TECHNICAL MEMORANDUM

To: Casey Clark [1], John Burrows [2]

From: Marcel Young-Scaggs, P.E.[3], Cameron Twombly, E.I.T [4]

Date: April 15, 2024

Project: Sabattus River – Mill Street Fish Passage

Re: Basis of Design Memo

This memorandum serves as the basis of design report for the Mill Street Fish Passage Project (Project) on the Sabattus River, in Lisbon Maine. The memo provides a brief Project background, summarizes the hydrologic and hydraulic analysis performed for the project, provides an explanation of the proposed design elements, and provides notes on additional design and construction considerations.

BACKGROUND

A tributary to the Androscoggin River, the Sabattus River originates at the outlet of Sabattus Pond, and flows through the Towns of Sabattus and Lisbon, Maine.

The former Mill Street Dam (also referred to as Farnsworth Dam - State Dam ID ME00343) was located on the Sabattus River approximately 0.9 miles upstream from the confluence with the Androscoggin River in Lisbon, ME. The Mill Street Dam was previously the most downstream dam located on the Sabattus River and was approximately 100 feet long and had a hydraulic height of eight feet. The former dam site is located within the Merrymeeting Bay salmon habitat recovery unit (SHRU) for Atlantic salmon (*Salmo salar*), an endangered species under the Endangered Species Act (ESA). Sabattus Pond at the headwaters of the river contains substantial spawning habitat for alewife (*Alosa pseudoharengus*) and the river may also support spawning by blueback herring (*Alosa aestivalis).*

A portion of the Mill Street Dam spillway on river right was breached in 2009. A feasibly study assessing fish passage alternatives at the Mill Street Dam site was released in 2012 (Stantec Consulting Services Inc., 2012). The remainder of the dam spillway was removed in 2019 as part of an effort to restore passable conditions for native sea-run fish along the Sabattus River. Following the removal of the Mill Street Dam spillway, passage of native sea-run fish continued to be blocked by a bedrock feature in the location of the former dam with an approximately four-foot vertical drop.

Inter-Fluve was contracted in 2022 to design fish passage enhancement at the site of the former Mill Street Dam. The designed solution is intended to focus on connecting the primary downstream fish passage channel with the upstream channel.

[1] Maine Department of Marine Resources
[2] Atlantic Salmon Federation
[3] Inter-Fluve
[4] Inter-Fluve

EXISTING CONDITIONS

Inter-Fluve performed a site survey and rapid assessment of the Project area in 2022 to supplement site specific survey data previously collected by Stantec (2012) and USFWS (2022). The survey and rapid assessment conducted by Inter-Fluve focused on the collection of bathymetric data and bridge data, and assessing the physical conditions of the stream channel and the features located within the channel.

The Mill Street Bridge is located directly upstream (approximately 90 feet) of the former Mill Street Dam spillway. The bridge was replaced in 2018 and spans the river channel with no piers or obstructions. The reach upstream of the Mill Street Bridge is a uniform channel with a very flat slope (less than 0.1%). In the area just downstream of the Mill Street Bridge, and continuing down past the former dam spillway, the channel bed is dominated by bedrock.

In the location of the former dam, and extending approximately 300 feet downstream, there remain portions of various mill foundation elements. Along the former dam spillway there exist two concrete piers situated on the bedrock channel that extend up to ten feet in height (Figure 1). Other former dam elements include portions of the old sluiceway on river right with a concrete wall constraining the channel (Figure 2), a concrete wall on the river left side of the channel, and remains of the old mill structure that exist on the river right bank and have been overgrown with vegetation.



Figure 1. Looking upstream at the former dam spillway from the river right bank. The concrete piers along the former spillway and concrete wall on the upstream end of a channel island are visible.



Figure 2. Remnant concrete elements from the former dam structure on the river right side of the channel, just downstream of the bridge abutments.

Just downstream of the dam, the channel is constrained by a vertical masonry wall that extends along the river right bank for approximately 300 feet. Portions of the former mill building's concrete foundation exist on river left just downstream of the dam. Additionally, at least four remanent concrete blocks exist in the channel in various locations downstream of the former spillway.

Currently, there are three distinct conveyances of flow downstream of the former dam spillway before merging approximately 200 feet downstream of the former spillway. These distinct channel paths are split by two island features that exist in the channel, with one flow path (the primary channel) situated between the islands and one channel on the outer side of each island feature (Figure 3). A former mill building was situated on top of the island on river right which consists of natural bedrock outcrops with portions of the mill building concrete foundations still present. The second island feature located on river left consists of a partially wooded bedrock outcrop.

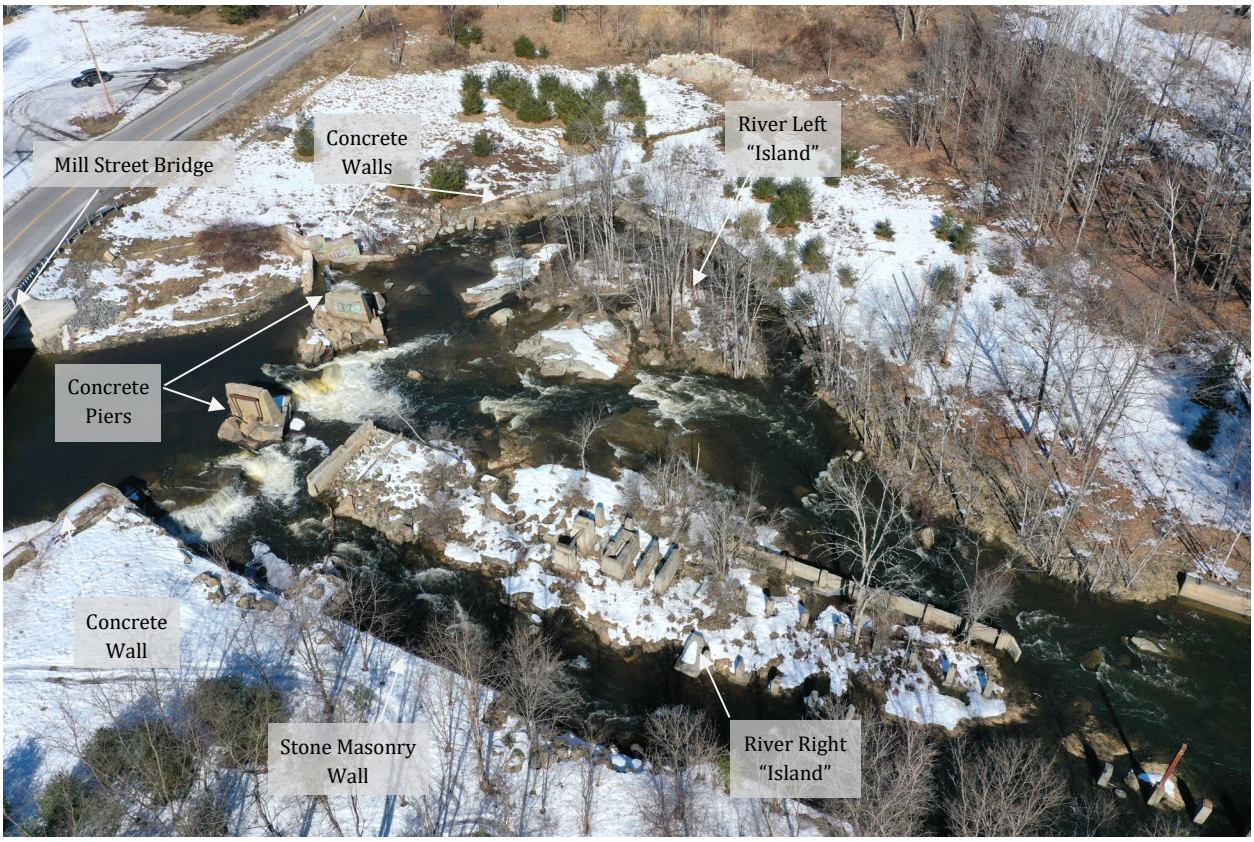


Figure 3. Aerial view of the former dam and mill site. The three distinct channel paths downstream of the former dam are visible.

