



Oyster River Dam at Mill Pond

Feasibility Study

Durham Town Council

November 16, 2020

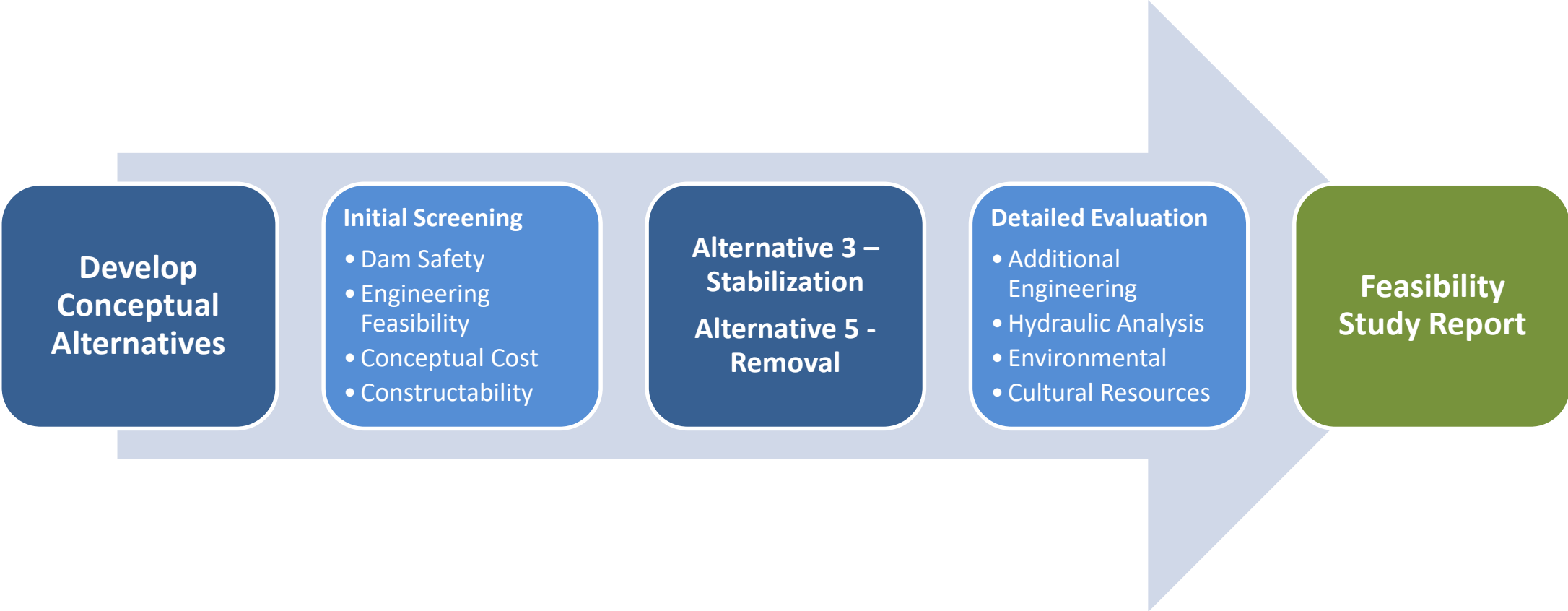


Agenda

- Project Orientation
- Findings:
 - Alternatives
 - Cost Estimates
 - Impacts and Benefits
 - Hydraulics
 - Natural Resources
 - Cultural Resources
 - Infrastructure
- Questions and Discussion



Study Process



**Develop
Conceptual
Alternatives**

Initial Screening

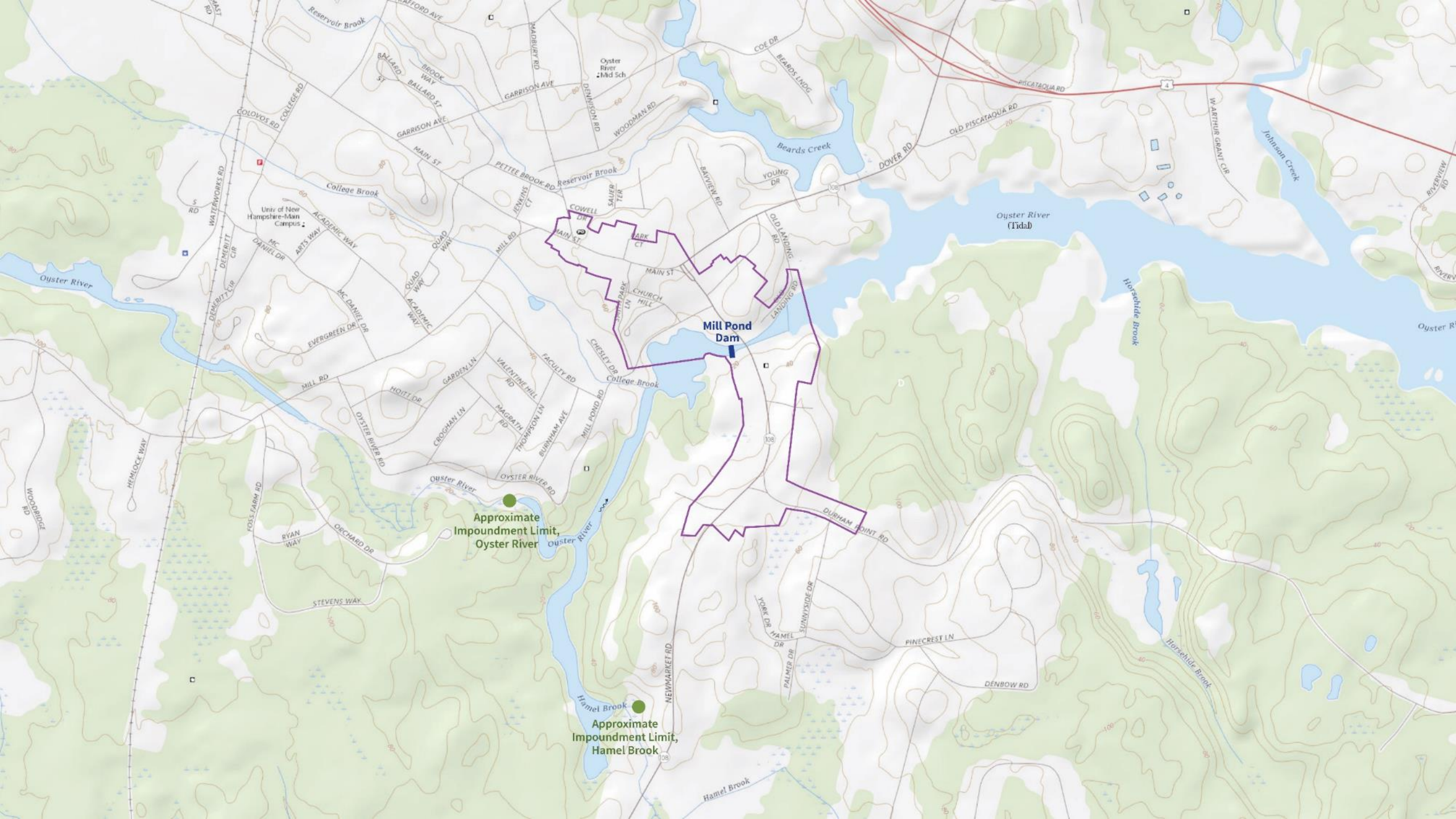
- Dam Safety
- Engineering Feasibility
- Conceptual Cost
- Constructability

