



Oyster River Dam at Mill Pond

Feasibility Study

Durham Town Council

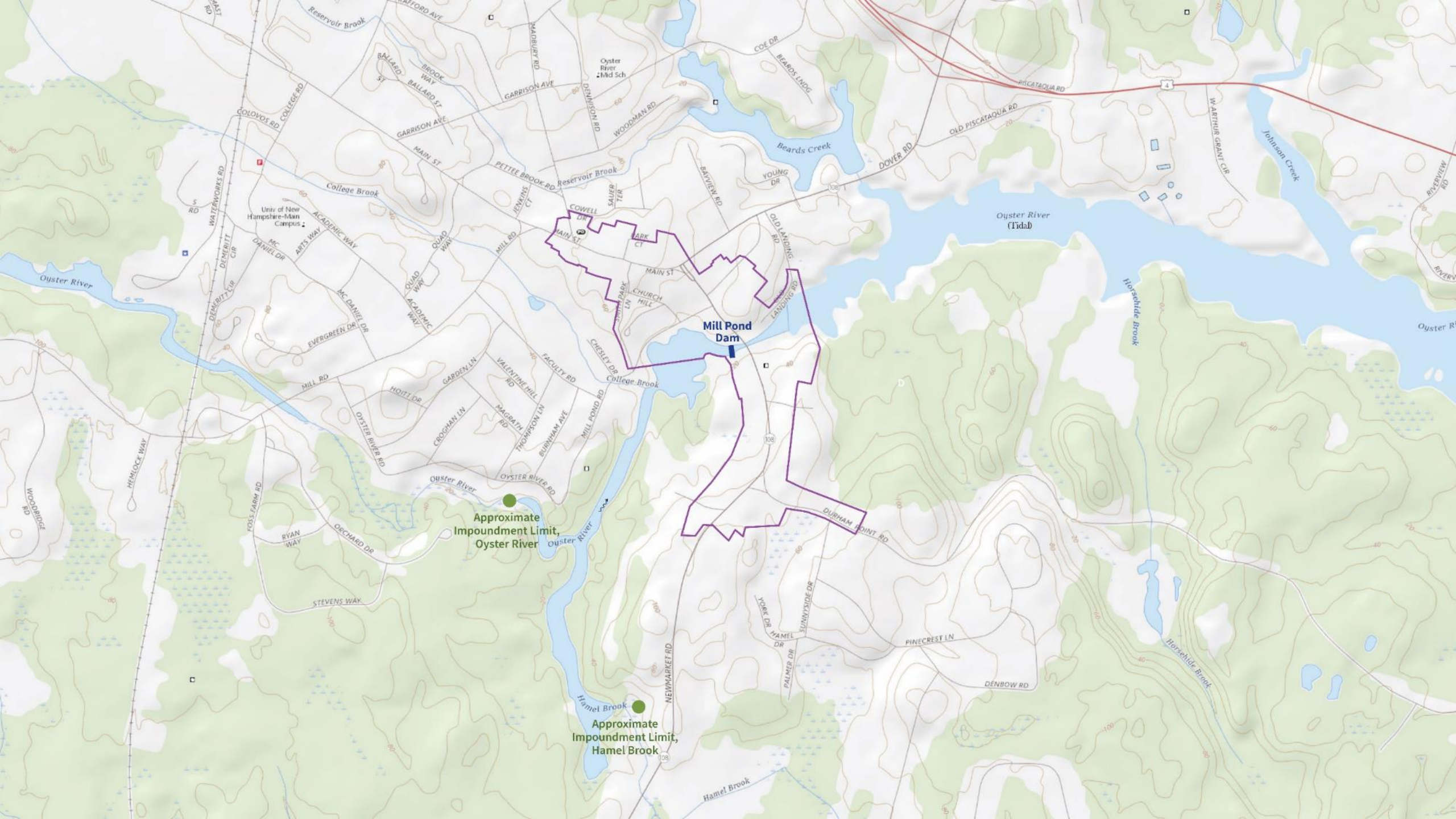
June 15, 2020



Agenda

- Project Orientation
- Update:
 - Dam Inspection
 - Hazard Classification
 - Preliminary Alternatives
 - Pond Restoration
- Next Steps
- Questions and Discussion

