
04 Apr 1990	116.0	24	2007	193.0	42.86
21 Apr 1991	127.0	25	1995	178.0	44.64
01 Nov 1991	157.0	26	1979	175.0	46.43
13 Dec 1992	286.0	27	2004	171.0	48.21
13 Aug 1994	335.0	28	1999	171.0	50.00
24 Dec 1994	178.0	29	2012	164.0	51.79
19 Jan 1996	304.0	30	1992	157.0	53.57
21 Oct 1996	303.0	31	2021	156.0	55.36
24 Feb 1998	224.0	32	2015	153.0	57.14
03 Feb 1999	171.0	33	1987	150.0	58.93
22 Apr 2000	133.0	34	2013	146.0	60.71
22 Mar 2001	290.0	35	1981	144.0	62.50
14 May 2002	83.0	36	2019	142.0	64.29
12 Apr 2003	127.0	37	1972	137.0	66.07
02 Apr 2004	171.0	38	2000	133.0	67.86
14 Aug 2005	402.0	39	1977	130.0	69.64
15 Oct 2005	458.0	40	2003	127.0	71.43
16 Apr 2007	193.0	41	1991	127.0	73.21
13 Feb 2008	226.0	42	1988	118.0	75.00
12 Dec 2008	197.0	43	1990	116.0	76.79
15 Mar 2010	399.0	44	1973	111.0	78.57
07 Mar 2011	85.0	45	2014	106.0	80.36
10 Aug 2012	164.0	46	2020	104.0	82.14

07 Jun 2013	146.0	47	1971	103.0	83.93
31 Mar 2014	106.0	48	2016	94.0	85.71
10 Dec 2014	153.0	49	1980	93.0	87.50
17 Feb 2016	94.0	50	1986	89.0	89.29
01 Apr 2017	388.0	51	2011	85.0	91.07
02 Mar 2018	194.0	52	2002	83.0	92.86
24 Jan 2019	142.0	53	1975	81.0	94.64
03 Apr 2020	104.0	54	1989	75.0	96.43
01 Jan 2021	156.0	55	1985	38.0	98.21

* Low outlier plotting positions are computed using Median parameters.

<< Frequency Curve >>
Old Swamp River Gauge-SOUTH WEYMOUTH, MA-FLOW-ANNUAL PEAK

Computed Curve FLOW, CFS	Variance Log(EMA)	Percent Chance Exceedance	Confidence Limits 0.05 FLOW, CFS	0.95
1,024.6	0.01614	0.200	2,117.2	716.8
851.7	0.01121	0.500	1,543.0	629.5
731.6	0.00820	1.000	1,204.1	562.3
620.0	0.00578	2.000	930.4	494.0
516.1	0.00394	4.000	709.9	424.5
389.1	0.00233	10.000	484.9	330.5
299.1	0.00168	20.000	354.5	257.9
181.4	0.00137	50.000	209.3	157.3
140.8	0.00140	66.660	162.2	121.4
85.7	0.00209	90.000	100.5	69.4
69.4	0.00303	95.000	83.1	52.6
46.9	0.00706	99.000	60.5	29.6

<< Multiple Grubbs-Beck Test P-Values >>
Old Swamp River Gauge-SOUTH WEYMOUTH, MA-FLOW-ANNUAL PEAK

Number Of Low Outliers	P-Values
1	1.654E-1
2	9.360E-1
3	9.341E-1
4	8.682E-1
5	7.783E-1
6	7.524E-1
7	7.347E-1
8	5.916E-1

9	7.867E-1
10	6.720E-1
11	5.829E-1
12	6.246E-1
13	6.691E-1
14	5.888E-1
15	7.865E-1
16	6.492E-1
17	6.123E-1
18	5.719E-1
19	5.690E-1
20	6.044E-1
21	5.207E-1
22	4.311E-1
23	4.105E-1
24	3.517E-1
25	2.911E-1
26	1.834E-1
27	2.122E-1

* = p-value corresponds to a zero flow value.

<< Systematic Statistics >>
Old Swamp River Gauge-SOUTH WEYMOUTH, MA-FLOW-ANNUAL PEAK

Log Transform: FLOW, CFS		Number of Events	
Mean	2.260	Historic Events	0
Standard Dev	0.256	High Outliers	0
Station Skew	0.039	Low Outliers	0
Regional Skew	---	Zero Events	0
Weighted Skew	---	Missing Events	0
Adopted Skew	0.039	Systematic Events	55

--- End of Analytical Frequency Curve ---

Appendix D HEC-RAS Modeling Results

HEC-RAS River: Old Swamp River Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2341	Bankfull	BT_E-Mix	68.0	74.6	75.6	75.6	75.8	0.015	4.2	23.2	86.5	0.9
Reach 1	2341	Bankfull	BT_P_Mix	68.0	74.6	75.6	75.6	75.8	0.015	4.2	23.2	86.5	0.9
Reach 1	2341	10-year	BT_E-Mix	389.0	74.6	76.8	76.6	77.2	0.010	6.5	128.7	181.1	0.8
Reach 1	2341	10-year	BT_P_Mix	389.0	74.6	76.8	76.6	77.2	0.010	6.5	128.7	181.1	0.8
Reach 1	2341	100-Year+25%	BT_E-Mix	915.0	74.6	78.2	77.3	78.3	0.003	4.9	491.7	224.0	0.5
Reach 1	2341	100-Year+25%	BT_P_Mix	915.0	74.6	78.2	77.3	78.3	0.003	4.9	491.7	224.0	0.5
Reach 1	2341	July 95% Exceeda	BT_E-Mix	0.2	74.6	74.6	74.6	74.6	0.029	0.9	0.2	4.9	0.8
Reach 1	2341	July 95% Exceeda	BT_P_Mix	0.2	74.6	74.6	74.6	74.6	0.029	0.9	0.2	4.9	0.8
Reach 1	2341	April 5% Exceeda	BT_E-Mix	40.0	74.6	75.3	75.3	75.6	0.021	3.9	10.6	41.8	1.0
Reach 1	2341	April 5% Exceeda	BT_P_Mix	40.0	74.6	75.3	75.3	75.6	0.021	3.9	10.6	41.8	1.0
Reach 1	2187	Bankfull	BT_E-Mix	68.0	72.9	74.6	74.0	74.6	0.003	2.2	31.1	33.1	0.4
Reach 1	2187	Bankfull	BT_P_Mix	68.0	72.9	74.6	74.0	74.6	0.003	2.2	30.9	33.0	0.4
Reach 1	2187	10-year	BT_E-Mix	389.0	72.9	76.3	75.3	76.5	0.002	4.0	143.7	117.9	0.4
Reach 1	2187	10-year	BT_P_Mix	389.0	72.9	76.3	75.3	76.5	0.002	4.0	143.7	117.9	0.4
Reach 1	2187	100-Year+25%	BT_E-Mix	915.0	72.9	77.9	76.5	78.1	0.001	4.2	439.5	203.6	0.4
Reach 1	2187	100-Year+25%	BT_P_Mix	915.0	72.9	77.9	76.5	78.1	0.001	4.2	439.5	203.6	0.4
Reach 1	2187	July 95% Exceeda	BT_E-Mix	0.2	72.9	73.0	73.0	73.0	0.005	0.6	0.3	4.4	0.4
Reach 1	2187	July 95% Exceeda	BT_P_Mix	0.2	72.9	73.0	73.0	73.0	0.005	0.6	0.3	4.4	0.4
Reach 1	2187	April 5% Exceeda	BT_E-Mix	40.0	72.9	74.2	73.8	74.3	0.003	1.9	21.4	28.2	0.4
Reach 1	2187	April 5% Exceeda	BT_P_Mix	40.0	72.9	74.2	73.8	74.3	0.003	1.9	20.9	28.0	0.4
Reach 1	1952	Bankfull	BT_E-Mix	68.0	71.9	73.5		73.6	0.007	3.2	21.1	23.4	0.6
Reach 1	1952	Bankfull	BT_P_Mix	68.0	71.9	73.5		73.7	0.006	3.1	21.6	23.7	0.6
Reach 1	1952	10-year	BT_E-Mix	389.0	71.9	75.0	74.6	75.6	0.008	6.3	73.4	53.8	0.7
Reach 1	1952	10-year	BT_P_Mix	389.0	71.9	75.0	74.6	75.6	0.007	6.3	73.5	53.9	0.7
Reach 1	1952	100-Year+25%	BT_E-Mix	915.0	71.9	76.0	76.0	77.2	0.010	9.4	146.9	83.1	0.9
Reach 1	1952	100-Year+25%	BT_P_Mix	915.0	71.9	76.0	76.0	77.2	0.010	9.4	146.9	83.1	0.9
Reach 1	1952	July 95% Exceeda	BT_E-Mix	0.2	71.9	72.1	72.0	72.1	0.003	0.5	0.4	5.1	0.3
Reach 1	1952	July 95% Exceeda	BT_P_Mix	0.2	71.9	72.1	72.0	72.1	0.003	0.5	0.4	5.1	0.3
Reach 1	1952	April 5% Exceeda	BT_E-Mix	40.0	71.9	73.1		73.3	0.007	2.9	13.8	19.4	0.6
Reach 1	1952	April 5% Exceeda	BT_P_Mix	40.0	71.9	73.2		73.3	0.006	2.7	14.9	20.0	0.5
Reach 1	1728	Bankfull	BT_E-Mix	68.0	71.1	72.4		72.5	0.004	2.6	25.9	25.6	0.5
Reach 1	1728	Bankfull	BT_P_Mix	68.0	71.1	72.4		72.5	0.004	2.8	24.6	24.6	0.5
Reach 1	1728	10-year	BT_E-Mix	389.0	71.1	74.0		74.3	0.004	5.0	143.7	121.1	0.6
Reach 1	1728	10-year	BT_P_Mix	389.0	71.1	74.0		74.3	0.004	5.0	143.4	121.1	0.6
Reach 1	1728	100-Year+25%	BT_E-Mix	915.0	71.1	75.7	74.6	75.9	0.002	5.2	402.5	166.9	0.4
Reach 1	1728	100-Year+25%	BT_P_Mix	915.0	71.1	75.7	74.6	75.9	0.002	5.2	403.1	167.0	0.4
Reach 1	1728	July 95% Exceeda	BT_E-Mix	0.2	71.1	71.1	71.1	71.1	0.007	0.4	0.5	13.0	0.4
Reach 1	1728	July 95% Exceeda	BT_P_Mix	0.2	71.1	71.1	71.1	71.1	0.007	0.4	0.5	13.0	0.4
Reach 1	1728	April 5% Exceeda	BT_E-Mix	40.0	71.1	72.1		72.2	0.003	2.1	18.6	22.3	0.4
Reach 1	1728	April 5% Exceeda	BT_P_Mix	40.0	71.1	72.0		72.1	0.005	2.5	16.3	21.3	0.5
Reach 1	1516	Bankfull	BT_E-Mix	68.0	69.7	70.7	70.7	71.1	0.016	4.7	14.5	17.5	0.9
Reach 1	1516	Bankfull	BT_P_Mix	68.0	69.7	70.8		71.1	0.011	4.1	16.6	17.8	0.7
Reach 1	1516	10-year	BT_E-Mix	389.0	69.7	72.8		73.3	0.006	6.1	104.1	73.3	0.6
Reach 1	1516	10-year	BT_P_Mix	389.0	69.7	72.8		73.3	0.006	6.1	104.9	73.5	0.6
Reach 1	1516	100-Year+25%	BT_E-Mix	915.0	69.7	75.2		75.5	0.002	5.4	364.0	158.8	0.4
Reach 1	1516	100-Year+25%	BT_P_Mix	915.0	69.7	75.2		75.5	0.002	5.4	365.3	158.9	0.4
Reach 1	1516	July 95% Exceeda	BT_E-Mix	0.2	69.7	69.8	69.7	69.8	0.006	0.5	0.4	6.2	0.4
Reach 1	1516	July 95% Exceeda	BT_P_Mix	0.2	69.7	69.8	69.7	69.8	0.006	0.5	0.4	6.2	0.4
Reach 1	1516	April 5% Exceeda	BT_E-Mix	40.0	69.7	70.4	70.4	70.7	0.022	4.2	9.5	16.9	1.0
Reach 1	1516	April 5% Exceeda	BT_P_Mix	40.0	69.7	70.6		70.8	0.008	3.1	12.9	17.3	0.6
Reach 1	1394	Bankfull	BT_E-Mix	68.0	68.3	70.2		70.3	0.003	2.5	27.3	25.4	0.4
Reach 1	1394	Bankfull	BT_P_Mix	68.0	68.3	69.9		70.1	0.006	3.3	20.3	20.0	0.6
Reach 1	1394	10-year	BT_E-Mix	389.0	68.3	72.5		72.8	0.002	4.3	137.7	88.2	0.4
Reach 1	1394	10-year	BT_P_Mix	389.0	68.3	72.5		72.8	0.002	4.3	139.0	88.8	0.4
Reach 1	1394	100-Year+25%	BT_E-Mix	915.0	68.3	75.1		75.3	0.001	4.1	525.3	180.5	0.3
Reach 1	1394	100-Year+25%	BT_P_Mix	915.0	68.3	75.2		75.3	0.001	4.1	526.8	180.7	0.3
Reach 1	1394	July 95% Exceeda	BT_E-Mix	0.2	68.3	68.4	68.4	68.4	0.032	1.2	0.2	2.6	0.8
Reach 1	1394	July 95% Exceeda	BT_P_Mix	0.2	68.3	68.4	68.4	68.4	0.032	1.2	0.2	2.6	0.8
Reach 1	1394	April 5% Exceeda	BT_E-Mix	40.0	68.3	69.9		69.9	0.003	2.1	18.9	19.5	0.4
Reach 1	1394	April 5% Exceeda	BT_P_Mix	40.0	68.3	69.5		69.7	0.010	3.3	12.1	17.6	0.7
Reach 1	1359	Bankfull	BT_E-Mix	68.0	67.7	70.2	69.2	70.3	0.002	2.5	27.7	17.4	0.3
Reach 1	1359	Bankfull	BT_P_Mix	68.0	67.7	69.7	69.2	69.9	0.005	3.3	20.6	15.8	0.5
Reach 1	1359	10-year	BT_E-Mix	389.0	67.7	72.4	71.2	72.7	0.003	5.0	121.0	69.1	0.5
Reach 1	1359	10-year	BT_P_Mix	389.0	67.7	72.4	71.2	72.7	0.003	5.0	122.3	69.5	0.5
Reach 1	1359	100-Year+25%	BT_E-Mix	915.0	67.7	75.0	72.9	75.3	0.002	5.3	366.5	167.1	0.4
Reach 1	1359	100-Year+25%	BT_P_Mix	915.0	67.7	75.0	72.9	75.3	0.002	5.2	367.5	167.2	0.4
Reach 1	1359	July 95% Exceeda	BT_E-Mix	0.2	67.7	67.9	67.9	67.9	0.008	0.7	0.3	3.0	0.4
Reach 1	1359	July 95% Exceeda	BT_P_Mix	0.2	67.7	67.9	67.9	67.9	0.008	0.7	0.3	3.0	0.4
Reach 1	1359	April 5% Exceeda	BT_E-Mix	40.0	67.7	69.8	68.9	69.9	0.001	1.9	21.5	16.0	0.3
Reach 1	1359	April 5% Exceeda	BT_P_Mix	40.0	67.7	69.3	68.9	69.4	0.005	3.0	13.3	13.7	0.5
Reach 1	1319	Bankfull	BT_E-Mix	68.0	67.8	70.2	68.5	70.2	0.000	1.5	46.0	20.6	0.2
Reach 1	1319	Bankfull	BT_P_Mix	68.0	67.8	69.7	68.5	69.8	0.001	1.8	37.2	20.1	0.2
Reach 1	1319	10-year	BT_E-Mix	389.0	67.8	72.3	70.2	72.6	0.002	4.2	92.2	22.9	0.4
Reach 1	1319	10-year	BT_P_Mix	389.0	67.8	72.3	70.2	72.6	0.002	4.2	92.6	22.9	0.4
Reach 1	1319	100-Year+25%	BT_E-Mix	915.0	67.8	74.5	71.9	75.1	0.002	6.1	186.5	70.6	0.4
Reach 1	1319	100-Year+25%	BT_P_Mix	915.0	67.8	74.6	71.9	75.1	0.002	6.1	187.2	70.8	0.4

HEC-RAS River: Old Swamp River Reach: Reach 1 (Continued)

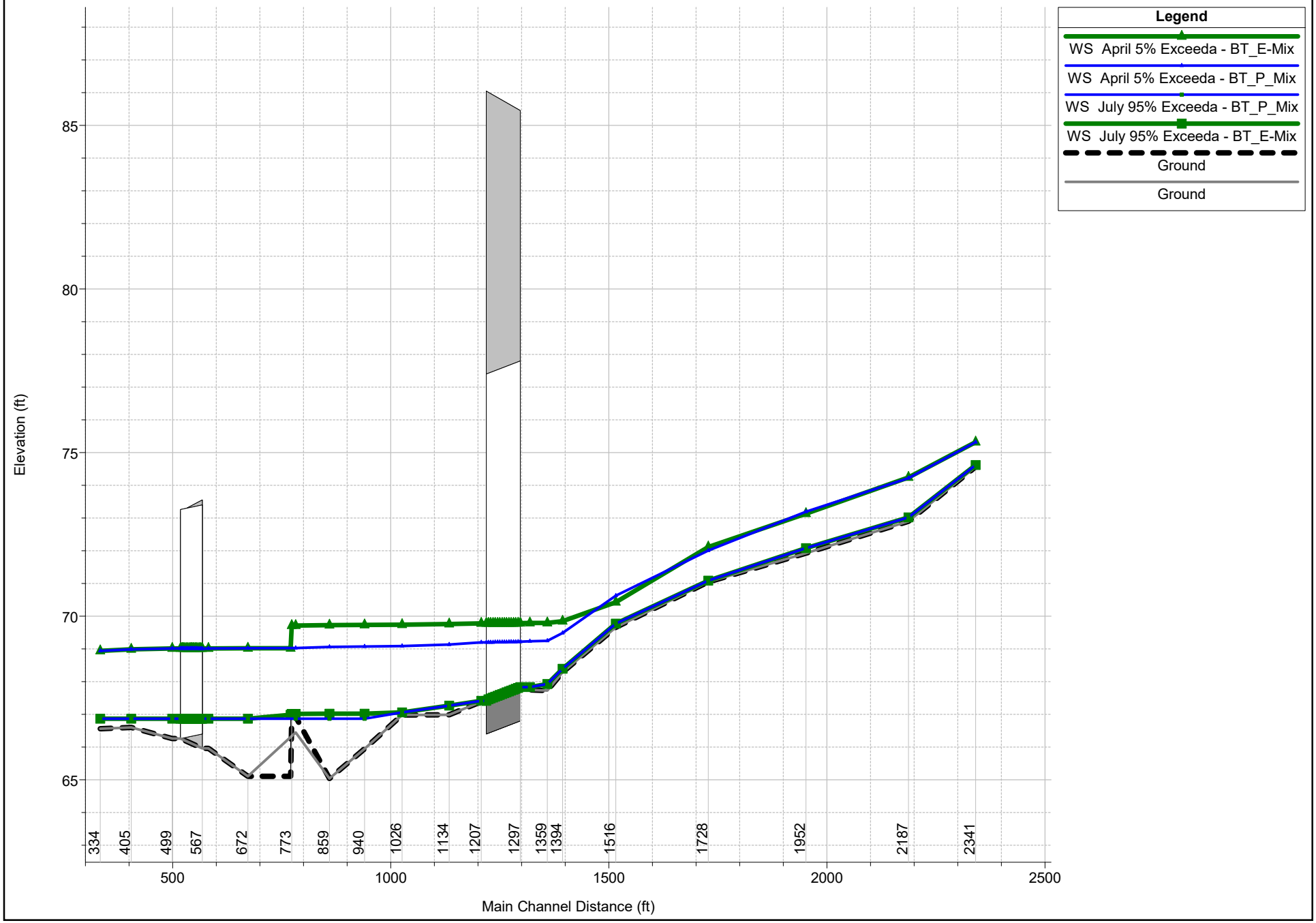
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1319	July 95% Exceeda	BT_E-Mix	0.2	67.8	67.8	67.8	67.8	0.001	0.2	1.0	18.1	0.2
Reach 1	1319	July 95% Exceeda	BT_P_Mix	0.2	67.8	67.8	67.8	67.8	0.001	0.2	1.0	18.1	0.2
Reach 1	1319	April 5% Exceeda	BT_E-Mix	40.0	67.8	69.8	68.3	69.8	0.000	1.0	38.4	20.2	0.1
Reach 1	1319	April 5% Exceeda	BT_P_Mix	40.0	67.8	69.2	68.3	69.3	0.001	1.5	27.3	19.6	0.2
Reach 1	1297			Culvert									
Reach 1	1207	Bankfull	BT_E-Mix	68.0	67.4	70.1	68.2	70.2	0.000	1.2	56.0	22.8	0.1
Reach 1	1207	Bankfull	BT_P_Mix	68.0	67.4	69.7	68.2	69.7	0.001	1.5	45.8	22.1	0.2
Reach 1	1207	10-year	BT_E-Mix	389.0	67.4	72.0	69.7	72.3	0.001	3.8	112.0	47.8	0.3
Reach 1	1207	10-year	BT_P_Mix	389.0	67.4	72.1	69.7	72.3	0.001	3.8	112.8	48.1	0.3
Reach 1	1207	100-Year+25%	BT_E-Mix	915.0	67.4	73.6	71.5	74.2	0.003	6.3	170.9	70.8	0.5
Reach 1	1207	100-Year+25%	BT_P_Mix	915.0	67.4	73.6	71.5	74.2	0.002	6.3	171.6	70.9	0.5
Reach 1	1207	July 95% Exceeda	BT_E-Mix	0.2	67.4	67.4	67.4	67.4	0.085	0.7	0.3	18.1	1.1
Reach 1	1207	July 95% Exceeda	BT_P_Mix	0.2	67.4	67.4	67.4	67.4	0.085	0.7	0.3	18.1	1.1
Reach 1	1207	April 5% Exceeda	BT_E-Mix	40.0	67.4	69.8	67.9	69.8	0.000	0.8	47.9	22.2	0.1
Reach 1	1207	April 5% Exceeda	BT_P_Mix	40.0	67.4	69.2	67.9	69.2	0.000	1.1	35.4	21.2	0.2
Reach 1	1134	Bankfull	BT_E-Mix	68.0	67.0	70.1		70.1	0.000	1.4	49.8	27.0	0.2
Reach 1	1134	Bankfull	BT_P_Mix	68.0	67.0	69.6		69.7	0.001	1.8	36.9	25.2	0.3
Reach 1	1134	10-year	BT_E-Mix	389.0	67.0	71.9		72.1	0.002	3.8	115.3	46.3	0.4
Reach 1	1134	10-year	BT_P_Mix	389.0	67.0	71.9		72.2	0.002	3.7	116.5	47.3	0.3
Reach 1	1134	100-Year+25%	BT_E-Mix	915.0	67.0	73.5		73.9	0.003	5.7	261.4	163.0	0.4
Reach 1	1134	100-Year+25%	BT_P_Mix	915.0	67.0	73.5		73.9	0.003	5.7	265.1	164.7	0.4
Reach 1	1134	July 95% Exceeda	BT_E-Mix	0.2	67.0	67.3	67.1	67.3	0.001	0.3	0.6	4.1	0.1
Reach 1	1134	July 95% Exceeda	BT_P_Mix	0.2	67.0	67.3	67.1	67.3	0.001	0.3	0.6	4.1	0.1
Reach 1	1134	April 5% Exceeda	BT_E-Mix	40.0	67.0	69.8		69.8	0.000	1.0	40.7	25.7	0.1
Reach 1	1134	April 5% Exceeda	BT_P_Mix	40.0	67.0	69.1		69.2	0.001	1.6	25.5	22.4	0.3
Reach 1	1026	Bankfull	BT_E-Mix	68.0	67.0	70.1	68.2	70.1	0.000	1.1	59.8	30.8	0.1
Reach 1	1026	Bankfull	BT_P_Mix	68.0	67.0	69.6	68.2	69.6	0.000	1.5	44.8	26.0	0.2
Reach 1	1026	10-year	BT_E-Mix	389.0	67.0	71.8	69.8	72.0	0.001	3.1	128.1	60.9	0.3
Reach 1	1026	10-year	BT_P_Mix	389.0	67.0	71.9	69.8	72.0	0.001	3.1	129.9	61.9	0.3
Reach 1	1026	100-Year+25%	BT_E-Mix	915.0	67.0	73.4	71.2	73.7	0.001	4.4	335.3	249.8	0.4
Reach 1	1026	100-Year+25%	BT_P_Mix	915.0	67.0	73.4	71.2	73.7	0.001	4.3	340.6	252.3	0.4
Reach 1	1026	July 95% Exceeda	BT_E-Mix	0.2	67.0	67.1	67.1	67.1	0.035	1.1	0.2	4.3	1.0
Reach 1	1026	July 95% Exceeda	BT_P_Mix	0.2	67.0	67.1	67.1	67.1	0.035	1.1	0.2	4.3	1.0
Reach 1	1026	April 5% Exceeda	BT_E-Mix	40.0	67.0	69.7	67.9	69.8	0.000	0.8	49.9	28.0	0.1
Reach 1	1026	April 5% Exceeda	BT_P_Mix	40.0	67.0	69.1	67.9	69.1	0.000	1.2	33.3	23.6	0.2
Reach 1	940	Bankfull	BT_E-Mix	68.0	66.0	70.1	67.4	70.1	0.000	1.0	69.4	29.2	0.1
Reach 1	940	Bankfull	BT_P_Mix	68.0	66.0	69.5	67.4	69.6	0.000	1.2	55.0	25.2	0.1
Reach 1	940	10-year	BT_E-Mix	389.0	66.0	71.7	69.3	71.9	0.001	3.3	128.7	103.1	0.3
Reach 1	940	10-year	BT_P_Mix	389.0	66.0	71.8	69.3	71.9	0.001	3.3	130.1	103.6	0.3
Reach 1	940	100-Year+25%	BT_E-Mix	915.0	66.0	73.1	70.8	73.5	0.002	5.7	195.5	185.0	0.4
Reach 1	940	100-Year+25%	BT_P_Mix	915.0	66.0	73.1	70.8	73.6	0.002	5.7	197.7	187.5	0.4
Reach 1	940	July 95% Exceeda	BT_E-Mix	0.2	66.0	67.0	66.0	67.0	0.000	0.0	7.5	11.9	0.0
Reach 1	940	July 95% Exceeda	BT_P_Mix	0.2	66.0	66.9	66.0	66.9	0.000	0.0	5.8	10.8	0.0
Reach 1	940	April 5% Exceeda	BT_E-Mix	40.0	66.0	69.7	67.1	69.7	0.000	0.7	60.3	26.7	0.1
Reach 1	940	April 5% Exceeda	BT_P_Mix	40.0	66.0	69.1	67.1	69.1	0.000	0.9	44.0	23.0	0.1
Reach 1	859	Bankfull	BT_E-Mix	68.0	65.0	70.0		70.1	0.000	1.1	62.4	22.6	0.1
Reach 1	859	Bankfull	BT_P_Mix	68.0	65.0	69.5		69.5	0.000	1.3	51.3	19.2	0.1
Reach 1	859	10-year	BT_E-Mix	389.0	65.0	71.7		71.8	0.001	2.8	190.7	120.2	0.3
Reach 1	859	10-year	BT_P_Mix	389.0	65.0	71.7		71.8	0.001	2.8	195.2	125.6	0.3
Reach 1	859	100-Year+25%	BT_E-Mix	915.0	65.0	73.2		73.3	0.001	3.2	504.9	342.3	0.2
Reach 1	859	100-Year+25%	BT_P_Mix	915.0	65.0	73.3		73.4	0.001	3.1	517.2	353.2	0.2
Reach 1	859	July 95% Exceeda	BT_E-Mix	0.2	65.0	67.0		67.0	0.000	0.0	13.1	11.1	0.0
Reach 1	859	July 95% Exceeda	BT_P_Mix	0.2	65.0	66.9		66.9	0.000	0.0	11.5	10.5	0.0
Reach 1	859	April 5% Exceeda	BT_E-Mix	40.0	65.0	69.7		69.7	0.000	0.7	55.6	20.3	0.1
Reach 1	859	April 5% Exceeda	BT_P_Mix	40.0	65.0	69.1		69.1	0.000	0.9	43.0	17.8	0.1
Reach 1	782	Bankfull	BT_E-Mix	68.0	66.9	70.0	68.3	70.0	0.000	1.4	61.8	80.6	0.2
Reach 1	782	Bankfull	BT_P_Mix	68.0	66.5	69.5		69.5	0.001	1.6	42.0	29.5	0.2
Reach 1	782	10-year	BT_E-Mix	389.0	66.9	71.7	70.3	71.7	0.001	2.4	322.4	259.3	0.2
Reach 1	782	10-year	BT_P_Mix	389.0	66.5	71.7		71.7	0.001	1.6	355.3	266.0	0.2
Reach 1	782	100-Year+25%	BT_E-Mix	915.0	66.9	73.2	71.1	73.3	0.000	2.7	801.7	390.7	0.2
Reach 1	782	100-Year+25%	BT_P_Mix	915.0	66.5	73.3		73.3	0.000	1.6	845.2	394.6	0.1
Reach 1	782	July 95% Exceeda	BT_E-Mix	0.2	66.9	67.0	67.0	67.0	0.003	0.5	0.4	4.5	0.3
Reach 1	782	July 95% Exceeda	BT_P_Mix	0.2	66.5	66.9		66.9	0.000	0.1	1.6	4.7	0.0
Reach 1	782	April 5% Exceeda	BT_E-Mix	40.0	66.9	69.7	68.0	69.7	0.000	1.0	43.1	43.5	0.1
Reach 1	782	April 5% Exceeda	BT_P_Mix	40.0	66.5	69.0		69.1	0.000	1.3	31.0	23.2	0.2
Reach 1	773			Inl Struct									
Reach 1	672	Bankfull	BT_E-Mix	68.0	65.1	69.4		69.5	0.000	1.1	66.2	60.3	0.1
Reach 1	672	Bankfull	BT_P_Mix	68.0	65.1	69.4		69.5	0.000	1.1	65.9	58.9	0.1
Reach 1	672	10-year	BT_E-Mix	389.0	65.1	71.7		71.7	0.000	1.7	426.1	232.2	0.1
Reach 1	672	10-year	BT_P_Mix	389.0	65.1	71.7		71.7	0.000	1.7	425.4	232.1	0.1
Reach 1	672	100-Year+25%	BT_E-Mix	915.0	65.1	73.2		73.2	0.000	2.0	911.3	395.1	0.1
Reach 1	672	100-Year+25%	BT_P_Mix	915.0	65.1	73.2		73.2	0.000	2.0	911.3	395.1	0.1
Reach 1	672	July 95% Exceeda	BT_E-Mix	0.2	65.1	66.9		66.9	0.000	0.0	15.4	14.1	0.0
Reach 1	672	July 95% Exceeda	BT_P_Mix	0.2	65.1	66.9		66.9	0.000	0.0	15.4	14.1	0.0