The reach downstream of the former dam is characterized by moderately steep bedrock steps and a relatively shallow braided channel. Further downstream there exist more bedrock outcrops that force channel steps that are more diverse in form with larger distances between each step.

HYDROLOGY

To support design development, Inter-Fluve performed a hydrologic analysis to estimate flows during fish passage migration periods and for typical low flow periods. Hydrology estimates were used in the subsequent hydraulic analysis to inform the project designs for fish passage. Historical hydrological evaluations were also reviewed and compared to our results.

Watershed Characteristics

Inter-Fluve used the web-based software application, USGS StreamStats, to determine the characteristics of the contributing watershed. StreamStats is a web-based tool that provides estimates of streamflow statistics for ungauged sites on streams in the U.S.

The contributing watershed to the Project Site is approximately 73.64 square miles. The proportion of the contributing watershed that is occupied by open water, as indicated by the National Land Cover

Dataset[5], is 4.82%. The proportion of the contributing watershed soils that are classifies as Hydrologic Soil Type A[6], as indicated by the NRCS State Soil Geographic (STATSGO) Data Base, is 5.47%.

Past Hydrologic Evaluations

As part of the 2012 feasibility study, Stantec conducted a hydrological evaluation of the Sabattus River at the former Mill Street Dam (Stantec Consulting Services Inc., 2012). Stantec generated monthly peak and low-flow statistics for the site using flows recorded at the USGS Station located on the Little Androscoggin River near South Paris, ME[7] (USGS # 01057000) for the period from January 1, 1970 through March 13, 2012. The median and mean monthly and annual stream flow statistics calculated by Stantec are provided in Table 1.

Table 1. Monthly and annual flow statistics for the Sabattus River at Mill Street Dam, provided by Stantec, 2012.

	Monthly Streamflow (cfs)												Annual Stream flow (cfs)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Median	59	60	130	307	151	66	27	18	17	46	110	89	71
Mean	97	95	223	432	204	117	62	52	37	107	155	148	144

Low Flow Statistics

Inter-Fluve developed fish passage flow statistics for the Project using daily streamflow data obtained from the Little Androscoggin River USGS gage for the period from January 1, 1970 through September 1, 2022. A duration analysis was conducted using the US Army Corps of Engineers (USACE) HEC-SSP software (Version 2.3) to estimate various percent exceedance monthly flow statistics. The calculated flow statistics using the Little Androscoggin River data were linearly adjusted to the Project site based on watershed area.

The Project site contributing watershed (73.64 square-miles) is slightly larger than the contributing area to the USGS streamgage (73.5 square-miles). Therefore, it is necessary to adjust flow estimates made using the streamgage data to be applicable to the Project site. For this work, Inter-Fluve used a simple drainage-area-ratio scaling method to adjust the flow estimates for the gaged site to the project site:

$$Scale\ Factor = \frac{A_u}{A_g} = 1.002$$

Where:

the contributing area to the ungaged site (the project site) is: $A_u = 73.64\ square\ miles$

and the contributing area to the gaged site (Dover-Foxcroft) is: $A_g = 73.50\ square\ miles$

[5] Areas of open water, generally with less than 25% cover of vegetation or soil.
[6] Soils having a high infiltration rate (low runoff potential) when thoroughly wet.
[7] https://waterdata.usgs.gov/nwis/uv?site_no=01057000&legacy=1

Typical fish passage flow range estimates during migration periods (May 1 – June 30) are presented in Table 2. It is important to note that the fish passage flow estimates do not account for the impacts of Sabattus Pond and the management regime of the outlet dam. To maintain water levels in the pond below its capacity throughout the year, the pond in drawn down in October to allow for the additional storage of high spring time flows. This management regime results in higher flows during the fall due to the releases, and flows that are lower than would naturally occur in the spring. Therefore, the May-June 5% flow estimate is higher than what is expected to occur during the fish passage migration period at the Site. The May-June 10% and 20% flow estimates are likely more representative of the maximum fish passage flows that will occur at the Site.

Table 2. Estimated discharges during fish migratory periods for exceedance percentiles for the Project site.

Exceedance Probability (%)	May 1 – June 31 (cfs)
95	18.5
50	95.1
20	218.4
10	321.9
5	428.9

HYDRAULICS

Inter-Fluve developed a hydraulic model of the Sabattus River local to the project site to evaluate the performance of the proposed project with respect to the design objectives. These objectives include restoring passable conditions for native sea-run fish at the Project site. The model focused on simulating fish passage potential for the proposed conditions. See details on the proposed design in the Channel Design section below.

Methods

Inter-Fluve developed a 1-dimensional, steady-flow hydraulic model of the Sabattus River using the USACE Hydraulic Engineering Center River Analysis System (HEC-RAS) software version 6.4.1.

Data

Inter-Fluve compiled a variety of data to build the hydraulic model of the Sabattus River. Flow data was attained using the methods described in the hydrology section above. Topographic and bathymetric data were obtained from multiple sources, presented in the table below (Table 3). Topographic data collected via field survey was supplemented with USGS LiDAR of the Northeast collected in 2020[8].

[8] https://www.usgs.gov/programs/national-geospatial-program/national-map

Table 3. Data sources used to develop the digital terrain model for hydraulic modeling purposes.

Topographic/Bathymetric Terrain Model Data Sources		
Data	**Collected by / Source**	**Collection Date**
Bathymetric/Topographic Survey	Inter-Fluve	2022
Bathymetric/Topographic Survey	USFWS	2022
Bathymetric Survey	Stantec	2012
Light Detection and Ranging (LiDAR)	USGS	2020

Model Domain

Inter-Fluve developed a hydraulic model of the Sabattus River from a downstream limit located approximately 768 feet downstream of the Mill Street Bridge, to an upstream limit located approximately 713 feet upstream of the bridge. The model is georeferenced horizontally to Maine State Plane, West Zone, NAD83 (2011) US Survey Feet. Elevations are in reference to the North American Vertical Datum of 1988, in units of feet.

Geometry

Inter-Fluve developed the model geometry utilizing HEC-RAS geometry creation tools, including the RAS Mapper GIS tools, to locate the river centerline and to sample the cross-section geometry from the composite topographic/bathymetric surface. A total of 27 cross sections were used in the model geometry to represent existing and proposed conditions.

The Mill Street Bridge, which was replaced in 2018, is simulated as a bridge at River Station 825 with a roadway embankment defined in the Roadway Editor. The expansion and contraction coefficients are set to typical values of 0.3 and 0.1, respectively, except in the vicinity of the Mill Street Bridge, where the values are set to 0.5 and 0.3, respectively.

In the proposed conditions model, a series of four cross sections were used to represent each new weir and pool pair proposed in the channel. These include cross sections placed at the weir crest, at the location of minimum pool depth downstream of the crest, at the minimum pool depth just upstream of the pool tailout, and at the pool tailout just upstream of the next downstream weir crest.

Boundary Conditions

Both the upstream and downstream boundary conditions were set to reflect the normal depth at the associated reach-average slope. The upstream normal depth slope was set at 0.005 feet per foot, while the downstream normal depth slope was set at 0.01 feet per foot. These values were estimated from site observations and measurements.