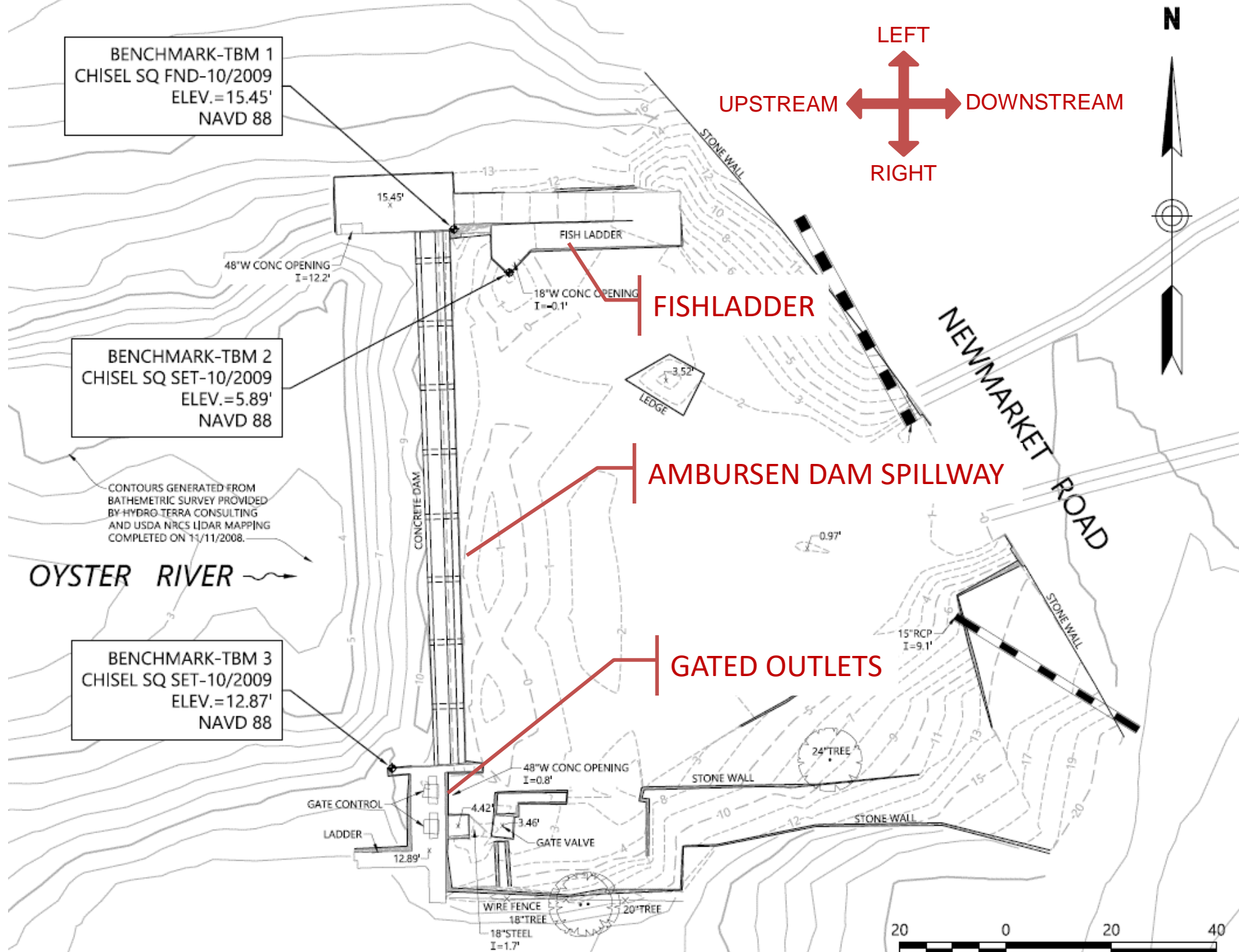




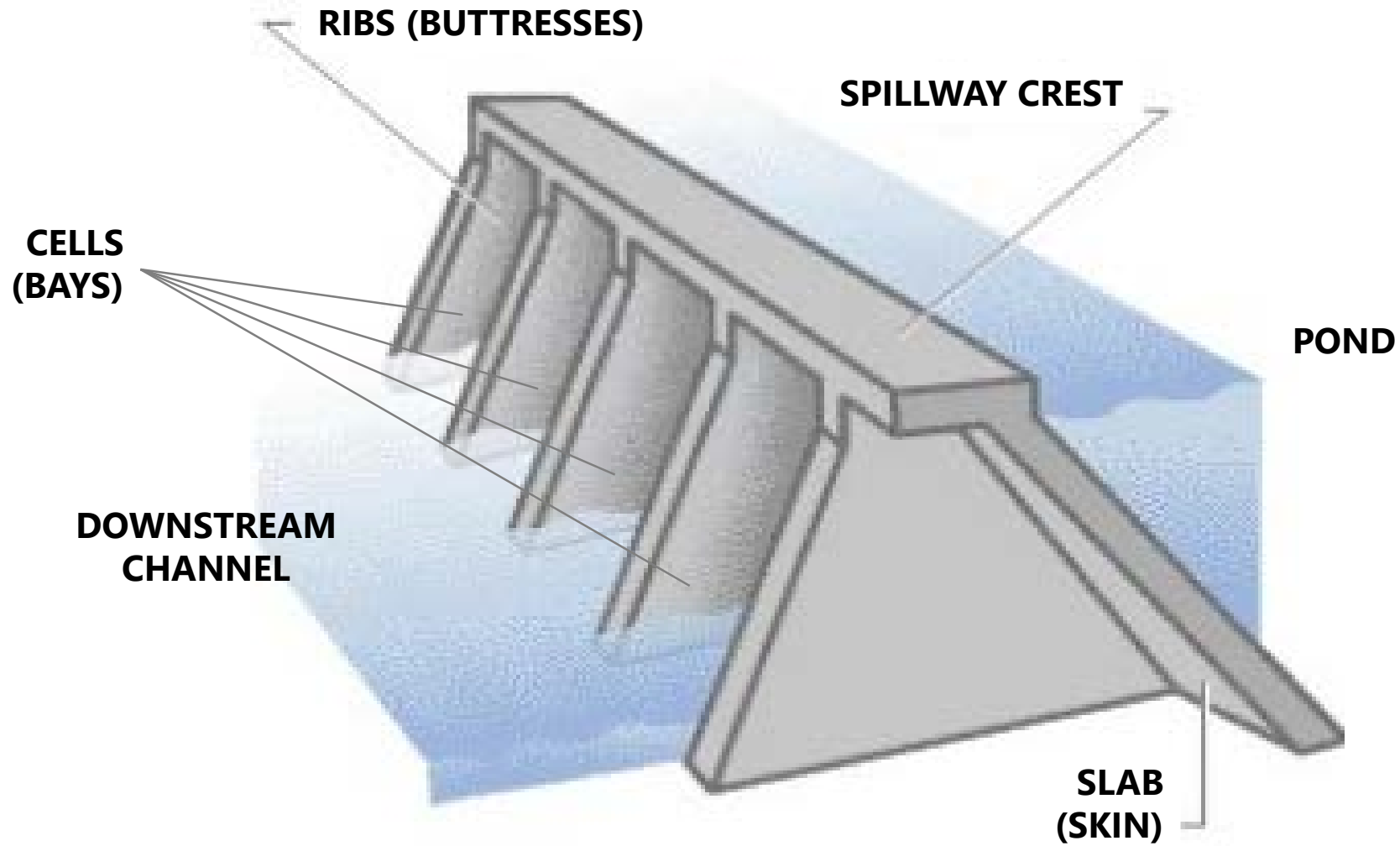
Mill Pond Dam

Approximate
Impoundment Limit,
Oyster River

Approximate
Impoundment Limit,
Hamel Brook



Anatomy of an Ambursen Dam



Dam Safety

- Current Classification
“Low Hazard Structure”
 - Does not meet discharge capacity requirements – 50-year flow – “Spillway Design Flood”
 - Known structural deficiencies
- NHDES Letter of Deficiency
 - Original Letter 1999
 - Revised Letter 2002
 - New Letter 2018



Completed to Date

- **Completed surveys:**
 - Dam Inspection—December 2019
 - Archaeological Sensitivity – January 2020
 - Boundary Survey— February 2020
 - Bathymetric Survey—February 2020
 - Dam Structure Survey—February 2020
 - Geotechnical Investigation—April 2020
- **Preliminary Design Alternatives**
- **Pond Dredge Conceptual Plan**



Dam Inspection

Dam Structural Inspection

Inspection Summary

- December 18, 2019
- 4-inch Drawdown to facilitate inspection
- Visual & Tactile Inspection of Above Water Components of the Spillway, Gate Headwalls, and Dam Sections
- Included:
 - Spillway “Exterior”
 - Spillway “Interior”
 - Gates
 - Fish Ladder



Dam Structural Inspection

Spillway "Exterior"



Dam Structural Inspection

Spillway "Interior" (Ribs & Cells)



Dam Structural Inspection

Gated Outlets



Dam Structural Inspection

Fish Ladder



Dam Structural Inspection

Examples of Deterioration Progression



2017

Dam Structural Inspection

Examples of Deterioration Progression



2019

Dam Structural Inspection

Examples of Deterioration Progression

2017



Dam Structural Inspection

Examples of Deterioration Progression



Dam Structural Inspection

Examples of Deterioration Progression



Dam Structural Inspection

Examples of Deterioration Progression



Dam Structural Inspection

Inspection Implications

- Gress Study Concurrence
 - Concrete Deterioration
 - Advanced Deterioration
- Degradation of Concrete Has Continued
- Immediate Stability Concerns