HEC-RAS River: Old Swamp River Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	672	April 5% Exceeda	BT_E-Mix	40.0	65.1	69.0		69.0	0.000	0.7	54.3	21.6	0.1
Reach 1	672	April 5% Exceeda	BT_P_Mix	40.0	65.1	69.0		69.0	0.000	0.7	54.3	21.6	0.1
Reach 1	582	Bankfull	BT_E-Mix	68.0	66.0	69.4	67.0	69.4	0.000	0.7	99.8	40.8	0.1
Reach 1	582	Bankfull	BT_P_Mix	68.0	66.0	69.4	67.0	69.4	0.000	0.7	99.7	40.8	0.1
Reach 1	582	10-year	BT_E-Mix	389.0	66.0	71.6	68.3	71.7	0.000	2.0	201.0	222.8	0.2
Reach 1	582	10-year	BT_P_Mix	389.0	66.0	71.6	68.3	71.7	0.000	2.0	200.8	222.7	0.2
Reach 1	582	100-Year+25%	BT_E-Mix	915.0	66.0	73.0	69.5	73.2	0.001	3.6	274.1	328.4	0.3
Reach 1	582	100-Year+25%	BT_P_Mix	915.0	66.0	73.0	69.5	73.2	0.001	3.6	274.1	328.4	0.3
Reach 1	582	July 95% Exceeda	BT_E-Mix	0.2	66.0	66.9	66.0	66.9	0.000	0.0	11.8	24.0	0.0
Reach 1	582	July 95% Exceeda	BT_P_Mix	0.2	66.0	66.9	66.0	66.9	0.000	0.0	11.8	24.0	0.0
Reach 1	582	April 5% Exceeda	BT_E-Mix	40.0	66.0	69.0	66.8	69.0	0.000	0.5	83.1	38.9	0.1
Reach 1	582	April 5% Exceeda	BT_P_Mix	40.0	66.0	69.0	66.8	69.0	0.000	0.5	83.0	38.8	0.1
Reach 1	567			Culvert									
Reach 1	499	Bankfull	BT_E-Mix	68.0	66.3	69.4	66.9	69.4	0.000	0.6	109.5	44.8	0.1
Reach 1	499	Bankfull	BT_P_Mix	68.0	66.3	69.4	66.9	69.4	0.000	0.6	109.3	44.7	0.1
Reach 1	499	10-year	BT_E-Mix	389.0	66.3	71.5	68.1	71.5	0.000	1.9	224.8	542.7	0.2
Reach 1	499	10-year	BT_P_Mix	389.0	66.3	71.5	68.1	71.5	0.000	1.9	224.5	542.0	0.2
Reach 1	499	100-Year+25%	BT_E-Mix	915.0	66.3	72.4	69.3	72.6	0.001	3.6	287.1	645.3	0.3
Reach 1	499	100-Year+25%	BT_P_Mix	915.0	66.3	72.4	69.3	72.6	0.001	3.6	287.1	645.3	0.3
Reach 1	499	July 95% Exceeda	BT_E-Mix	0.2	66.3	66.9	66.3	66.9	0.000	0.0	16.4	28.7	0.0
Reach 1	499	July 95% Exceeda	BT_P_Mix	0.2	66.3	66.9	66.3	66.9	0.000	0.0	16.4	28.7	0.0
Reach 1	499	April 5% Exceeda	BT_E-Mix	40.0	66.3	69.0	66.7	69.0	0.000	0.4	91.4	42.1	0.1
Reach 1	499	April 5% Exceeda	BT_P_Mix	40.0	66.3	69.0	66.7	69.0	0.000	0.4	91.4	42.1	0.1
Reach 1	405	Bankfull	BT_E-Mix	68.0	66.6	69.4	67.6	69.4	0.000	1.2	54.9	95.0	0.2
Reach 1	405	Bankfull	BT_P_Mix	68.0	66.6	69.4		69.4	0.000	1.2	76.1	95.3	0.2
Reach 1	405	10-year	BT_E-Mix	389.0	66.6	71.5	69.3	71.5	0.000	1.6	726.9	574.2	0.1
Reach 1	405	10-year	BT_P_Mix	389.0	66.6	71.5		71.5	0.000	1.5	857.7	574.3	0.1
Reach 1	405	100-Year+25%	BT_E-Mix	915.0	66.6	72.5	70.7	72.5	0.000	2.0	1461.6	616.6	0.2
Reach 1	405	100-Year+25%	BT_P_Mix	915.0	66.6	72.5		72.5	0.000	2.0	1461.6	616.6	0.2
Reach 1	405	July 95% Exceeda	BT_E-Mix	0.2	66.6	66.9	66.6	66.9	0.000	0.1	3.1	12.4	0.0
Reach 1	405	July 95% Exceeda	BT_P_Mix	0.2	66.6	66.9		66.9	0.000	0.1	3.1	12.4	0.0
Reach 1	405	April 5% Exceeda	BT_E-Mix	40.0	66.6	69.0	67.3	69.0	0.000	0.9	43.6	54.5	0.1
Reach 1	405	April 5% Exceeda	BT_P_Mix	40.0	66.6	69.0		69.0	0.000	0.9	49.1	54.5	0.1
Reach 1	334	Bankfull	BT_E-Mix	68.0	66.6	69.3	68.2	69.4	0.001	1.6	52.2	77.7	0.3
Reach 1	334	Bankfull	BT_P_Mix	68.0	66.6	69.3	68.2	69.4	0.001	1.6	52.2	77.7	0.3
Reach 1	334	10-year	BT_E-Mix	389.0	66.6	71.4	69.8	71.4	0.001	2.7	294.6	520.0	0.3
Reach 1	334	10-year	BT_P_Mix	389.0	66.6	71.4	69.8	71.4	0.001	2.7	294.6	520.0	0.3
Reach 1	334	100-Year+25%	BT_E-Mix	915.0	66.6	72.4	70.8	72.4	0.001	3.1	749.5	547.2	0.3
Reach 1	334	100-Year+25%	BT_P_Mix	915.0	66.6	72.4	70.8	72.4	0.001	3.1	749.5	547.2	0.3
Reach 1	334	July 95% Exceeda	BT_E-Mix	0.2	66.6	66.9	66.7	66.9	0.001	0.4	0.5	3.2	0.2
Reach 1	334	July 95% Exceeda	BT_P_Mix	0.2	66.6	66.9	66.7	66.9	0.001	0.4	0.5	3.2	0.2
Reach 1	334	April 5% Exceeda	BT_E-Mix	40.0	66.6	68.9	67.9	69.0	0.001	1.4	34.2	41.1	0.2
Reach 1	334	April 5% Exceeda	BT_P_Mix	40.0	66.6	68.9	67.9	69.0	0.001	1.4	34.2	41.1	0.2

Old Swamp River HECRAS B+T Plan: 1) BT_E-Mix 2/14/2024 2) BT_P_Mix 2/14/2024

Flow: USGS Gauge Flows Mixed



1 in Horiz. = 300 ft 1 in Vert. = 4 ft

HEC-RAS River: Old Swamp River Reach: Reach 1

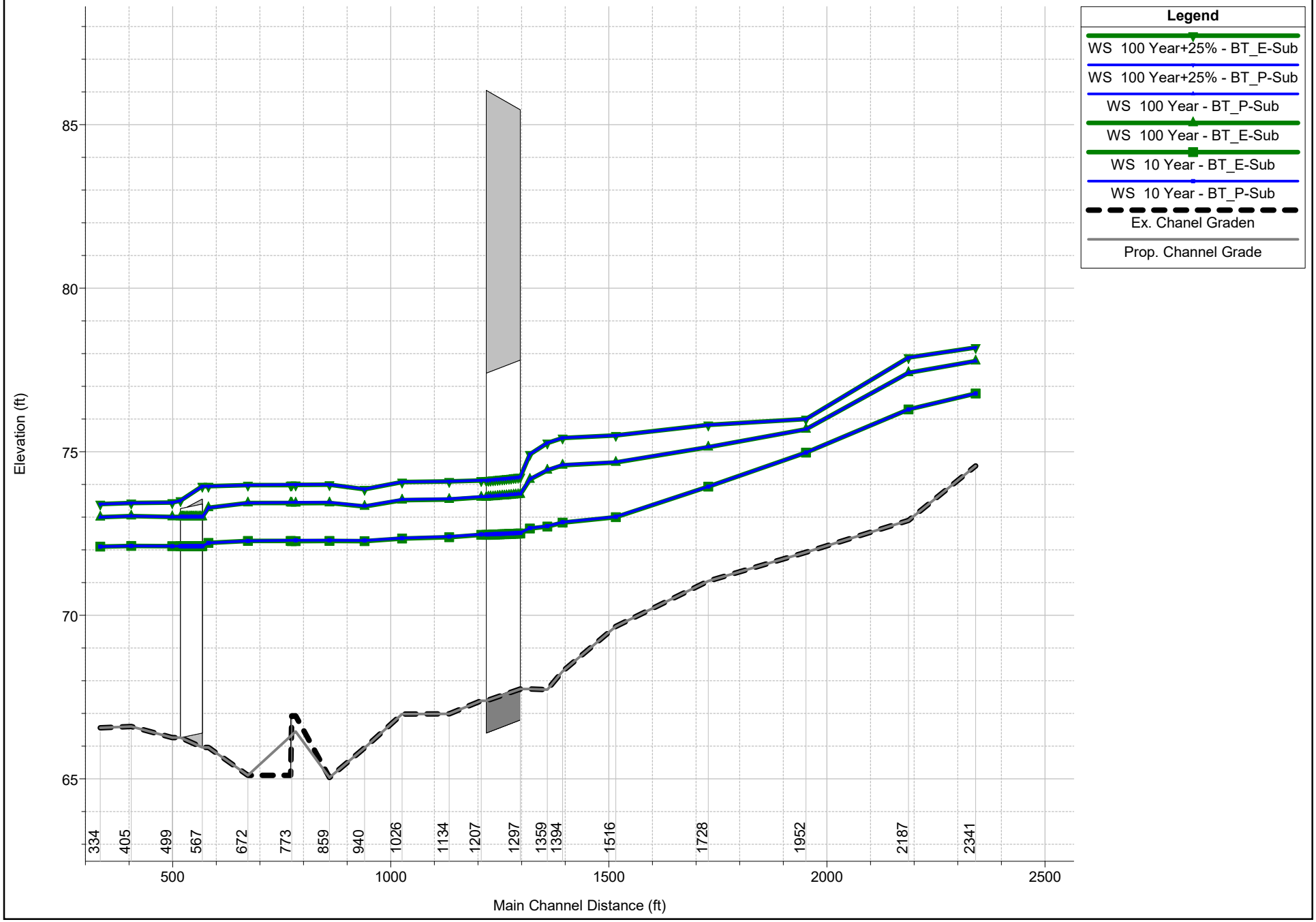
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2341	10 Year	BT_E-Sub	389.0	74.6	76.8	76.6	77.2	0.010	6.5	128.6	181.0	0.8
Reach 1	2341	10 Year	BT_P-Sub	389.0	74.6	76.8	76.6	77.2	0.010	6.5	128.6	181.0	0.8
Reach 1	2341	100 Year	BT_E-Sub	732.0	74.6	77.8	77.1	77.9	0.003	4.8	400.1	217.2	0.5
Reach 1	2341	100 Year	BT_P-Sub	732.0	74.6	77.8	77.1	77.9	0.003	4.8	400.1	217.2	0.5
Reach 1	2341	100 Year+25%	BT_E-Sub	915.0	74.6	78.2	77.3	78.3	0.003	4.9	491.7	224.0	0.5
Reach 1	2341	100 Year+25%	BT_P-Sub	915.0	74.6	78.2	77.3	78.3	0.003	4.9	491.7	224.0	0.5
Reach 1	2187	10 Year	BT_E-Sub	389.0	72.9	76.3	75.3	76.5	0.002	4.0	143.4	117.8	0.4
Reach 1	2187	10 Year	BT_P-Sub	389.0	72.9	76.3	75.3	76.5	0.002	4.0	143.4	117.8	0.4
Reach 1	2187	100 Year	BT_E-Sub	732.0	72.9	77.4	76.2	77.6	0.002	4.2	345.1	198.4	0.4
Reach 1	2187	100 Year	BT_P-Sub	732.0	72.9	77.4	76.2	77.6	0.002	4.2	345.1	198.4	0.4
Reach 1	2187	100 Year+25%	BT_E-Sub	915.0	72.9	77.9	76.5	78.1	0.001	4.2	439.5	203.6	0.4
Reach 1	2187	100 Year+25%	BT_P-Sub	915.0	72.9	77.9	76.5	78.1	0.001	4.2	439.5	203.6	0.4
Reach 1	1952	10 Year	BT_E-Sub	389.0	71.9	75.0	74.6	75.6	0.007	6.3	73.9	54.2	0.7
Reach 1	1952	10 Year	BT_P-Sub	389.0	71.9	75.0	74.6	75.6	0.007	6.3	74.0	54.2	0.7
Reach 1	1952	100 Year	BT_E-Sub	732.0	71.9	75.7	75.7	76.7	0.010	8.6	121.6	78.0	0.9
Reach 1	1952	100 Year	BT_P-Sub	732.0	71.9	75.7	75.7	76.7	0.010	8.6	121.6	78.0	0.9
Reach 1	1952	100 Year+25%	BT_E-Sub	915.0	71.9	76.0	76.0	77.2	0.010	9.4	146.9	83.1	0.9
Reach 1	1952	100 Year+25%	BT_P-Sub	915.0	71.9	76.0	76.0	77.2	0.010	9.4	146.9	83.1	0.9
Reach 1	1728	10 Year	BT_E-Sub	389.0	71.1	73.9		74.3	0.004	5.1	141.4	120.7	0.6
Reach 1	1728	10 Year	BT_P-Sub	389.0	71.1	73.9		74.3	0.004	5.1	141.3	120.7	0.6
Reach 1	1728	100 Year	BT_E-Sub	732.0	71.1	75.1		75.4	0.003	5.1	316.2	158.9	0.5
Reach 1	1728	100 Year	BT_P-Sub	732.0	71.1	75.1		75.4	0.003	5.1	317.3	158.9	0.5
Reach 1	1728	100 Year+25%	BT_E-Sub	915.0	71.1	75.8		76.1	0.002	4.9	427.9	168.9	0.4
Reach 1	1728	100 Year+25%	BT_P-Sub	915.0	71.1	75.8		76.1	0.002	4.9	428.1	168.9	0.4
Reach 1	1516	10 Year	BT_E-Sub	389.0	69.7	73.0		73.4	0.004	5.5	121.2	83.1	0.6
Reach 1	1516	10 Year	BT_P-Sub	389.0	69.7	73.0		73.4	0.004	5.5	122.1	83.3	0.6
Reach 1	1516	100 Year	BT_E-Sub	732.0	69.7	74.7		75.0	0.002	5.2	291.1	117.3	0.4
Reach 1	1516	100 Year	BT_P-Sub	732.0	69.7	74.7		75.0	0.002	5.1	292.5	117.8	0.4
Reach 1	1516	100 Year+25%	BT_E-Sub	915.0	69.7	75.5		75.7	0.001	4.8	408.1	161.5	0.4
Reach 1	1516	100 Year+25%	BT_P-Sub	915.0	69.7	75.5		75.7	0.001	4.8	408.4	161.6	0.4
Reach 1	1394	10 Year	BT_E-Sub	389.0	68.3	72.8		73.0	0.002	3.9	166.8	110.4	0.4
Reach 1	1394	10 Year	BT_P-Sub	389.0	68.3	72.9		73.1	0.002	3.9	168.2	112.4	0.4
Reach 1	1394	100 Year	BT_E-Sub	732.0	68.3	74.6		74.8	0.001	3.9	428.7	167.7	0.3
Reach 1	1394	100 Year	BT_P-Sub	732.0	68.3	74.6		74.8	0.001	3.9	430.8	168.0	0.3
Reach 1	1394	100 Year+25%	BT_E-Sub	915.0	68.3	75.4		75.6	0.001	3.8	577.1	187.7	0.3
Reach 1	1394	100 Year+25%	BT_P-Sub	915.0	68.3	75.4		75.6	0.001	3.8	577.5	187.7	0.3
Reach 1	1359	10 Year	BT_E-Sub	389.0	67.7	72.7	71.2	73.0	0.002	4.4	147.6	87.4	0.4
Reach 1	1359	10 Year	BT_P-Sub	389.0	67.7	72.7	71.2	73.0	0.002	4.4	148.7	88.1	0.4
Reach 1	1359	100 Year	BT_E-Sub	732.0	67.7	74.4	72.4	74.7	0.001	4.8	309.8	157.9	0.4
Reach 1	1359	100 Year	BT_P-Sub	732.0	67.7	74.5	72.4	74.7	0.001	4.8	311.3	158.1	0.4
Reach 1	1359	100 Year+25%	BT_E-Sub	915.0	67.7	75.3	72.9	75.5	0.001	4.9	401.4	172.9	0.3
Reach 1	1359	100 Year+25%	BT_P-Sub	915.0	67.7	75.3	72.9	75.5	0.001	4.9	401.7	173.0	0.3
Reach 1	1319	10 Year	BT_E-Sub	389.0	67.8	72.7	70.2	72.9	0.002	3.9	100.9	25.2	0.3
Reach 1	1319	10 Year	BT_P-Sub	389.0	67.8	72.7	70.2	72.9	0.002	3.9	101.2	25.4	0.3
Reach 1	1319	100 Year	BT_E-Sub	732.0	67.8	74.2	71.4	74.6	0.002	5.3	162.1	63.2	0.4
Reach 1	1319	100 Year	BT_P-Sub	732.0	67.8	74.2	71.4	74.6	0.002	5.3	163.1	63.6	0.4
Reach 1	1319	100 Year+25%	BT_E-Sub	915.0	67.8	74.9	71.9	75.4	0.002	5.6	209.8	77.1	0.4
Reach 1	1319	100 Year+25%	BT_P-Sub	915.0	67.8	74.9	71.9	75.4	0.002	5.6	210.0	77.1	0.4
Reach 1	1297			Culvert									
Reach 1	1207	10 Year	BT_E-Sub	389.0	67.4	72.5	69.7	72.6	0.001	3.4	128.3	54.2	0.3
Reach 1	1207	10 Year	BT_P-Sub	389.0	67.4	72.5	69.7	72.7	0.001	3.4	128.9	54.5	0.3
Reach 1	1207	100 Year	BT_E-Sub	732.0	67.4	73.6	70.9	74.0	0.002	5.0	172.0	71.0	0.4
Reach 1	1207	100 Year	BT_P-Sub	732.0	67.4	73.6	70.9	74.0	0.002	5.0	172.7	71.2	0.4
Reach 1	1207	100 Year+25%	BT_E-Sub	915.0	67.4	74.1	71.5	74.6	0.002	5.7	191.5	84.3	0.4
Reach 1	1207	100 Year+25%	BT_P-Sub	915.0	67.4	74.1	71.5	74.6	0.002	5.7	191.6	84.4	0.4
Reach 1	1134	10 Year	BT_E-Sub	389.0	67.0	72.4		72.6	0.001	3.3	145.9	76.4	0.3
Reach 1	1134	10 Year	BT_P-Sub	389.0	67.0	72.4		72.6	0.001	3.2	147.2	76.8	0.3
Reach 1	1134	100 Year	BT_E-Sub	732.0	67.0	73.5		73.8	0.002	4.5	274.9	172.7	0.3
Reach 1	1134	100 Year	BT_P-Sub	732.0	67.0	73.6		73.8	0.002	4.4	278.8	174.2	0.3
Reach 1	1134	100 Year+25%	BT_E-Sub	915.0	67.0	74.1		74.4	0.001	4.7	386.2	231.1	0.3
Reach 1	1134	100 Year+25%	BT_P-Sub	915.0	67.0	74.1		74.4	0.001	4.7	387.3	231.3	0.3
Reach 1	1026	10 Year	BT_E-Sub	389.0	67.0	72.3	69.8	72.5	0.001	2.6	167.8	154.1	0.2
Reach 1	1026	10 Year	BT_P-Sub	389.0	67.0	72.4	69.8	72.5	0.001	2.6	170.0	156.8	0.2
Reach 1	1026	100 Year	BT_E-Sub	732.0	67.0	73.5	70.8	73.7	0.001	3.4	355.1	263.5	0.3
Reach 1	1026	100 Year	BT_P-Sub	732.0	67.0	73.5	70.8	73.7	0.001	3.4	359.4	265.1	0.3
Reach 1	1026	100 Year+25%	BT_E-Sub	915.0	67.0	74.1	71.2	74.3	0.001	3.6	470.1	317.5	0.3
Reach 1	1026	100 Year+25%	BT_P-Sub	915.0	67.0	74.1	71.2	74.3	0.001	3.6	471.1	317.8	0.3
Reach 1	940	10 Year	BT_E-Sub	389.0	66.0	72.3	69.3	72.4	0.001	2.9	153.3	119.7	0.2

HEC-RAS River: Old Swamp River Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	940	10 Year	BT_P-Sub	389.0	66.0	72.3	69.3	72.4	0.001	2.9	154.2	120.4	0.2
Reach 1	940	100 Year	BT_E-Sub	732.0	66.0	73.3	70.4	73.6	0.001	4.3	214.3	224.6	0.3
Reach 1	940	100 Year	BT_P-Sub	732.0	66.0	73.3	70.4	73.6	0.001	4.3	215.7	226.8	0.3
Reach 1	940	100 Year+25%	BT_E-Sub	915.0	66.0	73.9	70.8	74.2	0.001	4.7	351.2	337.2	0.3
Reach 1	940	100 Year+25%	BT_P-Sub	915.0	66.0	73.9	70.8	74.2	0.001	4.7	352.6	337.7	0.3
Reach 1	859	10 Year	BT_E-Sub	389.0	65.0	72.3		72.3	0.000	2.1	278.4	166.2	0.2
Reach 1	859	10 Year	BT_P-Sub	389.0	65.0	72.3		72.3	0.000	2.1	281.6	167.0	0.2
Reach 1	859	100 Year	BT_E-Sub	732.0	65.0	73.4		73.5	0.000	2.3	579.8	367.0	0.2
Reach 1	859	100 Year	BT_P-Sub	732.0	65.0	73.5		73.5	0.000	2.3	587.7	369.1	0.2
Reach 1	859	100 Year+25%	BT_E-Sub	915.0	65.0	74.0		74.0	0.000	2.2	800.4	405.7	0.2
Reach 1	859	100 Year+25%	BT_P-Sub	915.0	65.0	74.0		74.0	0.000	2.2	802.5	406.0	0.2
Reach 1	782	10 Year	BT_E-Sub	389.0	66.9	72.3	70.3	72.3	0.000	1.7	492.8	296.3	0.2
Reach 1	782	10 Year	BT_P-Sub	389.0	66.5	72.3		72.3	0.000	1.1	522.6	299.8	0.1
Reach 1	782	100 Year	BT_E-Sub	732.0	66.9	73.4	70.9	73.5	0.000	2.0	887.9	409.6	0.2
Reach 1	782	100 Year	BT_P-Sub	732.0	66.5	73.5		73.5	0.000	1.2	924.0	409.9	0.1
Reach 1	782	100 Year+25%	BT_E-Sub	915.0	66.9	74.0	71.1	74.0	0.000	2.0	1123.3	427.0	0.1
Reach 1	782	100 Year+25%	BT_P-Sub	915.0	66.5	74.0		74.0	0.000	1.2	1152.9	427.1	0.1
Reach 1	773			Inl Struct									
Reach 1	672	10 Year	BT_E-Sub	389.0	65.1	72.3		72.3	0.000	1.2	583.3	306.1	0.1
Reach 1	672	10 Year	BT_P-Sub	389.0	65.1	72.3		72.3	0.000	1.2	583.3	306.1	0.1
Reach 1	672	100 Year	BT_E-Sub	732.0	65.1	73.4		73.5	0.000	1.4	996.2	401.7	0.1
Reach 1	672	100 Year	BT_P-Sub	732.0	65.1	73.4		73.5	0.000	1.4	996.2	401.7	0.1
Reach 1	672	100 Year+25%	BT_E-Sub	915.0	65.1	74.0		74.0	0.000	1.5	1219.5	415.9	0.1
Reach 1	672	100 Year+25%	BT_P-Sub	915.0	65.1	74.0		74.0	0.000	1.5	1219.4	415.9	0.1
Reach 1	582	10 Year	BT_E-Sub	389.0	66.0	72.2	68.3	72.3	0.000	1.8	234.4	260.3	0.1
Reach 1	582	10 Year	BT_P-Sub	389.0	66.0	72.2	68.3	72.3	0.000	1.8	234.4	260.3	0.1
Reach 1	582	100 Year	BT_E-Sub	732.0	66.0	73.3	69.1	73.4	0.000	2.8	291.4	345.0	0.2
Reach 1	582	100 Year	BT_P-Sub	732.0	66.0	73.3	69.1	73.4	0.000	2.8	291.4	345.0	0.2
Reach 1	582	100 Year+25%	BT_E-Sub	915.0	66.0	74.0	69.5	74.0	0.000	1.8	1111.6	404.1	0.1
Reach 1	582	100 Year+25%	BT_P-Sub	915.0	66.0	74.0	69.5	74.0	0.000	1.8	1111.6	404.1	0.1
Reach 1	567			Culvert									
Reach 1	499	10 Year	BT_E-Sub	389.0	66.3	72.1	68.1	72.2	0.000	1.6	267.1	642.1	0.1
Reach 1	499	10 Year	BT_P-Sub	389.0	66.3	72.1	68.1	72.2	0.000	1.6	267.1	642.1	0.1
Reach 1	499	100 Year	BT_E-Sub	732.0	66.3	73.0	68.9	73.1	0.001	2.6	324.9	652.0	0.2
Reach 1	499	100 Year	BT_P-Sub	732.0	66.3	73.0	68.9	73.1	0.001	2.6	324.9	652.0	0.2
Reach 1	499	100 Year+25%	BT_E-Sub	915.0	66.3	73.4	69.3	73.5	0.000	1.3	1918.6	658.3	0.1
Reach 1	499	100 Year+25%	BT_P-Sub	915.0	66.3	73.4	69.3	73.5	0.000	1.3	1918.6	658.3	0.1
Reach 1	405	10 Year	BT_E-Sub	389.0	66.6	72.1	69.3	72.1	0.000	1.0	1253.5	613.0	0.1
Reach 1	405	10 Year	BT_P-Sub	389.0	66.6	72.1		72.1	0.000	1.0	1253.5	613.0	0.1
Reach 1	405	100 Year	BT_E-Sub	732.0	66.6	73.0	70.3	73.0	0.000	1.3	1816.3	621.0	0.1
Reach 1	405	100 Year	BT_P-Sub	732.0	66.6	73.0		73.0	0.000	1.3	1816.3	621.0	0.1
Reach 1	405	100 Year+25%	BT_E-Sub	915.0	66.6	73.4	70.7	73.4	0.000	1.4	2068.2	623.4	0.1
Reach 1	405	100 Year+25%	BT_P-Sub	915.0	66.6	73.4		73.4	0.000	1.4	2068.2	623.4	0.1
Reach 1	334	10 Year	BT_E-Sub	389.0	66.6	72.1	69.8	72.1	0.000	1.5	667.7	540.2	0.1
Reach 1	334	10 Year	BT_P-Sub	389.0	66.6	72.1	69.8	72.1	0.000	1.5	667.7	540.2	0.1
Reach 1	334	100 Year	BT_E-Sub	732.0	66.6	73.0	70.5	73.0	0.000	2.0	943.5	566.9	0.2
Reach 1	334	100 Year	BT_P-Sub	732.0	66.6	73.0	70.5	73.0	0.000	2.0	943.5	566.9	0.2
Reach 1	334	100 Year+25%	BT_E-Sub	915.0	66.6	73.4	70.8	73.4	0.000	2.2	1068.7	576.5	0.2
Reach 1	334	100 Year+25%	BT_P-Sub	915.0	66.6	73.4	70.8	73.4	0.000	2.2	1068.7	576.5	0.2

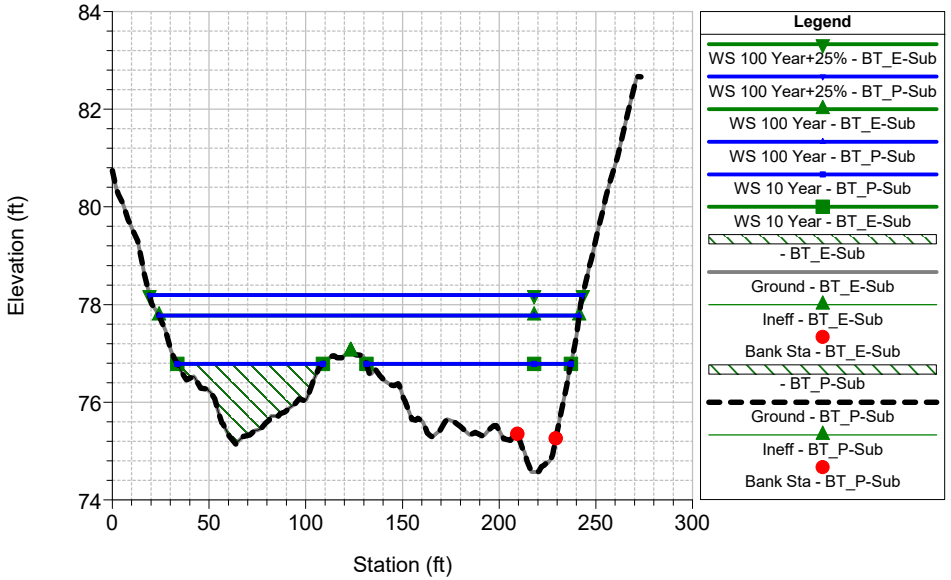
Old Swamp River HECRAS B+T Plan: 1) BT_E-Sub 2/14/2024 2) BT_P-Sub 2/14/2024

Flow: USGS Gauge Flows FEMA BC Subcritical

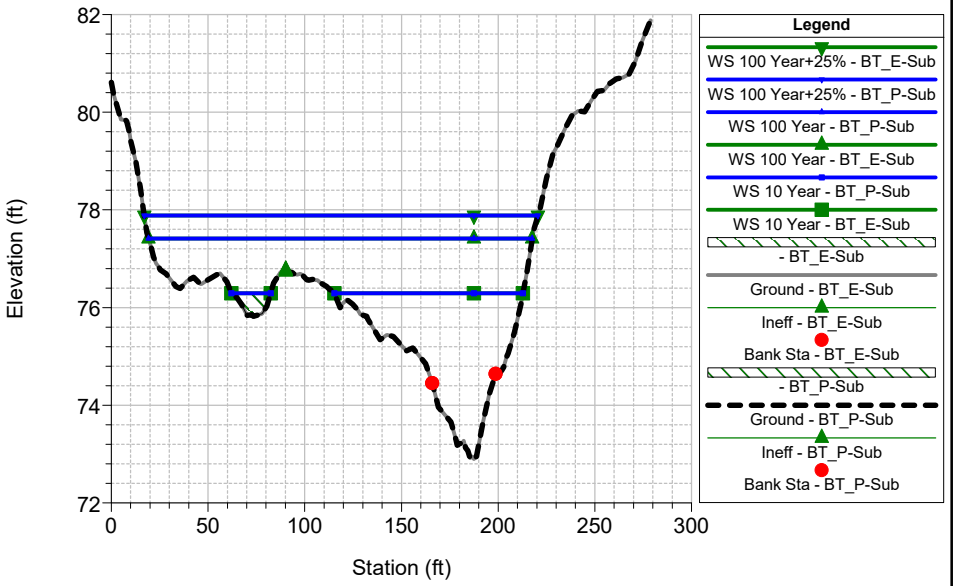


1 in Horiz. = 300 ft 1 in Vert. = 4 ft

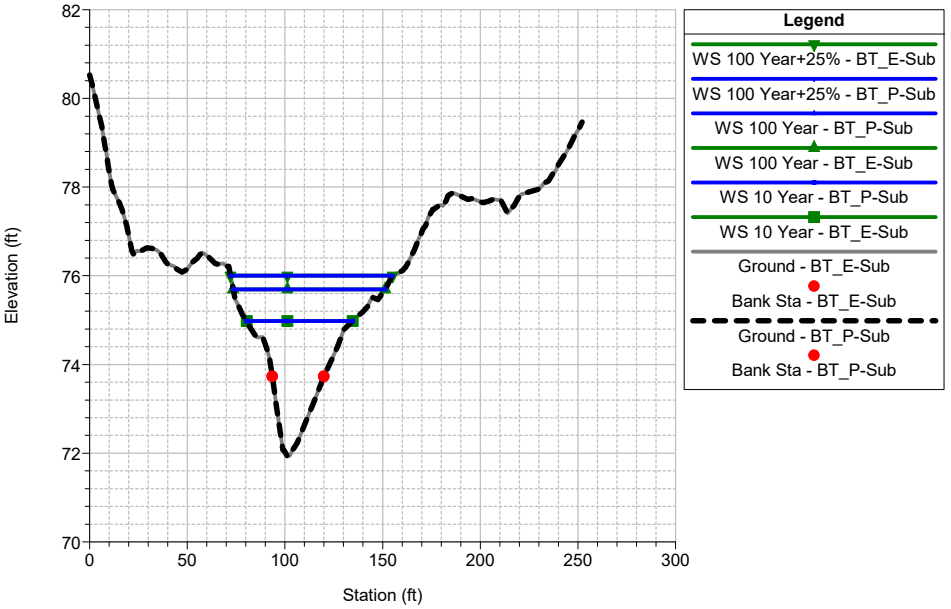
Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 2341