Mannings “n”

Hydraulic roughness values (Manning’s “n”) for the channel and floodplain were assigned based on field observations, and through consideration of published reference materials (Arcement & Schneider, 1989).

Table 4. Mannings "n" values used in the hydraulic model.

Location	Value	Description of Project Site
Channel	0.04	Typical channel area at the upstream portion of the model domain. Channel bed made of cobbled and gravels. Deeper depth of flow relative to substrate size.
Channel	0.05	Existing channel roughness at the downstream portion of the model domain. Channel bed consists of bedrock with boulders with other obstructions. Shallow depth of flow relative to substrate size.
Channel	0.07	Typical channel area downstream of the former Mill Street Dam. Step pool channel geometry with bedrock, boulders, and concrete elements obstructing flow. Shallow depth of flow relative to substrate size.
Channel	0.07	Proposed channel roughness. Bedrock weirs obstructing flow. Step pool channel geometry. Shallow depth of flow relative to substrate size.
Overbank	0.10	Typical overbank areas

Hydraulic Model Results

Hydraulic modelling shows that the proposed project will result in decreased water surface profiles through the area of proposed channel work, upstream of the location of the former Mill Street Dam spillway (Figure 4). Water surface elevations in the area of the proposed channel work, just upstream of the former spillway, are shown to decrease by up to 3.5 feet during fish passage flows. Proposed conditions also show a slight decrease in water surface profiles upstream of the Mill Street Bridge during fish passage flows. For proposed conditions, the modification of the bedrock drop in the location of the former dam spillway slightly reduces the impoundment of water that currently exists.

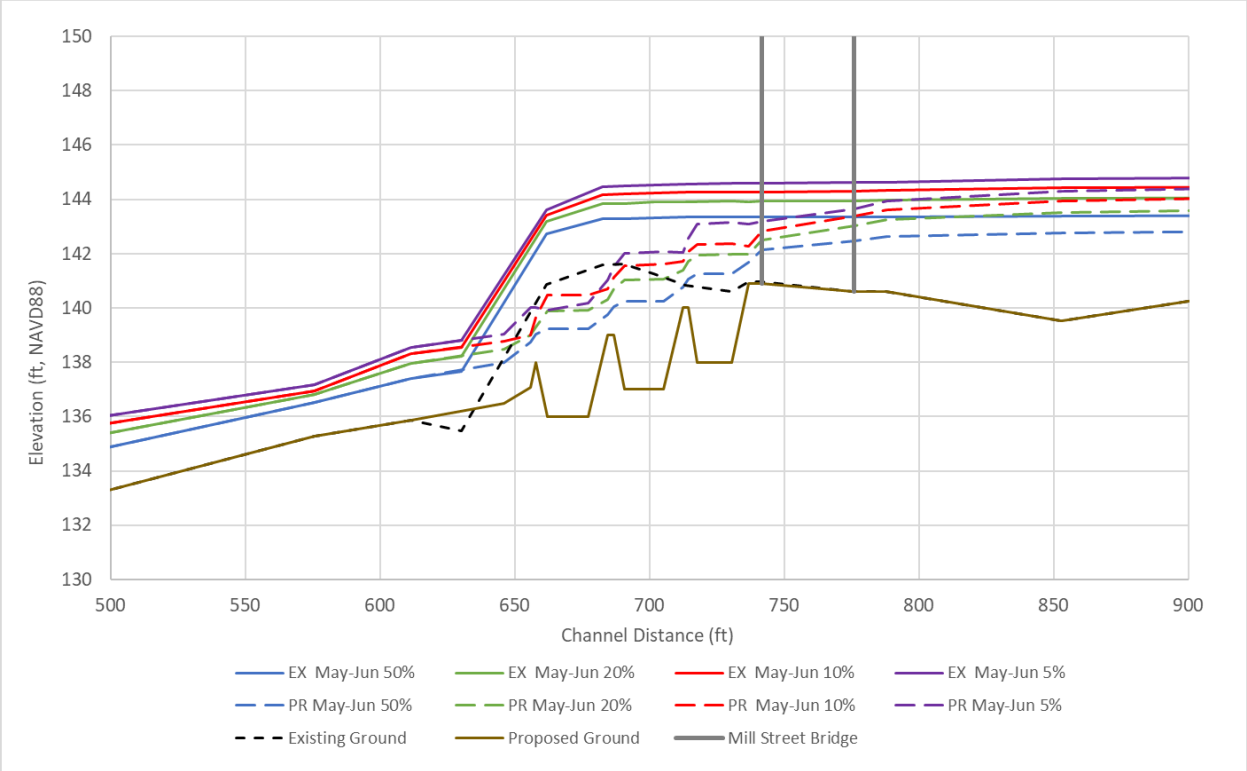


Figure 4. Existing and proposed condition water surface elevation profiles during selected fish passage flows.

The modeling results show that the depth of water in the designed pools will be approximately 3.3 feet during the May-June 50% exceedance probability flow and 4.5 feet during the May-June 10% flow. The depth of water over the designed weirs is shown to be 1 foot and 1.5 feet for the May-June 50% and 10% flows, respectively.

Channel velocities during the typical fish migratory period are expected to increase in proposed conditions at the locations of the three most upstream weirs associated with the proposed fish passage channel design (Figure 5). Velocities are estimated to increase from approximately 1 ft/sec during existing conditions to approximately 5 ft/sec during proposed conditions for the May – June 50% exceedance probability flow, localized at the weir crests. During the May – June 5% exceedance flow, velocities increase from 2-3 ft/sec to approximately 7.75 ft/s in the location of two middle most weirs. However, as discussed previously, the May-June 5% flow estimate is conservative and does not accurately represent the 5% exceedance flow event. Channel velocities decrease in proposed conditions at the location of the most downstream weir, or the current location of the bedrock drop.

We see a similar pattern in relation to the shear forces during the typical fish migratory period, with an increase in shear force in the location of the three most upstream weirs, and a decrease of shear force at the most downstream weir (Figure 6).