Dam Hazard Classification

Dam Hazard Classification

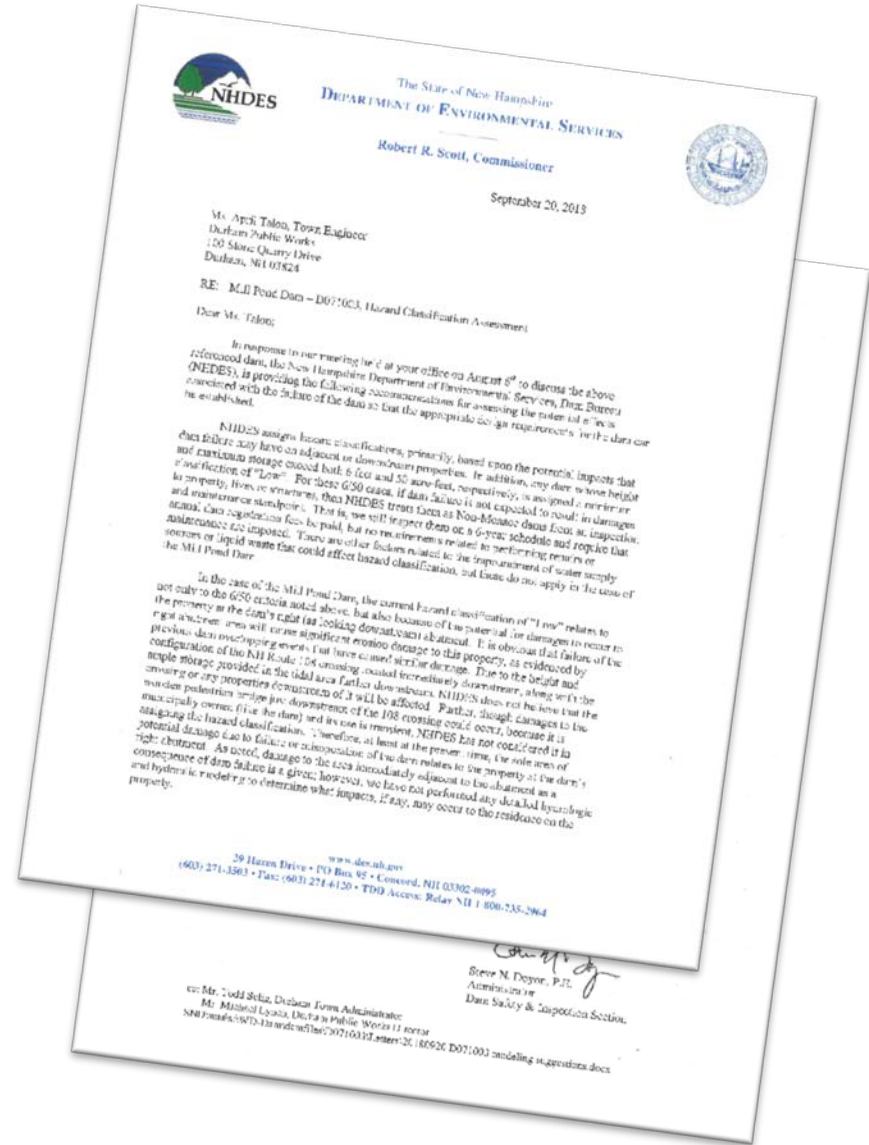
- Dam is classified as a **Low Hazard Dam**
 - Failure would likely cause significant erosion damage to property other than the dam owner's
 - Greater than 6 feet high and a storage capacity of greater than 50 acre-feet
- Safety Requirements for Low Hazard Dams
 - Must pass 50-year/24-hour storm with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

Dam Hazard Classification

Reclassification to a “Non-Menace” structure

- Concern with impacts to downstream property on river right (20 Newmarket Road)
- Requested analysis demonstrating the effect of the dam on flooding on this property.

Steve Doyon, NHDES, September 18, 2018



Dam Hazard Classification

W&S hydraulic model submitted to NHDES on March 2, 2020

- Analyzed impact of dam failure on 20 Newmarket Road under several flow conditions and breach geometries
- Findings:
 - 50-year (Spillway Design Flood) = 3,352 cfs
 - Existing Spillway Capacity = 1,015 cfs
 - Existing Spillway Capacity, with Freeboard = 352 cfs

Dam Hazard Classification

W&S hydraulic model submitted to NHDES on March 2, 2020

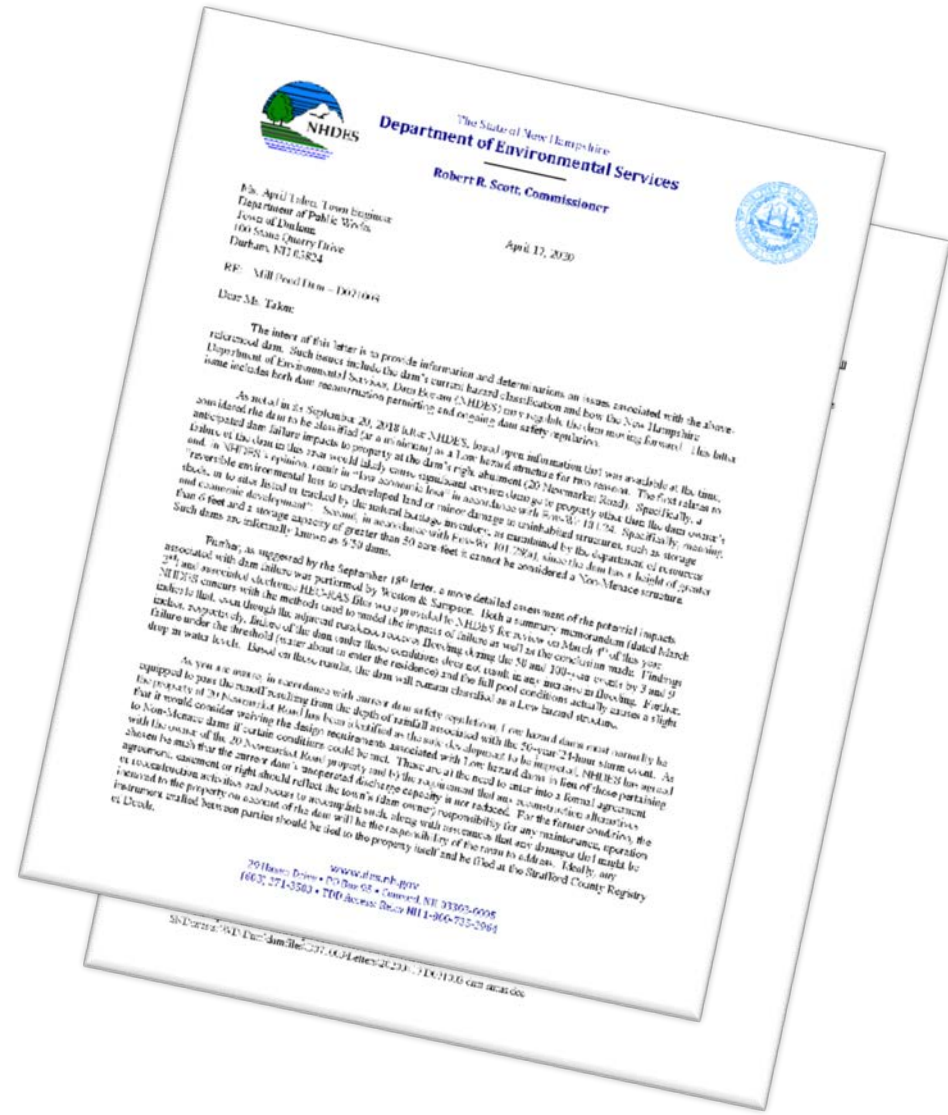
- **Findings:**
 - Under 50- and 100-year flood conditions, 20 Newmarket Road **is impacted with or without a failure** of Mill Pond Dam.
 - However, **dam failure is not expected to increase flooding** impacts at 20 Newmarket Road.
 - **Removal of the dam is expected to reduce flooding** impacts at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