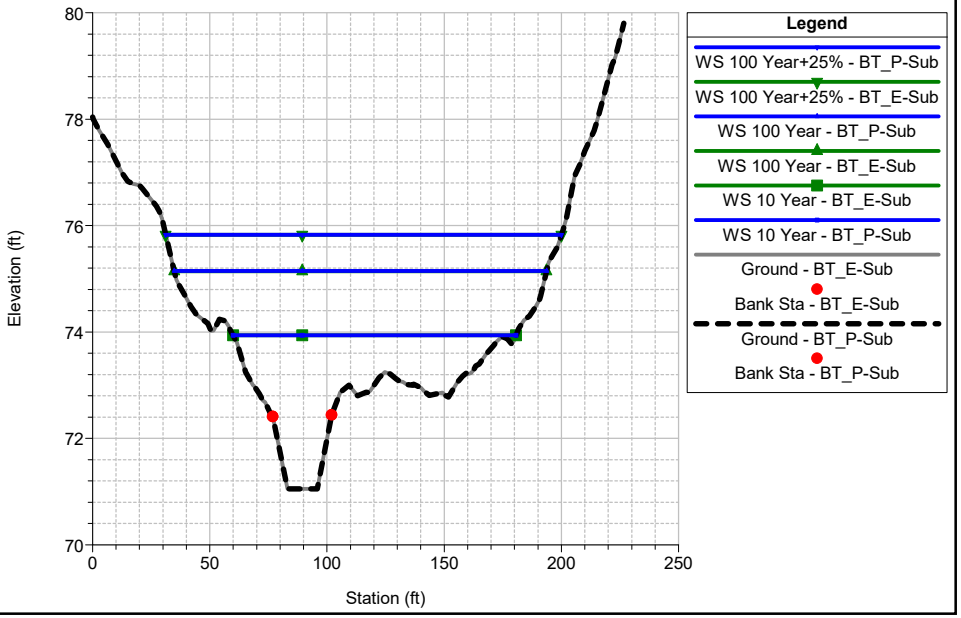
Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 2187



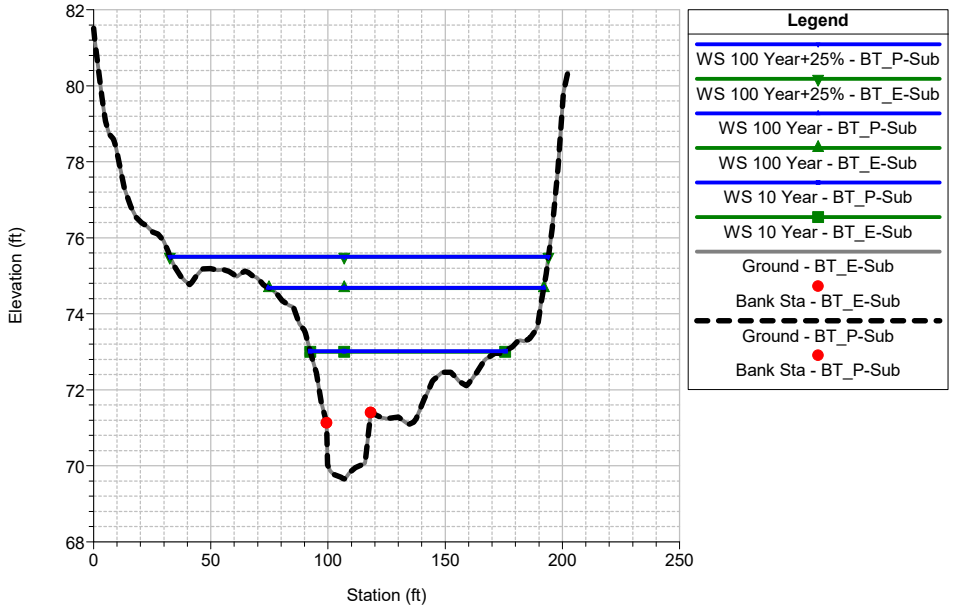
Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1952



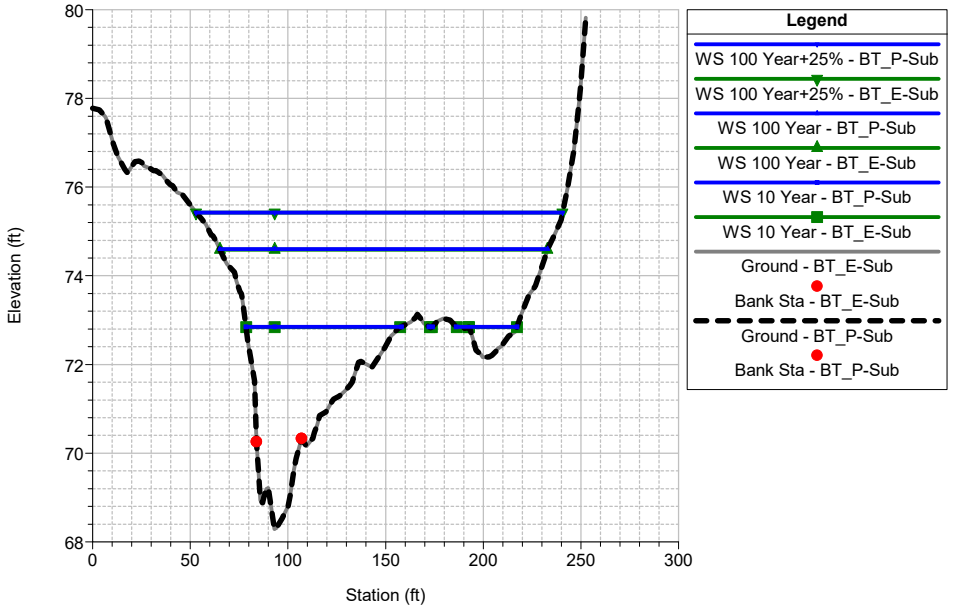
Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1728



Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1516



Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1394



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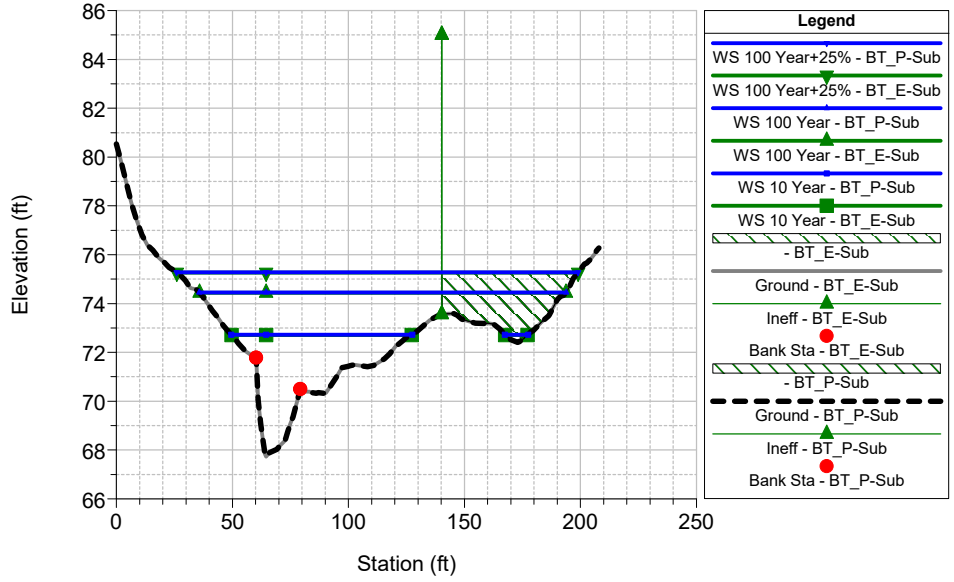
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1359



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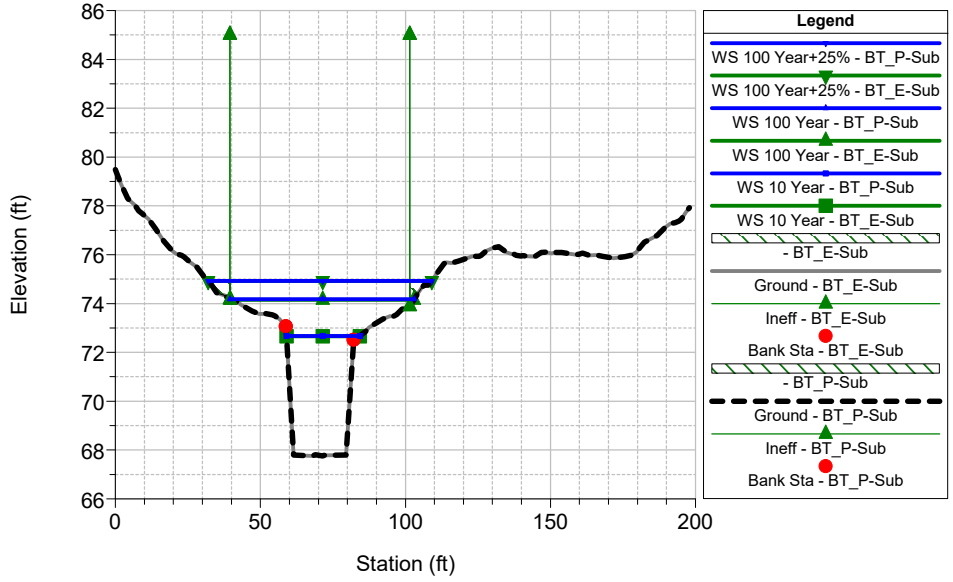
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1319



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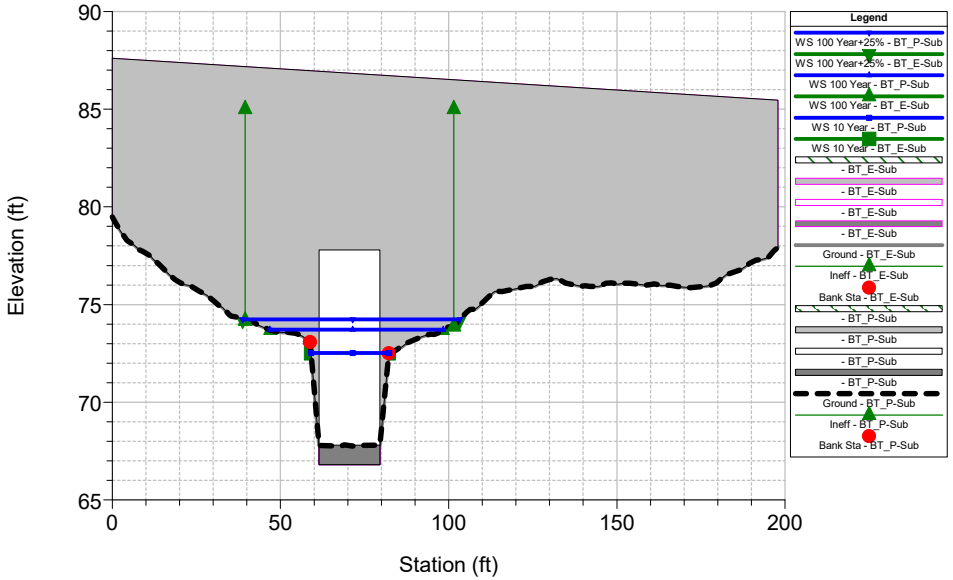
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1297 Culv



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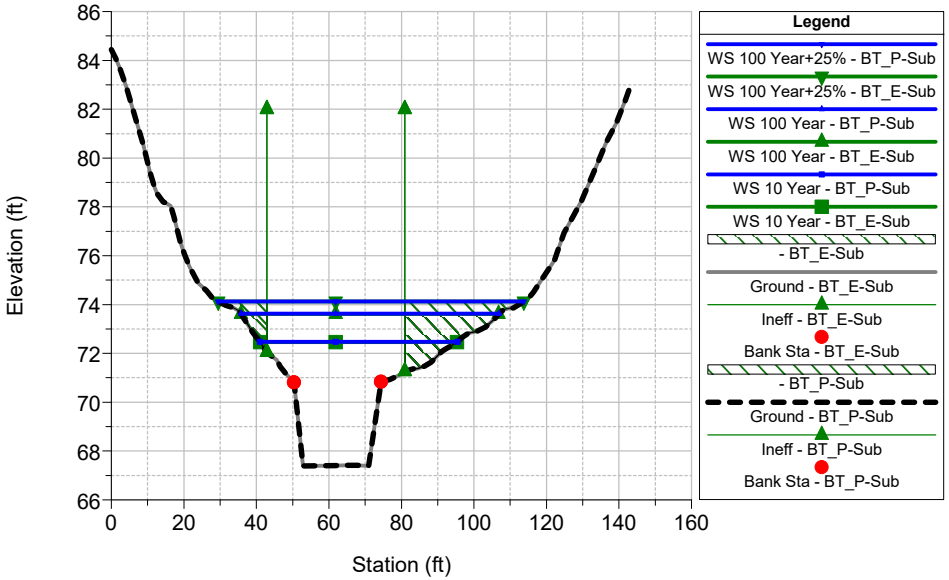
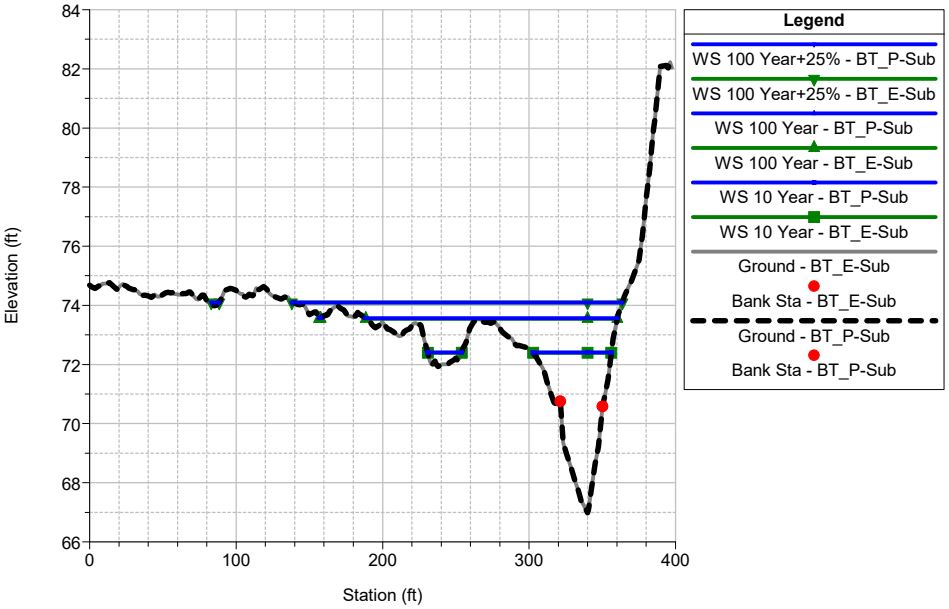
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1207



Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1134



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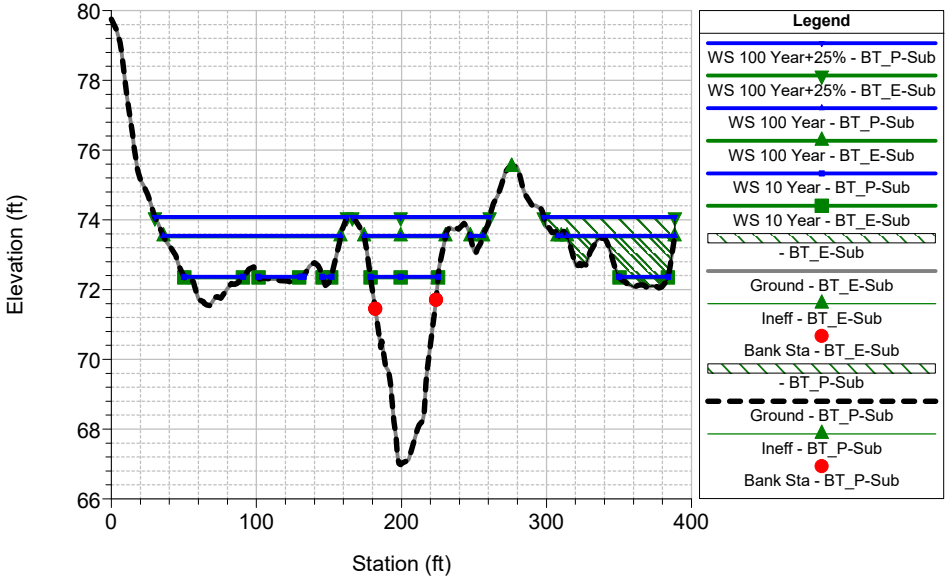
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 1026



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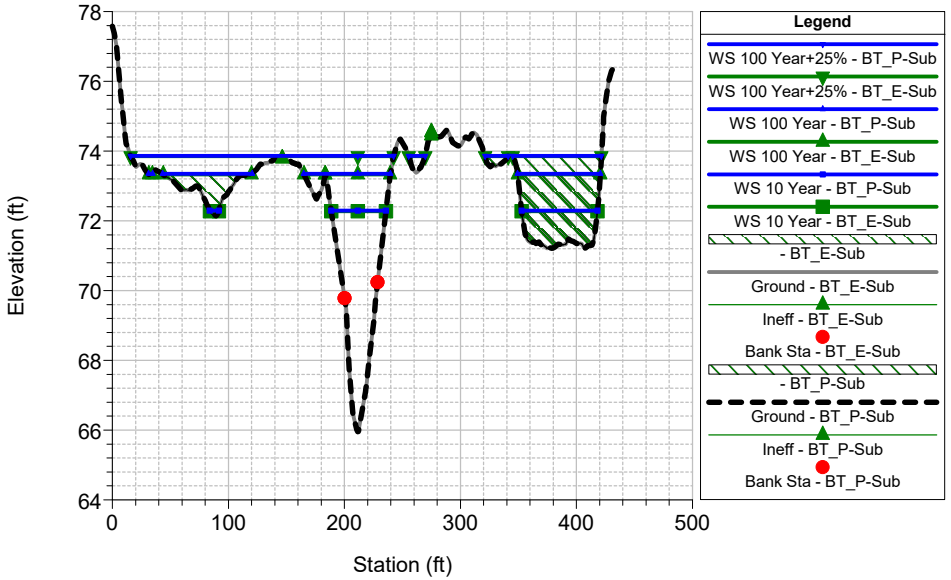
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 940



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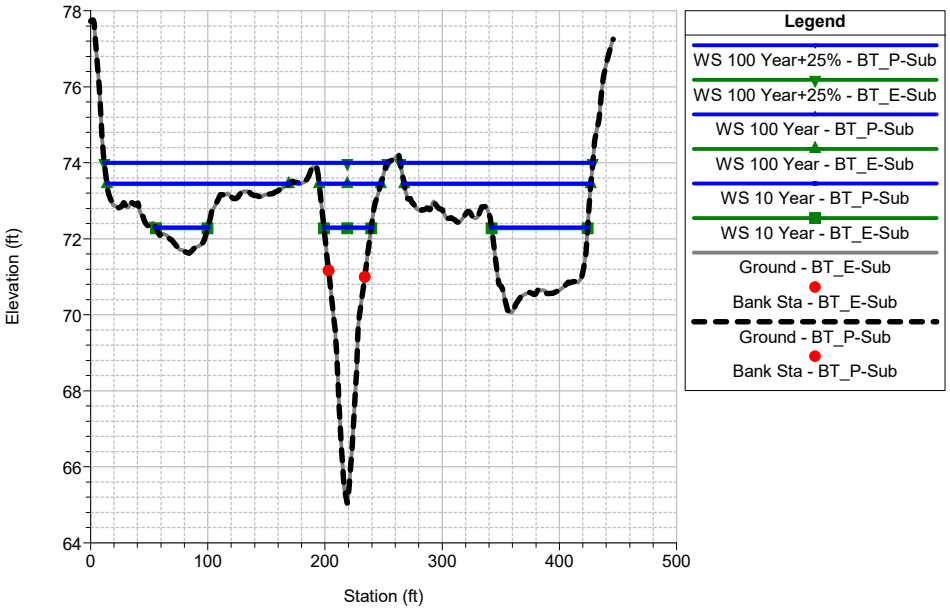
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 859



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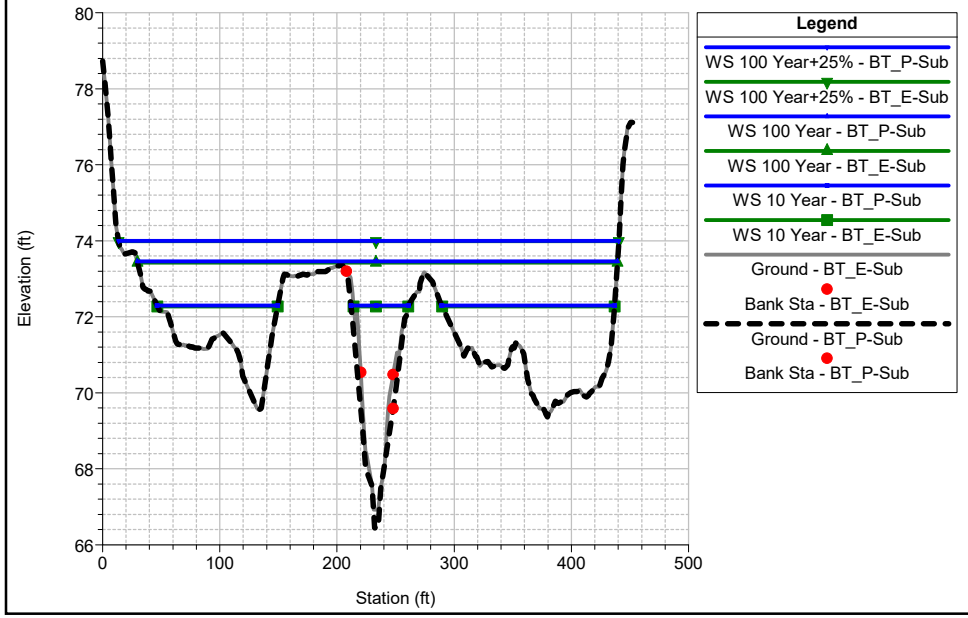
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 782



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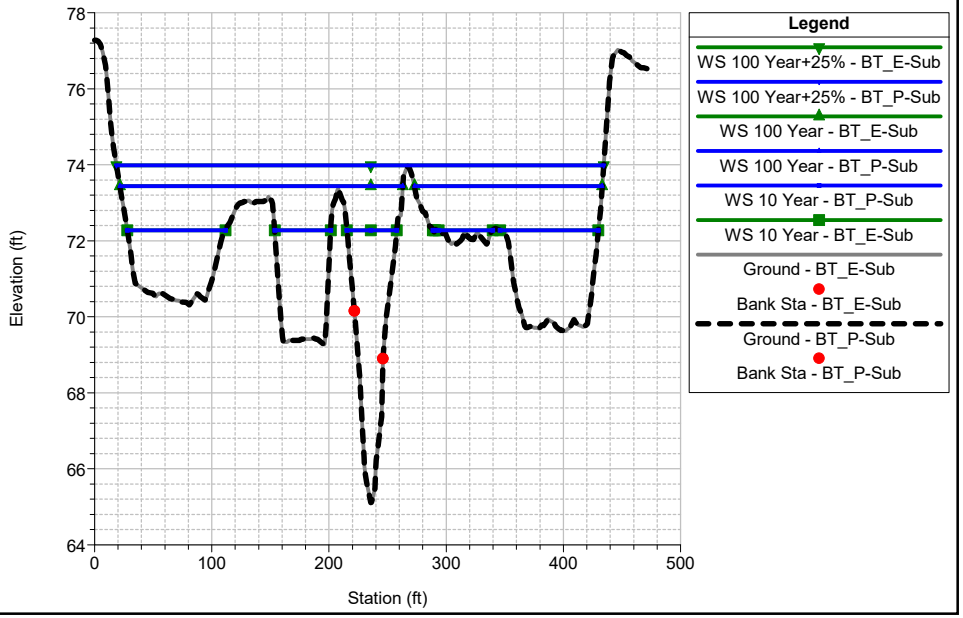
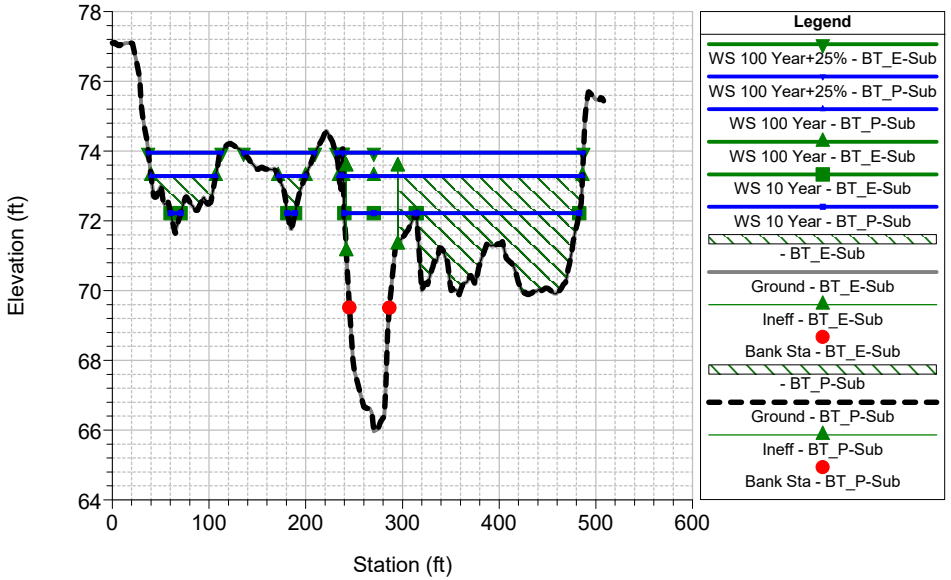
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 672



Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 582



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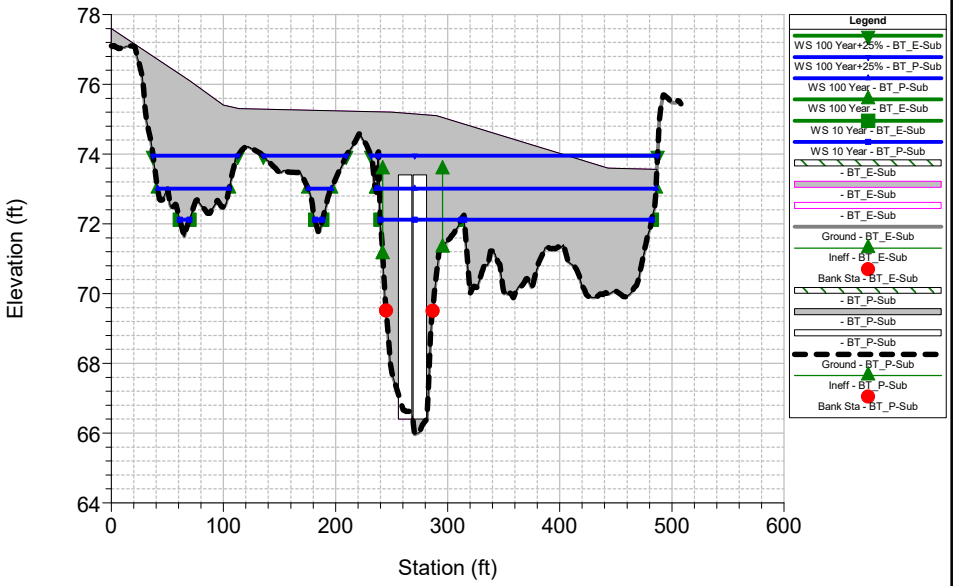
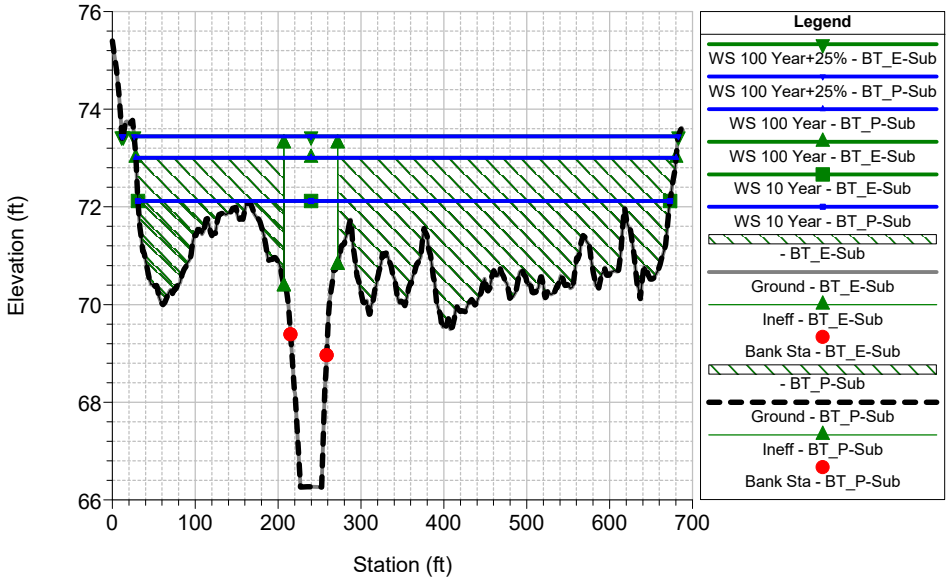
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 567 Culv



Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 499



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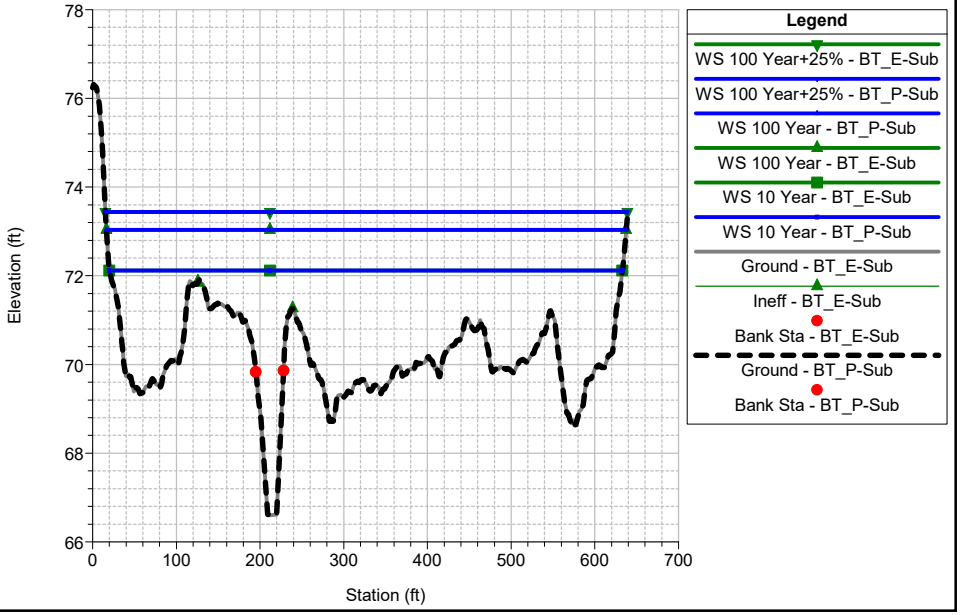
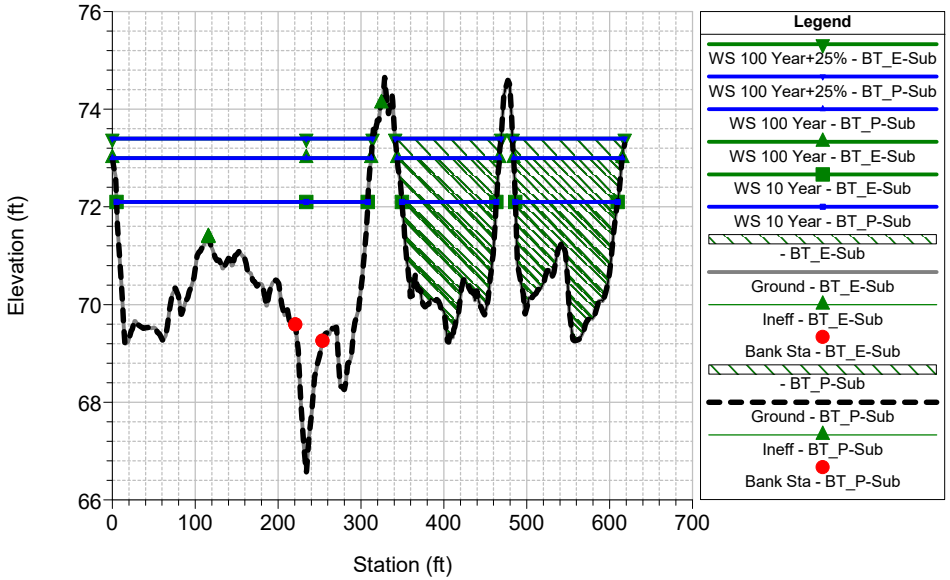
Flow: USGS Gauge Flows FEMA BC
River = Old Swamp River Reach = Reach 1 RS = 405