**Alternative 3 –
Stabilization
Alternative 5 -
Removal**

Detailed Evaluation

- Additional Engineering
- Hydraulic Analysis
- Environmental
- Cultural Resources

**Feasibility
Study Report**



Mill Pond Dam

Approximate Impoundment Limit, Oyster River

Approximate Impoundment Limit, Hamel Brook

Univ of New Hampshire Campus

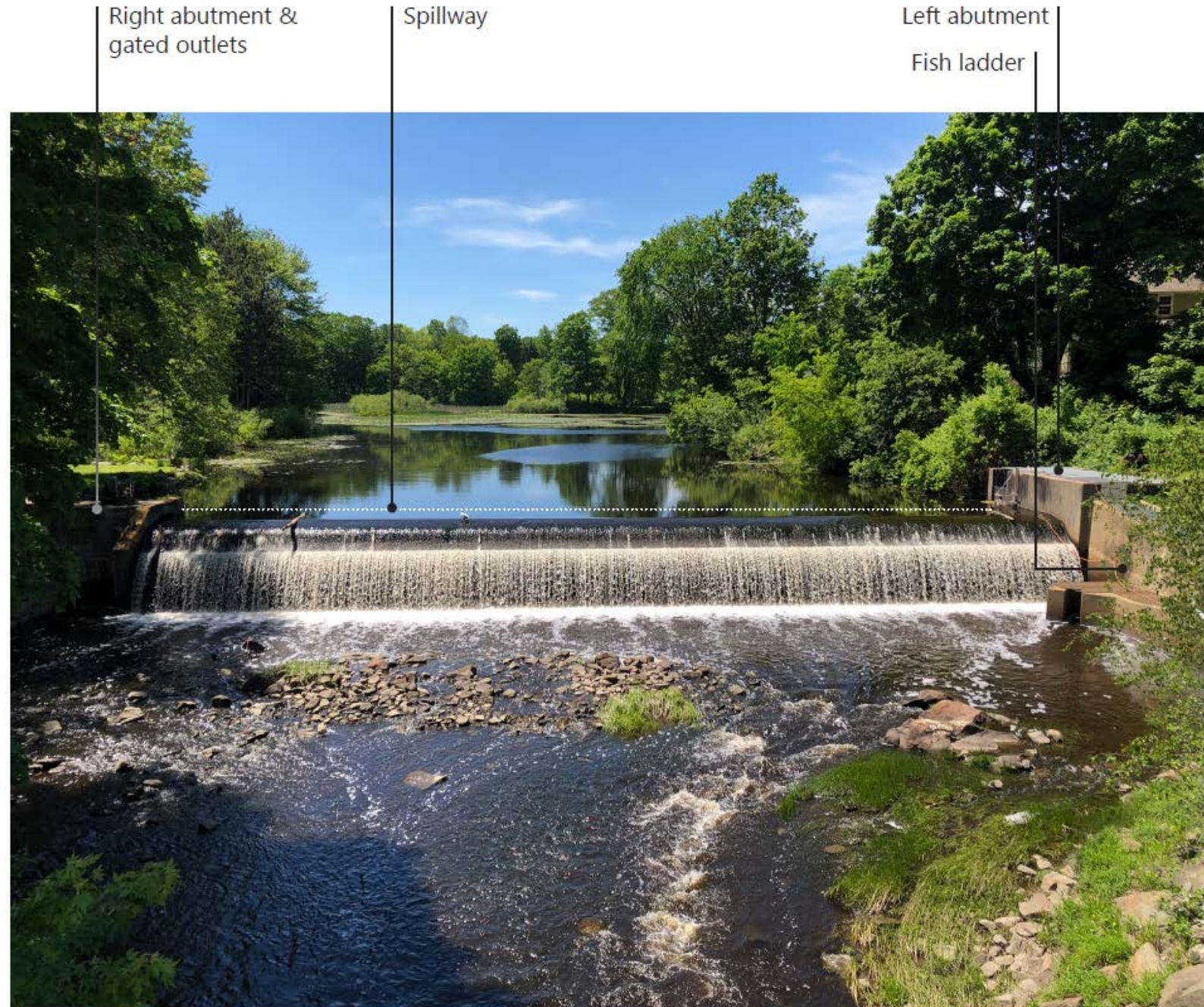
Oyster River Mid Sch

Oyster River (Tidal)

Approximate Impoundment Limit, Oyster River

Approximate Impoundment Limit, Hamel Brook

Parameter	Flow
50-year Flow (Spillway Design Flow)	3,352 cfs
Existing Spillway Capacity	1,015 cfs
Existing Spillway Capacity, with Freeboard	352 cfs



A view of the Oyster River Dam, looking upstream from the NH 108 Bridge.