Dam Hazard Classification

- NHDES concurs with methods used to model impacts of failure as well as conclusion made.
- 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

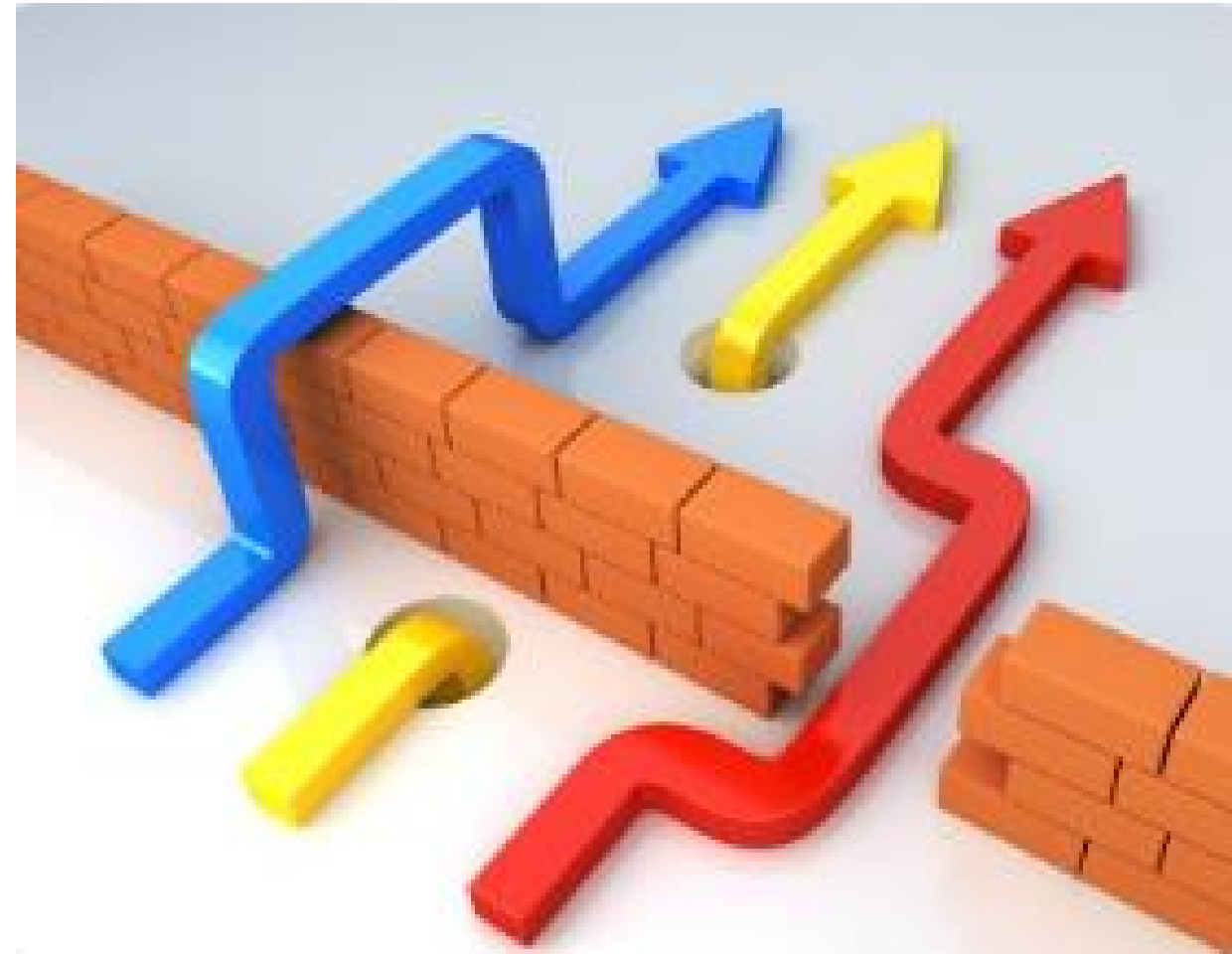
Steve Doyon, NHDES, April 17, 2020



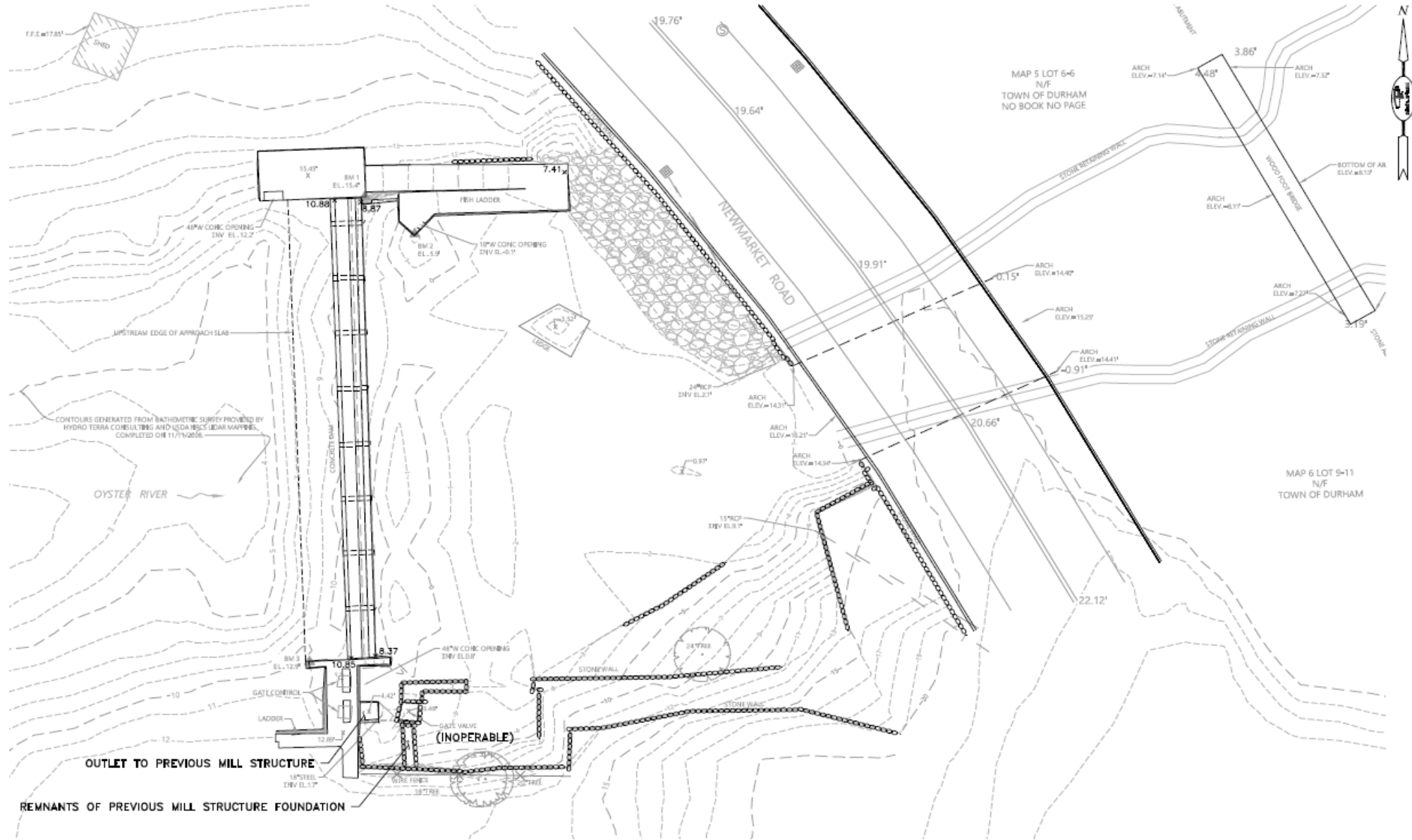
Alternatives

Alternatives Identified