Old Swamp River HECRAS B+T Plan: 1) BT_P-Sub 2) BT_E-Sub

Flow: USGS Gauge Flows FEMA BC

River = Old Swamp River Reach = Reach 1 RS = 334



Stable Channel Design Results - Copeland Method

d84(mm) = 25, D50(mm) = 6.0, D16(mm) = 2.0

Temperature (F)	55		
Specific Gravity of Sediments	2.65		
Unit Weight of Water (lb/cu ft)	62.385		
Viscosity (sq ft/s)		1.315E-05	
Discharge (cfs)	68		

Upstream Channel

Sediment Concentration (ppm)	31.65		
Base Width (ft)	15		
Channel Slope (ft/ft)	0.003		
		Left	Right
Side Slope	2	2	
Roughness Eq	Manning	Manning	
Roughness Value		0.035	0.035

Stable Channel

Median Channel Width (ft)	18		
Valley Slope(ft/ft)	0.004		
		Left	Right
Side Slope	2	2	
Roughness Eq	Manning	Manning	
Roughness Value		0.035	0.035

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress
2.0	2.8	0.003636	0.0353	1.45	3.28	0.35	0.63
4.0	2.5	0.003023	0.0352	1.49	3.05	0.34	0.47
5.0	2.4	0.002914	0.0348	1.47	2.98	0.34	0.43
7.0	2.1	0.002783	0.0350	1.45	2.89	0.35	0.36
9.0	1.9	0.002783	0.0346	1.39	2.82	0.36	0.33
11.0	1.7	0.002820	0.0343	1.32	2.77	0.37	0.30
13.0	1.6	0.002884	0.0342	1.25	2.72	0.38	0.28
14.0	1.5	0.002924	0.0341	1.22	2.70	0.39	0.27
16.0	1.4	0.003007	0.0340	1.16	2.66	0.40	0.26
18.0	1.3	0.003118	0.0338	1.10	2.62	0.41	0.25
20.0	1.2	0.003248	0.0337	1.04	2.59	0.42	0.24
22.0	1.1	0.003363	0.0336	0.99	2.55	0.43	0.23
23.0	1.1	0.003408	0.0337	0.97	2.54	0.43	0.23
25.0	1.0	0.003553	0.0334	0.92	2.51	0.44	0.22
27.0	0.9	0.003672	0.0334	0.88	2.48	0.45	0.22
29.0	0.9	0.003786	0.0334	0.84	2.46	0.46	0.21
31.0	0.9	0.003928	0.0332	0.80	2.44	0.46	0.21
32.0	0.8	0.003994	0.0331	0.79	2.42	0.47	0.21
34.0	0.8	0.004124	0.0331	0.76	2.40	0.47	0.20
36.0	0.8	0.004252	0.0329	0.73	2.38	0.48	0.20
*******Solution for Minimum Stream Power*******							
8.0	2.0	0.002781	0.0346	1.41	2.85	0.36	0.35

HYDRAULIC DESIGN RESULTS - HEC-RAS RIPRAP

		INPUT				OUTPUT	
Design event	Station	Reference Station	Radius of Curvature (ft)	Side Slope (deg)	Angle of Repose (deg)	USACE Average d30 (in)	USACE Sideslope d30 (in)
100yr+ 25%	782	859	1000	30	40	0.2	0.2
100yr+ 25%	859	940	600	30	40	1.2	1.3

APPENDIX E

RMAT CLIMATE RESILIENCE REPORT

Basis of Design Report

Massachusetts Division of Ecological Restoration
251 Causeway Street, Suite 400
Boston, MA 02114

May 2023

Climate Resilience Design Standards Tool Project Report

Old Swamp River
Date Created: 1/9/2023 9:23:51 AM
Date Report Generated: 1/12/2023 4:47:08 PM
Project Contact Information: Jenabay Sezen (jsezen@slrconsulting.com)

Created By: jsezen
Tool Version: Version 1.2

Project Summary

Link to Project

Estimated Capital Cost: $500000.00
End of Useful Life Year: 2034
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	High
Exposure	**Scores**
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	Moderate Exposure
Extreme Precipitation - Riverine Flooding	High Exposure
Extreme Heat	High Exposure

Asset Preliminary Climate Risk Rating Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Old Swamp River	—— Natural Resource project assets do not receive a preliminary climate risk rating. ——			

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Old Swamp River					
Extreme Precipitation					
Old Swamp River	2030				Tier 2
Extreme Heat					
Old Swamp River	2030		th		Tier 2

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

This project received a "Moderate Exposure" because of the following:

- No historic flooding at project site
- No increase to impervious area
- Maximum annual daily rainfall is within 6 to 10 inches within the overall project's useful life
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

This project received a "High Exposure" because of the following:

- Project site has a history of riverine flooding
- Part of the project is within a mapped FEMA floodplain, outside of the Massachusetts Coast Flood Risk Model (MC-FRM)
- Part of the project is within 100ft of a waterbody
- Project is potentially susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- Existing trees are being removed as part of the proposed project
- Between 10% and 40% of the existing project site has canopy cover
- 10 to 30 day increase in days over 90 deg. F within project's useful life
- Located within 100 ft of existing water body
- No increase to the impervious area of the project site

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - Old Swamp River
Primary asset criticality factors influencing risk ratings for this asset:

No score available

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: Old Swamp River — Natural Resources

Sea Level Rise/Storm Surge

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation

Target Planning Horizon: 2030

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Old Swamp River	2030	25-Year (4%)	7.2	Downloadable Methodology PDF

Return Period Recommendations for natural resource assets and subsequent projected values are provided as a consideration for users, not a formal standard. Users should follow industry best practices for designing natural resource assets in coordination with the appropriate regulatory agencies.

Projected Riverine Peak Discharge & Peak Flood Elevation: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Extreme Heat

Target Planning Horizon: 2030
Percentile: Does not apply

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Heat Index: NOT APPLICABLE

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: NOT APPLICABLE

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: NOT APPLICABLE

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): NOT APPLICABLE

Project Inputs

Core Project Information

Name:	Old Swamp River
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2034
Location of Project:	Weymouth
Estimated Capital Cost:	$500,000
Who is the Submitting Entity?	Private Other SLR International Corporation Jenabay Sezen (jsezen@slrconsulting.com)
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Design
Is climate resiliency a core objective of this project?	Yes
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	This project consists of removing a dam and restoring fish passage. The project will require a MEPA permit.
Project Submission Comments:	

Project Ecosystem Service Benefits

Factors Influencing Output

- ✓ This is an ecological restoration project
- ✓ Project provides flood protection through nature-based solutions
- ✓ Project reduces storm damage
- ✓ Project protects fisheries, wildlife, and plant habitat

Factors to Improve Output

- ✓ Protect public water supply by reducing the risk of contamination, pollution, and/or runoff of surface and groundwater sources used for human consumption
- ✓ Incorporate strategies that reduce carbon emissions
- ✓ Incorporate green infrastructure or nature-based solutions that recharge groundwater
- ✓ Incorporate green infrastructure to filter stormwater
- ✓ Incorporate nature-based solutions that improve water quality
- ✓ Incorporate nature-based solutions that sequester carbon carbon
- ✓ Preserve, enhance, and/or restore coastal shellfish habitats
- ✓ Incorporate vegetation that provides pollinator habitat
- ✓ Identify opportunities to remediate existing sources of pollution
- ✓ Provide opportunities for passive and/or active recreation through open space
- ✓ Increase plants, trees, and/or other vegetation to provide oxygen production
- ✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions
- ✓ Identify opportunities to prevent pollutants from impacting ecosystems
- ✓ Incorporate education and/or protect cultural resources as part of your project

Is the primary purpose of this project ecological restoration?

Yes

Project Benefits

Provides flood protection through nature-based solutions	Yes
Reduces storm damage	Yes
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	Yes
Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	Yes

Does the project site have a history of coastal flooding?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	Yes
Does the project result in a net increase in impervious area of the site?	No
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Old Swamp River
Asset Type: Aquatic Ecosystems
Asset Sub-Type: Large- and mid-size rivers
Construction Type: Dam Removal
Construction Year: 2024
Monitoring Frequency: 10

Report Comments

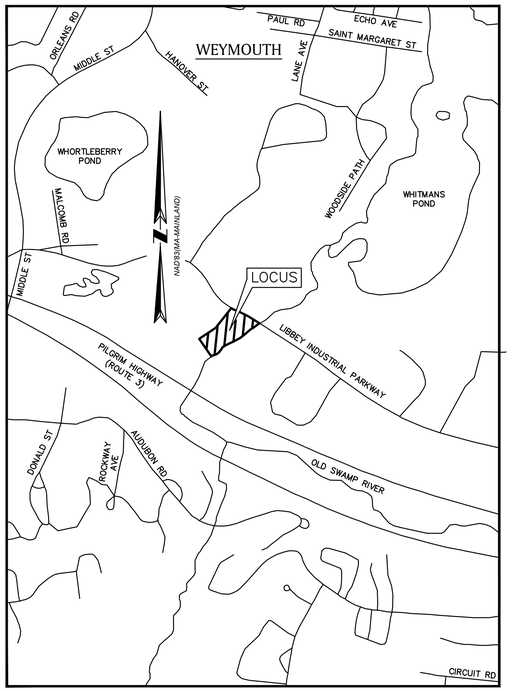
N/A

Appendix F Permit Drawings

BASE MAPPING AND FIELD DATA COLLECTION
OLD SWAMP RIVER AND SNUP

LIBBEY INDUSTRIAL PARKWAY
WEYMOUTH, MA

JUNE 30, 2022



LOCUS MAP

250 0 500 1000 1500 feet

SCALE: 1" = 500'±

INDEX OF DRAWINGS

1	Title Sheet
2	Existing Conditions Plan
3	Bathymetric Plan, Long Profile and Sediment Mapping
4-5	Channel and Pond Sections

Massachusetts Department of Fish and Game
Division of Ecological Restoration
Invested in Nature and Community

PREPARED FOR:

MASSACHUSETTS DIVISION OF
ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
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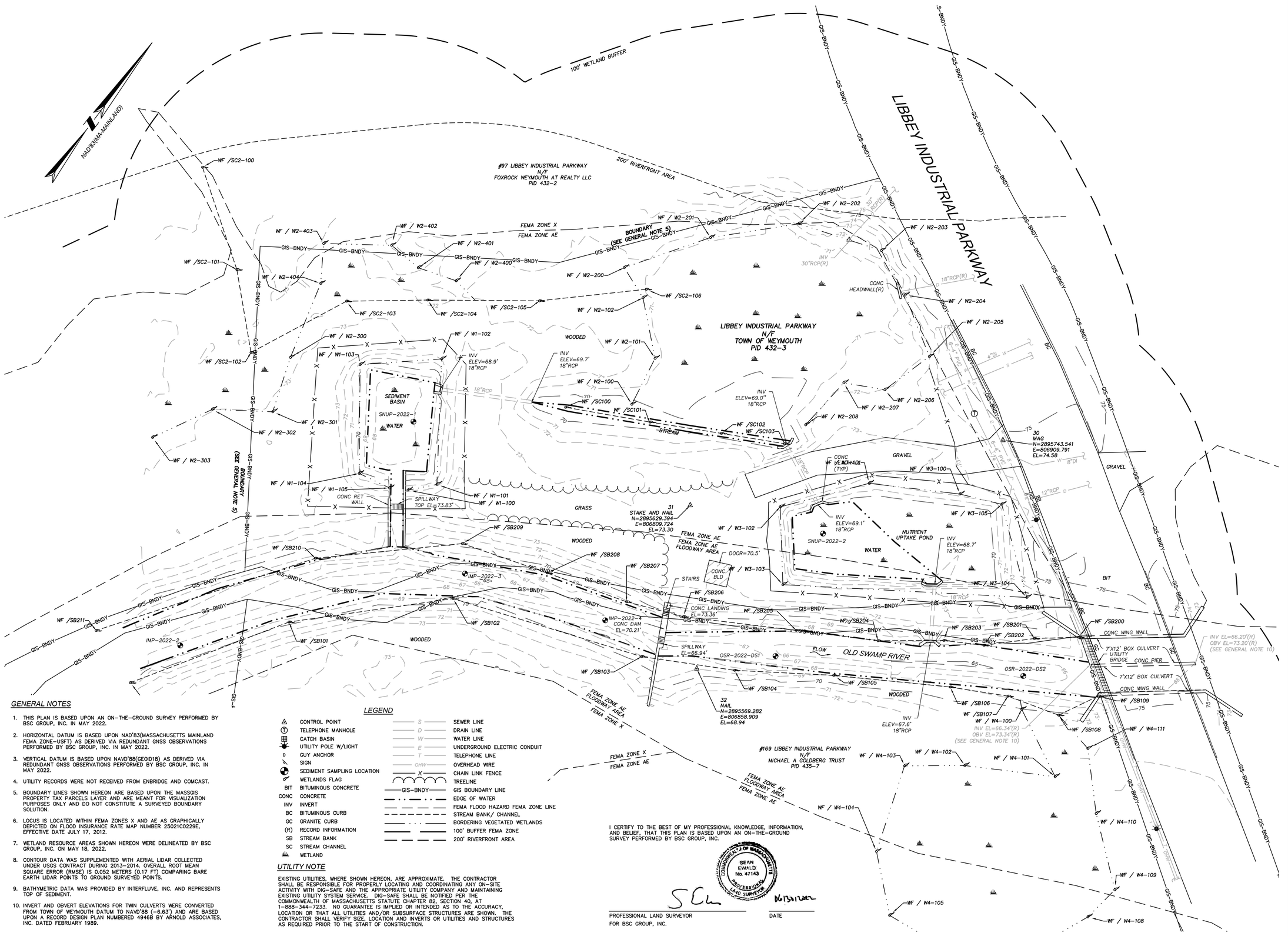
Cambridge, MA 02136
617.714.5537
www.interfluve.com

JOB NO: 8-9993.00(BSC) & PROJECT 22-05-11



GENERAL NOTES

1. THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC. IN MAY 2022.
2. HORIZONTAL DATUM IS BASED UPON NAD'83(MASSACHUSETTS MAINLAND FEMA ZONE-USFT) AS DERIVED VIA REDUNDANT GNSS OBSERVATIONS PERFORMED BY BSC GROUP, INC. IN MAY 2022.
3. VERTICAL DATUM IS BASED UPON NAVD'88(GEOID18) AS DERIVED VIA REDUNDANT GNSS OBSERVATIONS PERFORMED BY BSC GROUP, INC. IN MAY 2022.
4. UTILITY RECORDS WERE NOT RECEIVED FROM ENBRIDGE AND COMCAST.
5. BOUNDARY LINES SHOWN HEREON ARE BASED UPON THE MASSGIS PROPERTY TAX PARCELS LAYER AND ARE MEANT FOR VISUALIZATION PURPOSES ONLY AND DO NOT CONSTITUTE A SURVEYED BOUNDARY SOLUTION.
6. LOCUS IS LOCATED WITHIN FEMA ZONES X AND AE AS GRAPHICALLY DEPICTED ON FLOOD INSURANCE RATE MAP NUMBER 25021C0229E, EFFECTIVE DATE JULY 17, 2012.
7. WETLAND RESOURCE AREAS SHOWN HEREON WERE DELINEATED BY BSC GROUP, INC. ON MAY 18, 2022.
8. CONTOUR DATA WAS SUPPLEMENTED WITH AERIAL LIDAR COLLECTED UNDER USGS CONTRACT DURING 2013-2014. OVERALL ROOT MEAN SQUARE ERROR (RMSE) IS 0.052 METERS (0.17 FT) COMPARING BARE EARTH LIDAR POINTS TO GROUND SURVEYED POINTS.
9. BATHYMETRIC DATA WAS PROVIDED BY INTERFLUVE, INC. AND REPRESENTS TOP OF SEDIMENT.
10. INVERT AND OBVERT ELEVATIONS FOR TWN CULVERTS WERE CONVERTED FROM TOWN OF WEYMOUTH DATUM TO NAVD'88 (-6.63') AND ARE BASED UPON A RECORD DESIGN PLAN NUMBERED 4946B BY ARNOLD ASSOCIATES, INC. DATED FEBRUARY 1989.

LEGEND

△	CONTROL POINT	S	SEWER LINE
T	TELEPHONE MANHOLE	D	DRAIN LINE
	CATCH BASIN	W	WATER LINE
	UTILITY POLE W/LIGHT	E	UNDERGROUND ELECTRIC CONDUIT
D	GUY ANCHOR	T	TELEPHONE LINE
	SIGN	OHW	OVERHEAD WIRE
	SEDIMENT SAMPLING LOCATION	X	CHAIN LINK FENCE
	WETLANDS FLAG		TREELINE
BIT	BITUMINOUS CONCRETE	GIS-BNDY	GIS BOUNDARY LINE
CONC	CONCRETE		EDGE OF WATER
INV	INVERT		FEMA FLOOD HAZARD FEMA ZONE LINE
BC	BITUMINOUS CURB		STREAM BANK/ CHANNEL
GC	GRANITE CURB		BORDERING VEGETATED WETLANDS
(R)	RECORD INFORMATION		100' BUFFER FEMA ZONE
SB	STREAM BANK		200' RIVERFRONT AREA
SC	STREAM CHANNEL		
	WETLAND		

UTILITY NOTE

EXISTING UTILITIES, WHERE SHOWN HEREON, ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING ANY ON-SITE ACTIVITY WITH DIG-SAFE AND THE APPROPRIATE UTILITY COMPANY AND MAINTAINING EXISTING UTILITY SYSTEM SERVICE. DIG-SAFE SHALL BE NOTIFIED PER THE COMMONWEALTH OF MASSACHUSETTS STATUTE CHAPTER 82, SECTION 40, AT 1-888-344-7233. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY SIZE, LOCATION AND INVERTS OR UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF CONSTRUCTION.

I CERTIFY TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION, AND BELIEF, THAT THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC.

COMMONWEALTH OF MASSACHUSETTS
SEAN EWALD
No. 47143
REGISTERED
LAND SURVEYOR

PROFESSIONAL LAND SURVEYOR
FOR BSC GROUP, INC.

06/30/2022
DATE

EXISTING CONDITIONS PLAN

LIBBEY INDUSTRIAL PARKWAY

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER

JUNE 30, 2022

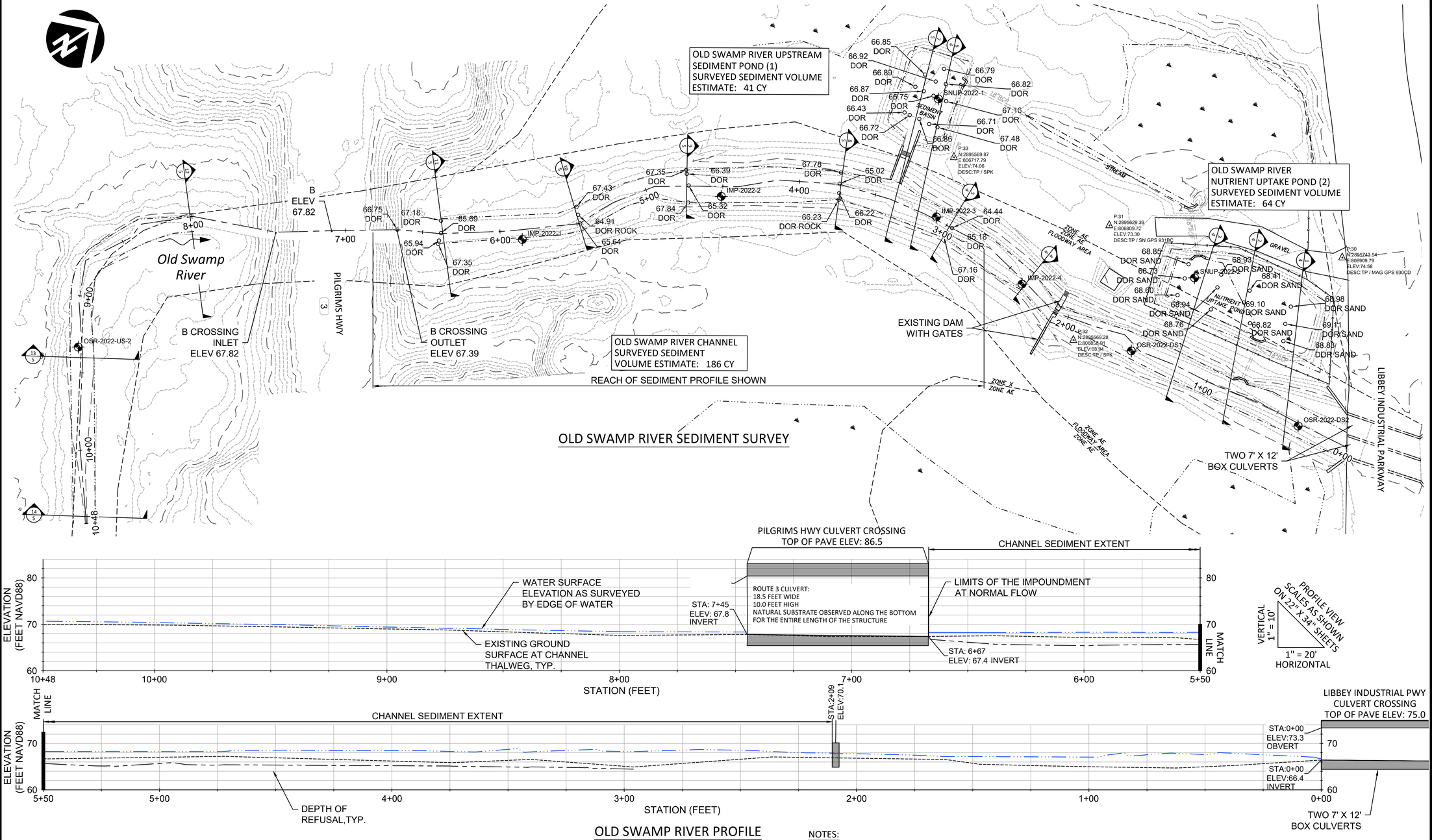
PREPARED FOR:
MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
BOSTON, MA 02114

inter·fluve
220 Concord Avenue, 2nd Floor
Cambridge, MA 02136
617.714.5537
www.interfluve.com

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

SCALE: 1" = 20'
0 2.5 5 10 METERS
0 10 20 40 FEET

PROJ. MGR.:	S.BONIN
FIELD:	J.PINTAVALLE, B.SNEESBY
CALC./DESIGN:	-
DRAWN:	S.BONIN
CHECK:	S.EWALD
FILE:	P:\8999300\S\D\F\8999300EC3.DWG
DWG.:	8999300EC3
SHEET	2 OF 5
JOB. NO:	8-9993.00



LEGEND

- 67.35 DOR — SEDIMENT PROBE LOCATION. DEPTH OF REFUSAL REPRESENTS THE ELEVATION OF THE BOTTOM OF THE SEDIMENT LAYER IN FEET NAVD 88
- EDGE OF WATER
- IMP-2022-2 — SEDIMENT SAMPLE LOCATIONS
- EXISTING 5 FT CONTOUR
- EXISTING 1 FT CONTOUR

NOTES:

1. THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC IN MAY 2022 AND AN ON-THE-GROUND BATHYMETRIC AND CHANNEL SURVEY PERFORMED BY INTER-FLUVE, INC IN MAY AND JUNE 2022.
2. THE EXISTING GROUND SURFACE REPRESENTS THE TOP OF THE SEDIMENT. THE DEPTH OF REFUSAL REPRESENTS THE BOTTOM OF THE SEDIMENT AT THE SAME LOCATION.
3. "DOR": DEPTH OF REFUSAL. THE VALUES ASSOCIATED WITH THESE POINTS ARE PRESENTED HERE AS ELEVATIONS IN FEET NAVD88.
4. "B": BED. REFERS TO THE ELEVATION OF THE STREAMBED, SHOWN ON THE PLAN AT THE INLET, OUTLET AND INTERIOR OF THE ROUTE 3 CROSSING.
5. THE EDGE OF WATER SHOWN IN PLAN VIEW AND THE WATER SURFACE SHOWN IN THE PROFILE WAS MEASURED IN THE FIELD ON MAY 11, 2022.
6. THE DIMENSIONS OF THE ROUTE 3 CULVERT (MassDOT W32032 8L5) WERE MEASURED IN THE FIELD.

BATHYMETRIC PLAN, LONG PROFILE, AND SEDIMENT MAPPING

LIBBEY INDUSTRIAL PARKWAY

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER AND SEDIMENT NUTRIENT UPTAKE PONDS (SNUP)

JUNE 30, 2022

PREPARED FOR:
MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
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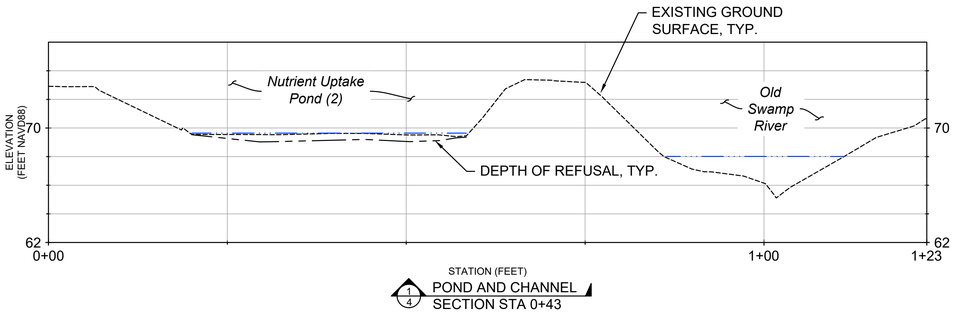
220 Concord Avenue, 2nd Floor
Cambridge, MA 02136
617.714.5537
www.interfluve.com

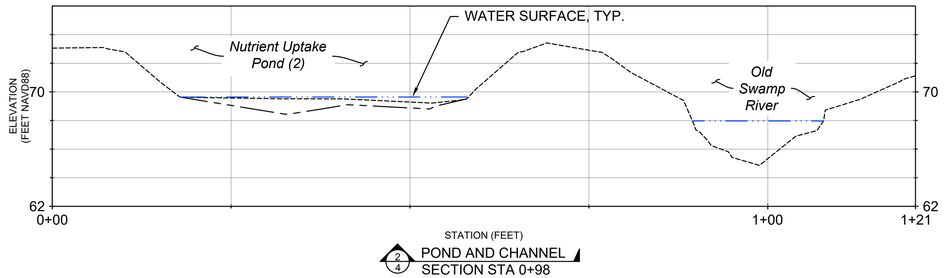
BSC GROUP
33 Waldo Street
Worcester, Massachusetts
01608
508 792 4500

PLAN VIEW HORIZONTAL SCALE: 1" = 30'
0 3.75 7.5 15 METERS
0 15 30 60 FEET

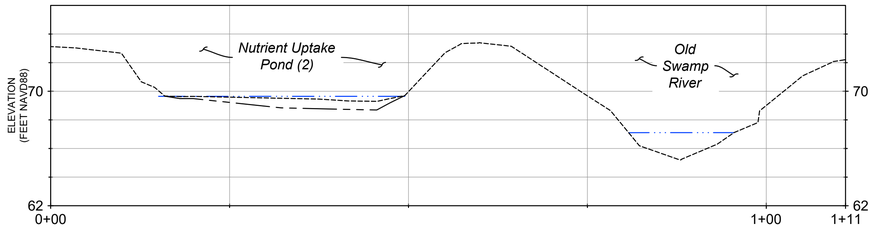
PROJ. MGR.: S.WIDING		
FIELD: N.SMITH, M.BRUNFELT, N.NELSON		
CALC./DESIGN: S.WIDING, S.JOHNSON		
DRAWN: S.JOHNSON		
CHECK: S.WIDING		
FILE: N:\\DERMaldenOldSwamp_220511\		
DWG.: WEYMOUTH		SHEET
JOB. NO: 8-9993.00		3 OF 5



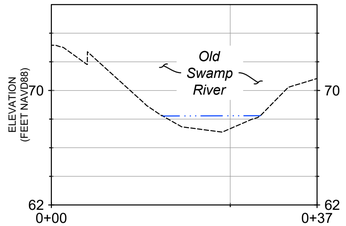
1/4 POND AND CHANNEL SECTION STA 0+43



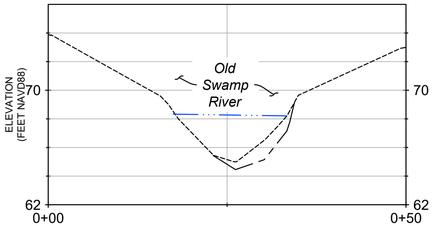
2/4 POND AND CHANNEL SECTION STA 0+98



3/4 POND AND CHANNEL SECTION STA 1+22



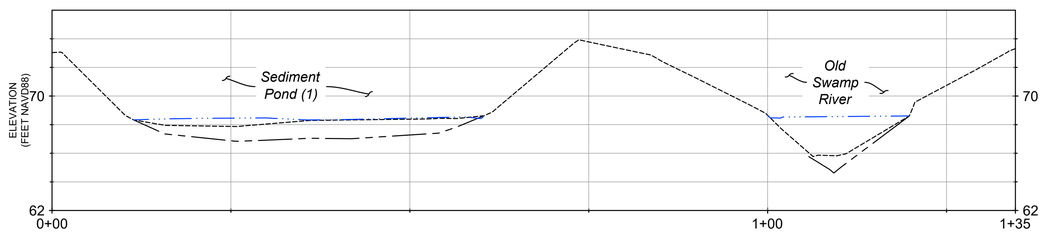
4/4 CHANNEL SECTION STA 2+36



5/4 CHANNEL SECTION STA 2+98

LEGEND

- EXISTING GROUND
- DEPTH OF REFUSAL
- WATER SURFACE



6/4 POND AND CHANNEL SECTION STA 3+20

NOTES:

1. SECTIONS ARE ORIENTED TO FACE DOWNSTREAM.
2. THE EXISTING GROUND REPRESENTED ON THESE SECTIONS IS DERIVED FROM A FIELD SURVEY COLLECTED BY INTER-FLUVE, INC. ON MAY 11, 2022 FOR THE PURPOSE OF DEFINING THE BATHYMETRY AND THICKNESS OF SEDIMENT.
3. THE EXISTING GROUND SURFACE REPRESENTS THE ELEVATION OF THE EARTHEN SURFACE AT THE BED OF THE POND OR RIVER. THE DEPTH OF REFUSAL REPRESENTS THE ELEVATION OF THE BOTTOM OF THE SEDIMENT LAYER AT THE SAME LOCATION.
4. OUTSIDE OF THE CHANNEL AND POND AREAS, THE SECTIONS PRESENTED ON THIS SHEET INCLUDE TOPOGRAPHIC DATA THAT WAS COLLECTED BY BSC GROUP OBTAINED AS PART OF THIS SAME CONTRACT WITH MassDER, AND LIDAR DATA OBTAINED FROM MassGIS (2013-2014).
5. THE WATER SURFACE SHOWN ON THESE SECTIONS WAS MEASURED IN THE FIELD ON MAY 11, 2022.