Dam Structural Inspection

Examples of Deterioration Progression

2017



Dam Structural Inspection

Examples of Deterioration Progression



Dam Hazard Classification

Dam Hazard Classification

- Dam is classified as a **Low Hazard Dam**
 - Greater than 6 feet high and a storage capacity of greater than 50 acre-feet
 - Failure would likely cause significant erosion damage to property other than the dam owner's
- Safety Requirements for Low Hazard Dams
 - Must pass 50-year/24-hour storm with 1.0 ft of "freeboard" (Known as the "spillway design flood")
- NHDES Letter of Deficiency
 - Original Letter 1999
 - Revised Letter 2002
 - New Letter 2018



Dam Hazard Classification – Non-Menace Waiver

Hydraulic modelling submitted to NHDES

Findings:

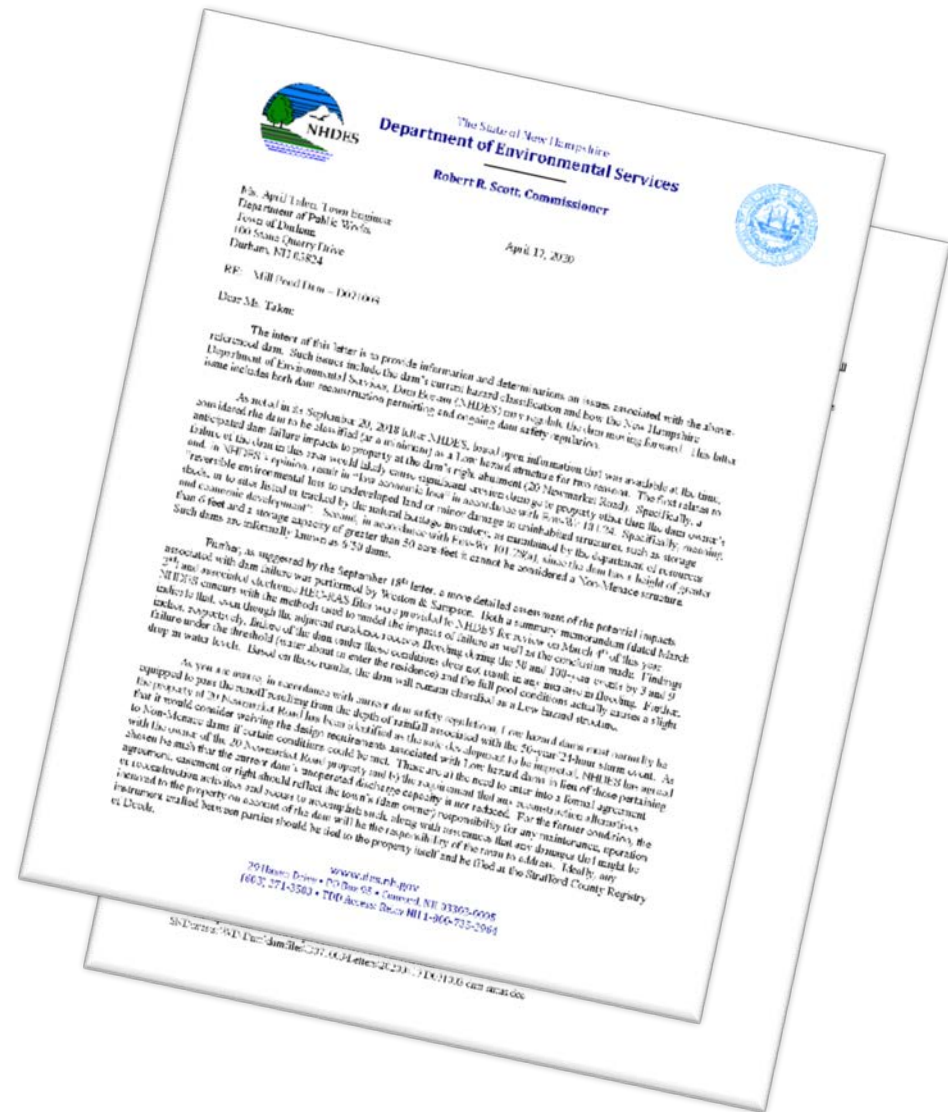
- Under 50- and 100-year flood conditions, 20 Newmarket Road **is impacted with or without a failure** of Mill Pond Dam.
- However, **dam failure is not expected to increase flooding** impacts at 20 Newmarket Road.
- **Removal of the dam is expected to reduce flooding** impacts at 20 Newmarket Road.



Dam Hazard Classification – Non-Menace Waiver

- Dam will remain classified as a Low Hazard structure.
- However, NHDES would consider waiving design requirement contingent upon:
 - Agreement with owner of 20 Newmarket Road
 - Must maintain current spillway capacity

Steve Doyon, NHDES, April 17, 2020



Alternatives

Summary of Alternatives Considered

Alternative	Description	Address Structural Deficiencies?	Non-Menace Waiver?	Detailed Analysis?	Comments
Alternative 1 No Action	Maintain status quo	No	N/A	No	Does not comply with NHDES dam safety rules. Not recommended or permissible.
Alternative 2 Repair	Address specific areas of substantial deterioration, reinforce spillway ribs	Yes	Yes	No	Limited design life, without substantial advantages over other alternatives.
Alternative 3 Stabilization	Fill existing dam cells with concrete reinforcement and anchor to the bedrock	Yes	Yes	Yes	Achieves dam stability while maintaining the impoundment but depends on NHDES approval of non-menace waiver.
Alternative 4 Redesign	Reconstruct the dam, extending the spillway onto adjacent property	Yes	No	No	Would have significant impacts on adjacent properties due to increase spillway length required.
Alternative 5 Removal	Remove dam entirely, restore upstream river channel	N/A	No	Yes	Potential grant opportunities