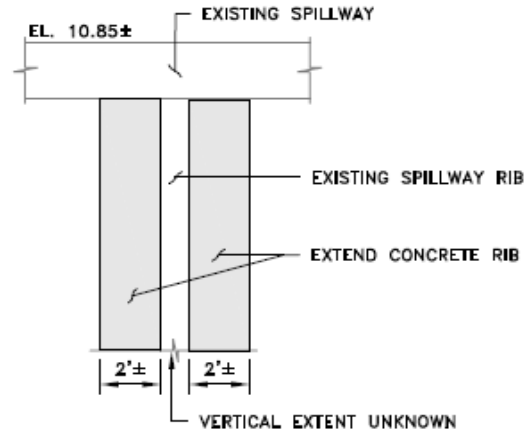
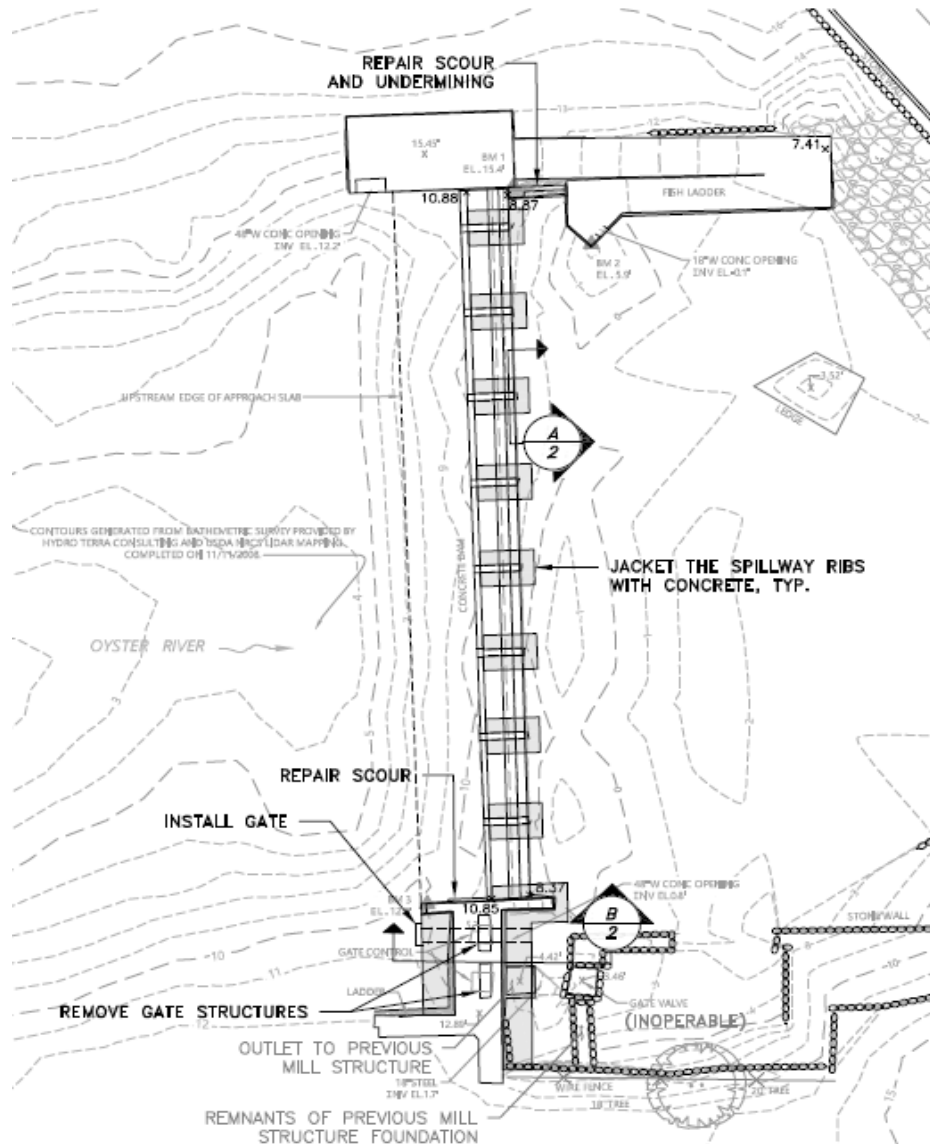
- Alternative 1 – No-Action
- Alternative 2 – Dam Repair
- Alternative 3 – Dam Stabilization
- Alternative 4 – Dam Redesign
- Alternative 5 – Dam Removal



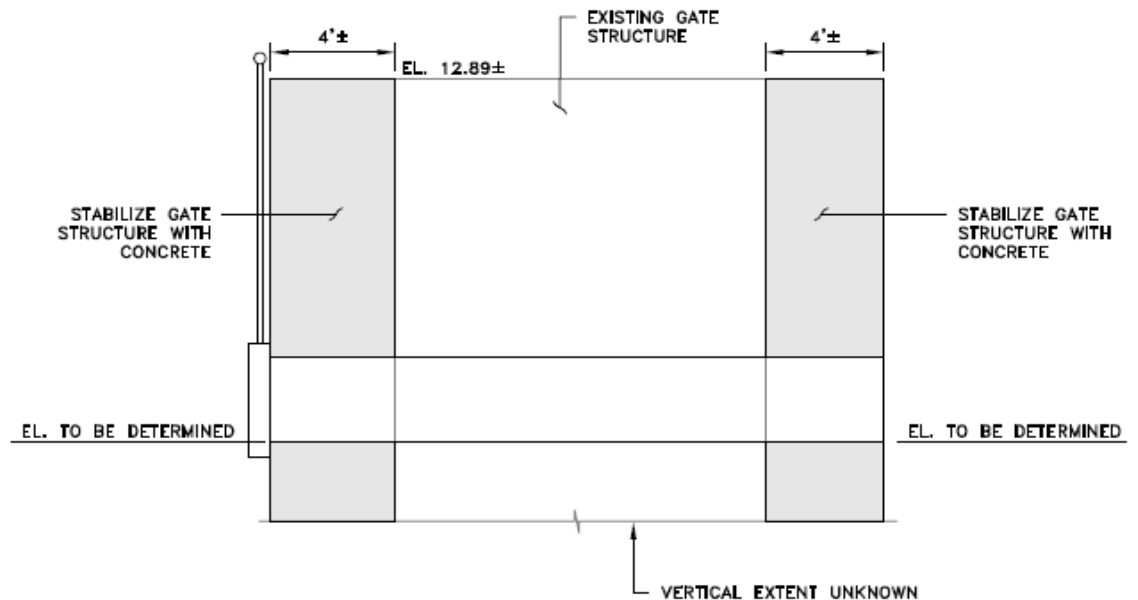
Alternative 1 – No-Action (Existing Condition)



