

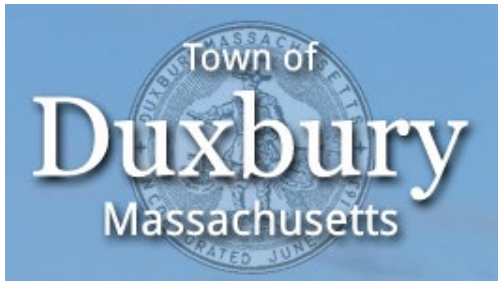
Temple Street Dam Removal

Revised Design Update

South River Restoration Project
Duxbury and Marshfield, MA



Partners & Support



Major Project Goals

1. Restore natural hydrology to the extent practical while eliminating downstream hydraulic impacts shown to occur in a full dam breach scenario
2. Restore fish and wildlife passage, particularly for river herring, American eel, and other anadromous/riverine fish species
3. Reduce or eliminate the need for dam maintenance by the Duxbury DPW staff
4. Mitigate the impacts of climate change (e.g. reduce risk of flooding due to dam failure, provide flood storage, reduce potential impacts to critical infrastructure like the downstream water main)

Critical Wildlife



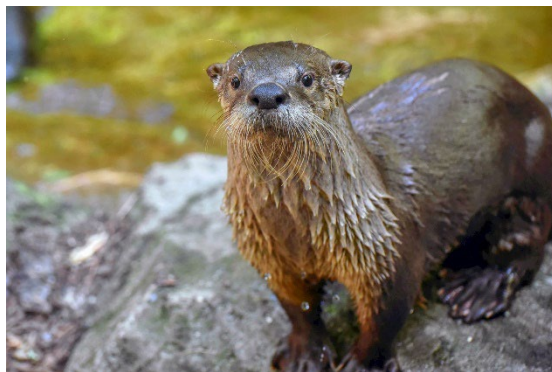
Brook Trout



American Eel



Waterfowl



River Otter



Blue Back

**NHESP Mapped Estimated Priority Habitat of Rare Species
MassDEP Outstanding Resource Water (ORW)**





Project Area

Major Features & Structures
Included (upstream to
downstream)