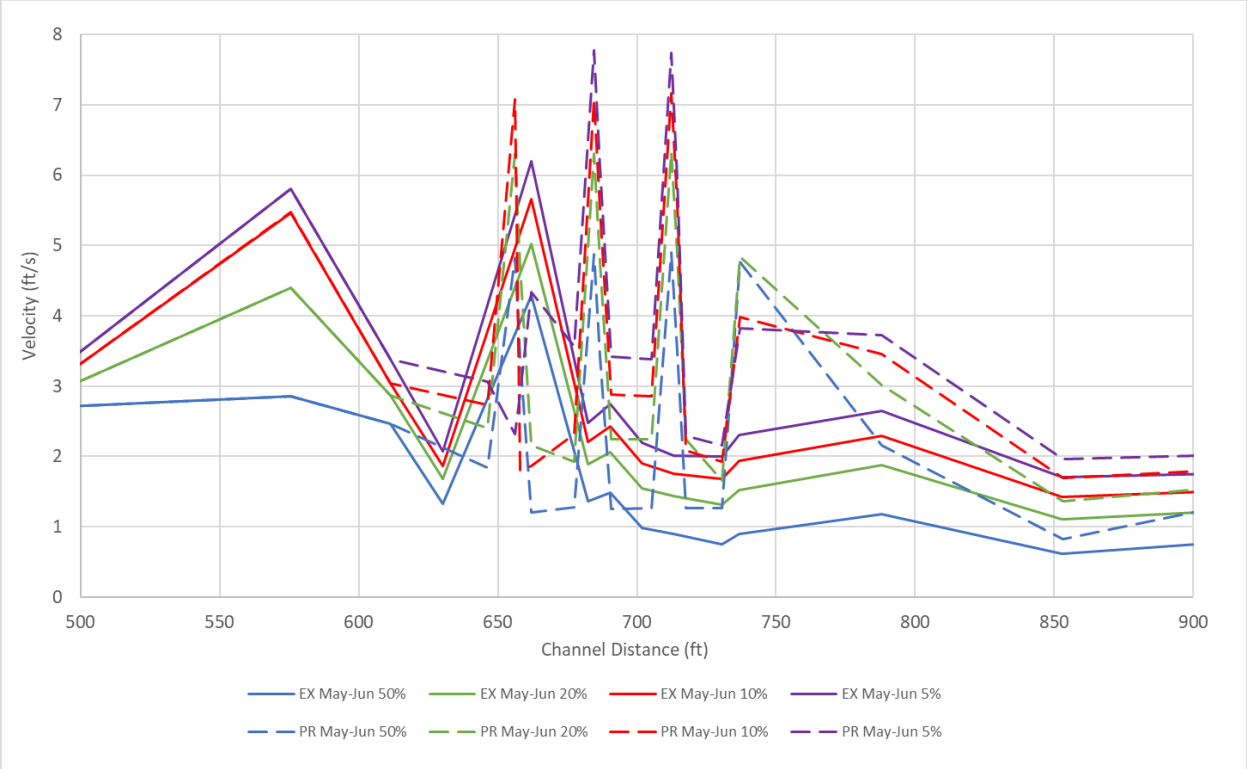


Figure 5. Existing and proposed condition velocity profiles during fish passage flows in the location of the proposed fishway.

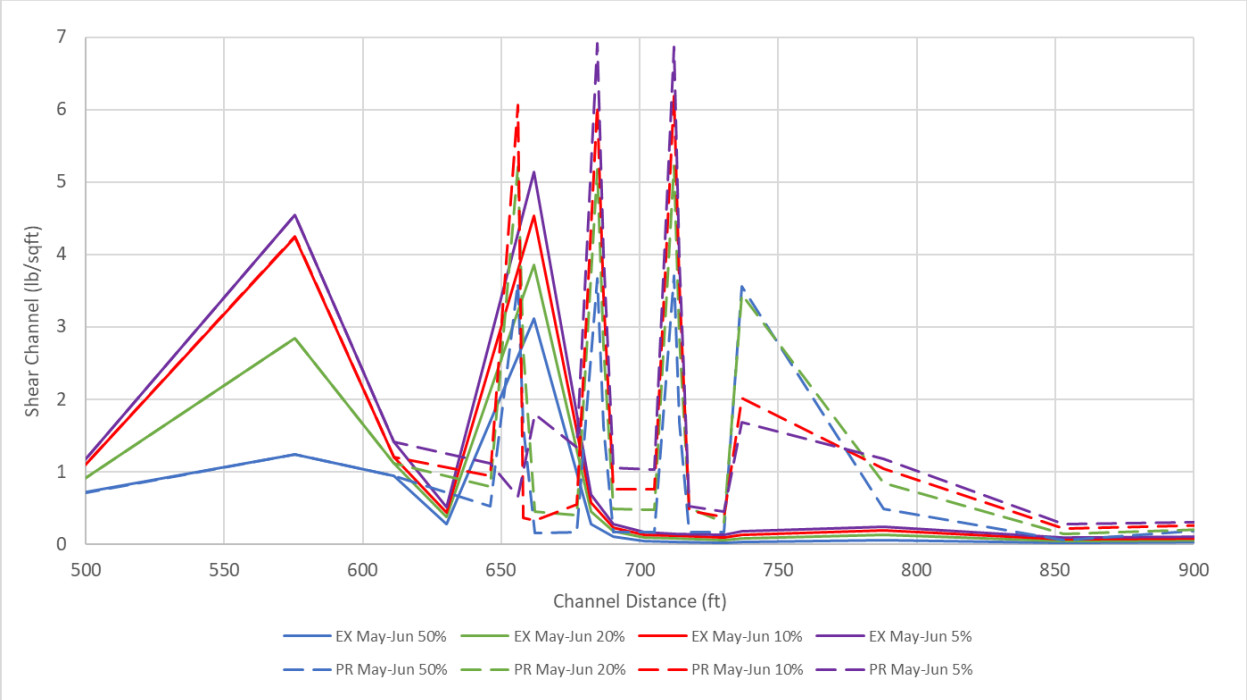


Figure 6. Existing and proposed condition shear profiles during fish passage flows in the location of the proposed fishway.

Inter-Fluve reviewed regional nature-like fishway design guidelines for the safe, timely, and efficient passage of Alewife (*Alosa Pseudoharengus*) (Turek et al., 2016). The recommended maximum weir opening velocity for Alewife is 6 ft/sec (Table 5). Model results indicate that estimated average velocities in the proposed channel meet the regional guidelines for alewife during the May - June 95% and 50% exceedance probability discharges. Velocities during the May - June 5%, 10%, and 20% exceedance probability discharges exceed these guidelines.

Table 5. Select fish passage design guidelines for target species.

Species	Minimum Pool/Channel Depth (ft)	Minimum Pool/Channel Length (ft)	Minimum Weir Opening Width (ft)	Minimum Wier Opening Depth (ft)	Maximum Weir Opening Velocity (ft/sec)	Maximum Fishway Channel Slope
Alewife	2.50	10.0	2.50	1.00	6.00	5.00%

The design of the proposed fishway was evaluated for energy dissipation in the pools through calculation of the energy dissipation factor (EDF). Often, desired reduction in velocities results in increased roughness in the water column, and excessive dissipation rates can result in unwanted turbulence and air entrainment (USFWS, 2019). The results for the EDF calculations are summarized in Table 6. Target EDF values for American shad, juvenile salmonids, and adult salmonids are 3.15, 5.0, and 2.0 ft-lb/ft3/s, respectively (USFWS, 2019). It should be noted that the target EDF guidelines were developed for technical fishways. Higher EDF values may be tolerable in nature like fishways due to the complexity of flow and the natural refugia that develops in these systems (personal communication with Bryan Sojkowski, USFWS Regional Fish Passage Engineer).

Table 6. Calculated EDF values for selected flow conditions during the typical upstream fish passage period. Simulated hydraulic drop of one foot and a residual pool depth of three feet was used.

Flow	**Discharge (cfs)**	**Simulated Hydraulic Drop Height (ft)**	**EDF (ft-lb/ft^3/s)**
May - June 5% Exceedance	428.9	1.00	3.97
May – June 10% Exceedance	269.6	1.00	2.83
May – June 20% Exceedance	201.3	1.00	2.37
May – June 50% Exceedance	95.1	1.00	1.34

CHANNEL DESIGN

The goal of the proposed channel design is to provide safe, timely, and effective passage for the fish species of interest in the location of the former Mill Street Dam. The regional nature-like fishway design guidelines for the passage of Alewife (*Alosa Pseudoharengus*), summarized in Table 5, were used to guide the channel design. Some of the other primary design considerations included the geomorphic context of the Project site and geomorphic suitability of the proposed fishway, fishway entrance attraction flows, potential turbulence within the fishway, potential for fish stranding in side pools, impacts of the design on flood flow water surface elevations and potential flooding, constructability and availably of required materials, and aesthetics of the proposed design. The Engineering Design Drawings are included as Appendix A.

The primary design constraint at the Project site is the Mill Street Bridge located upstream of the former dam spillway. To avoid any potential impacts to the bridge, the design avoided requiring any work under the bridge. This requirement constrained the design to the area of channel downstream of the bridge. Other infrastructure considered includes the remnant dam and mill structure elements. The Project design includes the supplemental removal of the concrete wall on the river left side of the former dam location along with the removal of various other residual concrete elements.