Preliminary Opinion of Cost – Dam Infrastructure

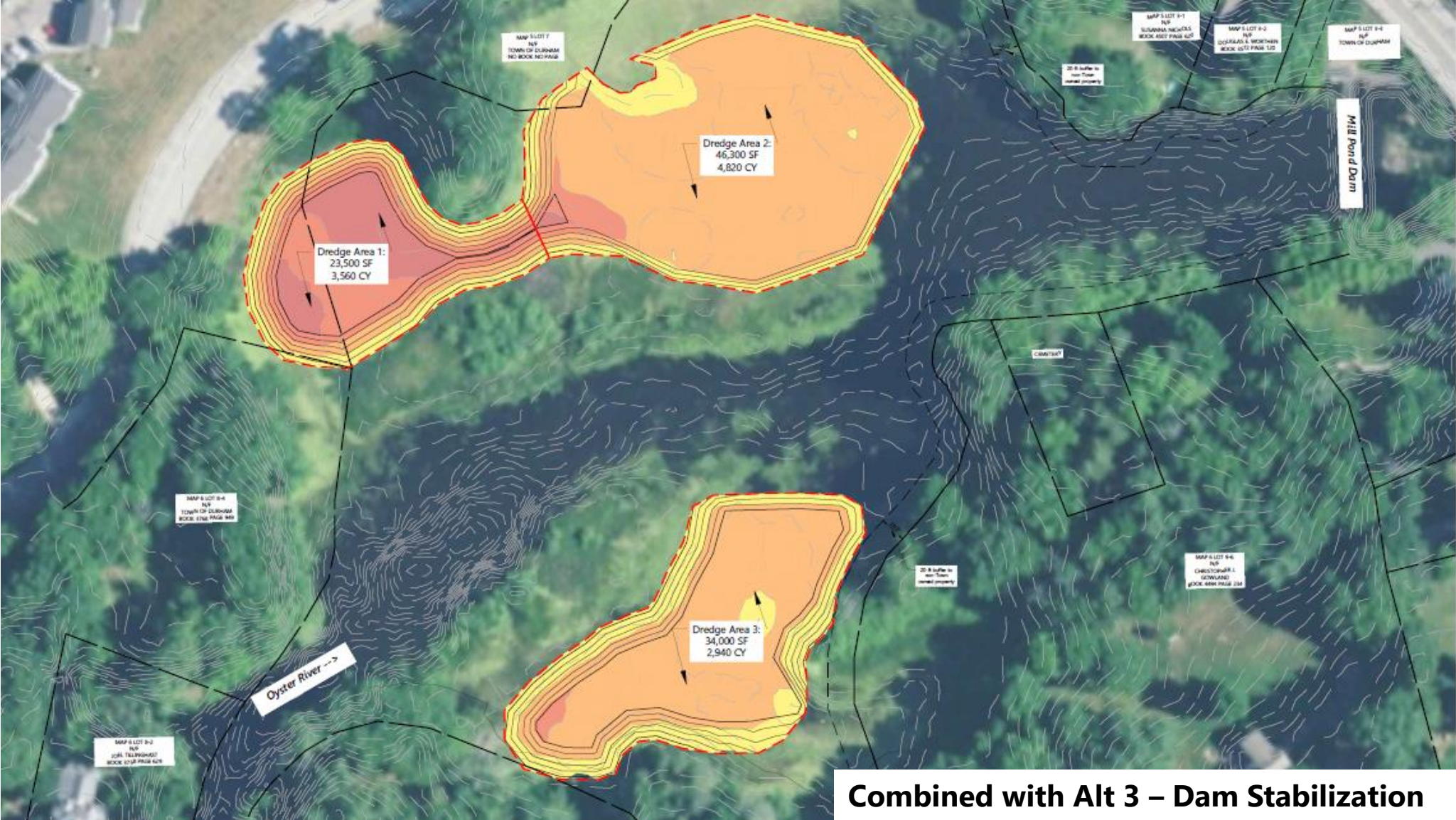
Alternative	Initial Capital Costs	Environmental Costs
Alt 1—No Action	\$0	Condition of Dam is Poor, <u>Not Recommended</u> . Requires Non-Menace waiver.
Alt 2—Dam Repair	\$875,000	Limited design life. Requires Non-Menace waiver.
Alt 3—Dam Stabilization	\$913,000	Requires Non-Menace waiver. Pond Dredging add-on possible.
Alt 4—Dam Redesign	\$1,146,000	Meets Spillway Design Flood requirement.
Alt 5—Dam Removal	\$603,000	Potential grant opportunities. Active Channel Restoration add-on possible.

Notes:

- 1. Costs are based on conceptual designs and are likely to change as design proceeds.*
- 2. Costs do not include water quality improvement, mitigation of natural resource/historic impacts, or long-term operations and maintenance.*

Environmental Components

Option 1 – Pond Restoration Dredge (Dam Stabilization)



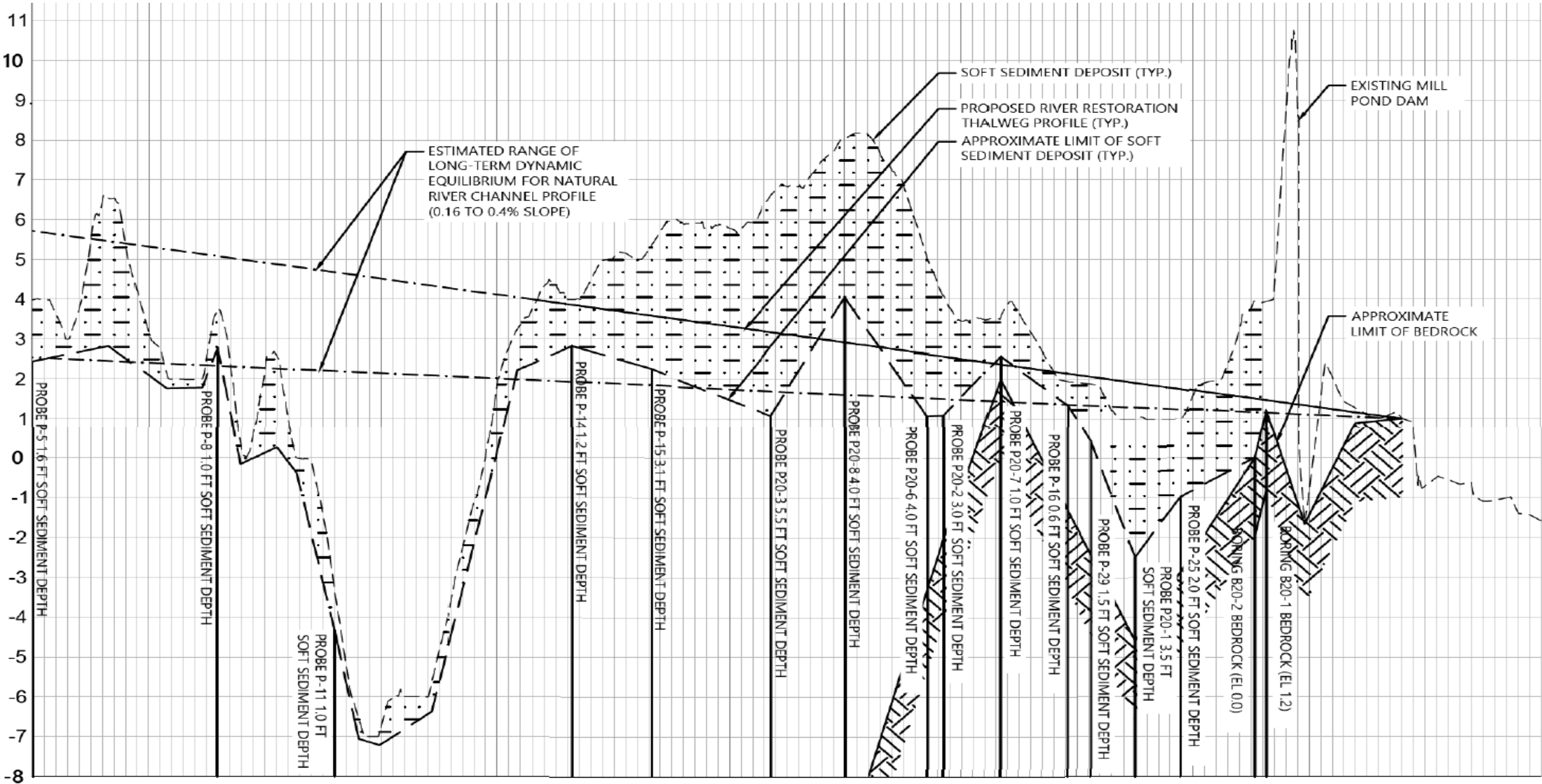
Pond Restoration Dredge - Preliminary Cost