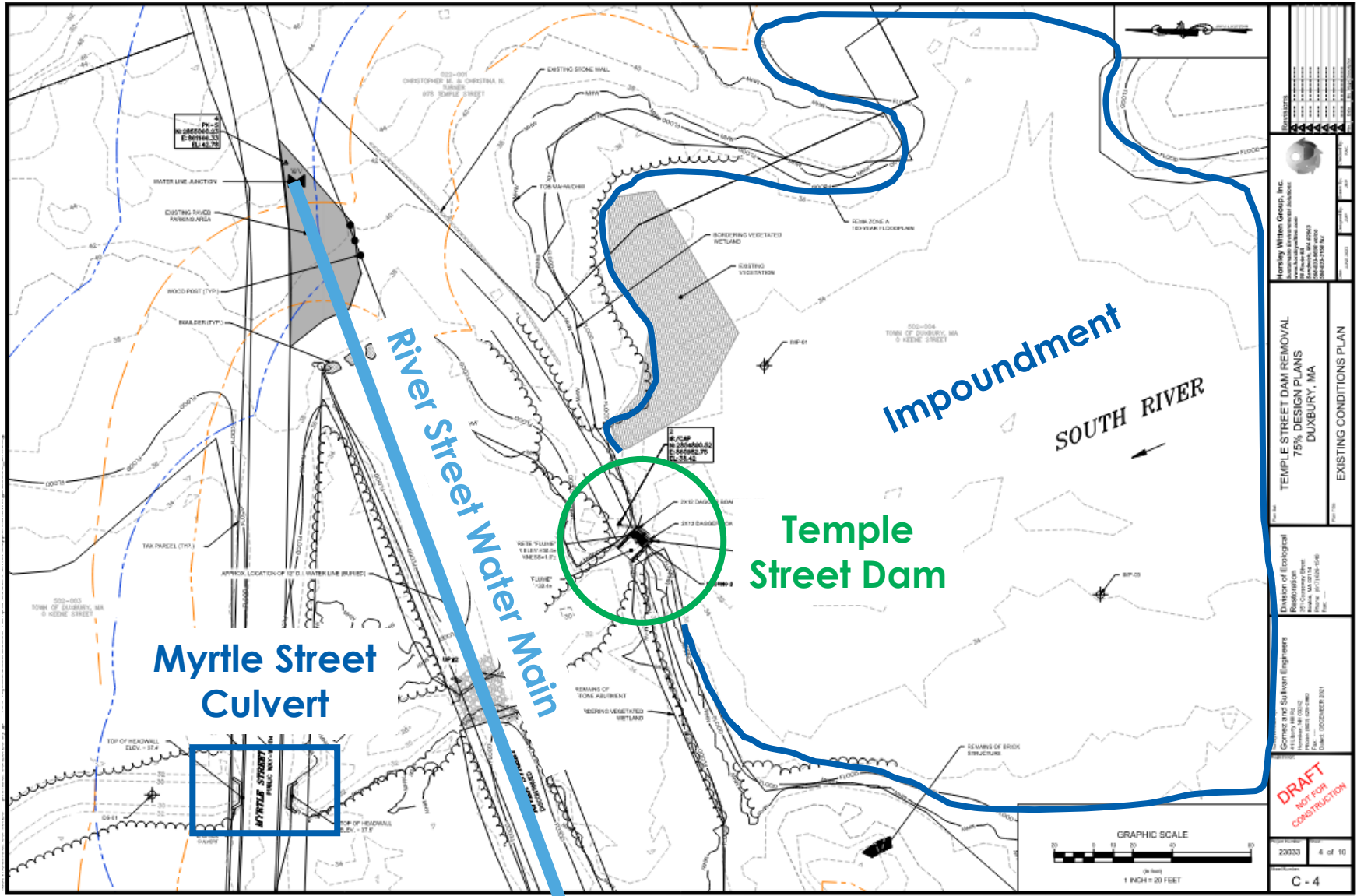
- ▶ Temple Street Dam
- ▶ Myrtle Street
- ▶ River Street (water main)
- ▶ 3 residences in 1% AEP floodplain (DS)
 - ▶ 229 Old Ocean Street
 - ▶ 108 Cross Street
 - ▶ 60 Cross Street