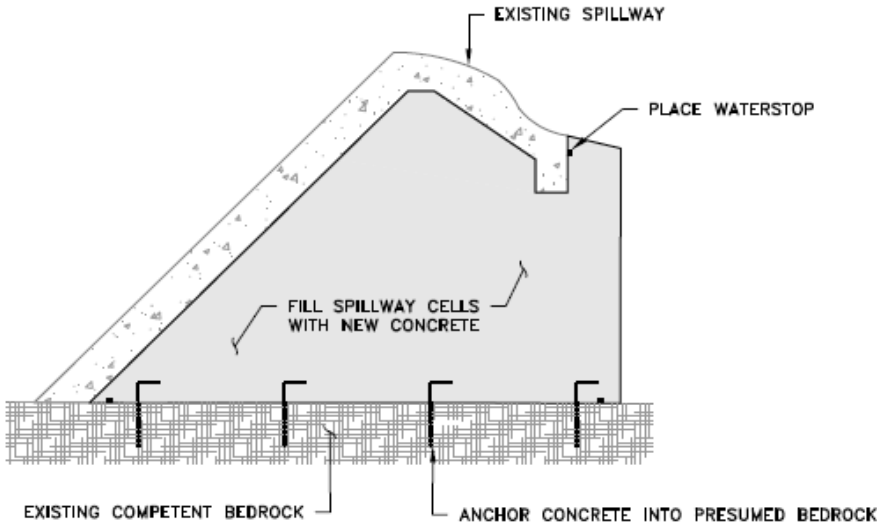
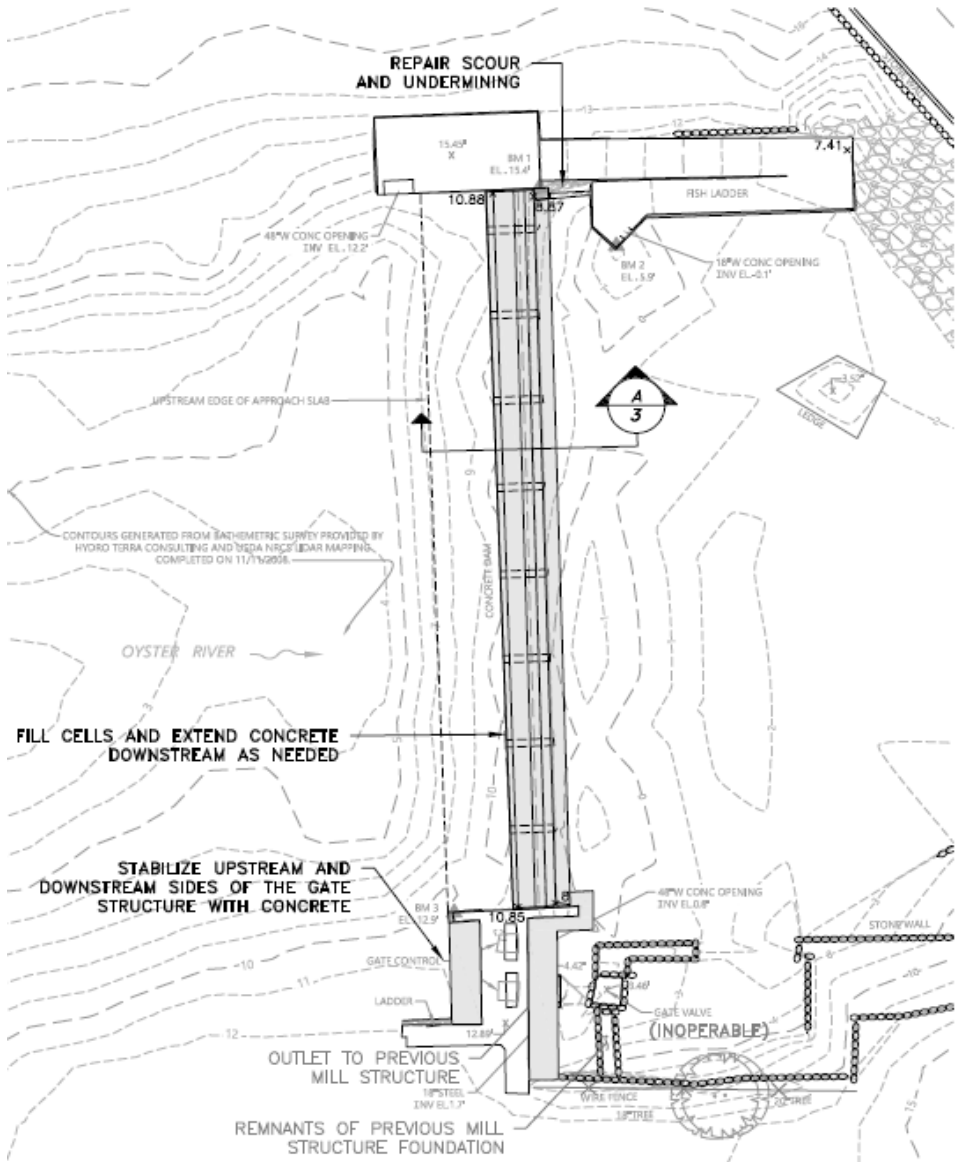
Alternative 2 – Dam Repair



SECTION A
SCALE: 1"=5'