VERTICAL 1" = 5'
PROFILE VIEW SCALES AS SHOWN ON 22" X 34" SHEETS
1" = 10' HORIZONTAL

CHANNEL AND POND SECTIONS (1 OF 2)

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER AND SEDIMENT NUTRIENT UPTAKE PONDS (SNUP)

JUNE 30, 2022

PREPARED FOR:
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BSC GROUP
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01608
508 792 4500

SECTION HORIZONTAL SCALE: 1" = 10'
0 1.25 2.5 5 METERS
0 5 10 20 FEET

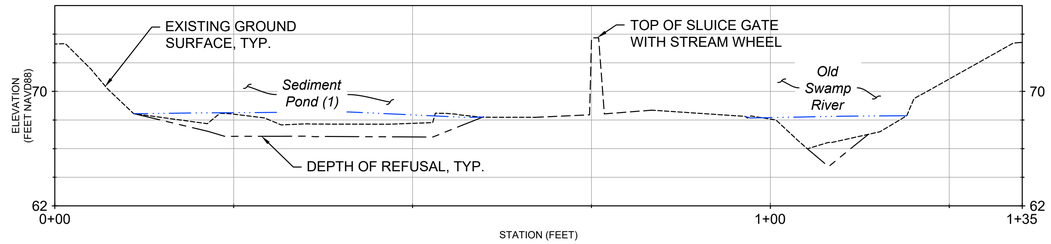
PROJ. MGR.: S.WIDING		
FIELD: N.SMITH, M.BRUNFELT, N.NELSON		
CALC./DESIGN: S.WIDING, S.JOHNSON		
DRAWN: S.JOHNSON		
CHECK: S.WIDING		
FILE: N:\\DERMaldenOldSwamp_220511\		
DWG.: WEYMOUTH		SHEET
JOB. NO: 8-9993.00		4 OF 5

LEGEND

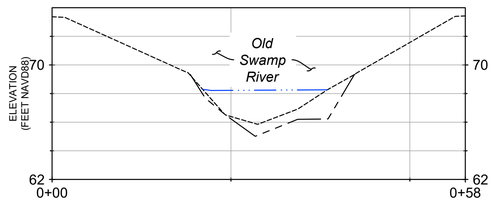
EXISTING GROUND

DEPTH OF REFUSAL

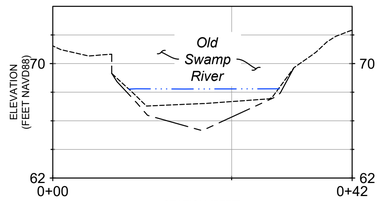
WATER SURFACE



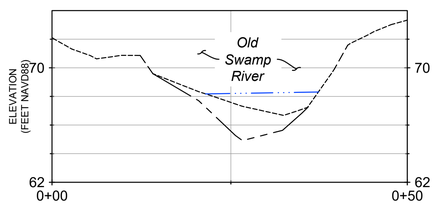
7/5 POND AND CHANNEL SECTION STA 3+37



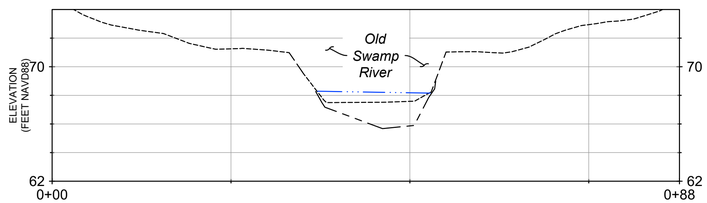
8/5 CHANNEL SECTION STA 3+73



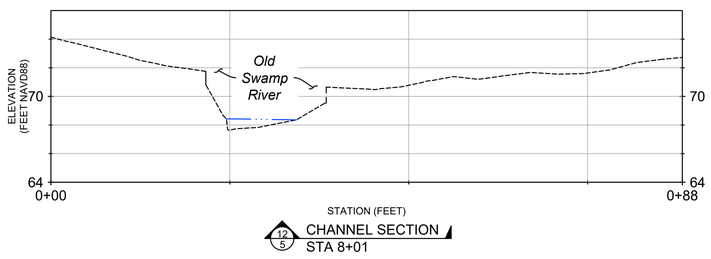
9/5 CHANNEL SECTION STA 4+73



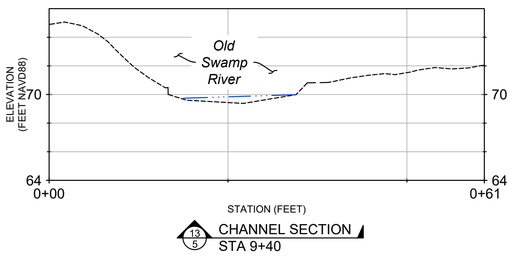
10/5 CHANNEL SECTION STA 5+49



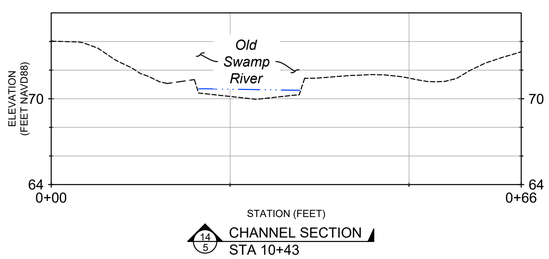
11/5 CHANNEL SECTION STA 6+37



12/5 CHANNEL SECTION STA 8+01



13/5 CHANNEL SECTION STA 9+40



14/5 CHANNEL SECTION STA 10+43

NOTES:

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2. THE EXISTING GROUND REPRESENTED ON THESE SECTIONS IS DERIVED FROM A FIELD SURVEY COLLECTED BY INTER-FLUVE, INC. ON MAY 11, 2022 FOR THE PURPOSE OF DEFINING THE BATHYMETRY AND THICKNESS OF SEDIMENT.
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4. OUTSIDE OF THE CHANNEL AND POND AREAS, THE SECTIONS PRESENTED ON THIS SHEET INCLUDE TOPOGRAPHIC DATA THAT WAS COLLECTED BY BSC GROUP OBTAINED AS PART OF THIS SAME CONTRACT WITH MassDER, AND LIDAR DATA OBTAINED FROM MassGIS (2013-2014).
5. THE WATER SURFACE SHOWN ON THESE SECTIONS WAS MEASURED IN THE FIELD ON MAY 11, 2022.

VERTICAL 1" = 5'
PROFILE VIEW SCALES AS SHOWN ON 22" X 34" SHEETS
1" = 10' HORIZONTAL

CHANNEL AND POND SECTIONS (2 OF 2)

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER AND SEDIMENT NUTRIENT UPTAKE PONDS (SNUP)

JUNE 30, 2022

PREPARED FOR:
MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
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SECTION HORIZONTAL SCALE: 1" = 10'
0 1.25 2.5 5 METERS
0 5 10 20 FEET

PROJ. MGR.: S.WIDING		
FIELD: N.SMITH, M.BRUNFELT, N.NELSON		
CALC./DESIGN: S.WIDING, S.JOHNSON		
DRAWN: S.JOHNSON		
CHECK: S.WIDING		
FILE: N:\\DERMaldenOldSwamp_220511\		
DWG.: WEYMOUTH		SHEET
JOB. NO: 8-9993.00		5 OF 5

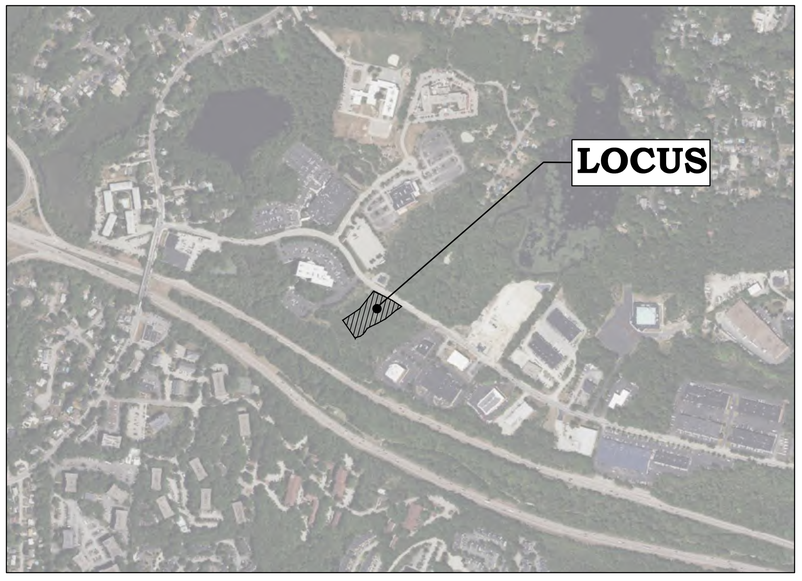
OLD SWAMP RIVER DAM REMOVAL AND RESTORATION
IN
WEYMOUTH, MASSACHUSETTS
(Norfolk County)

OWNER/APPLICANT

Town of Weymouth
175 Middle Street
Weymouth, MA 02189

CIVIL ENGINEER
LANDSCAPE ARCHITECT AND
WETLAND SCIENTIST

Beals and Thomas, Inc.
32 Court Street
Plymouth, Massachusetts 02360



Locus Map
Scale: 1" = 500'

NORTH

SHEET INDEX

	Cover Sheet
C1.1	Notes, References and Legend Sheet
2	Existing Conditions Plan (Prepared by BSC Group)
3	Bathymetric Plan, Long Profile and Sediment Mapping (Prepared by BSC Group)
4-5	Channel and Pond Sections (Prepared by BSC Group)
C2.1	Sedimentation and Erosion Control Plan
C3.1	Site Preparation Plan
C4.1	Grading Plan
C5.1	Landscape Plan
C6.1	Wetland Replication Plan
C7.1	Temporary Diversion Plan
C8.1	Profile Plan
C9.1-9.2	Site Details

Permit Plan Set - APRIL 1, 2024
Revised - MAY 13, 2024

Job No.: 3483.00
Plan No.: 348300P001B-001
Sheet 1 of 15

GENERAL NOTES

1. MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND OBTAIN NECESSARY CONSTRUCTION PERMITS. THE CONTRACTOR SHALL PAY FEES AND POST BONDS ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE ENGINEER AND ARCHITECT AS REQUIRED.
2. CONTRACTOR IS SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND CONSTRUCTION MEANS AND METHODS.
3. LIMIT OF WORK SHALL BE EROSION CONTROL BARRIERS, LIMIT OF GRADING, SITE PROPERTY LINES, AND/OR AS INDICATED ON DRAWINGS.
4. PORTIONS OF THE ROADWAY, SIDEWALK, AND ROADSIDE AREA DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION PRIOR TO DISTURBANCE. ANY AREA OUTSIDE THE LIMIT OF WORK THAT IS DISTURBED SHALL BE RESTORED TO ITS ORIGINAL CONDITION AT NO COST TO OWNER.
5. VERIFY UTILITY STUB LOCATIONS AND ELEVATIONS IN THE FIELD PRIOR TO COMMENCING WORK.
6. ANY ALTERATION TO THESE DRAWINGS MADE IN THE FIELD DURING CONSTRUCTION SHALL BE RECORDED BY THE CONTRACTOR ON RECORD DRAWINGS.
7. EXISTING TREES AND SHRUBS OUTSIDE THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON PRIOR APPROVAL OF THE OWNER.
8. CONTRACTORS AND SUBCONTRACTORS SHALL OBTAIN A TRENCH PERMIT PRIOR TO ANY TRENCHING ON SITE IN ACCORDANCE WITH 520 CMR 14.00.
9. FOR DRAWING LEGIBILITY, EXISTING TOPOGRAPHIC FEATURES, EXISTING UTILITIES, PROPERTY BOUNDARIES, EASEMENTS, ETC. MAY NOT BE SHOWN ON DRAWINGS. REFER TO REFERENCED DRAWINGS AND OTHER DRAWINGS IN THIS SET FOR ADDITIONAL INFORMATION.
10. PRIOR TO THE COMMENCEMENT OF WORK, A PRE-CONSTRUCTION MEETING SHALL BE HELD WITH REPRESENTATIVE OF MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION, REPRESENTATIVE OF THE TOWN OF WEYMOUTH, THE ENGINEER-OF-RECORD, AND THE CONTRACTOR.
11. ALL FUEL, OIL, PAINT, OR OTHER HAZARDOUS MATERIALS SHALL BE STORED IN A SECONDARY CONTAINER AND REMOVED TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
12. CONTRACTOR SHALL DEVELOP WRITTEN CONTINGENCY PLAN FOR SUDDEN OR PROLONGED HIGH FLOWS. A PLAN SHALL BE DEVELOPED AND SUBMITTED FOR REVIEW THAT DETAILS HOW THE PROJECT TEAM WILL MONITOR FLOWS IN THE RIVER, DEFINE THRESHOLDS FOR ACTION, INCLUDING RETREAT OF EQUIPMENT FROM THE FLOODING CORRIDOR, AND IDENTIFY OTHER ACTIONS.
13. BIODEGRADABLE HYDRAULIC FLUID: ALL EQUIPMENT SHALL HAVE BIODEGRADABLE HYDRAULIC FLUIDS.
14. STORAGE: ALL MACHINERY, EQUIPMENT, SUPPLIES, AND PROJECT MATERIALS SHALL BE STORED WITHIN THE CONSTRUCTION LAYDOWN AREA WHEN NOT IN ACTIVE USE OR DURING BREAKS IN WORK OF GREATER THAN 6 HOURS.
15. INVASIVE SPECIES CONTROL: CLEAN/INSPECT VEHICLES FOR NON-NATIVE PLANTS. PRIOR TO EACH ENTRANCE TO THE SITE, ALL VEHICLES SHALL BE INSPECTED AND, AS NEEDED, CLEANED OF ANY PLANT MATERIAL. A DESIGNATED LOCATION SHALL BE IDENTIFIED ONSITE FOR THE CLEAN/INSPECTION AND A LOCATION FOR THE DISPOSAL OF PLANT MATERIAL SHALL BE ASSIGNED.
16. DREDGED MATERIALS FROM SNUP BASIN-1 SHALL BE DEWATERED WITHIN THE TEMPORARY LAYDOWN AREA AND AS DIRECTED BY THE PROJECTS LICENSED SITE PROFESSIONAL (LSP).
17. DEWATERED DREDGE MATERIAL FROM SNUP BASIN-1 SHALL BE HAULED OFF SITE AND DISPOSED IN ACCORDANCE ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS AND AS DIRECTED BY THE PROJECTS LICENSED SITE PROFESSIONAL (LSP).

EROSION CONTROL AND SEDIMENTATION NOTES

1. INSTALL SEDIMENT CONTROL BARRIER AT THE EDGE OF PROPOSED WORK AS INDICATED ON THE DRAWINGS PRIOR TO THE COMMENCEMENT OF DEMOLITION OR CONSTRUCTION.
2. CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTATION OF THE REQUIREMENTS AND CONDITIONS OF THE PROJECT STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND THE EPA CONSTRUCTION GENERAL PERMIT (CGP).
3. CLEAN AND MAINTAIN SEDIMENT AND EROSION CONTROL MEASURES FOR THE DURATION OF CONSTRUCTION TO ENSURE THEIR CONTINUED FUNCTIONALITY.
4. IMPLEMENT ADDITIONAL EROSION CONTROL MEASURES AND/OR SEDIMENT CONTROL BARRIERS AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.
5. INSPECT AND MAINTAIN EROSION AND SEDIMENTATION CONTROL MEASURES DAILY DURING CONSTRUCTION TO ENSURE THAT CHANNELS, DITCHES, AND PIPES REMAIN CLEAR OF DEBRIS AND THAT THE EROSION AND SEDIMENTATION CONTROL MEASURES ARE INTACT.
6. MAINTAIN POINTS OF CONSTRUCTION EGRESS OR INGRESS TO PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC WAYS. ANY SEDIMENT TRACKED ONTO PUBLIC WAYS SHALL BE SWEPT AT THE END OF EACH WORKING DAY.
7. LOCATE STOCKPILE AREAS WITHIN LIMIT OF WORK LINE AND STABILIZE STOCKPILES TO PREVENT EROSION.
8. LEGALLY DISPOSE DEBRIS GENERATED DURING SITE PREPARATION ACTIVITIES OFF SITE.
9. PROVIDE CRIBBING AS NECESSARY TO PROTECT EXISTING UTILITY LINES DURING CONSTRUCTION.
10. PROTECT SITE ELEMENTS TO REMAIN FOR THE DURATION OF CONSTRUCTION.
11. STRIP TOPSOIL ENCOUNTERED WITHIN THE LIMIT OF WORK TO ITS FULL DEPTH AND STOCKPILE FOR REUSE. DISPOSE EXCESS TOPSOIL ON SITE AS DIRECTED BY OWNER. TOPSOIL STOCKPILES SHALL REMAIN SEGREGATED FROM OTHER EXCAVATED SOIL MATERIALS.
12. CRITICAL VEGETATION AREAS: TEMPORARY DIVERSION DITCHES, PERMANENT DITCHES, CHANNELS, EMBANKMENTS, AND ANY DENUDED SURFACE WHICH WILL BE EXPOSED FOR A PERIOD OF ONE MONTH OR MORE. MULCHED THESE AREA WITH STRAW. SPREAD MULCH UNIFORMLY IN A CONTINUOUS BLANKET OF SUFFICIENT THICKNESS TO COMPLETELY HIDE THE SOIL FROM VIEW.
13. STABILIZE CRITICAL VEGETATION AREAS DURING CONSTRUCTION BY SEEDING WITH ANNUAL RYE GRASS AT THE RATE OF FORTY (40) LBS/ACRE.
14. PROVIDE DUST CONTROL BY SPRINKLING OR OTHER APPROVED METHODS NECESSARY AND/OR AS DIRECTED BY THE OWNER OR THEIR REPRESENTATIVE.
15. INSTALL FILTER BAGS IN EXISTING CATCH BASINS PRIOR TO COMMENCEMENT OF CONSTRUCTION. INSTALL FILTER BAGS IN NEWLY INSTALLED CATCH BASINS PRIOR TO PERMANENT PAVEMENT PLACEMENT TO CONTROL SILTATION.
16. PREVENT SOIL AND MATERIALS FROM ENTERING WETLANDS, STREAMS, AND OTHER RESOURCE AREAS.
17. EROSION AND SEDIMENTATION CONTROL MEASURES: ADEQUATE EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE IMPLEMENTED, INCLUDING ANY NECESSARY CONTROLS NOT SPECIFICALLY REFERENCED IN THE PLANS, AND BE MAINTAINED IN EFFECT THROUGHOUT CONSTRUCTION UNTIL THE SITE HAS BECOME STABILIZED WITH ADEQUATE VEGETATIVE COVER OR VIA ALTERNATIVE MEANS. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE WILDLIFE FRIENDLY AND CONSIST OF MATERIAL THAT IS ORGANIC AND BIODEGRADABLE. AVOID THE USE OF WELDED PLASTIC OR BIODEGRADABLE NETTING OR THREAD.

LAYOUT AND MATERIALS NOTES

1. LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED UNLESS OTHERWISE INDICATED.
2. VERIFY CONDITIONS IN THE FIELD AND REPORT ANY DISCREPANCIES TO THE OWNER AND OWNER'S REPRESENTATIVE FOR RESOLUTION.
3. NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN SITE PLAN DIMENSIONS AND BUILDING PLANS BEFORE PROCEEDING WITH ANY PORTION OF SITE WORK WHICH MAY BE AFFECTED SO THAT PROPER ADJUSTMENTS TO THE SITE LAYOUT CAN BE MADE IF NECESSARY.
4. PROTECT EXISTING PROPERTY MONUMENTS AND ABUTTING PROPERTIES DURING CONSTRUCTION.

GRADING, DRAINAGE AND UTILITY NOTES

1. UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES AND ARE APPROXIMATE AND ASSUMED. BEFORE COMMENCING SITE WORK CONTACT "DIG SAFE" AT 1-888-344-7233 TO LOCATE UNDERGROUND UTILITIES. ANY DAMAGE TO EXISTING UTILITIES OR STRUCTURES SHALL BE THE CONTRACTOR'S RESPONSIBILITY. NO EXCAVATION SHALL BE PERFORMED UNTIL UTILITY COMPANIES ARE PROPERLY NOTIFIED.
2. SITE WORK SHALL MEET OR EXCEED THE SITE WORK SPECIFICATIONS PREPARED FOR THIS PROJECT.
3. VERIFY THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLATION OF ANY PORTION OF THE SITE WORK WHICH COULD BE AFFECTED.
4. WORK PERFORMED AND MATERIALS FURNISHED SHALL CONFORM WITH THE LINES, GRADES AND OTHER SPECIFIC REQUIREMENTS AND SPECIFICATIONS OF THE MUNICIPALITY OR AUTHORITIES HAVING JURISDICTION.
5. VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
6. PITCH GRADES EVENLY BETWEEN SPOT ELEVATIONS. PITCH PAVED AREAS TO DRAIN AT A MINIMUM OF 1/8" PER FOOT UNLESS SPECIFIED OTHERWISE. ANY DISCREPANCIES NOT ALLOWING THIS MINIMUM PITCH SHALL BE REPORTED TO THE ENGINEER PRIOR TO CONTINUING WORK.
7. MAKE ARRANGEMENTS WITH THE RESPECTIVE UTILITY COMPANIES FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE, AND ANY OTHER PRIVATE UTILITIES, AS REQUIRED.
8. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, ACCURATELY DETERMINE THE LOCATION, ELEVATION AND SIZE OF THE UTILITY WITHOUT DELAY AND FURNISH THE INFORMATION TO THE OWNER AND ENGINEER FOR RESOLUTION.
9. PROTECT UNDERGROUND UTILITIES FROM EXCESSIVE LOADS DURING CONSTRUCTION. RESTORE UTILITIES TO ORIGINAL CONDITION IF DAMAGE RESULTING FROM CONSTRUCTION LOADS OCCURS.
10. REMOVE EROSION AND SEDIMENT CONTROL BARRIERS AFTER RE-VEGETATION AND STABILIZATION OF DISTURBED AREAS, FOLLOWING APPROVAL OF THE CONSERVATION COMMISSION AND WETLAND SPECIALIST.

STABILIZATION NOTES

1. LOAM AND SEED DISTURBED AREAS UNLESS OTHERWISE NOTED ON THE DRAWINGS. INSTALLATION OF STABILIZATION MEASURES WILL BE COMPLETED AS SOON AS PRACTICABLE, BUT NO LATER THAN SEVEN (7) CALENDAR DAYS AFTER STABILIZATION HAS BEEN INITIATED.
2. REGRADE STOCKPILE AREA AFTER REMOVAL OF SURPLUS MATERIALS. LOAM AND SEED THE DISTURBED AREA.
3. TOPSOIL STRIPPED FROM THE SITE AND PROPERLY STOCKPILED MAY, UPON APPROVAL OF THE ENGINEER, BE USED FOR PREPARATION OF LAWNS AND PLANTING BEDS. IT SHALL BE FREE OF LARGE (ONE (1) INCH OR GREATER) COBBLES, ROOTS, OLD SOD, TRASH, WOOD OR OTHER CONTAMINANTS AND BE OF A FRIABLE CONSISTENCY AND SUITABLE FOR PLANT GROWTH
4. FURNISH TOPSOIL AS NEEDED. TOPSOIL SHALL BE FERTILE, FRIABLE, NATURAL AND PRODUCTIVE TOPSOIL OF GOOD CLAY-LOAM TYPE. IT SHALL BE FREE OF WEED SEEDS. TOPSOIL SHALL BE WITHOUT ADMIXTURE OF SUBSOIL AND SHALL BE REASONABLY FREE OF STONES, LUMPS, ROOTS, STICKS AND OTHER FOREIGN MATTER. TOPSOIL SHALL NOT BE WORKED OR APPLIED IN A MUDDY OR WET CONDITION.
5. SPREAD TOPSOIL TO A MINIMUM DEPTH OF FOUR (4) INCHES ON STRIPPED VEGETATED AREAS INCLUDING SLOPE STABILIZATION, LAWN AREAS, AND PLANTING BEDS AFTER EARTH FILLS HAVE PROPERLY SETTLED AND SUBGRADE HAS BEEN APPROVED BY THE OWNER. THE SETTLED TOPSOIL SHALL BE PROVIDED TO FINISHED GRADES AS INDICATED ON THE DRAWINGS. SCARIFY SUBGRADE TO A DEPTH OF TWO (2) INCHES BEFORE PLACING TOPSOIL.
6. REMOVE ROCKS AND DEBRIS FROM SOIL SURFACE AND GRADE TO AN EVEN SURFACE.
7. SOW PLANTING SEED SHALL IN SEASONAL CONDITIONS AS APPROPRIATE FOR GOOD SEED SURVIVAL, OR AT SUCH TIMES AS APPROVED BY THE OWNER.
8. AFTER SEEDING, EVENLY RAKE THE SURFACE WITH A FINE-TOOTHED RAKE AND THEN ROLLED WITH A HAND ROLLER WEIGHING NOT LESS THAN ONE HUNDRED (100) POUNDS PER FOOT OF WIDTH.
9. WATER THE MULCH AND SEEDED AREAS THOROUGHLY AND IMMEDIATELY AFTER COMPLETION OF MULCHING AND SEEDING OPERATIONS. SOIL SHALL BE MOISTENED TO A DEPTH OF FOUR (4) INCHES. PROVIDE INSTRUCTION TO OWNER'S REPRESENTATIVE ON APPROPRIATE WATERING PROCEDURES DURING INITIAL ESTABLISHMENT.
10. IF ANY AREAS OF SEEDING DO NOT SHOW A PROMPT "CATCH", RESEED THESE AREAS AT THE SAME RATE AND IN THE SAME MANNER IN TEN (10) DAY INTERVALS. CONTINUE THIS RESEEDING PROCESS UNTIL GRASS IS ESTABLISHED OVER THE ENTIRE AREA.
11. PROTECT NEWLY TOPSOILED, GRADED, AND/OR SEEDED AREAS FROM VEHICLES AND EROSION. KEEP AREAS FREE OF TRASH AND DEBRIS RESULTING FROM LANDSCAPE CONTRACTOR OPERATIONS.
12. PLACE WARNING SIGNS IN SEEDED AREAS AND ERECT BARRICADES TO PREVENT DAMAGE BY PERSONS OR MACHINES; MAINTAIN THESE PROTECTIONS FOR AT LEAST THIRTY (30) DAYS. REMOVE SIGNS WHEN DIRECTED BY OWNER/ENGINEER.
13. REPAIR AND RE-ESTABLISH GRADES IN SETTLED, ERODED, AND RUTTED AREAS TO THE SPECIFIED GRADES AND TOLERANCES.

SURVEY NOTES

1. GROUND SURVEY PERFORMED BY BSC GROUP, INC. IN MAY 2022.
2. BSC GROUP, INC. SUPPLEMENTED CONTOUR DATA WITH AERIAL LIDAR COLLECTED UNDER USGS CONTRACT DURING 2013-2014. OVERALL ROOT MEAN SQUARE ERROR (RMSE) IS 0.052 METERS (0.17 FT) COMPARING BARE EARTH LIDAR POINTS TO GROUND SURVEYED POINTS.
3. BATHYMETRIC SURVEY OF OLD SWAMP RIVER WAS PERFORMED BY INTERFLUVE, INC. AND REPRESENTS TOP OF SEDIMENT.
4. HORIZONTAL MAPPING IS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83) IN THE MASSACHUSETTS STATE PLANES, MAINLAND ZONE.
5. ELEVATION DATA IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). ALL CONTOURS ARE PRESENTED IN FEET.
6. INVERT AND OBVERT ELEVATIONS FOR TWIN CULVERTS PROVIDED BY BSC GROUP, INC. BSC GROUP, INC. CONVERTED CULVERT INVERT ELEVATIONS FROM TOWN OF WEYMOUTH DATUM TO NAVD88 (-6.63') AND ARE BASED UPON A RECORD DESIGN PLAN NUMBERS 4946B BY ARNOLD ASSOCIATES, INC. DATED FEBRUARY 1989.
7. WETLAND RESOURCE AREAS DELINEATED BY BSC GROUP, INC. ON MAY 18, 2022.
8. APPROXIMATE PROPERTY AND DRAINAGE EASEMENT LINES AS PROVIDED BY TOWN OF WEYMOUTH ENGINEERING DEPARTMENT IN CAD FILE 'SNUP EASEMENT EXPORT.DWG' ON MARCH 29, 2024.

PLANTING NOTES

1. PLANT MATERIAL SHALL CONFORM TO THE MINIMUM GUIDELINES ESTABLISHED BY THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE AMERICAN HORTICULTURE INDUSTRY ASSOCIATION.
2. NO PLANT SHALL BE INSTALLED BEFORE ACCEPTANCE OF ROUGH GRADING.
3. PLANT MATERIALS SHALL BEAR SAME RELATIONSHIP TO GRADE AS THEY BORE TO GRADE IN THE NURSERY.
4. PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
5. LOAM AND SEED DISTURBED AREAS UNLESS OTHERWISE INDICATED.
6. REGRADE STOCKPILE AREA AFTER REMOVAL OF SURPLUS MATERIALS (SEE SPECIFICATIONS). LOAM AND SEED DISTURBED AREAS. SEED SHALL BE NEW ENGLAND CONSERVATION WILDLIFE MIX BY NEWP, INC. OR APPROVED EQUAL.
7. TOPSOIL STRIPPED FROM THE SITE AND PROPERLY STOCKPILED MAY, UPON APPROVAL OF THE LANDSCAPE ARCHITECT, BE USED FOR PREPARATION OF LAWNS AND PLANTING BEDS. IT SHALL BE FREE OF LARGE (ONE (1) INCH OR GREATER) COBBLES, ROOTS, OLD SOD, TRASH, WOOD OR OTHER CONTAMINANTS AND BE OF A FRIABLE CONSISTENCY AND SUITABLE FOR PLANT GROWTH.
8. LANDSCAPE CONTRACTOR SHALL FURNISH TOPSOIL AS NEEDED. TOPSOIL SHALL BE FERTILE, FRIABLE, NATURAL AND PRODUCTIVE TOPSOIL OF GOOD CLAY-LOAM TYPE. IT SHALL BE FREE OF WEED SEEDS. TOPSOIL SHALL BE WITHOUT ADMIXTURE OF SUBSOIL AND SHALL BE REASONABLY FREE OF STONES, LUMPS, ROOTS, STICKS AND OTHER FOREIGN MATTER. TOPSOIL SHALL NOT BE WORKED OR APPLIED IN A MUDDY OR WET CONDITION.
9. PEAT AND ORGANIC MATERIAL STRIPPED FROM AN ALTERED WETLAND SHALL BE PROPERLY STOCKPILED AND USED FOR PREPARATION OF PROPOSED WETLAND AREA. WETLAND SEED SHALL BE FRESH, RECLEANED SEED OF THE LATEST CROP. WETLAND SEED SHALL BE DELIVERED TO THE SITE IN THE ORIGINAL CONTAINERS WHICH SHALL BEAR THE VENDOR'S GUARANTEE OF ANALYSIS.
10. TOPSOIL SHALL BE SPREAD TO A MINIMUM DEPTH OF FOUR (4) INCHES ON STRIPPED PLANTED AREAS INCLUDING SLOPE STABILIZATION, LAWN AREAS, AND PLANTING BEDS AFTER EARTH FILLS HAVE PROPERLY SETTLED AND SUBGRADE HAS BEEN APPROVED BY THE OWNER. THE SETTLED TOPSOIL SHALL BE UP TO THE FINISHED GRADE AS REQUIRED ON THE DRAWINGS. SCARIFY SUBGRADE TO A DEPTH OF TWO (2) INCHES BEFORE PLACING TOPSOIL.
11. SOW PLANTING SEED IN SEASONAL CONDITIONS AS APPROPRIATE FOR GOOD SEED SURVIVAL, OR AT SUCH TIMES AS APPROVED BY THE OWNER. PROVIDE SUFFICIENT HOSE AND SPRINKLER HEADS FOR ADEQUATE WATERING TO MAINTAIN A MOIST SEED BED AT ALL TIMES.
12. AFTER SEEDING, RAKE THE SURFACE OF THE SOIL EVENLY WITH A FINE-TOOTHED RAKE AND THEN ROLL WITH A HAND ROLLER WEIGHING NOT LESS THAN ONE HUNDRED (100) POUNDS PER FOOT OF WIDTH.
13. WATER THE MULCH AND SEED BEDS THOROUGHLY AND IMMEDIATELY AFTER COMPLETION OF MULCHING AND SEEDING OPERATIONS. SOIL SHALL BE MOISTENED TO A DEPTH OF FOUR (4) INCHES. INSTRUCT OWNER'S REPRESENTATIVE ON APPROPRIATE WATERING PROCEDURES DURING INITIAL ESTABLISHMENT.
14. IF CERTAIN AREAS OF THE LAWN DO NOT SHOW A PROMPT "CATCH", RESEED THESE AREAS AT THE SAME RATE AND IN THE SAME MANNER IN TEN (10) DAY INTERVALS. CONTINUE THIS SEEDING PROCESS UNTIL A GROWTH OF GRASS IS ESTABLISHED OVER THE ENTIRE AREA.
15. PROTECT NEWLY TOPSOILED, GRADED AND/OR SEEDED AREAS FROM TRAFFIC AND EROSION. KEEP AREAS FREE OF TRASH AND DEBRIS RESULTING FROM LANDSCAPE CONTRACTOR OPERATIONS.
16. PLACE WARNING SIGNS IN SEEDED AREAS AND ERECT BARRICADES TO PREVENT DAMAGE BY PERSONS OR MACHINES; MAINTAIN THESE PROTECTIONS FOR AT LEAST THIRTY (30) DAYS. REMOVE SIGNS WHEN DIRECTED BY OWNER/ENGINEER.
17. REPAIR AND RE-ESTABLISH GRADES IN SETTLED, ERODED, AND RUTTED AREAS TO THE SPECIFIED GRADE AND TOLERANCES.
18. CLEAN UP AND REMOVE DEBRIS FROM THE SITE CAUSED BY THE LANDSCAPE CONTRACTOR OR THEIR SUBCONTRACTORS.
19. MAINTAIN PLANT MATERIAL FOR THE DURATION OF THE PROJECT.
20. ALL PLANTS AND SEED MIXES SHALL BE COMPOSED OF SPECIES NATIVE TO THE COUNTY IN ACCORDANCE WITH THE VASCULAR PLANTS OF MASSACHUSETTS: A COUNTY CHECKLIST FIRST REVISION (DOW CULLINA, M, B CONNOLLY, B SORRIE, AND P SOMERS. 2011 MA NHESP DFW).
21. STATE-LISTED PLANT SPECIES SHALL NOT BE PLANTED. THE DIVISION ALSO DOES NOT APPROVE OF THE PLANTING OF STATE-LISTED SPECIES, EVEN IF THE SEEDS ARE SOURCED OUTSIDE OF MASSACHUSETTS.