Temple Street Dam & Impoundment



Existing Conditions



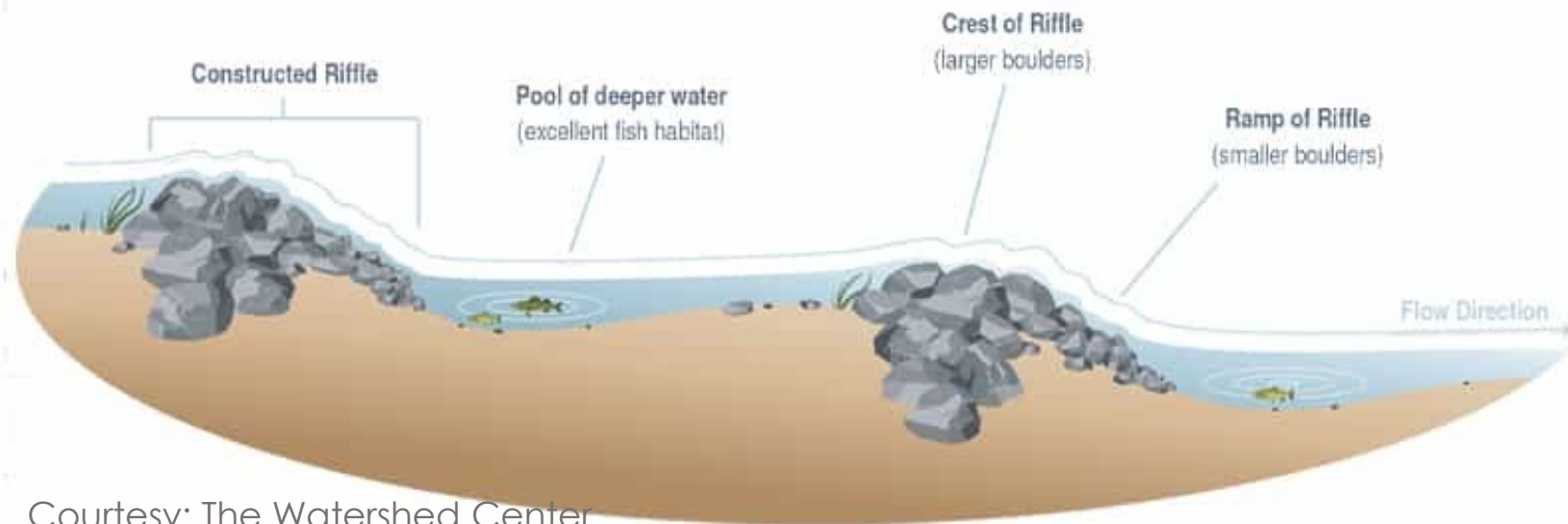
Design Objectives

- ▶ Restore aquatic connectivity of target species along South River
 - ▶ River herring
 - ▶ American eel
 - ▶ Sea lamprey
- ▶ Remove physical structure of Temple Street Dam
 - ▶ Eliminate maintenance needs and liability
- ▶ Limit flooding impacts to DS structures
 - ▶ Which maintains high quality open water habitat upstream of dam



Key Design Element: Constructed Riffles

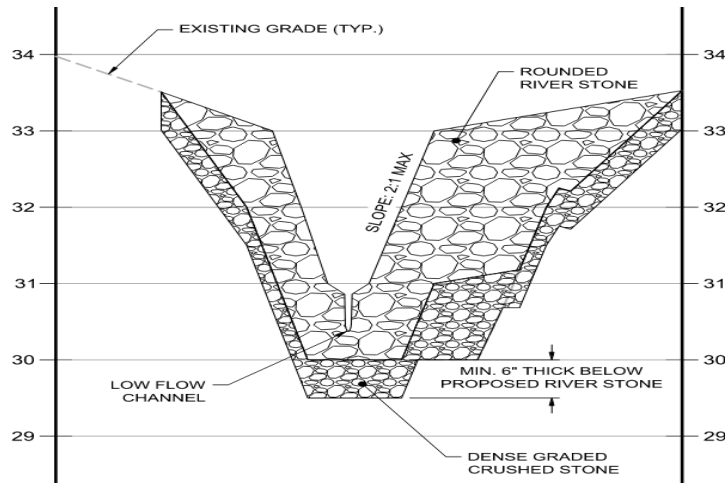
- ▶ Method for raising grade along river while maintaining passage
 - ▶ Riffle brings grade up
 - ▶ Pool allows aquatic species to rest
- ▶ Composed of gravel/cobbles/boulders
 - ▶ Size large enough to resist scour/erosion during high flows



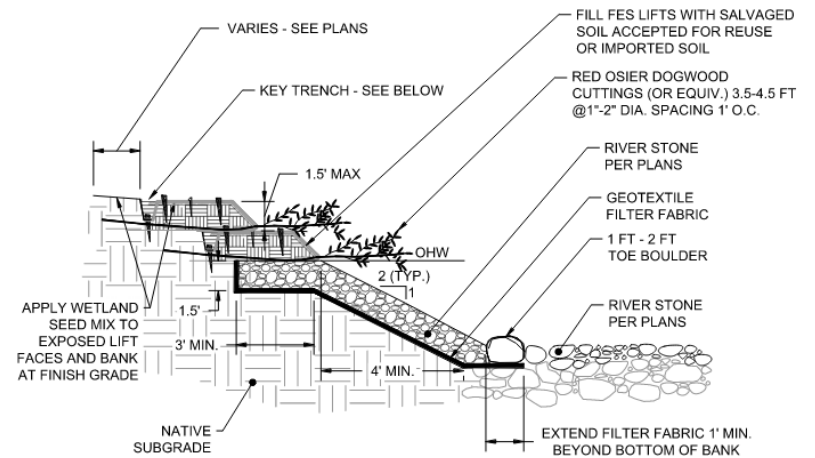
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Key Design Details