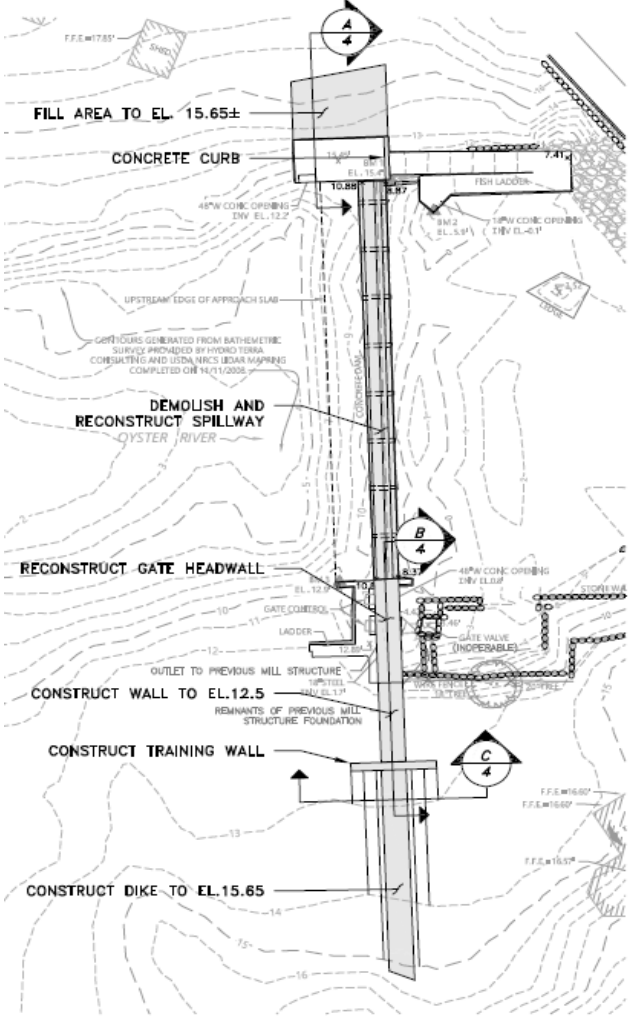


Alternative 3 – Dam Stabilization

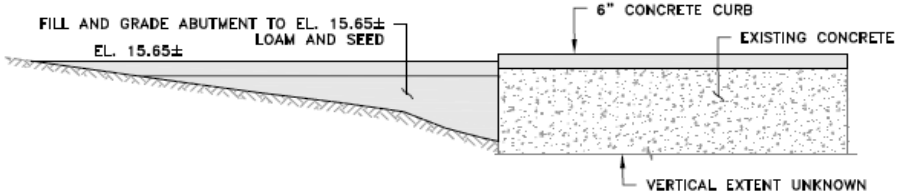


SECTION A
SCALE: 1"=2'

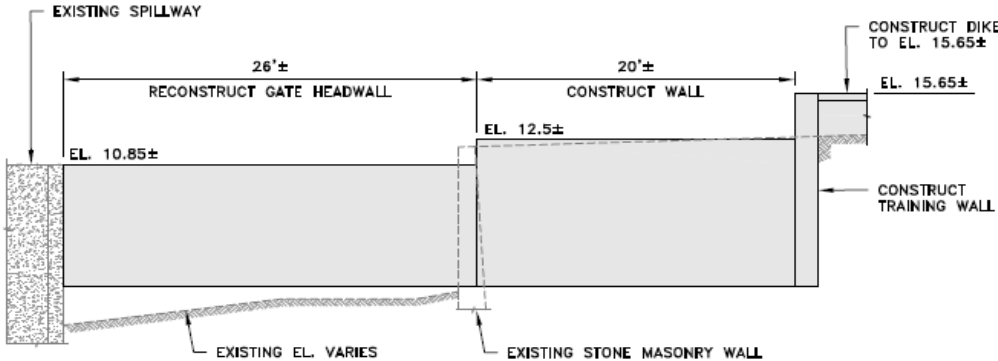
Alternative 4 – Dam Redesign



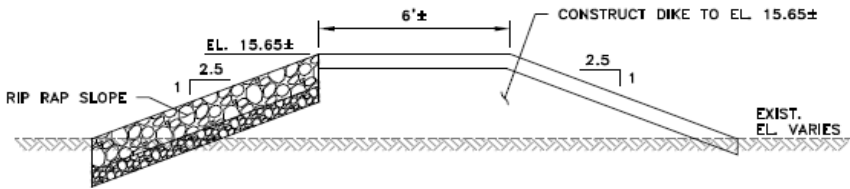
SITE SKETCH
SCALE: 1"=30'±



SECTION A
SCALE: 1"=4'

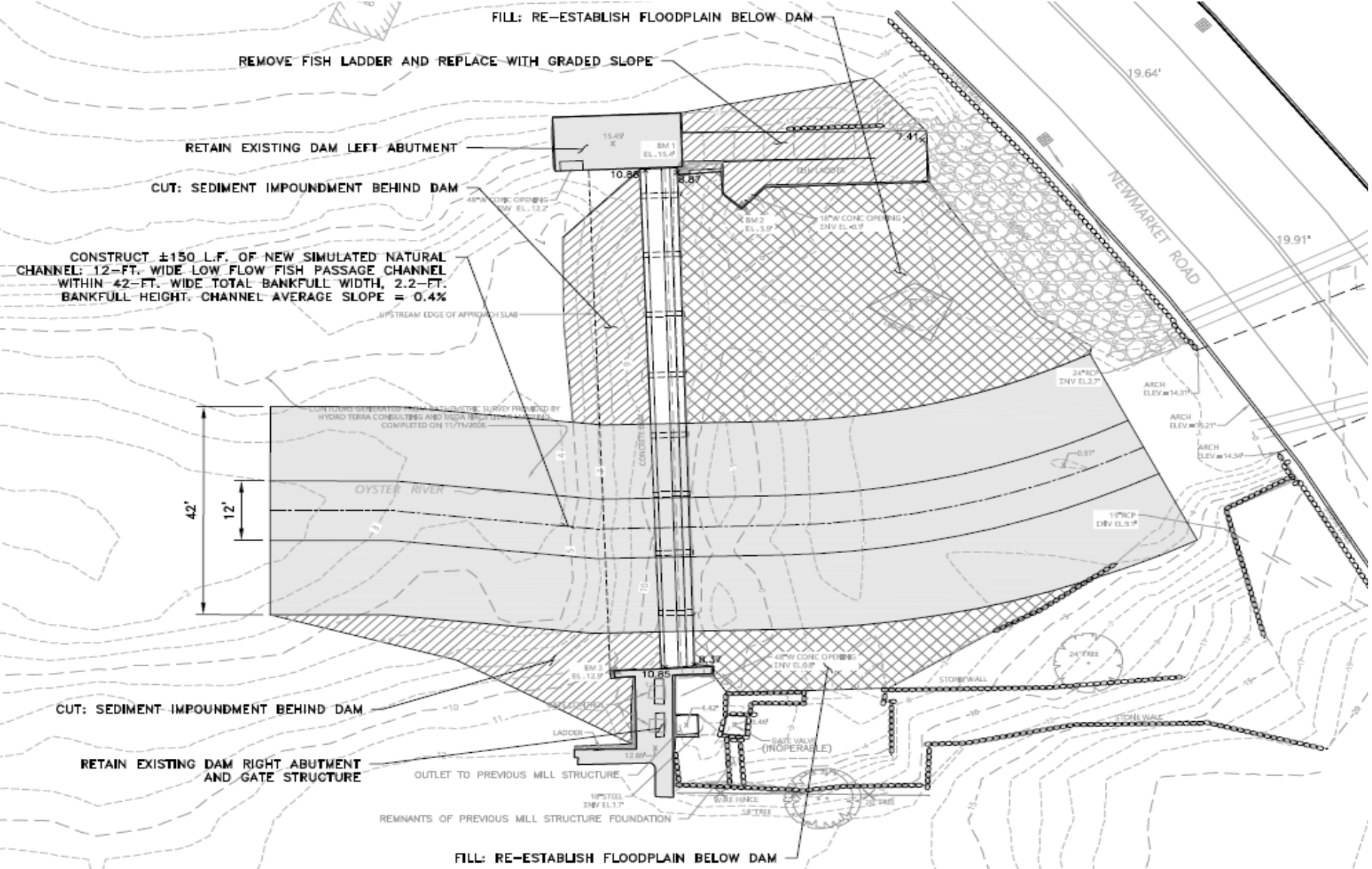


SECTION B
SCALE: 1"=8'



SECTION C
SCALE: 1"=4'

Alternative 5 – Dam Removal



Preliminary Opinion of Cost

Alternative	Initial Capital Costs	Notes
Alt 1—No Action	\$0	Condition of Dam is Poor, <u>Not Recommended</u> . Requires Non-Menace waiver.
Alt 2—Dam Repair	\$600,000-\$740,000	Limited design life. Requires Non-Menace waiver.
Alt 3—Dam Stabilization	\$530,000-\$640,000	Requires Non-Menace waiver.
Alt 4—Dam Redesign	\$650,000-\$815,000	Meets 50-year flood.
Alt 5—Dam Removal	\$400,000-\$750,000	Potential grant opportunities.