The proposed channel design utilizes the existing bathymetry of the bedrock streambed to minimize bedrock excavation while meeting all of the design criteria. The proposed steppool fishway geometry meets the fish passage criteria for Alewives while fitting into the natural step-pool form of the downstream channel. The proposed design maintains pools that meet the minimum depth for Alewives during migration periods, and still maintains its current conveyance during flood flow events. Considering the constraints of the upstream bridge and downstream tie-in locations, the proposed vertical alignment was designed to minimize impacts and overall project scope while achieving a reasonable slope for effective passage. The overall average gradient of the proposed fishway is 3.7%.

Based on modeling results, an existing low spot in the bedrock just downstream of the bridge on river left has the potential to create an isolated pool during low flow periods that would become disconnected from the fishway. In order to mitigate the potential for fish to become stranded in this pool, additional bedrock excavation to create small flow-through channel is proposed. This flow-through channel consists of the excavation of two connection channels into the bedrock that would be rectangular in shape with a bottom width of 2.5 feet. One channel will connect the fishway to the pool, and the other channel will connect the pool to the upstream reach, allowing fish to safely pass through the pool during low flow periods.

COST

The Engineer's Opinion of Probable Construction Costs (EOPCC, Appendix B) assumes the site-specific approaches discussed above. The cost opinion has been developed based on review of construction costs for similar items in past projects, consultation with construction contractors and material suppliers, and applicable reference cost data. The actual cost of implementation of the project may vary from the cost opinions due to heavy construction market fluctuations and other unforeseen factors. In

particular, recent bid results have seen substantial escalation in bid pricing due to labor shortages in the state of Maine and in the broader region, continued market volatility post COVID Pandemic, and supply chain pressures for materials and equipment. While construction costs seem to be stabilizing, it is important to account for any potential variation, so a construction cost contingency of 20% has been included in the cost opinion.

REFERENCES

Arcement, G. J., & Schneider, V. R. (1989). Guide for selecting Manning's roughness coefficients for natural channels and flood plains. In *US Geological Survey Water-Supply Paper* (Vol. 2339). https://doi.org/10.3133/wsp2339

Stantec Consulting Services Inc. (2012). *Fish Passage Alternatives Analysis Mill Street Dam Sabattus River Lisbon Falls, Maine*.

Turek, J., Haro, A., & Towler, B. (2016). Federal Interagency Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes. *Interagency Technical Memorandum*, *May*, 47 p.

USFWS. (2019). Fish Passage Engineering Design Criteria. *Report*, *June*, 248.

APPENDICIES

Appendix A – Engineering Design Drawings

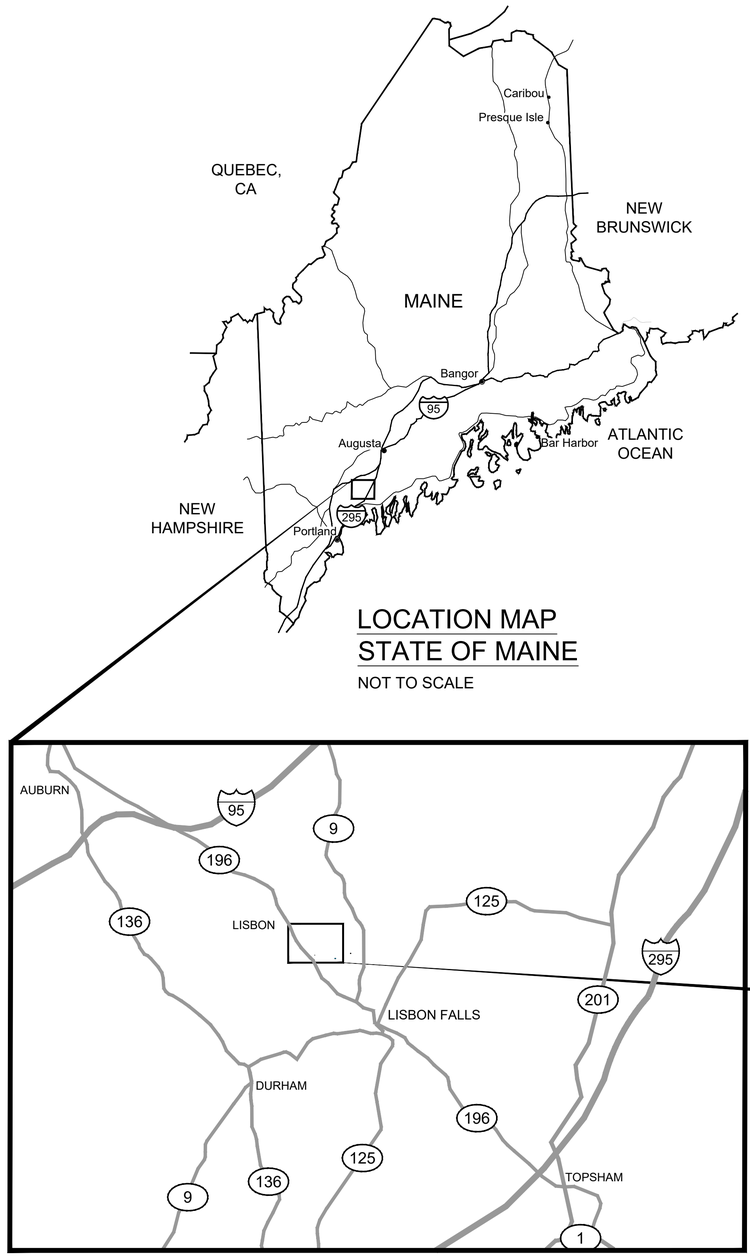
Appendix B – Engineers Opinion of Probable Costs