	Dredge Area (SF)	Dredge Volume (CY)	Project Total Cost
Area 1	23,500	3,560	\$840,000-\$980,000
Area 2	46,300	4,820	\$1,330,000
Area 3	34,000	2,940	\$970,000-\$990,000
Total	103,800	11,320	\$2,960,000 - \$3,150,000

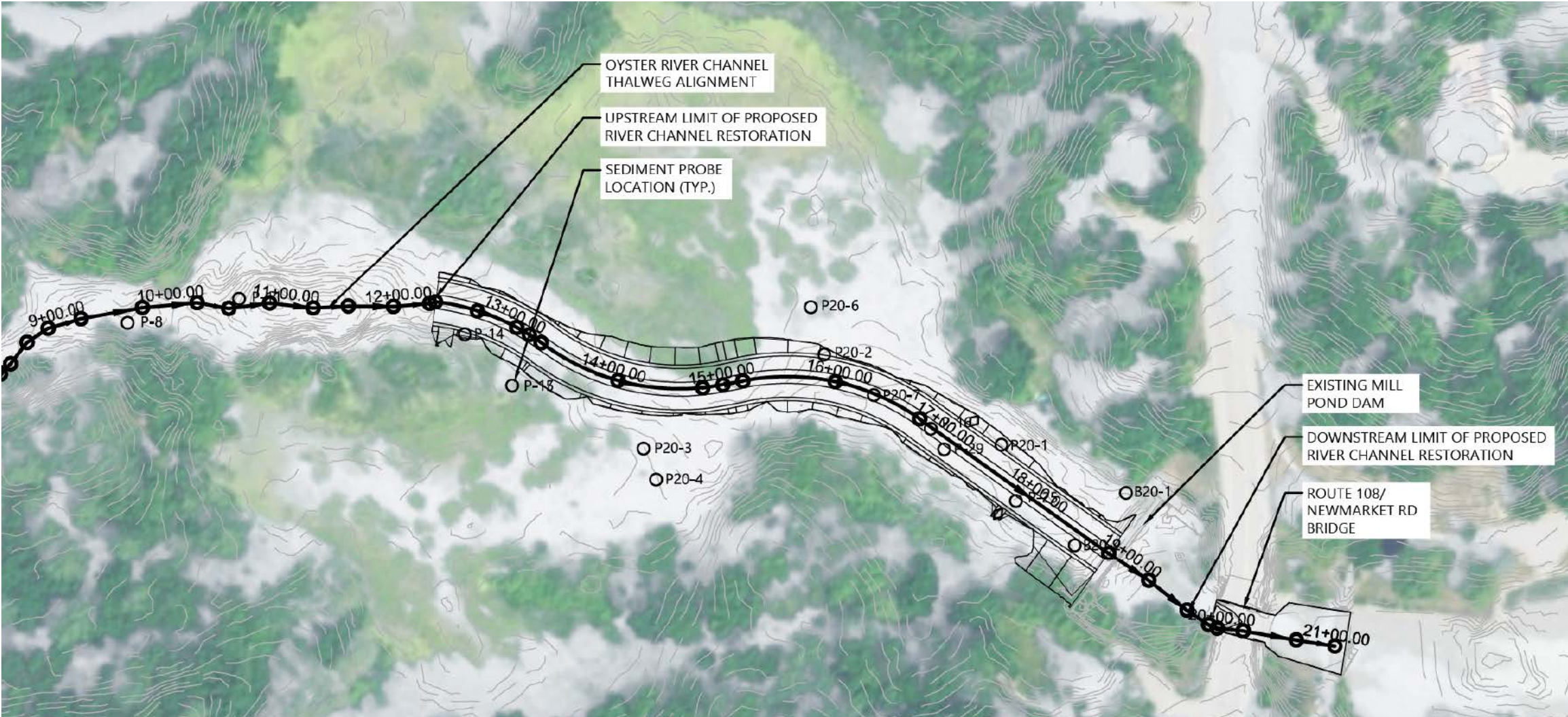
Notes:

- 1. Costs estimates include mechanical and hydraulic dredging options.*
- 2. Areas and volumes based on restoring pond to 6 ft depth.*
- 3. Includes mobilization, construction costs, engineering and 25% contingency.*
- 4. Permitting will be difficult to impossible.*

Option 2 - Active Channel Restoration (Dam Removal)