WATER CONTROL NOTES

1. THE TEMPORARY DIVERSION PLAN PRESENTED HEREIN IS A RECOMMENDED APPROACH. THE CONTRACTOR IS RESPONSIBLE FOR WATER CONTROL AND DIVERSION DURING THE PROJECT.
2. DISCHARGE FROM TEMPORARY DIVERSION METHODS SHALL BE CLEAR OF TURBIDITY AND DEBRIS. ANY TURBIDITY SHALL BE ADDRESSED THROUGH THE USE OF DEWATERING CONTAINMENT AREAS, SEDIMENT DEWATERING FILTERING BAGS, OR OTHER MEANS, AS REQUIRED.
3. THE PROJECT SITE IS SUBJECT TO FLOODING. THE CONTRACTOR SHALL MONITOR WEATHER AND BE PREPARED TO STOP WORK AND STABILIZE THE SITE, AS NEEDED. THE CONTRACTOR SHALL PREPARE AND SUBMIT A FORMAL FLOOD CONTINGENCY PLAN PRIOR TO THE START OF CONSTRUCTION.
4. THE ESTIMATED BANKFULL FLOW OF OLD SWAMP RIVER (APPROX. 68 CFS) EXCEEDS THE ESTIMATED CAPACITY OF THE TEMPORARY DIVERSION (12 CFS). THE TEMPORARY DIVERSION AND DAM REMOVAL SHALL BE CONDUCTED DURING PERIODS OF LOW RIVER FLOW, COORDINATED WITH ANTICIPATED WEATHER AND SHALL BE COMPLETED AS QUICKLY AS PRACTICAL.

LEGEND AND ABBREVIATIONS

EXISTING / PROPOSED

- DRAIN LINE/MANHOLE
- CATCH BASIN
- FLARED END/INVERT
- WATER LINE/GATE
- HYDRANT
- POST INDICATOR VALVE
- TELEPHONE LINE/MANHOLE
- ELECTRIC LINE/MANHOLE
- OVERHEAD WIRE
- LIGHT POLE
- UTILITY POLE
- CHAIN LINK FENCE
- TREE
- TREE LINE
- RIPRAP
- BOUNDARY OF BORDERING VEGETATED WETLAND
- BANK/BANK FLAG
- 100' BUFFER ZONE
- MINOR CONTOUR
- MAJOR CONTOUR
- SPOT ELEVATION
- EDGE OF WATER
- 100-YEAR FLOOD ELEVATION
- LIMIT OF WORK
- SEDIMENTATION CONTROL BARRIER
- TEMPORARY COFFERDAM

DREDGE/FILL QUANTITIES

CATEGORY	DESCRIPTION	DAM REMOVAL	RIFFLE CONSTRUCTION	BANK GRADING	SNUP-1	TOTAL
DREDGE (CY)	PASSIVE SEDIMENT RELEASE	0	0	0	0	0
	ACTIVE SEDIMENT DREDGING	0	70	5	40	115
	CONCRETE REMOVAL	15	0	0	0	15
	STONE MASONRY REMOVAL	0	0	0	0	0
					TOTAL DREDGE:	130
FILL (CY)	RIPRAP + FILLER STONE	0	55	5	0	60
	SEDIMENT	0	0	0	0	40
					TOTAL FILL:	100
NET DREDGE/FILL (CY)	NEGATIVE = NET FILL	15	15	0	0	30
DREDGE DIMENSIONS	LENGTH (FT)		90	10	42	
	WIDTH (FT)	WITHIN	26	2.5	31	
	MAX DEPTH (FT)	RIFFLE	0.75	1	0.83	
	AREA (SF)	FOOTPRINT	2,400	30	1,330	3,760

DANIEL M. GAGNE CIVIL No. 48655 REGISTERED PROFESSIONAL ENGINEER — COMMONWEALTH OF MASSACHUSETTS
5/13/24

PREPARED FOR:

WESSAGUSSET - 1622 · LABORARE VINCERE · MASSACHUSETTS · WEYMOUTH - 1635

TOWN OF WEYMOUTH
175 MIDDLE STREET
WEYMOUTH, MASSACHUSETTS

NOT ISSUED FOR CONSTRUCTION

PREPARED BY:

BEALS AND THOMAS

BEALS AND THOMAS, INC.
32 Court Street
Plymouth, Massachusetts 02360-3866
T 508.746.3288 | www.bealsandthomas.com

5		
4		
3		
2		
1	05/13/2024	PER DER COMMENTS
0	04/01/2024	FIRST ISSUE
	ISSUE DATE	DESCRIPTION

ELC	ELC	DMG	DMG
DES	DWN	CHK'D	APP'D

PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION
WEYMOUTH, MASSACHUSETTS

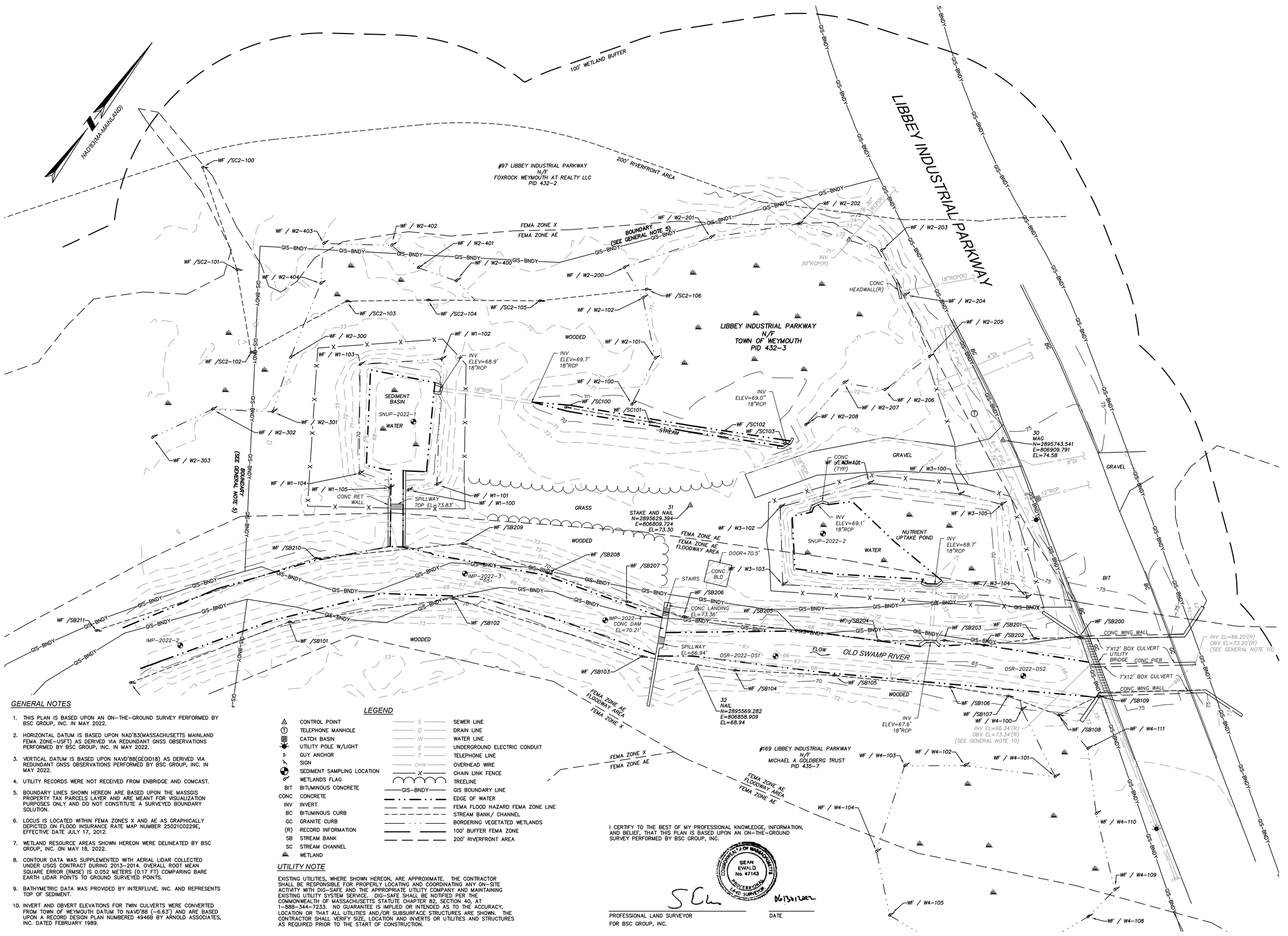
SCALE: NTS DATE: APRIL 1, 2024

METERS 0 5 10 15
FEET 0 10 20 40 60

NOTES, LEGEND AND REFERENCES

B+T JOB NO.3483.00
B+T PLAN NO. 348300P001B-002

C1.1



GENERAL NOTES

1. THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC. IN MAY 2022.
2. HORIZONTAL DATUM IS BASED UPON NAD'83(MASSACHUSETTS MAINLAND FEMA ZONE-USFT) AS DERIVED VIA REDUNDANT GNSS OBSERVATIONS PERFORMED BY BSC GROUP, INC. IN MAY 2022.
3. VERTICAL DATUM IS BASED UPON NAVD'88(GEOID18) AS DERIVED VIA REDUNDANT GNSS OBSERVATIONS PERFORMED BY BSC GROUP, INC. IN MAY 2022.
4. UTILITY RECORDS WERE NOT RECEIVED FROM ENBRIDGE AND COMCAST.
5. BOUNDARY LINES SHOWN HEREON ARE BASED UPON THE MASSGIS PROPERTY TAX PARCELS LAYER AND ARE MEANT FOR VISUALIZATION PURPOSES ONLY AND DO NOT CONSTITUTE A SURVEYED BOUNDARY SOLUTION.
6. LOCUS IS LOCATED WITHIN FEMA ZONES X AND AE AS GRAPHICALLY DEPICTED ON FLOOD INSURANCE RATE MAP NUMBER 25021C0229E, EFFECTIVE DATE JULY 17, 2012.
7. WETLAND RESOURCE AREAS SHOWN HEREON WERE DELINEATED BY BSC GROUP, INC. ON MAY 18, 2022.
8. CONTOUR DATA WAS SUPPLEMENTED WITH AERIAL LIDAR COLLECTED UNDER USGS CONTRACT DURING 2013-2014. OVERALL ROOT MEAN SQUARE ERROR (RMSE) IS 0.052 METERS (0.17 FT) COMPARING BARE EARTH LIDAR POINTS TO GROUND SURVEYED POINTS.
9. BATHYMETRIC DATA WAS PROVIDED BY INTERFLUVE, INC. AND REPRESENTS TOP OF SEDIMENT.
10. INVERT AND OBVERT ELEVATIONS FOR TWN CULVERTS WERE CONVERTED FROM TOWN OF WEYMOUTH DATUM TO NAVD'88 (-6.63') AND ARE BASED UPON A RECORD DESIGN PLAN NUMBERED 4946B BY ARNOLD ASSOCIATES, INC. DATED FEBRUARY 1989.

LEGEND

△	CONTROL POINT	S	SEWER LINE
T	TELEPHONE MANHOLE	D	DRAIN LINE
	CATCH BASIN	W	WATER LINE
	UTILITY POLE W/LIGHT	E	UNDERGROUND ELECTRIC CONDUIT
D	GUY ANCHOR	T	TELEPHONE LINE
	SIGN	OHW	OVERHEAD WIRE
	SEDIMENT SAMPLING LOCATION	X	CHAIN LINK FENCE
	WETLANDS FLAG		TREELINE
BIT	BITUMINOUS CONCRETE	GIS-BNDY	GIS BOUNDARY LINE
CONC	CONCRETE		EDGE OF WATER
INV	INVERT		FEMA FLOOD HAZARD FEMA ZONE LINE
BC	BITUMINOUS CURB		STREAM BANK/ CHANNEL
GC	GRANITE CURB		BORDERING VEGETATED WETLANDS
(R)	RECORD INFORMATION		100' BUFFER FEMA ZONE
SB	STREAM BANK		200' RIVERFRONT AREA
SC	STREAM CHANNEL		
	WETLAND		

UTILITY NOTE

EXISTING UTILITIES, WHERE SHOWN HEREON, ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING ANY ON-SITE ACTIVITY WITH DIG-SAFE AND THE APPROPRIATE UTILITY COMPANY AND MAINTAINING EXISTING UTILITY SYSTEM SERVICE. DIG-SAFE SHALL BE NOTIFIED PER THE COMMONWEALTH OF MASSACHUSETTS STATUTE CHAPTER 82, SECTION 40, AT 1-888-344-7233. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY SIZE, LOCATION AND INVERTS OR UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF CONSTRUCTION.

I CERTIFY TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION, AND BELIEF, THAT THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC.

COMMONWEALTH OF MASSACHUSETTS
SEAN EWALD
No. 47143
REGISTERED
LAND SURVEYOR

PROFESSIONAL LAND SURVEYOR
FOR BSC GROUP, INC.

06/30/2022
DATE

EXISTING CONDITIONS PLAN

LIBBEY INDUSTRIAL PARKWAY

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER

JUNE 30, 2022

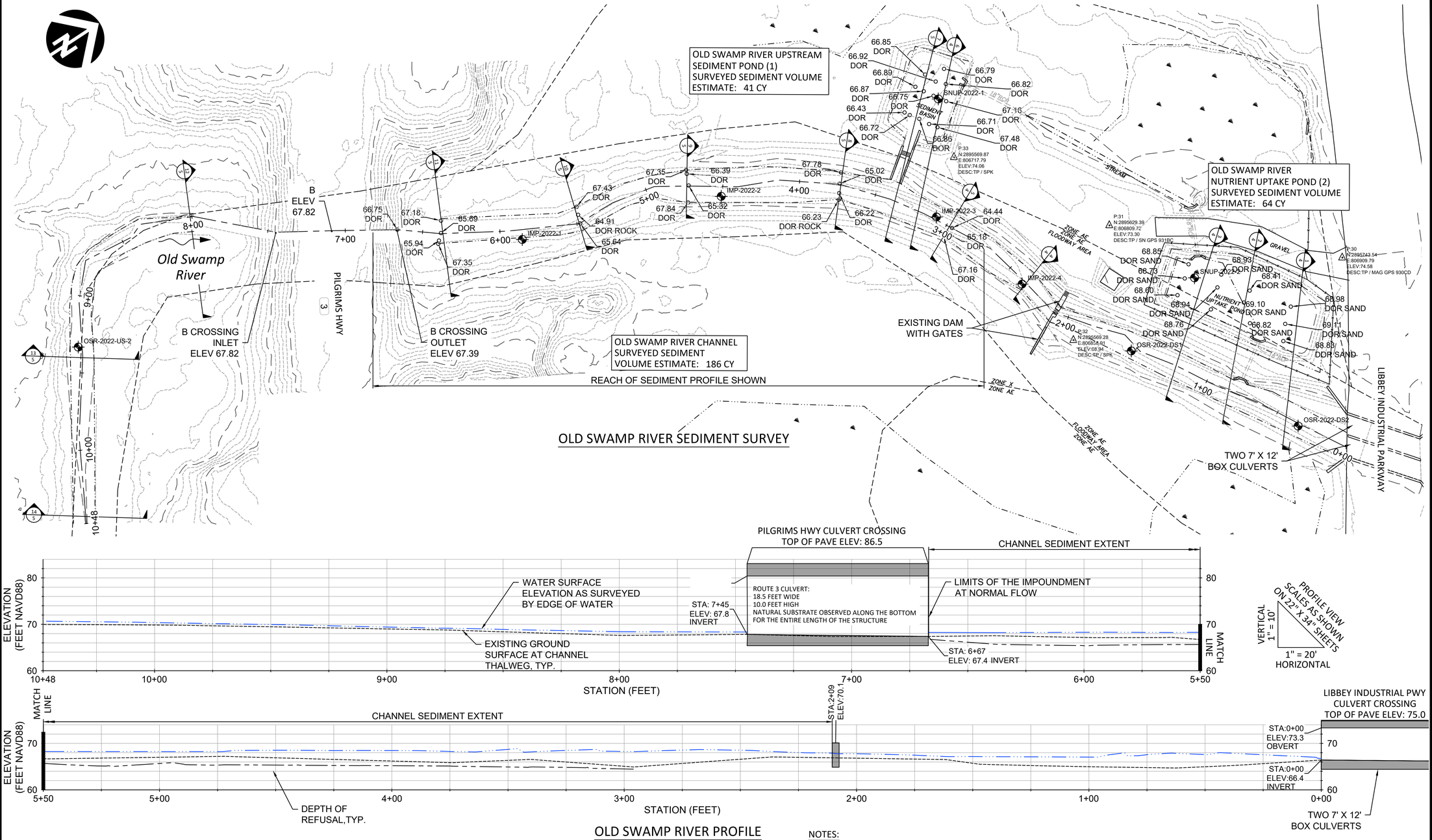
PREPARED FOR:
MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
BOSTON, MA 02114

inter·fluve
220 Concord Avenue, 2nd Floor
Cambridge, MA 02136
617.714.5537
www.interfluve.com

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

SCALE: 1" = 20'
0 2.5 5 10 METERS
0 10 20 40 FEET

PROJ. MGR.: S.BONIN		
FIELD: J.PINTAVALLE, B.SNEESBY		
CALC./DESIGN: -		
DRAWN: S.BONIN		
CHECK: S.EWALD		
FILE: P:\8999300\S\D\F\8999300EC3.DWG		
DWG.: 8999300EC3		SHEET
JOB. NO: 8-9993.00		2 OF 5



OLD SWAMP RIVER PROFILE

LEGEND

- 67.35 DOR — SEDIMENT PROBE LOCATION. DEPTH OF REFUSAL REPRESENTS THE ELEVATION OF THE BOTTOM OF THE SEDIMENT LAYER IN FEET NAVD 88
- EDGE OF WATER
- IMP-2022-2 — SEDIMENT SAMPLE LOCATIONS
- EXISTING 5 FT CONTOUR
- EXISTING 1 FT CONTOUR

NOTES:

1. THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC IN MAY 2022 AND AN ON-THE-GROUND BATHYMETRIC AND CHANNEL SURVEY PERFORMED BY INTER-FLUVE, INC IN MAY AND JUNE 2022.
2. THE EXISTING GROUND SURFACE REPRESENTS THE TOP OF THE SEDIMENT. THE DEPTH OF REFUSAL REPRESENTS THE BOTTOM OF THE SEDIMENT AT THE SAME LOCATION.
3. "DOR": DEPTH OF REFUSAL. THE VALUES ASSOCIATED WITH THESE POINTS ARE PRESENTED HERE AS ELEVATIONS IN FEET NAVD88.
4. "B": BED. REFERS TO THE ELEVATION OF THE STREAMBED, SHOWN ON THE PLAN AT THE INLET, OUTLET AND INTERIOR OF THE ROUTE 3 CROSSING.
5. THE EDGE OF WATER SHOWN IN PLAN VIEW AND THE WATER SURFACE SHOWN IN THE PROFILE WAS MEASURED IN THE FIELD ON MAY 11, 2022.
6. THE DIMENSIONS OF THE ROUTE 3 CULVERT (MassDOT W32032 8L5) WERE MEASURED IN THE FIELD.

BATHYMETRIC PLAN, LONG PROFILE, AND SEDIMENT MAPPING

LIBBEY INDUSTRIAL PARKWAY

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER AND SEDIMENT NUTRIENT UPTAKE PONDS (SNUP)

JUNE 30, 2022

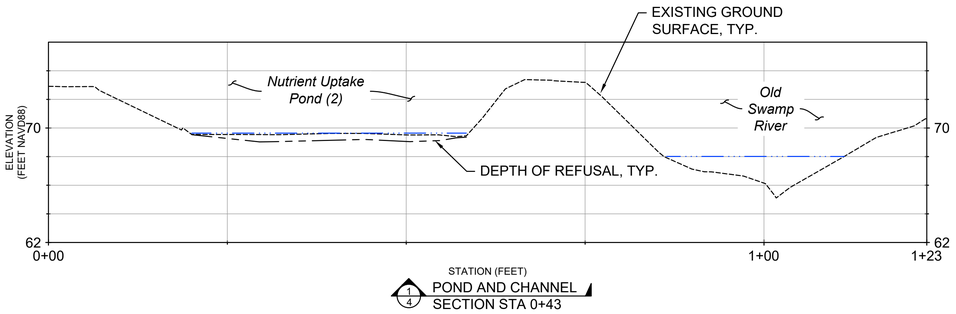
PREPARED FOR:
MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
BOSTON, MA 02114

inter·fluve
220 Concord Avenue, 2nd Floor
Cambridge, MA 02136
617.714.5537
www.interfluve.com

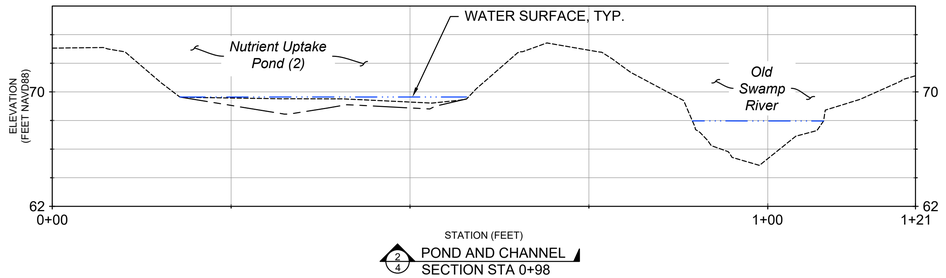
BSC GROUP
33 Waldo Street
Worcester, Massachusetts
01608
508 792 4500

PLAN VIEW HORIZONTAL SCALE: 1" = 30'
0 3.75 7.5 15 METERS
0 15 30 60 FEET

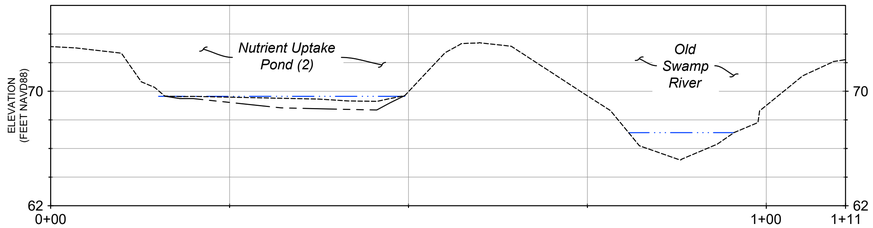
PROJ. MGR.: S.WIDING		
FIELD: N.SMITH, M.BRUNFELT, N.NELSON		
CALC./DESIGN: S.WIDING, S.JOHNSON		
DRAWN: S.JOHNSON		
CHECK: S.WIDING		
FILE: N:\\DERMaldenOldSwamp_220511\		
DWG.: WEYMOUTH		SHEET
JOB. NO: 8-9993.00		3 OF 5



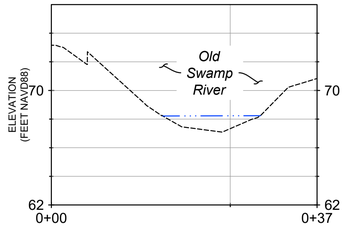
1/4 POND AND CHANNEL SECTION STA 0+43



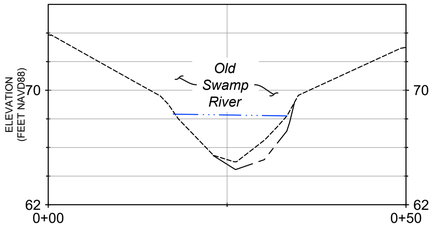
2/4 POND AND CHANNEL SECTION STA 0+98



3/4 POND AND CHANNEL SECTION STA 1+22



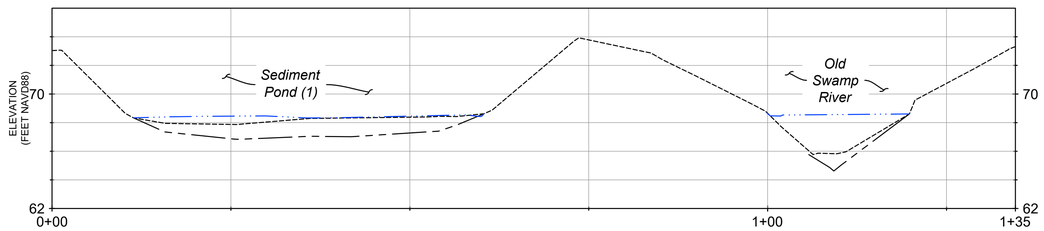
4/4 CHANNEL SECTION STA 2+36



5/4 CHANNEL SECTION STA 2+98

LEGEND

- EXISTING GROUND
- DEPTH OF REFUSAL
- WATER SURFACE



6/4 POND AND CHANNEL SECTION STA 3+20

NOTES:

1. SECTIONS ARE ORIENTED TO FACE DOWNSTREAM.
2. THE EXISTING GROUND REPRESENTED ON THESE SECTIONS IS DERIVED FROM A FIELD SURVEY COLLECTED BY INTER-FLUVE, INC. ON MAY 11, 2022 FOR THE PURPOSE OF DEFINING THE BATHYMETRY AND THICKNESS OF SEDIMENT.
3. THE EXISTING GROUND SURFACE REPRESENTS THE ELEVATION OF THE EARTHEN SURFACE AT THE BED OF THE POND OR RIVER. THE DEPTH OF REFUSAL REPRESENTS THE ELEVATION OF THE BOTTOM OF THE SEDIMENT LAYER AT THE SAME LOCATION.
4. OUTSIDE OF THE CHANNEL AND POND AREAS, THE SECTIONS PRESENTED ON THIS SHEET INCLUDE TOPOGRAPHIC DATA THAT WAS COLLECTED BY BSC GROUP OBTAINED AS PART OF THIS SAME CONTRACT WITH MassDER, AND LIDAR DATA OBTAINED FROM MassGIS (2013-2014).
5. THE WATER SURFACE SHOWN ON THESE SECTIONS WAS MEASURED IN THE FIELD ON MAY 11, 2022.