APPENDIX A – ENGINEERING DESIGN DRAWINGS

MILL STREET FISH PASSAGE

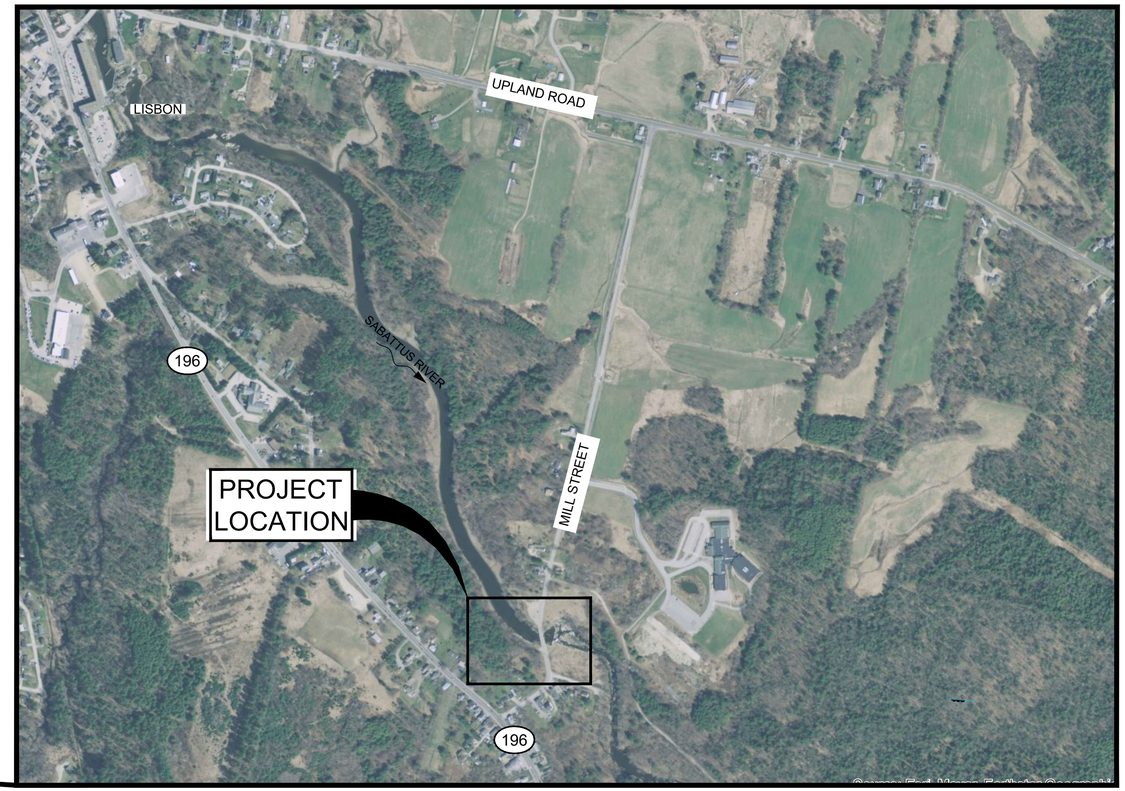
DRAFT FINAL

APRIL 2024



LOCATION MAP
STATE OF MAINE
NOT TO SCALE

VICINITY MAP
1" = 10,000'



SITE MAP
1"= 500'

COORDINATES:
LATITUDE : 44.021022°
LONGITUDE: -70.092300°

LISBON, ME

WATERBODY: SABATTUS RIVER
TRIBUTARY OF: ANDROSCOGGIN RIVER

SHEET INDEX

1 - COVER SHEET, SHEET INDEX, AND VICINITY MAPS

2 - EXISTING CONDTIONS, SURVEY CONTROL, AND REMOVALS

3 - PROPOSED CONDITIONS PLAN & PROFILE

4 - TYPICAL DETAILS

NO.	BY	DATE	REVISION DESCRIPTION

BB	MYS	MB
DRAWN	DESIGNED	CHECKED
-	04/24	22-05-32
APPROVED	DATE	PROJECT

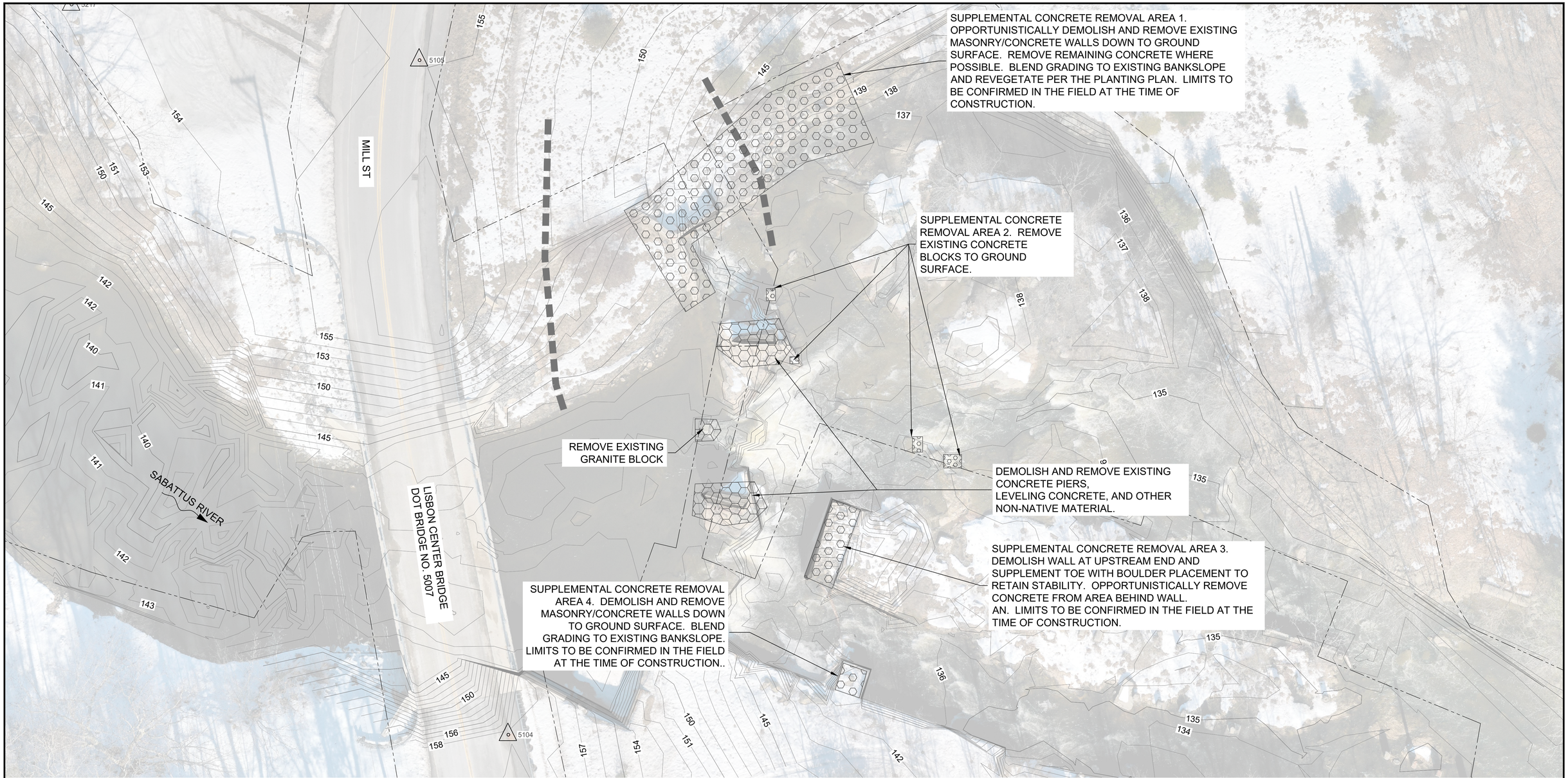
MAINE DEPT OF MARINE RESOURCES
MILL STREET FISH PASSAGE
LISBON, ME

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PO Box 236
Damariscotta, ME 04543
207.315.7014
www.interfluve.com

COVER SHEET, SHEET INDEX, AND VICINITY MAPS

SHEET
1 OF 4

X:\Projects\...\MSDO\Layout\SSS_Cover Sht_Vicinity 4/1/24



0 30 60

SCALE IN FEET

LEGEND

- EXISTING 5 FT CONTOUR
- EXISTING 1 FT CONTOUR
- ACCESS ROUTE
- CONTROL POINT
- PARCEL LINES
- REMOVAL AREAS

NOTES:

1. TOPOGRAPHIC AND BATHYMETRIC DATA DATA BASED ON SURVEY COLLECTED BY INTER-FLUVE DECEMBER 2022, USFWS JUNE 2022, AND STANTEC 2012.
2. HORIZONTAL AND VERTICAL COORDINATES ARE REFERENCED TO MAINE STATE PLANE, EAST ZONE, NAD 83, US SURVEY FEET. ELEVATIONS ARE REFERENCED TO NAVD 1988, FEET.
3. PARCEL BOUNDARIES ARE PUBLICLY AVAILABLE DATA DOWNLOADED FROM STATE OF MAINE GIS GEOLIBRARY.
4. AERIAL COLLECTED BY INTER-FLUVE DECEMBER 2022.