Option 2 - Active Channel Restoration



Combined with Alt 1 – Dam Removal

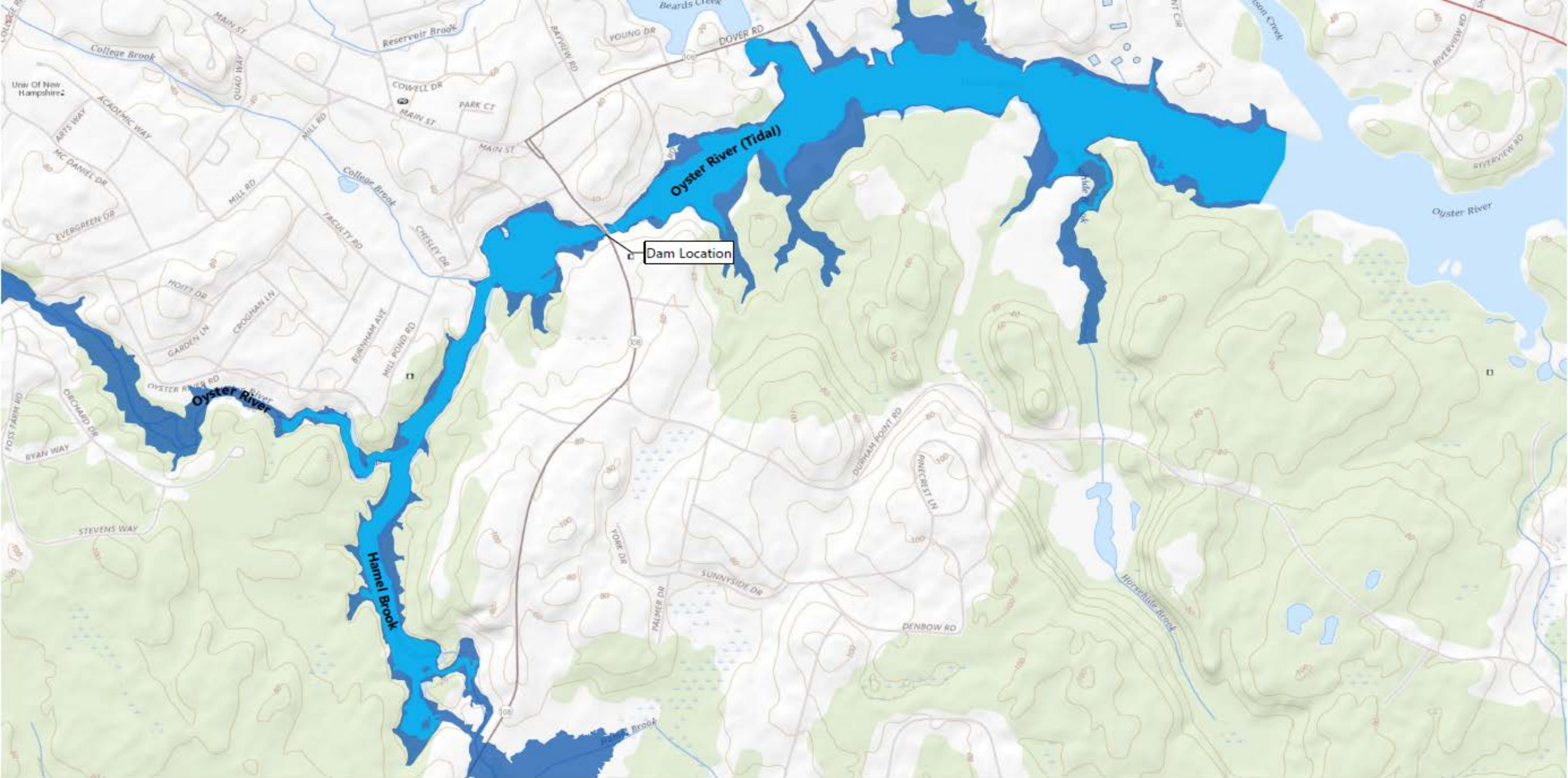
Active Channel Restoration - Cost Estimate

Component	Quantity	Unit Cost	Total Cost
Sediment Excavation, Handling and Disposal	3,000 CY	\$ 135 / CY	\$ 405,000
Streambed Fill and Channel Restoration	1,000 CY	\$ 164 / CY	\$ 164,000
Control of Water / Temporary Cofferdams	(Lump Sum)	\$ 80,000	\$ 80,000
Mobilization, Demobilization, Site Access, and Erosion Control	(Lump Sum)	\$ 62,000	\$ 62,000
Total			\$ 711,000

Notes:

- 1. Quantities assume a 650-ft long, 42-ft wide constructed channel at 0.4% average longitudinal slope, 12-inch thick streambed fill section, and 3,000 CY of associated sediment removal.*
- 2. Costs do not include contract bonds, contingency, engineering, design, permitting, or construction phase engineering services.*