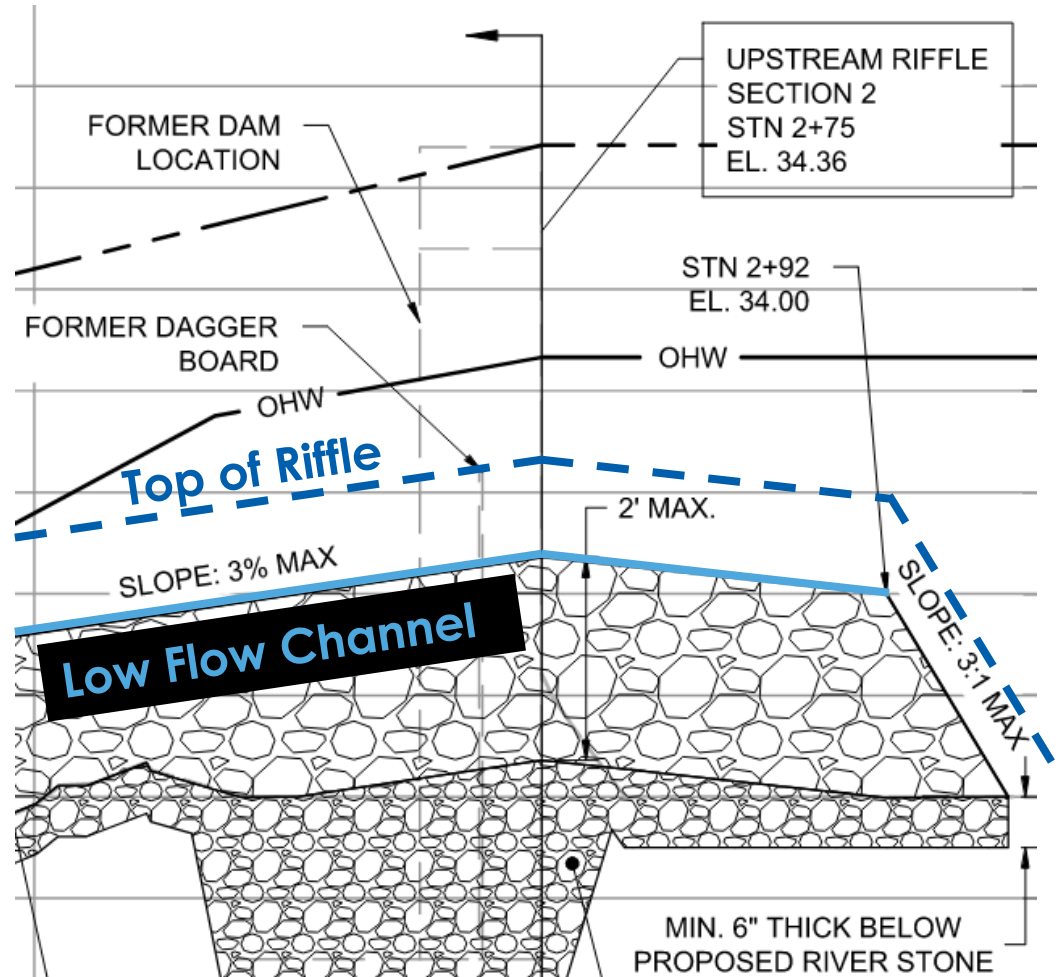


Constructed Rock Riffle



Constructed Bank

Key Design Details



Upstream Riffle Profile

Updated H&H Model Takeaways

Table 9. Hydraulic Model Results at Structures of Concern Under **Current Climate Conditions**

Model Condition	Parameter	5-year Flow			25-year Flow			100-year Flow		
		229 Old Ocean Street	108 Cross Street	60 Cross Street	229 Old Ocean Street	108 Cross Street	60 Cross Street	229 Old Ocean Street	108 Cross Street	60 Cross Street
FFE		28.63	17.05	13.06	28.63	17.05	13.06	28.63	17.05	13.06
Existing Conditions	Peak WSE (ft)	28.27	13.70	12.67	28.89	14.15	13.14	29.54	17.39	13.55
	Freeboard (ft)	0.36	3.35	0.39	-0.26	2.90	-0.08	-0.91	-0.34	-0.49
Proposed Conditions	Peak WSE (ft)	28.20	13.68	12.67	28.89	14.14	13.14	29.53	17.38	13.55
	Freeboard (ft)	0.43	3.37	0.39	-0.26	2.91	-0.08	-0.90	-0.33	-0.49
WSE Change due to Proposed Conditions (ft)		-0.07	-0.02	0	0	-0.01	0	-0.01	-0.01	0

H&H Results show a **slight reduction** (less than 0.1 foot) in WSE at **downstream properties** under the 5, 25, and 100-yr storm events.