VERTICAL 1" = 5'
PROFILE VIEW SCALES AS SHOWN ON 22" X 34" SHEETS
1" = 10' HORIZONTAL

CHANNEL AND POND SECTIONS (1 OF 2)

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER AND SEDIMENT NUTRIENT UPTAKE PONDS (SNUP)

JUNE 30, 2022

PREPARED FOR:
MASSACHUSETTS DIVISION OF ECOLOGICAL RESTORATION
251 CAUSEWAY ST., STE 400,
BOSTON, MA 02114

inter·fluve
220 Concord Avenue, 2nd Floor
Cambridge, MA 02136
617.714.5537
www.interfluve.com

BSC GROUP
33 Waldo Street
Worcester, Massachusetts
01608
508 792 4500

SECTION HORIZONTAL SCALE: 1" = 10'
0 1.25 2.5 5 METERS
0 5 10 20 FEET

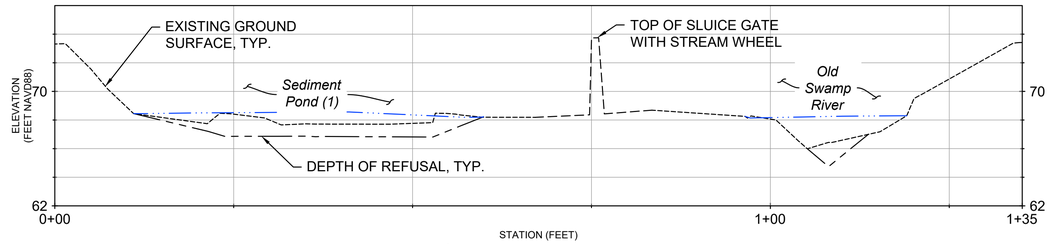
PROJ. MGR.: S.WIDING		
FIELD: N.SMITH, M.BRUNFELT, N.NELSON		
CALC./DESIGN: S.WIDING, S.JOHNSON		
DRAWN: S.JOHNSON		
CHECK: S.WIDING		
FILE: N:\\DERMaldenOldSwamp_220511\		
DWG.: WEYMOUTH		SHEET
JOB. NO: 8-9993.00		4 OF 5

LEGEND

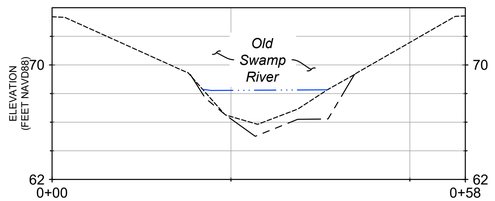
EXISTING GROUND

DEPTH OF REFUSAL

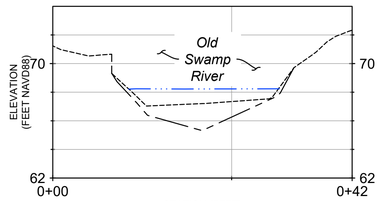
WATER SURFACE



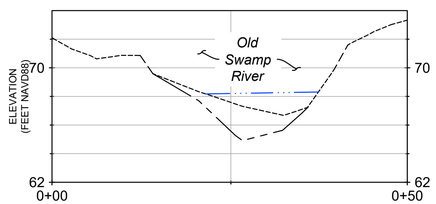
7/5 POND AND CHANNEL SECTION STA 3+37



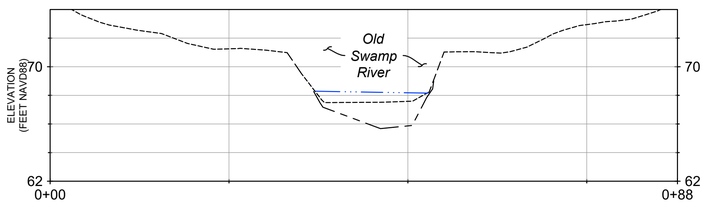
8/5 CHANNEL SECTION STA 3+73



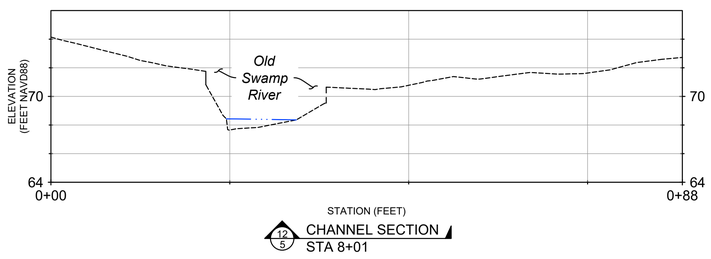
9/5 CHANNEL SECTION STA 4+73



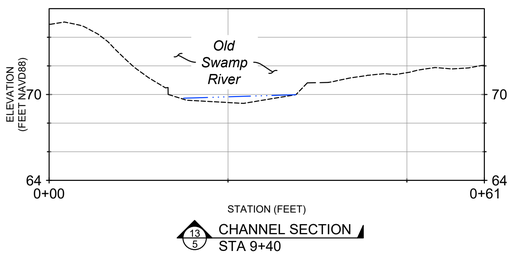
10/5 CHANNEL SECTION STA 5+49



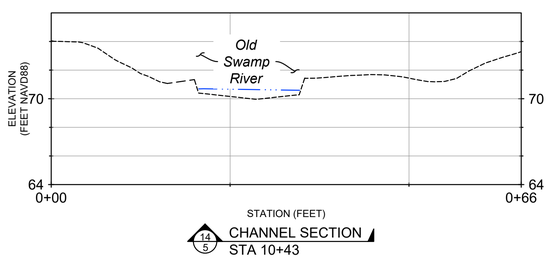
11/5 CHANNEL SECTION STA 6+37



12/5 CHANNEL SECTION STA 8+01



13/5 CHANNEL SECTION STA 9+40



14/5 CHANNEL SECTION STA 10+43

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2. THE EXISTING GROUND REPRESENTED ON THESE SECTIONS IS DERIVED FROM A FIELD SURVEY COLLECTED BY INTER-FLUVE, INC. ON MAY 11, 2022 FOR THE PURPOSE OF DEFINING THE BATHYMETRY AND THICKNESS OF SEDIMENT.
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PROFILE VIEW SCALES AS SHOWN ON 22" X 34" SHEETS
VERTICAL 1" = 5'
1" = 10' HORIZONTAL

CHANNEL AND POND SECTIONS (2 OF 2)

IN

WEYMOUTH
MASSACHUSETTS
(NORFOLK COUNTY)

OLD SWAMP RIVER AND SEDIMENT NUTRIENT UPTAKE PONDS (SNUP)

JUNE 30, 2022

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SECTION HORIZONTAL SCALE: 1" = 10'
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FIELD: N.SMITH, M.BRUNFELT, N.NELSON		
CALC./DESIGN: S.WIDING, S.JOHNSON		
DRAWN: S.JOHNSON		
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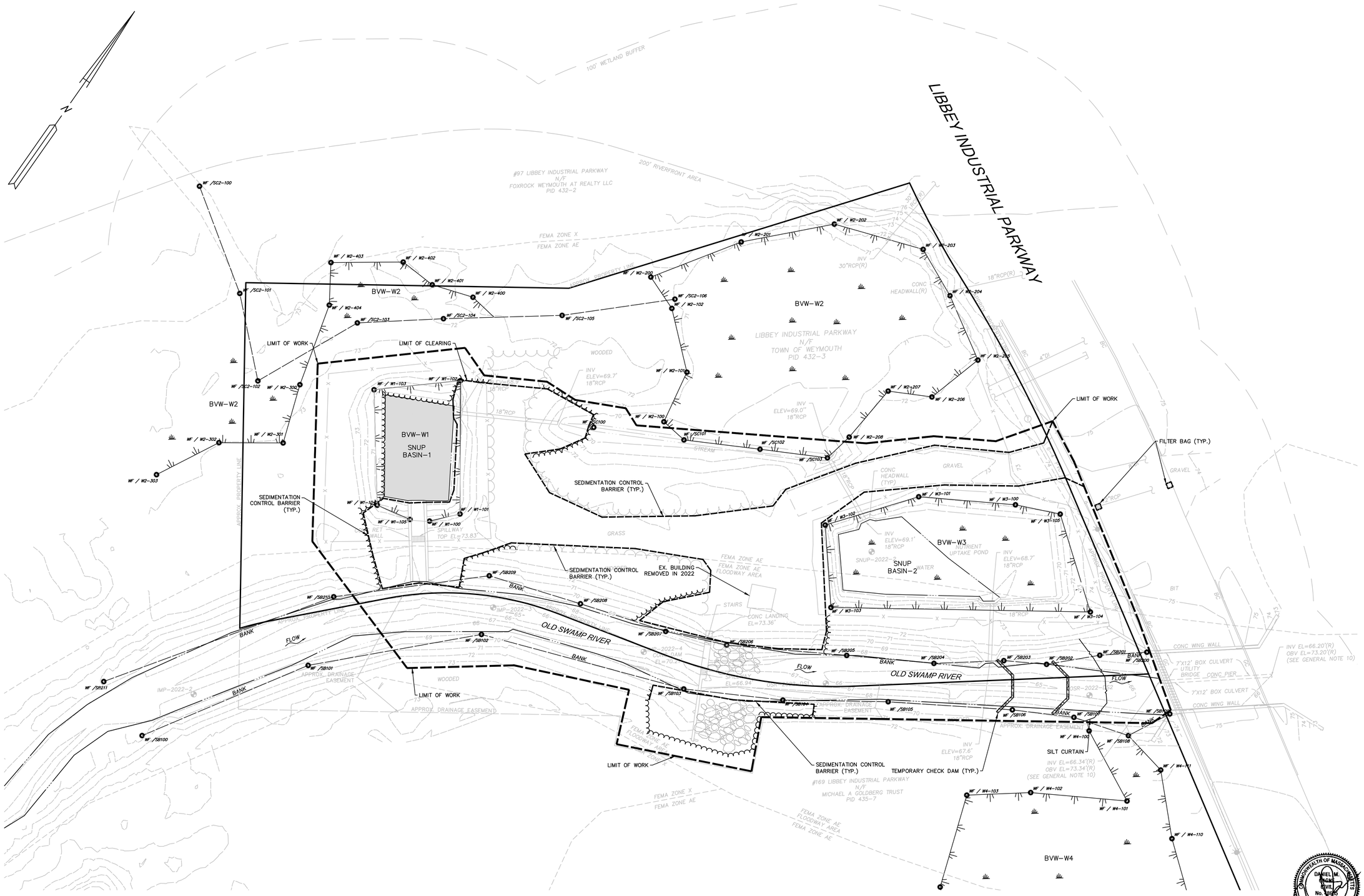
FILE: N:\\DERMaldenOldSwamp_220511\		
DWG.: WEYMOUTH		SHEET
JOB. NO: 8-9993.00		5 OF 5



FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

BEALS AND THOMAS, INC. SHALL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, OR PROCEDURES UTILIZED BY THE CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR CONTRACTOR'S EMPLOYEES; OR FOR THE FAILURE OF THE CONTRACTOR TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

PREPARED FOR:

TOWN OF WEYMOUTH

175 MIDDLE STREET
WEYMOUTH, MASSACHUSETTS

NOT ISSUED FOR CONSTRUCTION

PREPARED BY:

BEALS AND THOMAS

BEALS AND THOMAS, INC.
32 Court Street
Plymouth, Massachusetts 02360-3866
T 508.746.3288 | www.bealsandthomas.com

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2		
1	05/13/2024	PER DER COMMENTS
0	04/01/2024	FIRST ISSUE
ISSUE DATE	DESCRIPTION	

ELC	ELC	DMG	DMG
DES	DWN	CHK'D	APP'D

PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION

WEYMOUTH, MASSACHUSETTS

SCALE: 1" = 20' DATE: APRIL 1, 2024

METERS 0 5 10 15
FEET 0 10 20 40 60

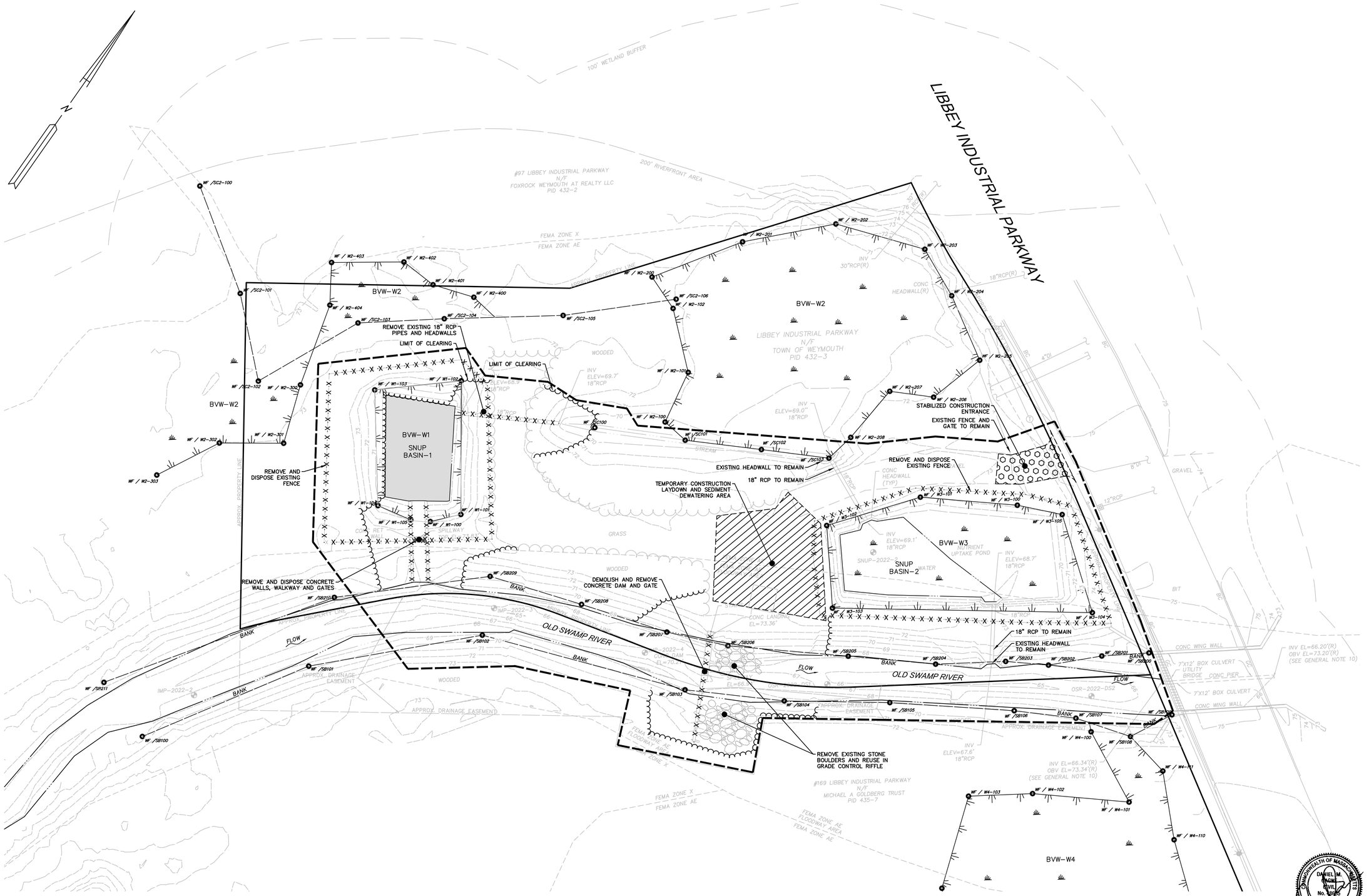
COMMONWEALTH OF MASSACHUSETTS — DANIEL M. MAGNI — CIVIL — No. 49045 — REGISTERED PROFESSIONAL ENGINEER — 5/13/24

SEDIMENTATION AND EROSION CONTROL PLAN

B+T JOB NO.3483.00

B+T PLAN NO. 348300P001B-003

C2.1



FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

PREPARED FOR:

TOWN OF WEYMOUTH

175 MIDDLE STREET
WEYMOUTH, MASSACHUSETTS

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PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION

WEYMOUTH, MASSACHUSETTS

SCALE: 1" = 20' DATE: APRIL 1, 2024

METERS 0 5 10 15
FEET 0 10 20 40 60

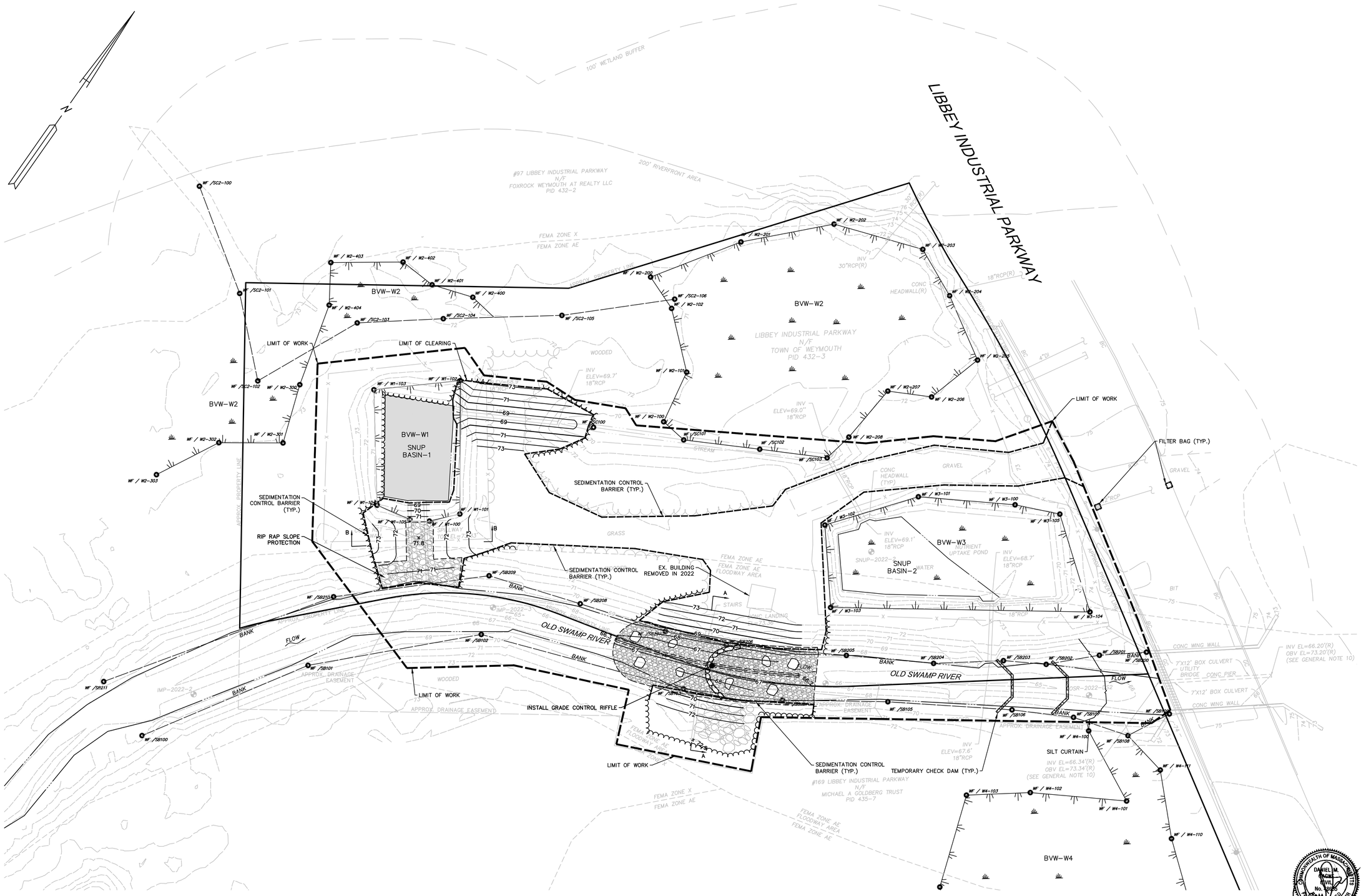
COMMONWEALTH OF MASSACHUSETTS — DANIEL M. MAGNI — CIVIL — No. 49345 — REGISTERED PROFESSIONAL ENGINEER — 5/13/24

SITE PREPARATION PLAN

B+T JOB NO.3483.00

B+T PLAN NO. 3483OOP001B-004

C3.1



FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

PREPARED FOR:

TOWN OF WEYMOUTH

175 MIDDLE STREET
WEYMOUTH, MASSACHUSETTS

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ELC	ELC	DMG	DMG
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PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION

WEYMOUTH, MASSACHUSETTS

SCALE: 1" = 20' DATE: APRIL 1, 2024

METERS 0 5 10 15
FEET 0 10 20 40 60

COMMONWEALTH OF MASSACHUSETTS
DANIEL M. GAGNE
CIVIL
No. 39935
REGISTERED PROFESSIONAL ENGINEER
5/13/24

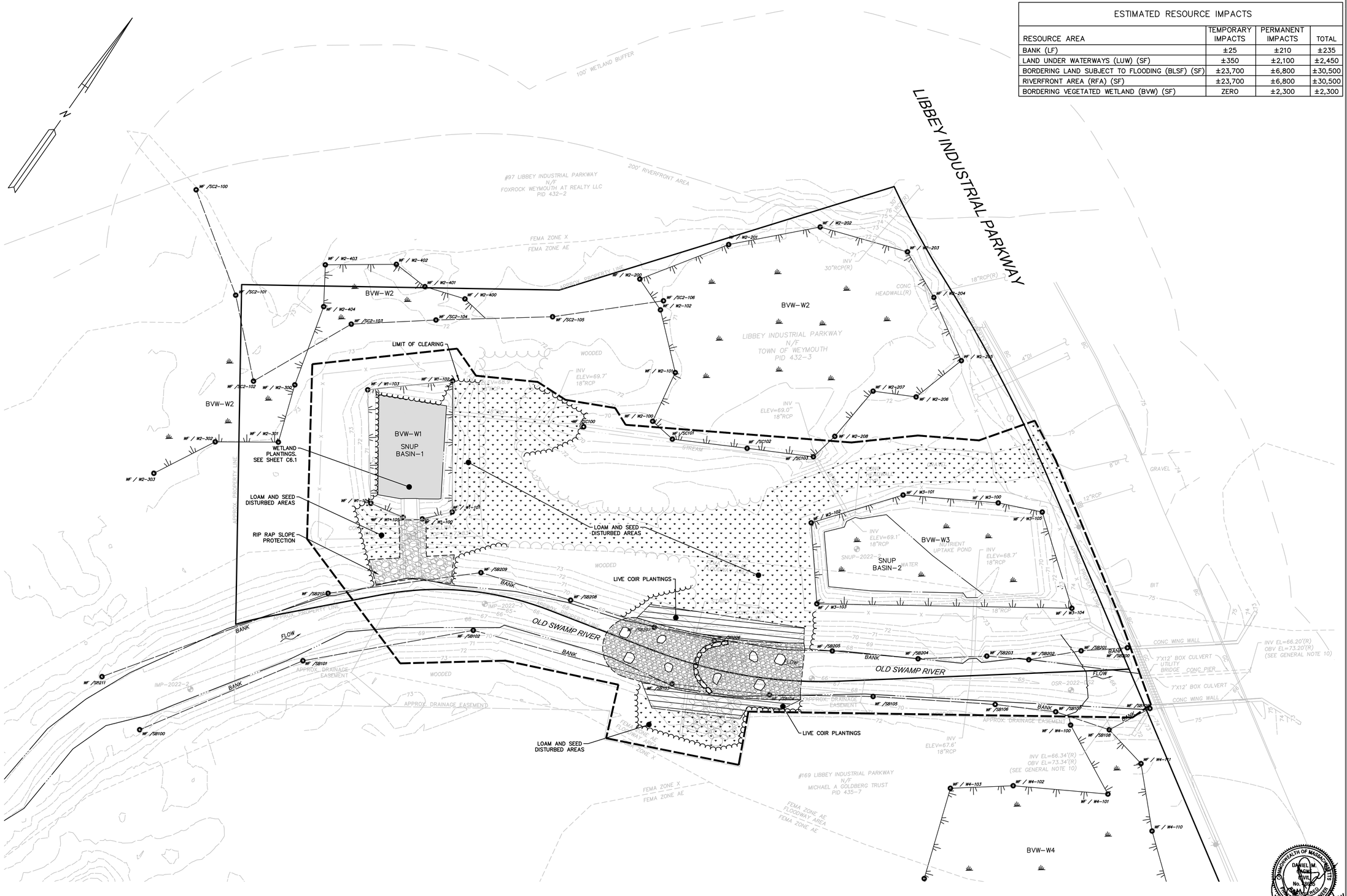
GRADING PLAN

B+T JOB NO.3483.00

B+T PLAN NO. 348300P001B-005

C4.1

ESTIMATED RESOURCE IMPACTS			
RESOURCE AREA	TEMPORARY IMPACTS	PERMANENT IMPACTS	TOTAL
BANK (LF)	±25	±210	±235
LAND UNDER WATERWAYS (LUW) (SF)	±350	±2,100	±2,450
BORDERING LAND SUBJECT TO FLOODING (BLSF) (SF)	±23,700	±6,800	±30,500
RIVERFRONT AREA (RFA) (SF)	±23,700	±6,800	±30,500
BORDERING VEGETATED WETLAND (BVW) (SF)	ZERO	±2,300	±2,300



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PREPARED FOR:

TOWN OF WEYMOUTH

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PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION

WEYMOUTH, MASSACHUSETTS

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METERS 0 5 10 15
FEET 0 10 20 40 60

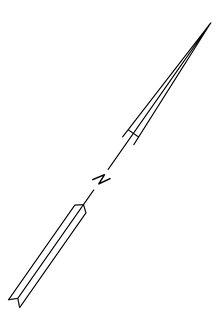
COMMONWEALTH OF MASSACHUSETTS
DANIEL M. GIGNAC
CIVIL
No. 38855
REGISTERED PROFESSIONAL ENGINEER
5/13/24

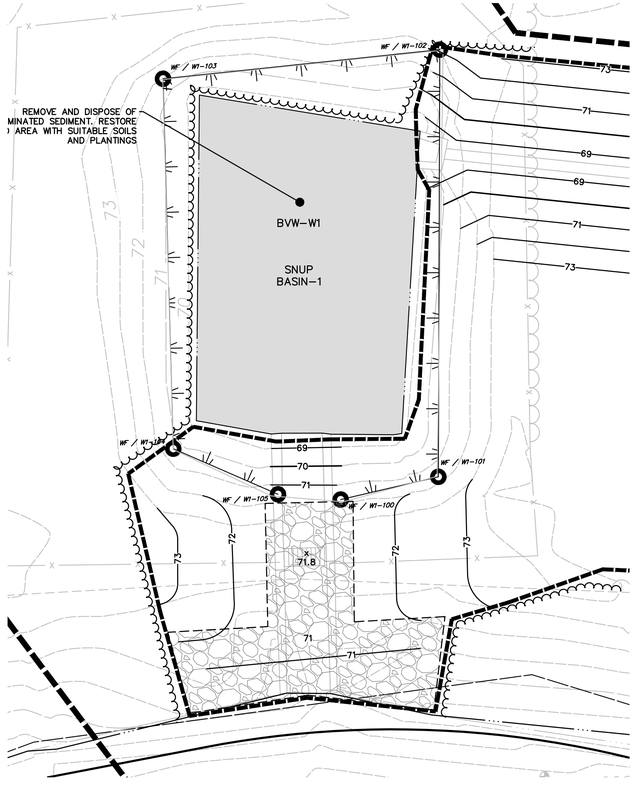
LANDSCAPE PLAN

B+T JOB NO.3483.00

B+T PLAN NO. 348300P001B-006

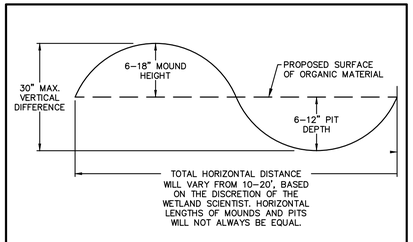
C5.1





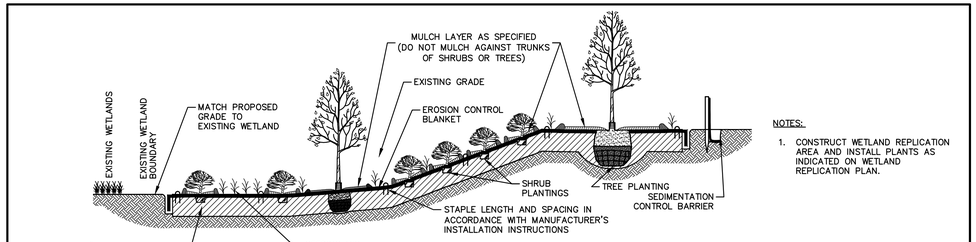
WETLAND RESTORATION AREA – PLANTING AND PROCESSING NOTES

1. PRIOR TO THE COMMENCEMENT OF EARTH–DISTURBING ACTIVITIES, THE SEDIMENT CONTROL BARRIER SHALL BE PROPERLY INSTALLED ALONG THE AUTHORIZED LIMIT OF WORK.
2. ONCE THE SEDIMENT CONTROL BARRIERS ARE INSTALLED, THE DESIGNATED REPLICATION AREA WILL BE CLEARED AND GRUBBED. SLASH AND WOODY DEBRIS WILL BE REMOVED FROM THIS AREA AND DISPOSED OF OFF–SITE OUTSIDE OF WETLAND RESOURCE AREAS AND THEIR BUFFER ZONES. UNDER THE DIRECTION OF A QUALIFIED ENVIRONMENTAL PROFESSIONAL, THE CONTRACTOR WILL RETAIN SPECIFIC WOODY MATERIAL FROM NATIVE SPECIES TO PLACE WITHIN THE REPLICATION AREA ONCE THE DESIRED GRADE AND HYDROLOGY IS ACHIEVED FOR HABITAT VALUE.
3. EXCAVATE AND DISPOSE OF THE ACCUMULATED ORGANIC SEDIMENTS WITHIN SNUP BASIN–1 IN ACCORDANCE WITH APPLICABLE REGULATIONS. SOIL AMENDMENTS FROM OFF–SITE SHALL BE REQUIRED PROCURED BY THE CONTRACTOR UNDER THE DIRECTION OF A QUALIFIED ENVIRONMENTAL PROFESSIONAL IN ACCORDANCE WITH MASSDEP WETLAND REPLICATION STANDARDS (2002) TO ACHIEVE CONDITIONS NECESSARY TO SUSTAIN THE WETLAND HYDROLOGY AND HYDROPHYTIC PLANT GROWTH. SOIL AMENDMENTS FORMING THE NEW A HORIZON SHALL BE COMPOSED OF EQUAL PARTS ORGANIC AND MINERAL MATERIAL.
4. PLANTING AND SEEDING ACTIVITIES SHALL BE PERFORMED EITHER AT THE START OF THE GROWING SEASON (APPROXIMATELY APRIL 15TH THROUGH JUNE 1ST) UNLESS IRRIGATION IS PROVIDED TO SUSTAIN LATER–SEASON PLANTING.
5. THE SUBSTITUTION OF ANY PLANT MATERIAL MAY ONLY BE SUBSTITUTED WITH THE INPUT FROM A QUALIFIED ENVIRONMENTAL PROFESSIONAL.
6. THE CONTRACTOR WILL ESTABLISH THE INDIVIDUAL PLANTINGS THROUGHOUT THE WETLAND RESTORATION AREA, SPACING EACH SPECIMEN APPROXIMATELY FIVE (5) TO SIX (6) FEET ON–CENTER. UNDER THE DIRECTION OF A QUALIFIED ENVIRONMENTAL PROFESSIONAL, THESE INDIVIDUAL PLANTINGS SHALL BE INTERSPERSED TO CREATE AN EVEN DISPERSAL THROUGHOUT THE FOOTPRINT OF THE RESTORATION AREA. THESE PLANTINGS WILL BE MONITORED BY A QUALIFIED ENVIRONMENTAL PROFESSIONAL TO DETERMINE SURVIVAL IN SUBSEQUENT GROWING SEASONS. ANY INDIVIDUAL PLANTING WHICH DOES NOT SURVIVE WITHIN THE FIRST THREE (3) GROWING SEASONS SHALL BE REPLACED IN–KIND UNTIL THE REGULATORY REQUIREMENTS FOR RESTORATION ARE ACHIEVED TO THE SATISFACTION OF THE ISSUING AUTHORITY.
7. ONCE THE INITIAL INDIVIDUAL PLANTINGS ARE ACHIEVED, THE WETLAND RESTORATION AREA SHALL BE SEEDED WITH THE 'NEW ENGLAND WET MIX' PREPARED BY NEW ENGLAND WETLAND PLANTS, INC. OR EQUIVALENT. THE SEEDING SHALL BE PERFORMED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND WILL BE OVERSEEN BY A QUALIFIED ENVIRONMENTAL PROFESSIONAL TO ENSURE THAT NO AREAS ARE OMITTED OR THAT SHADOWING DOES NOT OCCUR. IF THE HERBACEOUS PLANTINGS DO NOT ESTABLISH BY THE CONCLUSION OF THE FIRST GROWING SEASON, ADDITIONAL APPLICATION OF THE WETLAND SEED MIX WILL BE PERFORMED BY THE CONTRACTOR.
8. AT THE DIRECTION OF A QUALIFIED ENVIRONMENTAL PROFESSIONAL, PIT AND MOUND MICRO–TOPOGRAPHY SHALL BE CREATED WITHIN THE RESTORATION AREA UTILIZING EXISTING TOPSOIL OR SOIL AMENDMENTS WHERE APPLICABLE. HUMMOCKS CREATED WITHIN THE RESTORATION AREA SHALL NOT EXCEED ONE FOOT (1') ABOVE THE SURFACE ELEVATION OF THE SURROUNDING RESTORATION AREA.
9. THE WETLAND RESTORATION AREA SHALL BE MONITORED BY A QUALIFIED ENVIRONMENTAL PROFESSIONAL. MONITORING SHALL INCLUDE ESTABLISHMENT OF PHOTOGRAPHIC POINTS, SOIL PLOT LOCATIONS, AND VEGETATIVE TRANSECT LOCATIONS COMMENSURATE WITH THE SIZE OF THE RESTORATION AREA. MONITORING SHALL OCCUR TWICE ANNUALLY DURING THE GROWING SEASON FOR A MINIMUM OF TWO YEARS UNTIL AT LEAST 75% COVER OF NATIVE PLANTS IS ACHIEVED, WITH ANNUAL REPORTS SUBMITTED TO THE CONSERVATION COMMISSION. IF NON–NATIVE INVASIVE SPECIES ARE OBSERVED WITHIN THE WETLAND RESTORATION AREA, HAND REMOVAL OF INVASIVE SPECIES SHALL BE PERFORMED THEREIN OR THROUGH ANOTHER METHOD THAT IS DEEMED ACCEPTABLE TO THE ISSUING AUTHORITY.
10. JAPANESE KNOTWEED SHOOTS AND OTHER INVASIVE SPECIES ENCOUNTERED DURING SITE PREPARATION SHALL BE PULLED BY HAND AND/OR CUT. ALL KNOTWEED REMOVED SHALL BE BAGGED AND DISPOSED OF OFF–SITE. TARGETED FOLIAR HERBICIDE TREATMENT SHALL BE APPLIED TO THE REMNANT KNOW WEED SPECIMENS DURING THE FIRST 3 YEARS OF THE WETLAND RESTORATION EFFORT. ALL FOLIAR APPLICATIONS SHALL BE PERFORMED BY A LICENSED HERBICIDE APPLICATOR AND IN CONFORMANCE WITH THE APPROVED ORDER OF CONDITIONS ISSUED BY THE DEDHAM CONSERVATION COMMISSION.
11. BLACK TARPS SHALL BE STAKED IN THE AREA PREVIOUSLY COVERED BY KNOTWEED TO SUPPRESS GROWTH. THE TARPS SHALL REMAIN IN PLACE UNTIL THE REQUIRED TIMELINE FOR NEW PLANT SURVIVAL HAS BEEN ACHIEVED.