Impacts and Benefits

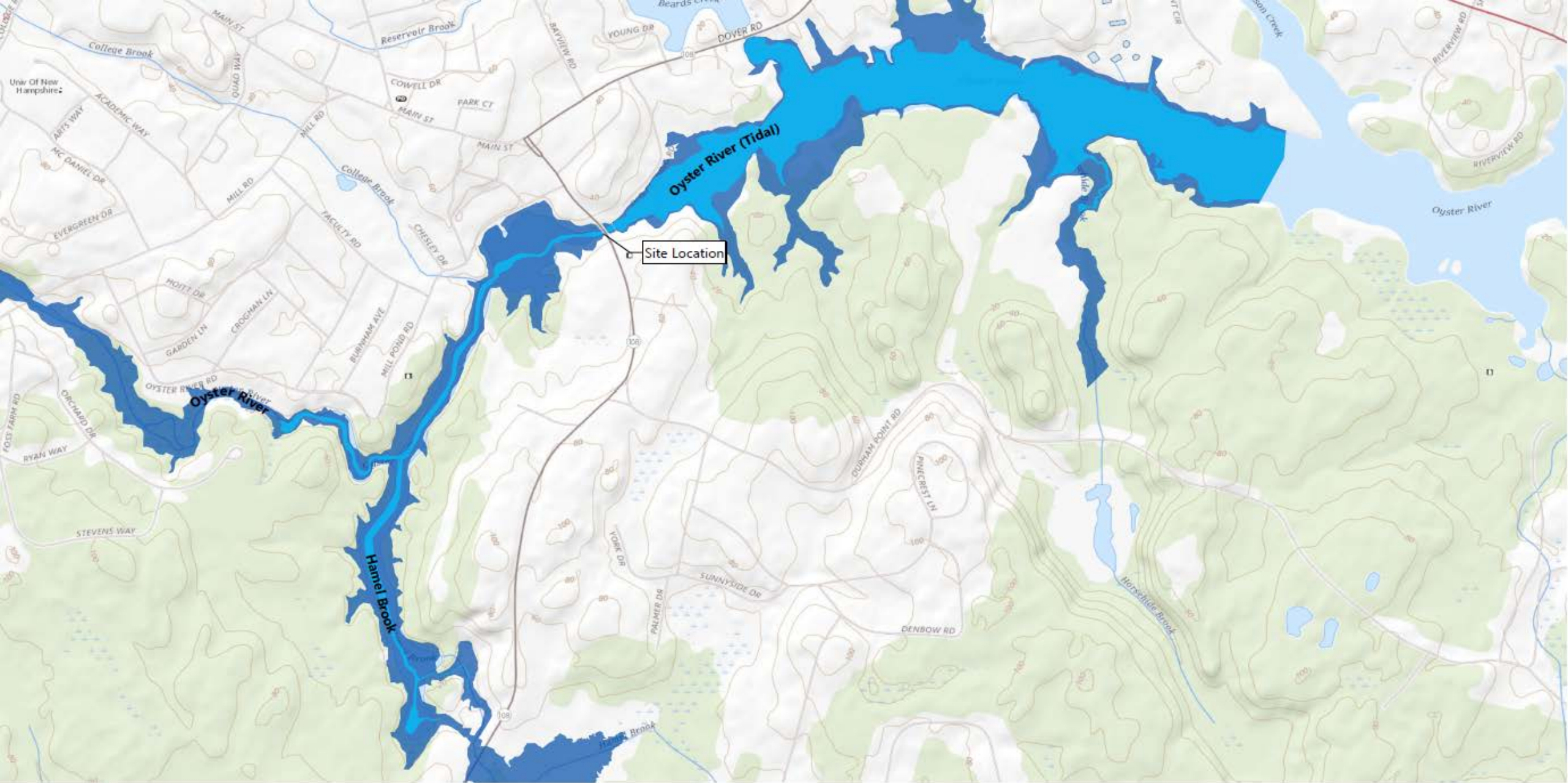


Oyster River Feasibility Study

Source : NHDES, VHB, ArcGIS Online,
Weston & Sampson

Durham, New Hampshire

**Limits of Inundation
Alternative 3 - Dam Stabilization**

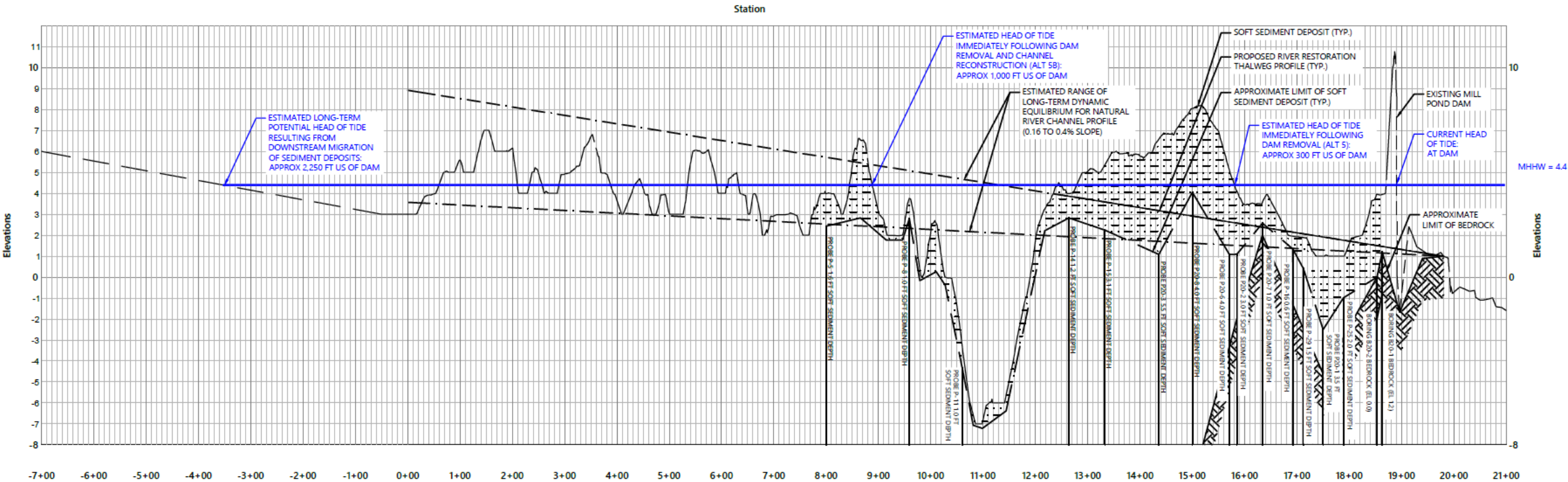


Oyster River Feasibility Study

Source : NHDES, VHB, ArcGIS Online, Weston & Sampson

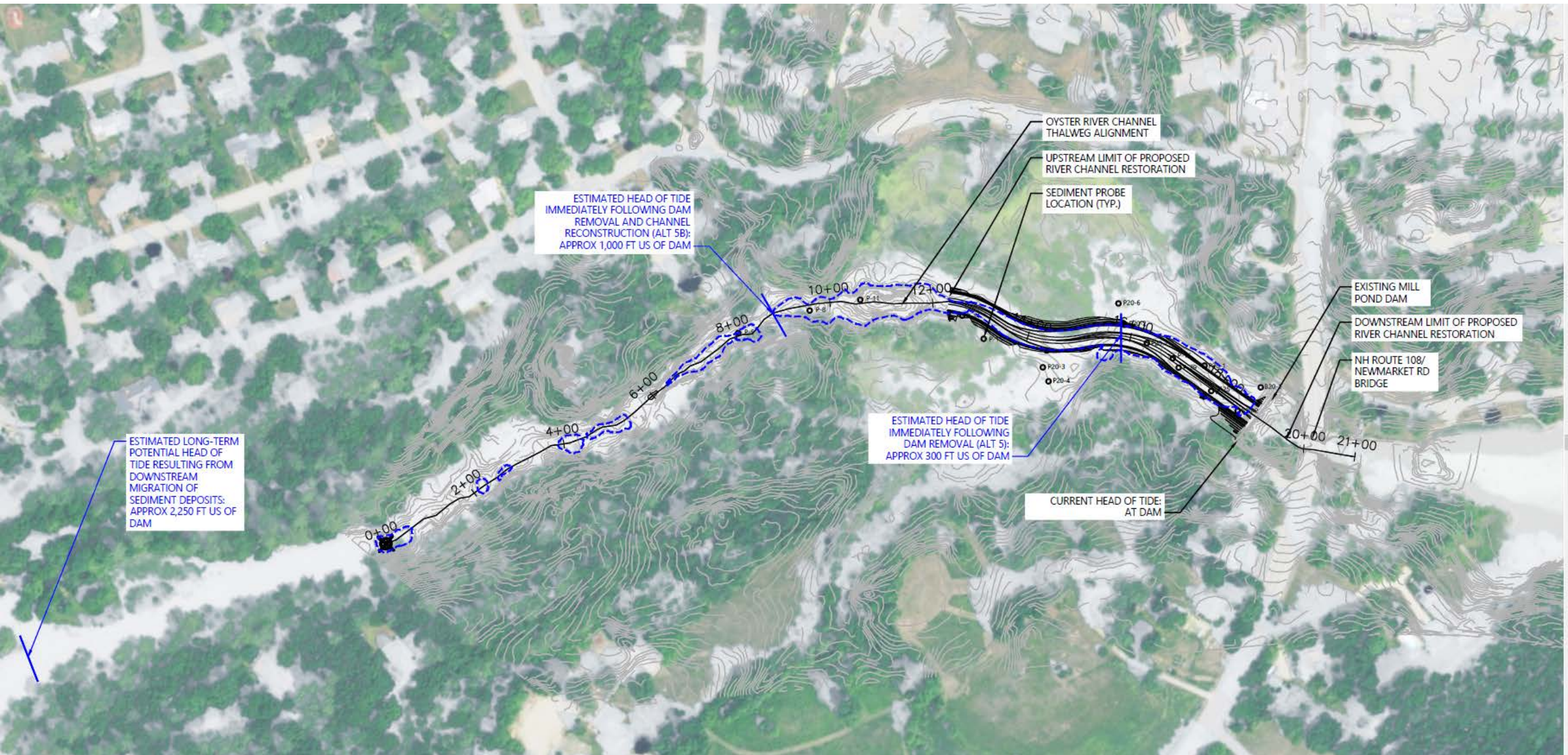
Durham, New Hampshire

**Limits of Inundation
Alternative 5 - Dam Removal**



NOTE:
 BEYOND 0+00, OUTSIDE LIMITS OF BATHMETRIC SURVEY,
 CHANNEL PROFILE EXTRAPOLATED FROM SURVEYED
 CROSS-SECTIONS IN HEC-RAS MODEL

Station
Oyster River Thalweg



ESTIMATED HEAD OF TIDE IMMEDIATELY FOLLOWING DAM REMOVAL AND CHANNEL RECONSTRUCTION (ALT 5B): APPROX 1,000 FT US OF DAM

ESTIMATED HEAD OF TIDE IMMEDIATELY FOLLOWING DAM REMOVAL (ALT 5): APPROX 300 FT US OF DAM

CURRENT HEAD OF TIDE: AT DAM

OYSTER RIVER CHANNEL THALWEG ALIGNMENT

UPSTREAM LIMIT OF PROPOSED RIVER CHANNEL RESTORATION

SEDIMENT PROBE LOCATION (TYP.)

EXISTING MILL POND DAM

DOWNSTREAM LIMIT OF PROPOSED RIVER CHANNEL RESTORATION

NH ROUTE 108/NEWMARKET RD BRIDGE

ESTIMATED LONG-TERM POTENTIAL HEAD OF TIDE RESULTING FROM DOWNSTREAM MIGRATION OF SEDIMENT DEPOSITS: APPROX 2,250 FT US OF DAM



Anticipated Vegetation Transition Zones

- < 5' Open Water
- 5'-6' Emergent Wetland
- 6'-8' Freshwater Emergent Marsh/Shrub
- 9'-10' Marsh/Shrub/Forested Wetland
- >10' Shrub/Forested Wetland/Upland Transition

Anticipated High Water Lines

- Mean Higher High Water - 4.4' - Higher Low Marsh
- Head of Tide Limit - 5.4' - High Marsh
- Mean Higher High Water + 2.9' RSLR (Likely Range)
- Mean Higher High Water + 3.8' RSLR (5% Chance)

Index Contour (5 ft)

- 1' Contour Intervals

Oyster River Feasibility Study

Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