Slight reductions (less than 0.1 foot) are also shown to occur when accounting for climate change.

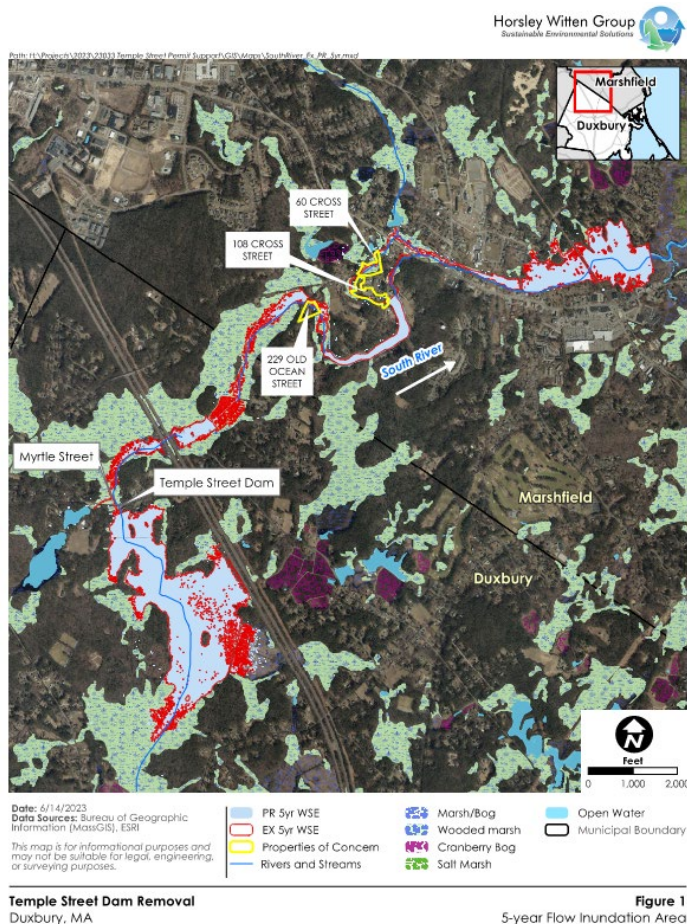
This is showing predicted change in WSEL at these structures as a result of the Temple Steet project.

Table 10. Hydraulic Model Results at Structures of Concern Under **Projected Climate Conditions**

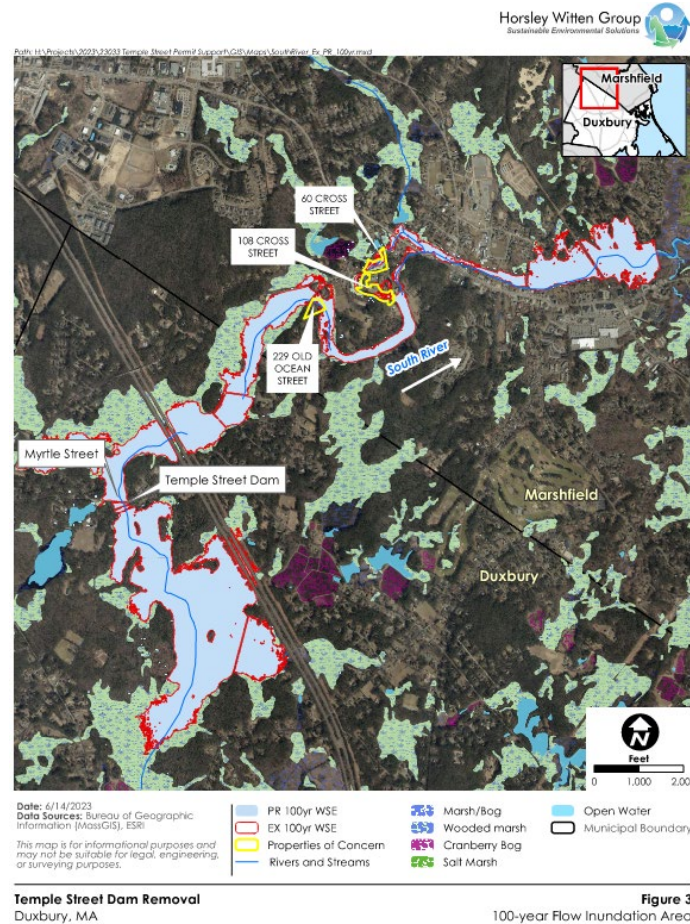
Model Condition	Parameter	5-year Flow			25-year Flow			100-year Flow		
		229 Old Ocean Street	108 Cross Street	60 Cross Street	229 Old Ocean Street	108 Cross Street	60 Cross Street	229 Old Ocean Street	108 Cross Street	60 Cross Street
FFE		28.63	17.05	13.06	28.63	17.05	13.06	28.63	17.05	13.06
Existing Conditions	Peak WSE (ft)	28.38	13.79	12.76	28.94	14.19	13.26	29.81	17.59	14.08
	Freeboard (ft)	0.25	3.26	0.30	-0.31	2.86	-0.20	-1.18	-0.54	-1.02
Proposed Conditions	Peak WSE (ft)	28.33	13.77	12.76	28.93	14.18	13.26	29.81	17.58	14.03
	Freeboard (ft)	0.30	3.28	0.30	-0.30	2.87	-0.20	-1.18	-0.53	-0.99
WSE Change due to Proposed Conditions (ft)		-0.05	-0.02	0	-0.01	-0.01	0	0	-0.01	-0.05