PIT AND MOUND MICROTOPOGRAPHY DETAIL

NOT TO SCALE



TYPICAL SECTION FOR
WETLAND REPLICATION

NOT TO SCALE

REPLICATION PLANT SCHEDUILE

COMMON NAME	BOTANICAL NAME	SIZE	SPACING	QUANTITY
BUTTONBUSH	CEPHALANTHUS OCCIDENTALIS	2–3' HT.	5–6' O.C.	6
SWAMP AZALEA	RHODODENDRON VISCOSUM	2–3' HT.	5–6' O.C.	6
SENSITIVE FERN	ONOCLEA SENSIBILIS	PLUG	VARIABLE, MIN. 1'	24–36 HERBACEOUS PLUGS BASED ON PREFERENCE AND AVAILABILITY
CINNAMON FERN	OSMUNDA CINNAMOMEA	PLUG	VARIABLE, MIN. 1'	
ROYAL FERN	OSMUNDA REGALIS	PLUG	VARIABLE, MIN. 1'	
TUSSOCK SEDGE	CAREX STRICTA	PLUG	VARIABLE, MIN. 1'	
FOX SEDGE	CAREX VULPINOIDEA	PLUG	VARIABLE, MIN. 1'	
SOFT RUSH	JUNCUS EFFUSUS	PLUG	VARIABLE, MIN. 1'	
CANADA RUSH	JUNCUS CANADENSIS	PLUG	VARIABLE, MIN. 1'	
NEW ENGLAND WET MIX OR EQUIVALENT SEED MIX, APPLIED AT MANUFACTURER'S RECOMMENDED LBS/SQUARE FOOT				

FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

PREPARED FOR:

TOWN OF WEYMOUTH

175 MIDDLE STREET
WEYMOUTH, MASSACHUSETTS

NOT ISSUED FOR CONSTRUCTION

PREPARED BY:

BEALS AND THOMAS

BEALS AND THOMAS, INC.
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0	04/01/2024	FIRST ISSUE
ISSUE DATE	DESCRIPTION	

ELC	ELC	DMG	DMG
DES	DWN	CHK'D	APP'D

PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION

WEYMOUTH, MASSACHUSETTS

SCALE: 1" = 10' DATE: APRIL 1, 2024

METERS 0 2.5 5 7.5
FEET 0 5 10 20 30

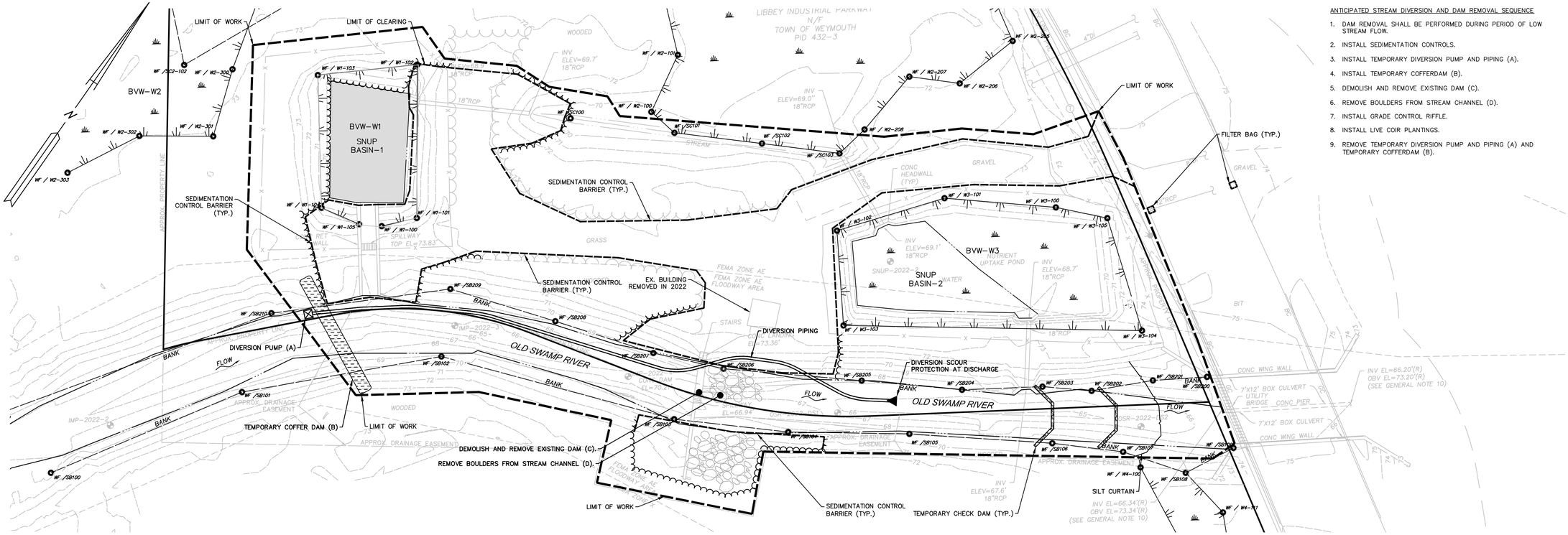
WETLAND REPLICATION PLAN

B+T JOB NO.3483.00

B+T PLAN NO. 348300P001B–007

C6.1

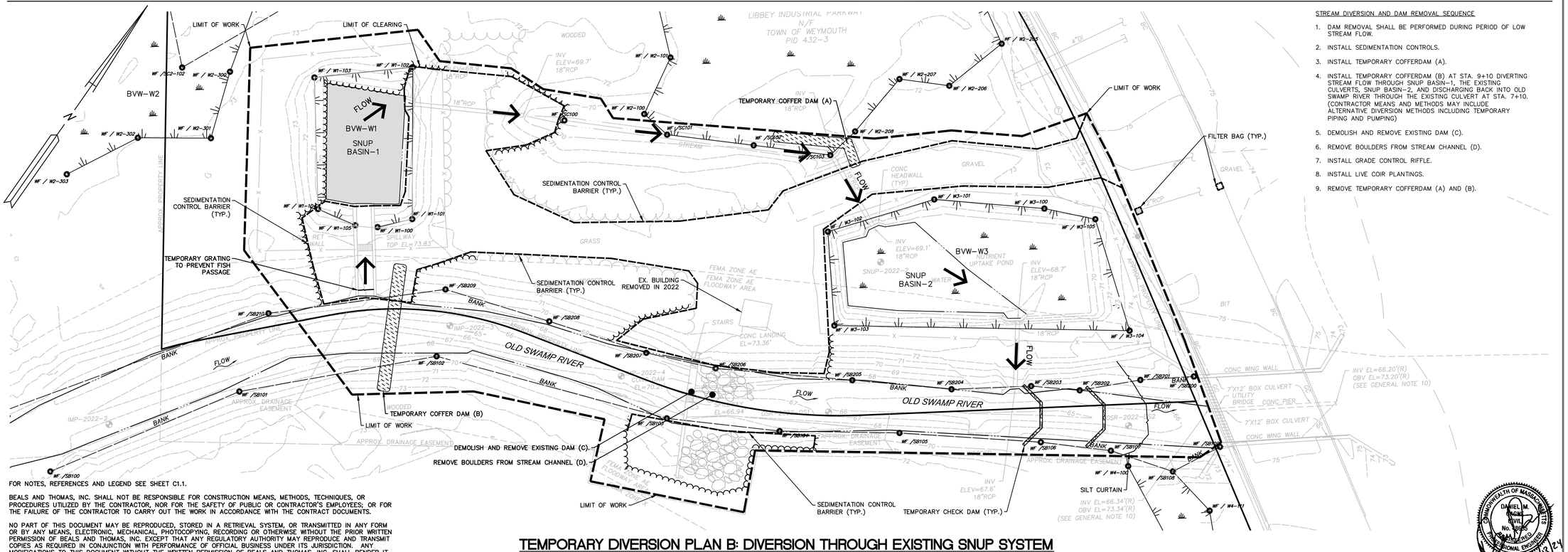
COMMONWEALTH OF MASSACHUSETTS
DANIEL M. DUNN
CIVIL
No. 49935
REGISTERED PROFESSIONAL ENGINEER
5/13/24



TEMPORARY DIVERSION PLAN A: PUMPED DIVERSION
SCALE: 1"=20'

ANTICIPATED STREAM DIVERSION AND DAM REMOVAL SEQUENCE

1. DAM REMOVAL SHALL BE PERFORMED DURING PERIOD OF LOW STREAM FLOW.
2. INSTALL SEDIMENTATION CONTROLS.
3. INSTALL TEMPORARY DIVERSION PUMP AND PIPING (A).
4. INSTALL TEMPORARY COFFERDAM (B).
5. DEMOLISH AND REMOVE EXISTING DAM (C).
6. REMOVE BOULDERS FROM STREAM CHANNEL (D).
7. INSTALL GRADE CONTROL RIFFLE.
8. INSTALL LIVE COIR PLANTINGS.
9. REMOVE TEMPORARY DIVERSION PUMP AND PIPING (A) AND TEMPORARY COFFERDAM (B).



TEMPORARY DIVERSION PLAN B: DIVERSION THROUGH EXISTING SNUP SYSTEM
SCALE: 1"=20'

STREAM DIVERSION AND DAM REMOVAL SEQUENCE

1. DAM REMOVAL SHALL BE PERFORMED DURING PERIOD OF LOW STREAM FLOW.
2. INSTALL SEDIMENTATION CONTROLS.
3. INSTALL TEMPORARY COFFERDAM (A).
4. INSTALL TEMPORARY COFFERDAM (B) AT STA. 9+10 DIVERTING STREAM FLOW THROUGH SNUP BASIN-1, THE EXISTING CULVERTS, SNUP BASIN-2, AND DISCHARGING BACK INTO OLD SWAMP RIVER THROUGH THE EXISTING CULVERT AT STA. 7+10. (CONTRACTOR MEANS AND METHODS MAY INCLUDE ALTERNATIVE DIVERSION METHODS INCLUDING TEMPORARY PIPING AND PUMPING)
5. DEMOLISH AND REMOVE EXISTING DAM (C).
6. REMOVE BOULDERS FROM STREAM CHANNEL (D).
7. INSTALL GRADE CONTROL RIFFLE.
8. INSTALL LIVE COIR PLANTINGS.
9. REMOVE TEMPORARY COFFERDAM (A) AND (B).

FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

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WEYMOUTH, MASSACHUSETTS

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PROJECT:
OLD SWAMP RIVER DAM REMOVAL AND RESTORATION
WEYMOUTH, MASSACHUSETTS

SCALE: 1" = 20' DATE: APRIL 1, 2024

METERS 0 5 10 15
FEET 0 10 20 40 60

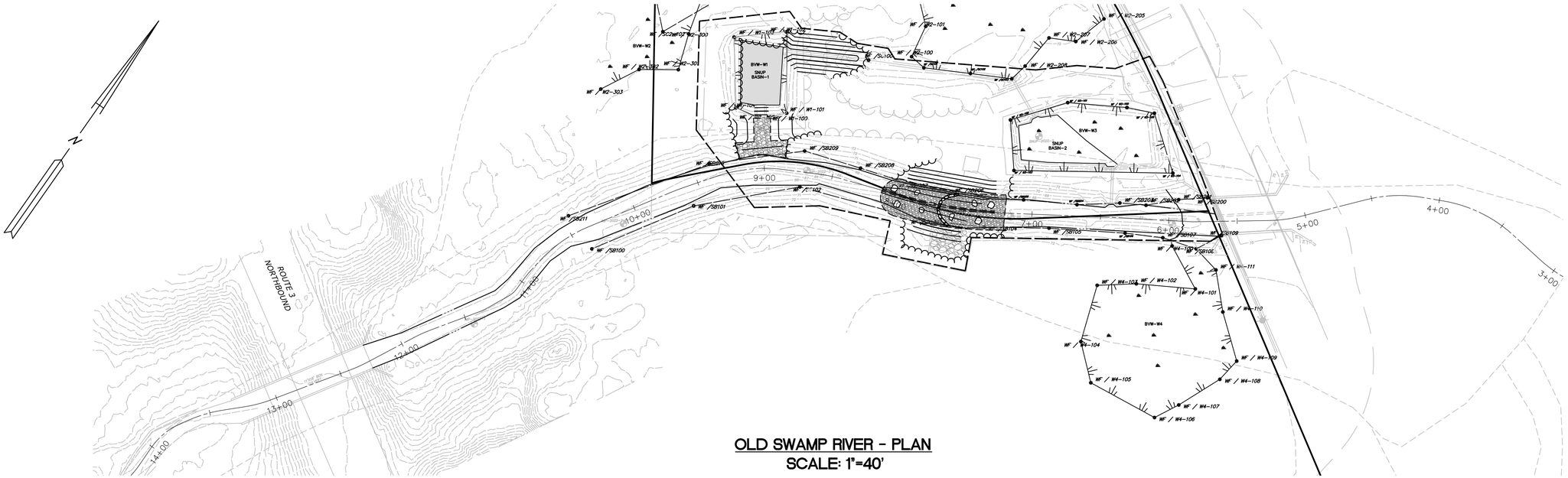
TEMPORARY DIVERSION PLAN

B+T JOB NO.3483.00

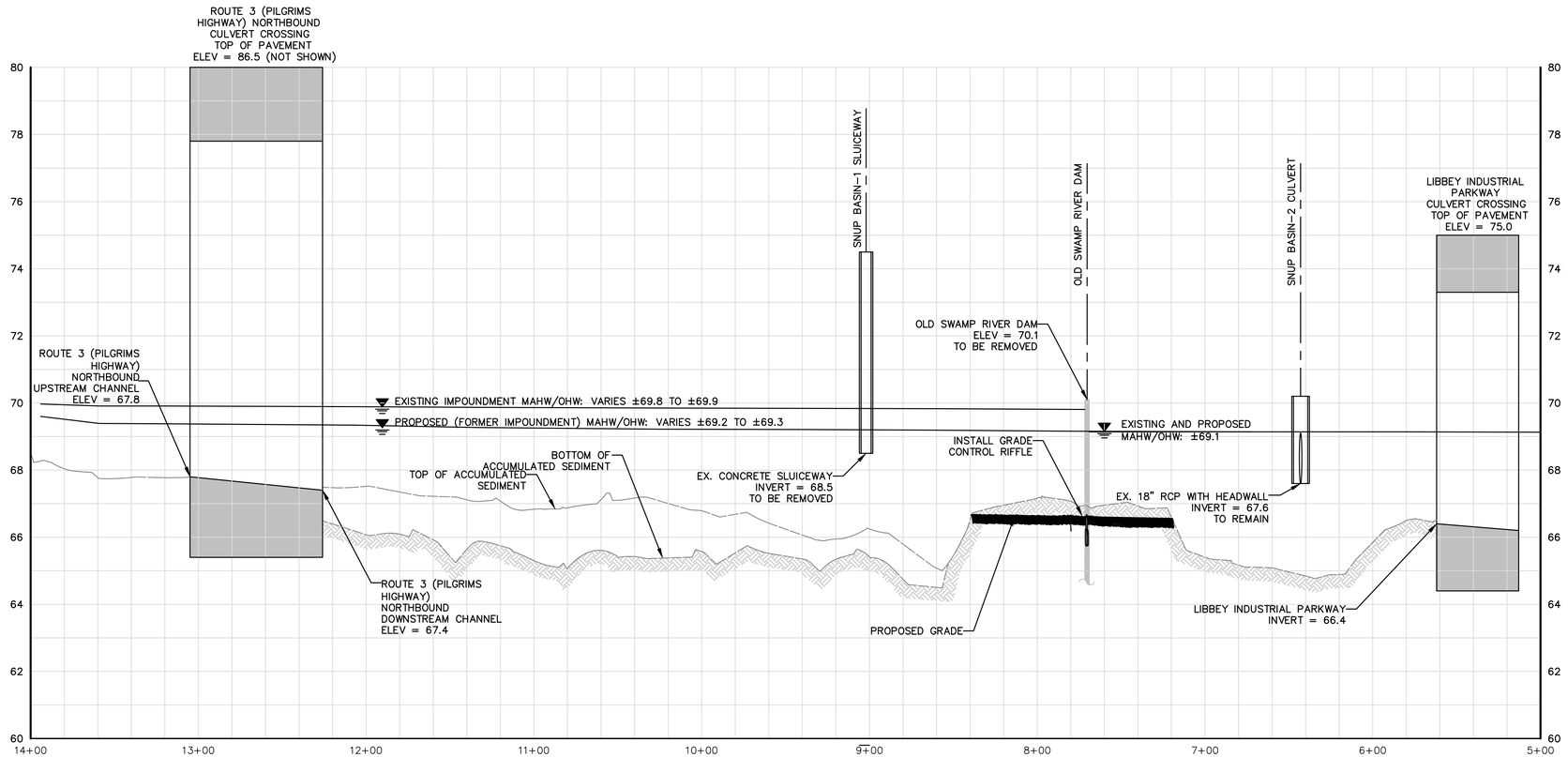
B+T PLAN NO. 348300P001B-008

C7.1

COMMONWEALTH OF MASSACHUSETTS
DANIEL M. GRIMM
CIVIL
No. 49915
REGISTERED PROFESSIONAL ENGINEER
5/13/24



OLD SWAMP RIVER - PLAN
SCALE: 1"=40'



OLD SWAMP RIVER - PROFILE
SCALE: 1"=40' H; 1" = 2' V

FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

PREPARED FOR:

TOWN OF WEYMOUTH
175 MIDDLE STREET
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PROJECT:

OLD SWAMP RIVER DAM REMOVAL AND RESTORATION
WEYMOUTH, MASSACHUSETTS

SCALE: AS SHOWN DATE: APRIL 1, 2024

METERS 0 5 10 25
FEET 0 20 40 80 120

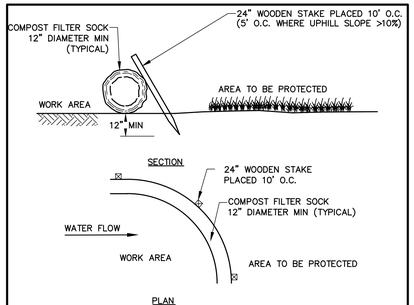
PROFILE

B+T JOB NO.3483.00

B+T PLAN NO. 348300P001B-009

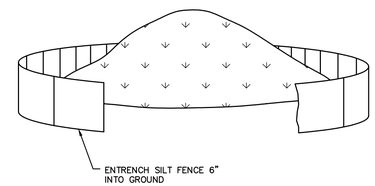
C8.1

COMMONWEALTH OF MASSACHUSETTS
DANIEL M. GAGNE
CIVIL
No. 39855
REGISTERED PROFESSIONAL ENGINEER
5/13/24



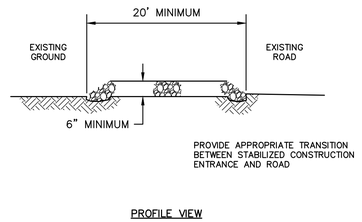
NOTES:
1. ORGANIC AND BIODEGRADABLE COMPOST FILTER SOCK SHALL BE 12" MIN. DIAMETER. WELDED PLASTIC OR BIODEGRADABLE PLASTIC NETTING SHALL NOT BE USED
2. WOODED STAKES SHALL BE PLACED DOWNSLOPE OF THE FILTER SOCK.
3. STAKE FILTER SOCK AT 5' O.C. WHERE UPHILL SLOPE EXCEEDS 10%

SILTATION CONTROL BARRIER (SCB)
NOT TO SCALE



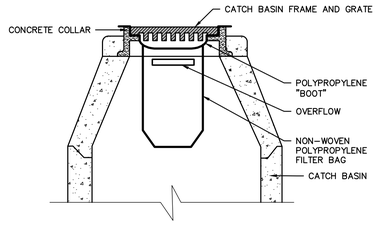
NOTE: CHOOSE DRY AND STABLE AREA FOR STOCKPILE.

SOIL STOCKPILE
NOT TO SCALE



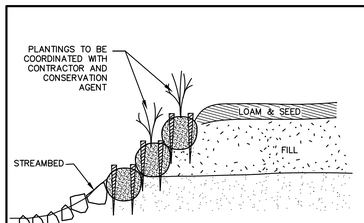
THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO EXISTING ROAD. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO EXISTING ROAD SHALL BE REMOVED IMMEDIATELY.

STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE



NOTES:
1. TO BE INSTALLED IN CATCH BASINS IN TRAFFIC AREAS UNTIL COMPLETION OF CONSTRUCTION.
2. BOOT ADAPTER MAY BE TRIMMED TO SIZE.

FILTER BAG
NOT TO SCALE

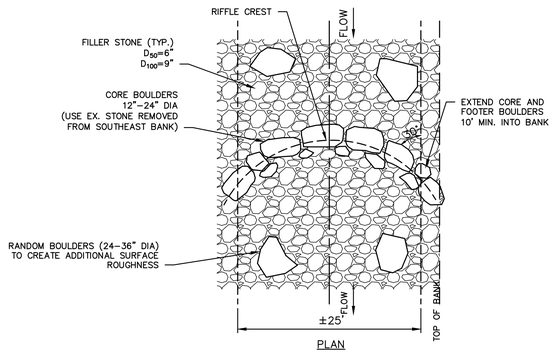


NOTE: USE APPROVED PLANTS TO MATCH EXISTING COURSE VEGETATION. SUBSTITUTIONS SHALL BE CONSIDERED AT THE DISCRETION OF THE SITE OWNER.

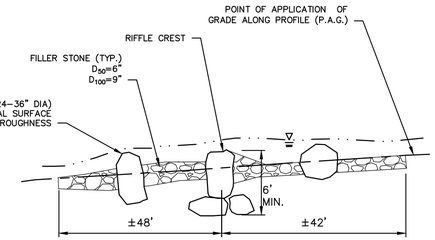
COIR LOGS SHALL BE ENTRENCHED, STAKED AND STACKED TO CREATE A BANK. THE ENDS OF THE COIR LOGS SHALL BE POSITIONED SO THEY TRANSITION SMOOTHLY INTO A STABILIZED BANK.

*COIR LOGS TO BE INSTALLED ALONG ALL SLOPES STEEPER THAN 2H:1V

LIVE COIR PLANTINGS
NOT TO SCALE



NOTES:
1. REFER TO PLAN AND PROFILE FOR LOCATION AND ELEVATION OF THE RIFFLE GRADE CONTROL FEATURE RIB STRUCTURES, POINT OF APPLICATION OF GRADE (P.A.G.) AND ELEVATIONS 'A', 'B' AND 'C' FOR EACH RIB. STAKEOUT SHOT LOCATIONS ALONG STRUCTURE FOR ENGINEER'S APPROVAL.
2. BOTTOM OF FOOTER BOULDERS SHALL BE A MINIMUM OF SIX FEET BELOW THE PROPOSED CHANNEL BED/POINT OF GRADE APPLICATION. ENGINEER TO APPROVE EXCAVATED TRENCH ELEVATIONS PRIOR TO PLACING FOOTER AND CORE BOULDERS.
3. SELECTED CORE BOULDERS SHOULD EXTEND ABOVE PROPOSED GRADE. CORE BOULDERS TO BE BURIED BY MINIMUM 1/2 TOTAL ROCK HEIGHT.
4. PLACE RANDOM BOULDERS OVER FACE OF RIFFLE TO CREATE CHANNEL ROUGHNESS. DO NOT BLOCK MORE THAN 1/5 OF TOTAL CROSS SECTION WITH RANDOM BOULDERS.
5. USE 10-12 SINGLE RANDOM BOULDERS PER RIFFLE. SINGLE RANDOM BOULDERS TO BE 24"-36" ROUNDED STONE.
6. ROOTWADS INSTALLED WITH RIFFLES SHOULD BE INSTALLED AT THE BANK ADJACENT TO THE FURTHEST UPSTREAM CREST.
7. RIBS SHALL EXTEND A MIN. OF 10' FROM EDGE OF BANK. RIBS CONNECTED TO FLOODPLAIN CUTOFF STRUCTURES SHALL BE TIGHTLY INTERLOCKED SUCH THAT NO SPACE EXISTS BETWEEN RIB BOULDERS AND CUTOFF STRUCTURE BOULDERS.
8. ALL VOIDS WITHIN CORE AND FOOTER BOULDERS AND WITHIN FILLER STONES TO BE FILLED WITH NATIVE CHANNEL MATERIAL TO FILL VOIDS IN STRUCTURE.
9. STONE SIZE MAY NEED TO BE MODIFIED TO ACCOMMODATE TOP OF BEDROCK ELEVATION. IF BEDROCK IS ENCOUNTERED DURING INSTALLATION OF FOOTER BOULDERS, CONTRACTOR SHALL PIN FOOTER BOULDERS TO BEDROCK; SEE DETAIL.

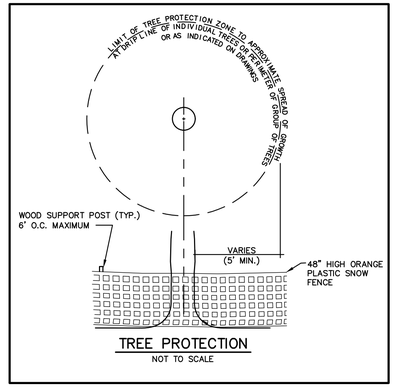


RIFFLE GRADE CONTROL FEATURE (GCF)
NOT TO SCALE

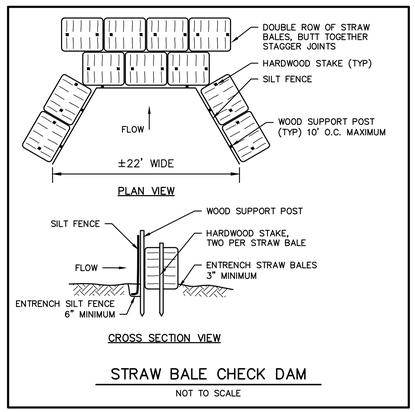
NOTES:
A. LONGEST AXIS (LENGTH)
B. INTERMEDIATE AXIS (WIDTH)
C. SHORTEST AXIS (THICKNESS/DEPTH)

1. THE "AVERAGE DIAMETER" (DIAMETER) OF A SINGLE, IRREGULARLY SHAPED STONE SHALL BE MEASURED ALONG ITS MEDIAN AXIS, ILLUSTRATED AS THE "B" AXIS.

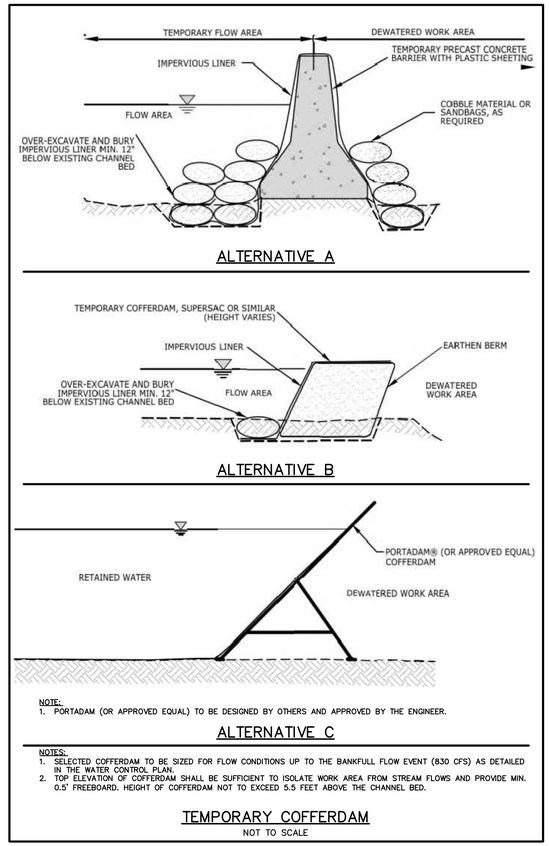
ROCK MEASUREMENT
NOT TO SCALE



TREE PROTECTION
NOT TO SCALE



STRAW BALE CHECK DAM
NOT TO SCALE

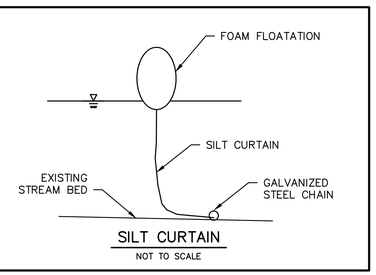


NOTE:
1. PORTADAM (OR APPROVED EQUAL) TO BE DESIGNED BY OTHERS AND APPROVED BY THE ENGINEER.

ALTERNATIVE C

NOTES:
1. SELECTED COFFERDAM TO BE SIZED FOR FLOW CONDITIONS UP TO THE BANKFULL FLOW EVENT (830 CFS) AS DETAILED IN THE WATER CONTROL PLAN.
2. TOP ELEVATION OF COFFERDAM SHALL BE SUFFICIENT TO ISOLATE WORK AREA FROM STREAM FLOWS AND PROVIDE MIN. 0.5' FREEBOARD. HEIGHT OF COFFERDAM NOT TO EXCEED 5.5 FEET ABOVE THE CHANNEL BED.

TEMPORARY COFFERDAM
NOT TO SCALE



SILT CURTAIN
NOT TO SCALE

FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

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SCALE: NTS DATE: APRIL 1, 2024

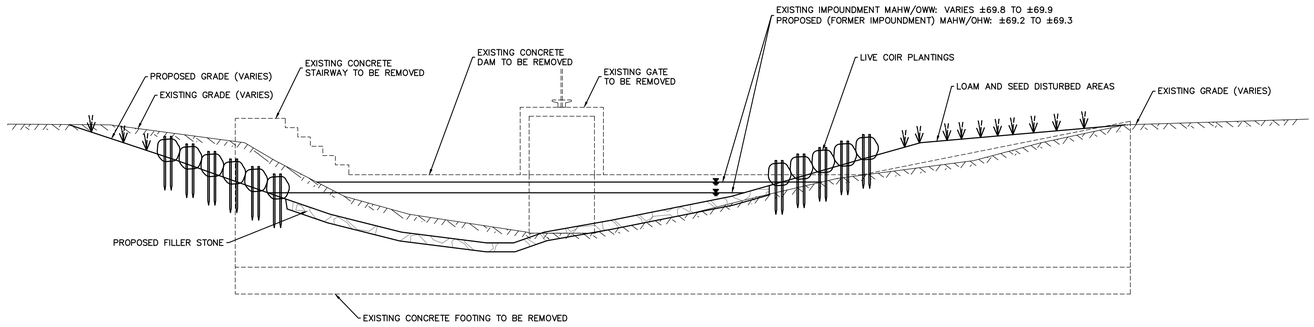
METERS 0 5 10 15
FEET 0 10 20 40 60

SITE DETAILS

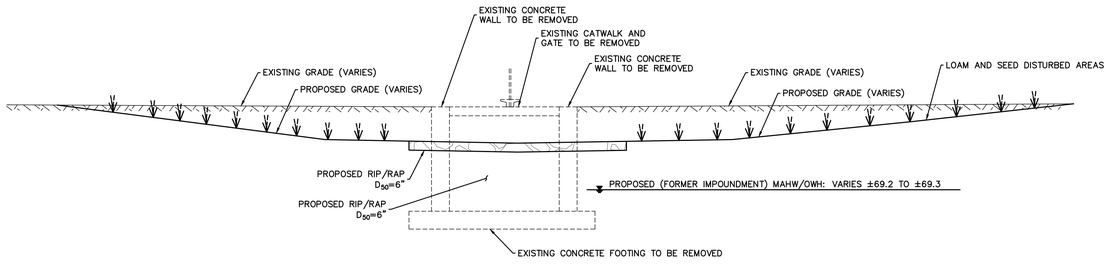
B+T JOB NO.3483.00

B+T PLAN NO. 348300P001B-010

C9.1



SECTION A–A
NOT TO SCALE



SECTION B–B
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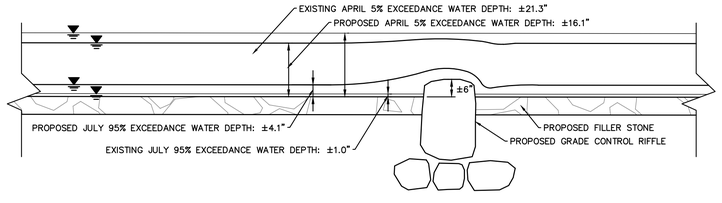

RIFFLE WATER DEPTH DETAIL
NOT TO SCALE

FOR NOTES, REFERENCES AND LEGEND SEE SHEET C1.1.

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SITE DETAILS

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B+T PLAN NO. 348300P001B–011

C9.2