**Alternative 5 - Dam Removal
Predicted Tidal Influence and
Wetland Habitats**

Infrastructure and Cultural Resources

	Alternative 3	Alternative 5
	Dam Stabilization	Dam Removal
Bridges, Walls, Foundations	No change relative to existing condition.	No adverse effect on the downstream NH 108 Bridge or pedestrian bridge. Adjacent retaining walls could be stabilized through proper design.
Water Supplies	No change relative to existing condition.	No known surface water withdrawals; impoundment is not a significant source of recharge to the underlying bedrock aquifer; private and municipal water supplies will not be affected.
Cultural Resources	Expected to be deemed a Section 106 "adverse effect" to the NH State Register-listed resource.	Major adverse effect to the NH State Register-listed historic structure; potential indirect effects to surrounding district.

Natural Resources

	Alternative 3 Dam Stabilization	Alternative 5 Dam Removal
Rare Species/Exemplary Natural Communities	No effect relative to existing condition.	Four state-tracked plant species and two state-tracked fish species present in impoundment.
Invasive Species	No effect relative to existing condition.	Management plan recommended to limit potential for spread of invasive species.
Water Quality	Maintain existing water quality impairments. Dredging could provide temporary improvement but would require regular maintenance.	Improved dissolved oxygen levels and lower water temperatures; possibly eliminate upstream impairments.
Fisheries	Dam limits upstream and downstream migration of anadromous fish species, favors warm water species.	Would restore fish passage, benefitting anadromous species and the downstream estuary system.















Thank you! Questions?

April Talon, PE | atalon@ci.durham.nh.us | 603.868.5578

Peter J. Walker | pwalker@vhb.com | 603.391.3942