H&H Takeaways (continued)



**5-yr Storm
(20% Recurrence Interval)**



**100-yr Storm
(1% Recurrence Interval)**

Shows visually what the modeled WSEL extents look like on the land.

Slight increase in WSE in impoundment (0.1 ft).

Expands to **existing wetlands**, no structures.



Ecological Impacts

- Very small loss of open water
 - ~2,160 SF (0.05 acres)
 - Little to no impact to waterfowl expected
- Fish passage restored for...
 - Herring
 - American eel
 - Sea lamprey
 - Brook trout (if present)

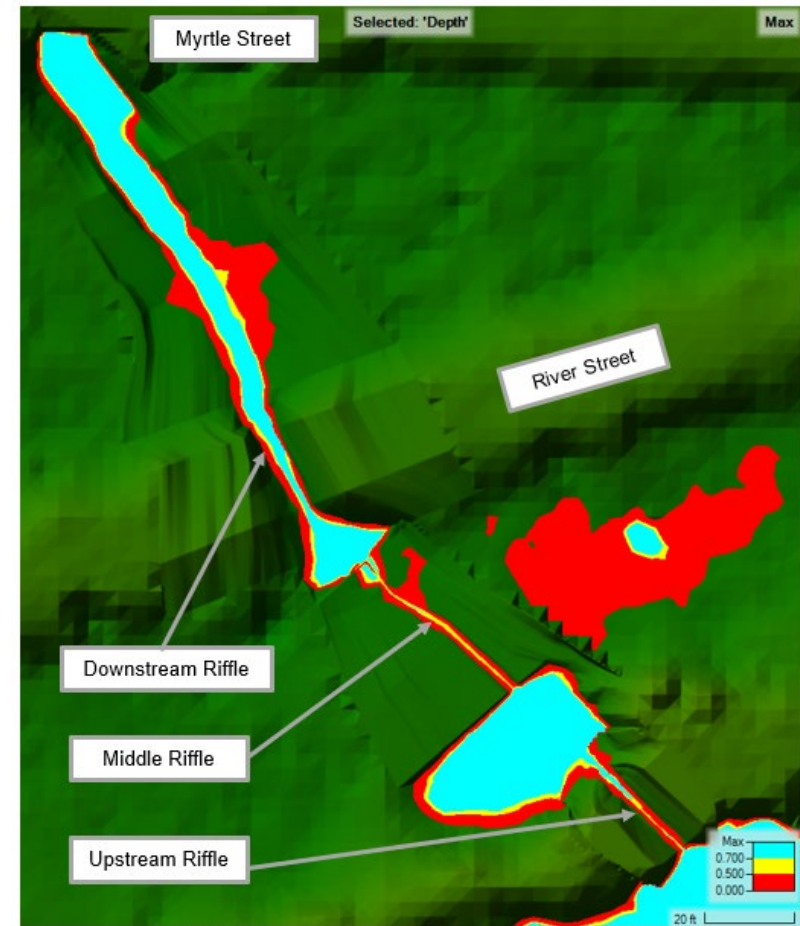


Figure 2. 95% Exceedance Flow – Channel Depth

**Low Flow (95%
Exceedance)**

Sediment Management Consideration

- No sediment mobilization expected following dam removal
 - Vertical control against mobilization lowers only 3 inches in PR design
 - Velocity/shear in impoundment not expected to exceed thresholds for mobilization