SURVEY CONTROL

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
* 5103	432715.83	2972376.01	164.85	REBAR/CAP
5104	432851.11	2972335.83	158.95	PK NAIL
5105	433058.78	2972308.5	155.16	PK NAIL
5119	432878.11	2972383.02	152.19	THREADED ROD
* 5215	433102.01	2972326.66	155.92	REBAR/CAP
* 5217	433075.94	2972201.38	153.88	REBAR/CAP

* CONTROL POINTS LOCATED OUTSIDE PLANVIEW EXTENTS

NO.	BY	DATE	REVISION DESCRIPTION

BB DRAWN | MYS DESIGNED | MB CHECKED
- APPROVED | 04/24 DATE | 22-05-32 PROJECT

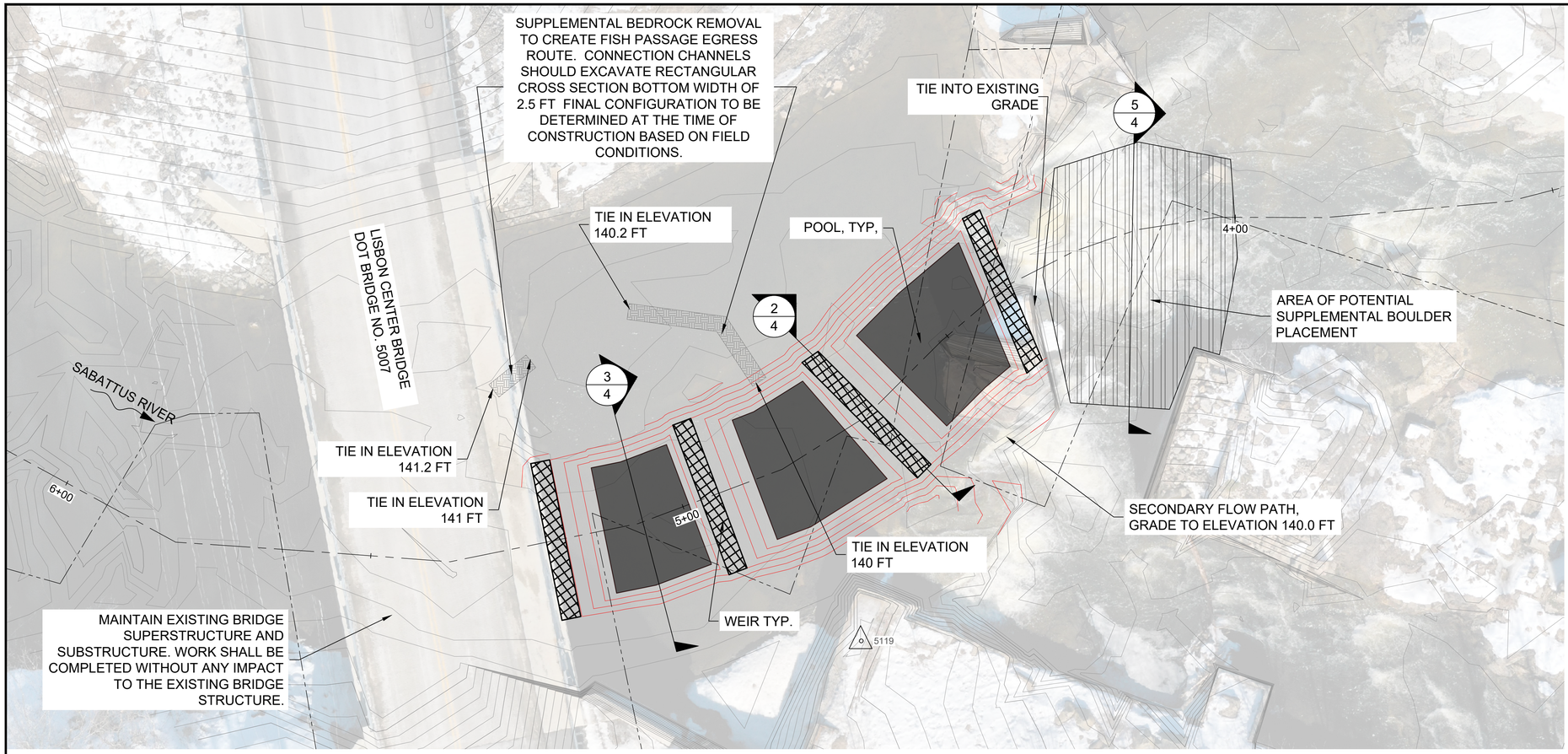
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EXISTING CONDTIONS, SURVEY CONTROL, AND REMOVALS

SHEET 2 OF 4

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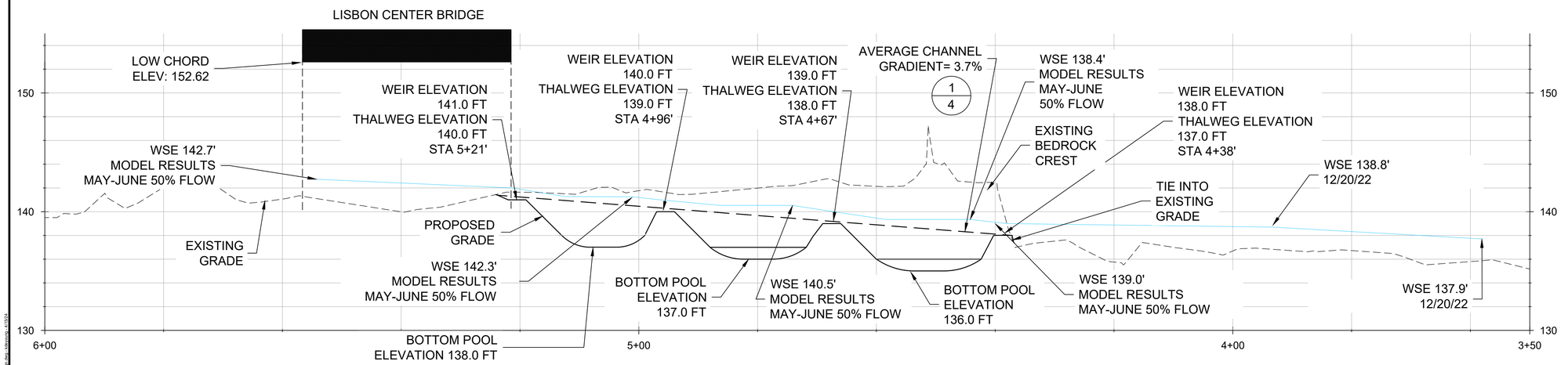


NOTES:

FINAL WEIR, POOL, AND CONNECTION CHANNEL LOCATIONS AND ELEVATIONS ARE TO BE CONFIRMED IN THE FIELD BY THE ENGINEER AT THE TIME OF CONSTRUCTION, AND WILL DEPEND ON EXISTING SITE CONDITIONS.

SUPPLEMENTAL BOULDER PLACEMENT MAY BE NEEDED, TO BE DETERMINED BASED ON FIELD CONDITIONS AT THE TIME OF CONSTRUCTION. BOULDERS MAY NEED TO BE PINNED TO BEDROCK FOR STABILITY. SEE PROJECT SPECIFICATIONS.