- ▶ And on top of that...
 - ▶ Sediment in impoundment is **clean**, and a **DEP-approved** Sediment Management Plan was obtained

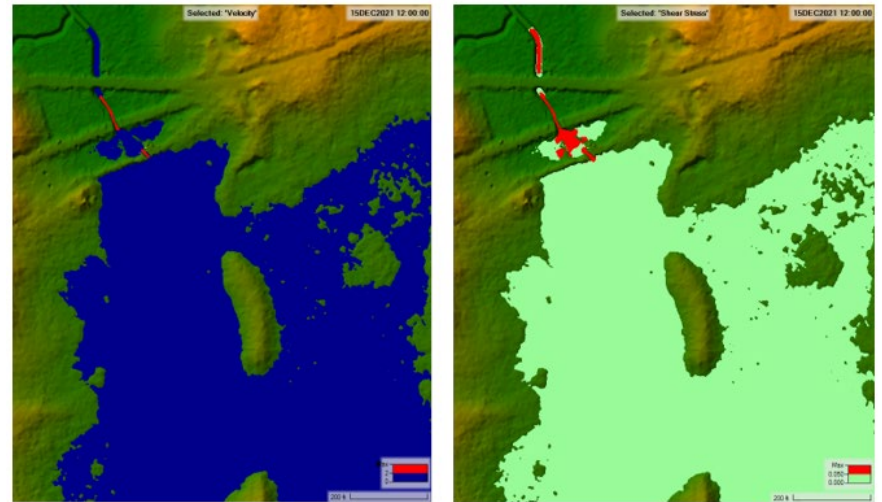


Figure 9. Post-Removal Velocity (left) and Shear Stress (right) Under 5% Exceedance Flow. Red areas indicate velocity or shear values in excess of threshold for silt mobilization

High Flow (5% Exceedance)



Project Timeline

Work Completed

- ▶ 2016 Site Reconnaissance & Preliminary Evaluation by Pare Corporation
- ▶ 2018 H&H Study of Upper South River by Pare Corporation
- ▶ 2020 Expanded H&H Study & Alternatives Analysis by Pare Corporation
- ▶ 2021 Conceptual Design, Data Collection and Modeling by Inter-Fluve, Inc. (Pare sub-consultant)
- ▶ 2022 Preliminary (75%) Design and Analysis by Gomez and Sullivan
- ▶ 2023 Permit-Level Design and Analysis by Horsley Witten Group

Future Work – *anticipated timeline*

- ▶ 2023 Regulatory Review/Permitting – public meetings
- ▶ 2023/4 Final Design and Bidding
- ▶ 2024/5 Construction and Post Monitoring (beyond)

**Other South River Restoration Projects – 2022/3

- ▶ Chandler Pond Dam Removal – Preliminary Design and Feasibility (GZA)
- ▶ Veteran's Park Dam Removal – Complete Permits and 75% Design



Permits Required

- ▶ MEPA – Notice of Ecological Restoration Project (*notice no ENF required received 9/11/2023*)
- ▶ Chapter 91 dredge permit - MA DEP
- ▶ Section 401 Water Quality Cert - MA DEP
- ▶ Wetland Protection Act Ecological Restoration Notice of Intent/Order Of Conditions - Duxbury ConCom
- ▶ Section 404 dredge and fill permit - US ACOE
- ▶ LOMR – FEMA (*Maybe Required*)
- ▶ Section 106 Historical Review– MHC (*Maybe Required*)

**Public meetings/site walks will be held for 401 and NOI/OC



Thank you!

- ▶ Nancy Rufo, Duxbury Conservation Commission
- ▶ Samantha Wood, North and South River Watershed Association
- ▶ Becky Malamut, North and South River Watershed Association
- ▶ Joseph Gould, Massachusetts Fish and Game, DER