SABATTUS RIVER - PLAN VIEW



SABATTUS RIVER - PROPOSED PROFILE

NO.	BY	DATE	REVISION DESCRIPTION

BB	MYS	MB
DRAWN	DESIGNED	CHECKED
-	04/24	22-05-32
APPROVED	DATE	PROJECT

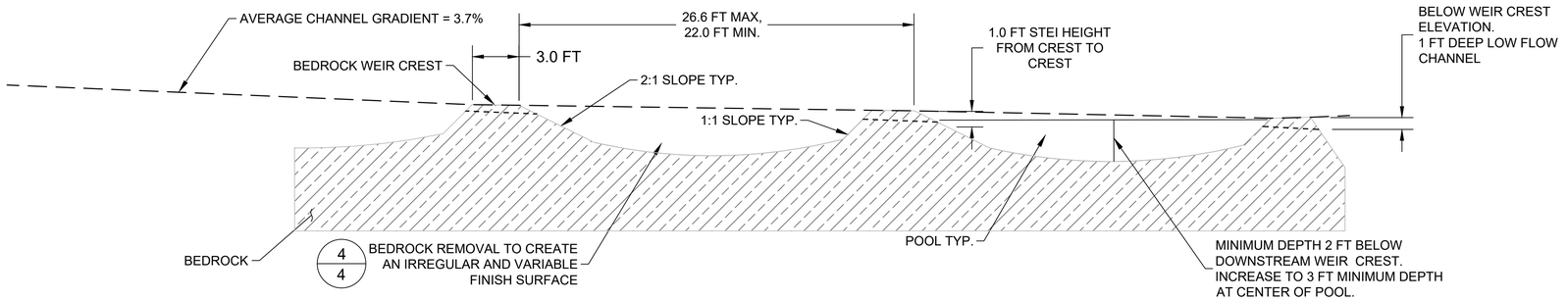
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PROPOSED CONDITIONS PLAN & PROFILE

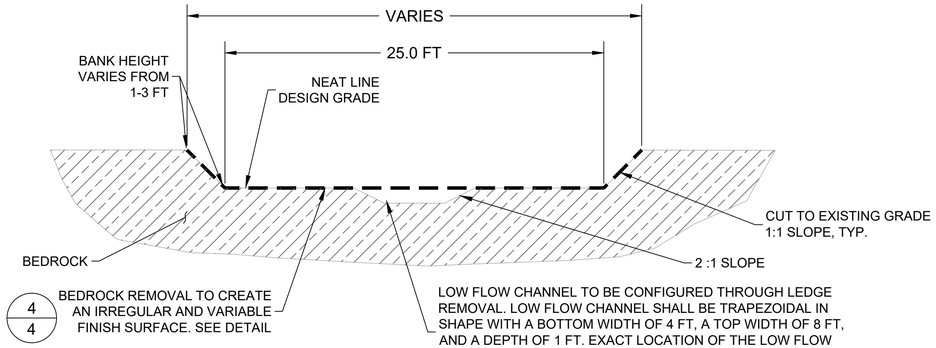
SHEET 3 OF 4

N:\Projects\Sabattus River_MMRS\Sabattus_Design Dev\Sabattus_24.dwg



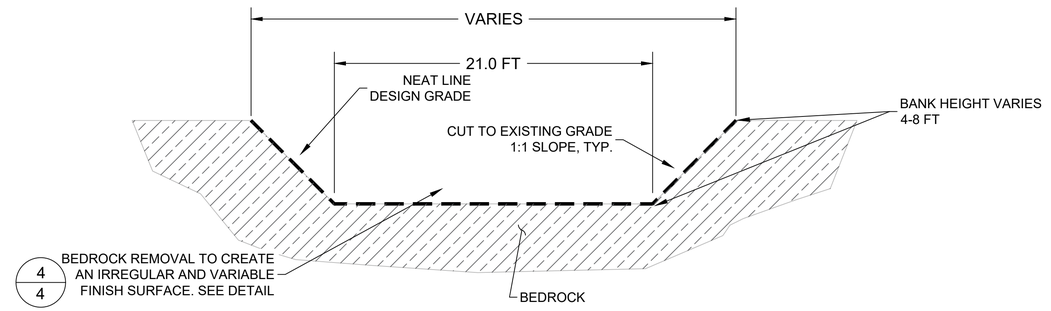
1/4 TYPICAL CHANNEL PROFILE

1" = 5'



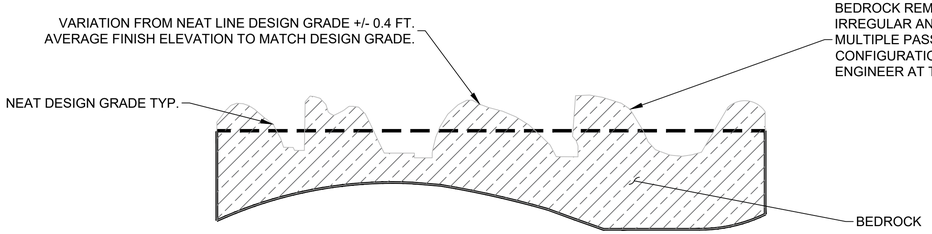
2/4 TYPICAL WEIR SECTION

1" = 5'



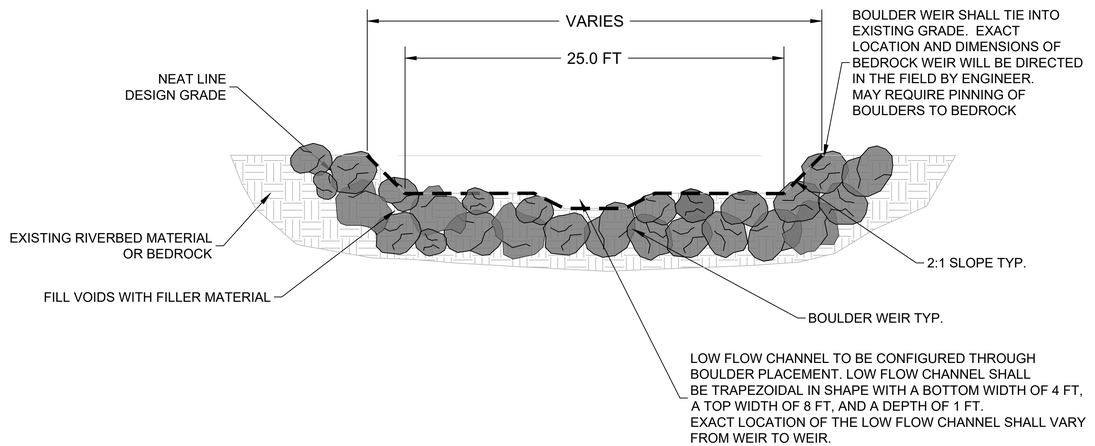
3/4 TYPICAL POOL SECTION

1" = 5'



4/4 TYPICAL DETAIL BEDROCK REMOVAL BED VARIABILITY

1" = 5'



5/4 TYPICAL WEIR SECTION - SUPPLEMENTAL BOULDER PLACEMENT

1" = 5'

NOTE:

BEFORE BEDROCK EXCAVATION BEGINS, THE CONTRACTOR SHALL REMOVE ALL MATERIAL AND OVERBURDEN FROM THE EXISTING BEDROCK GRADE. ALL BEDROCK EXCAVATION WORK SHALL BE DONE UNDER THE SUPERVISION OF THE ENGINEER. MODIFICATIONS TO THE ALIGNMENT, PROFILE, AND SECTIONS MAY BE DETERMINED BY THE ENGINEER IN THE FIELD TO MINIMIZE ROCK EXCAVATION WHILE PROVIDING OPTIMIZED FISH PASSAGE.

NO.	BY	DATE	REVISION DESCRIPTION

BB	MYS	MB
DRAWN	DESIGNED	CHECKED
-	04/24	22-05-32
APPROVED	DATE	PROJECT

MAINE DEPT OF MARINE RESOURCES
MILL STREET FISH PASSAGE
LISBON, ME

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165 Main Street, Suite 2 B
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Damariscotta, ME 04543
207.315.7014
www.interfluve.com

TYPICAL DETAILS

SHEET
4 OF 4

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