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.*

Preliminary Opinion of Cost Life Cycle Cost

Alternative	Life Cycle Cost
Alt 1—No Action	N/A
Alt 2—Dam Repair	Medium-High
Alt 3—Dam Stabilization	Medium
Alt 4—Dam Redesign	Medium
Alt 5—Dam Removal	Low-Very Low

Life Cycle Costs account for maintenance and repairs over a defined period of time.

The consulting team will be estimating Life Cycle Costs for each alternative over a 30 year period.

Pond Dredging



MAP 5 LOT 7
N/T
TOWN OF DURHAM
NO BOOK NO PAGE

MAP 5 LOT 2-1
N/T
SUSANNA NICHOLS
BOOK 4507 PAGE 620

MAP 5 LOT 3-2
N/T
DOUGLAS E. WORTHEN
BOOK 1572 PAGE 120

MAP 5 LOT 3-3
N/T
TOWN OF DURHAM

20-ft buffer to
nearby
owned property

Mill Pond Dam

Dredge Area 2:
46,300 SF
4,820 CY

Dredge Area 1:
23,500 SF
3,560 CY

CEMETERY

MAP 6 LOT 8-4
N/T
TOWN OF DURHAM
BOOK 3710 PAGE 849

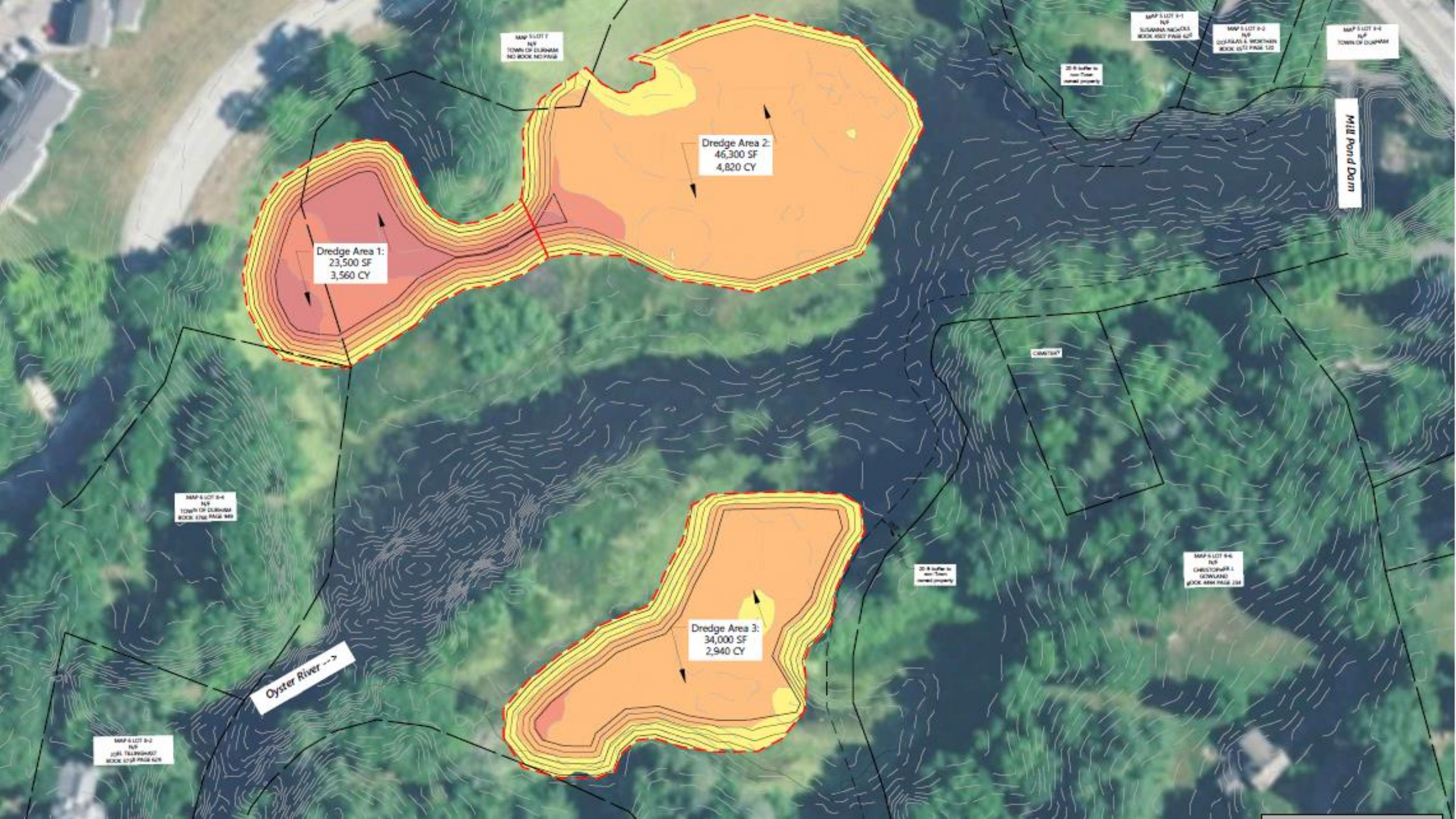
20-ft buffer to
nearby
owned property

MAP 6 LOT 9-6
N/T
CHRISTOPHER L
COWLAND
BOOK 4494 PAGE 234

Dredge Area 3:
34,000 SF
2,940 CY

Oyster River -->

MAP 6 LOT 8-2
N/T
JOEL T. LINGHART
BOOK 3712 PAGE 629



MAP 5 LOT 7
N/P
TOWN OF DURHAM
NO BOOK NO PAGE

MAP 5 LOT 9-1
N/P
SUSANNA NICKLES
BOOK 4571 PAGE 625

MAP 5 LOT 9-2
N/P
SOLMAN & WORTNER
BOOK 4571 PAGE 122

MAP 5 LOT 9-4
N/P
TOWN OF DURHAM

20 ft buffer to
near flow
channel property

Mill Pond Dam

Dredge Area 2:
46,300 SF
4,820 CY

Dredge Area 1:
23,500 SF
3,560 CY

COMBURY

MAP 6 LOT 8-4
N/P
TOWN OF DURHAM
BOOK 4794 PAGE 949

20 ft buffer to
near flow
channel property

MAP 6 LOT 8-6
N/P
CHRISTOPHER J.
SICWLAND
BOOK 4884 PAGE 234

Oyster River →

Dredge Area 3:
34,000 SF
2,940 CY

MAP 6 LOT 8-2
N/P
JERRI TULLINGWELL
BOOK 4748 PAGE 626

Pond Dredge—Preliminary Cost

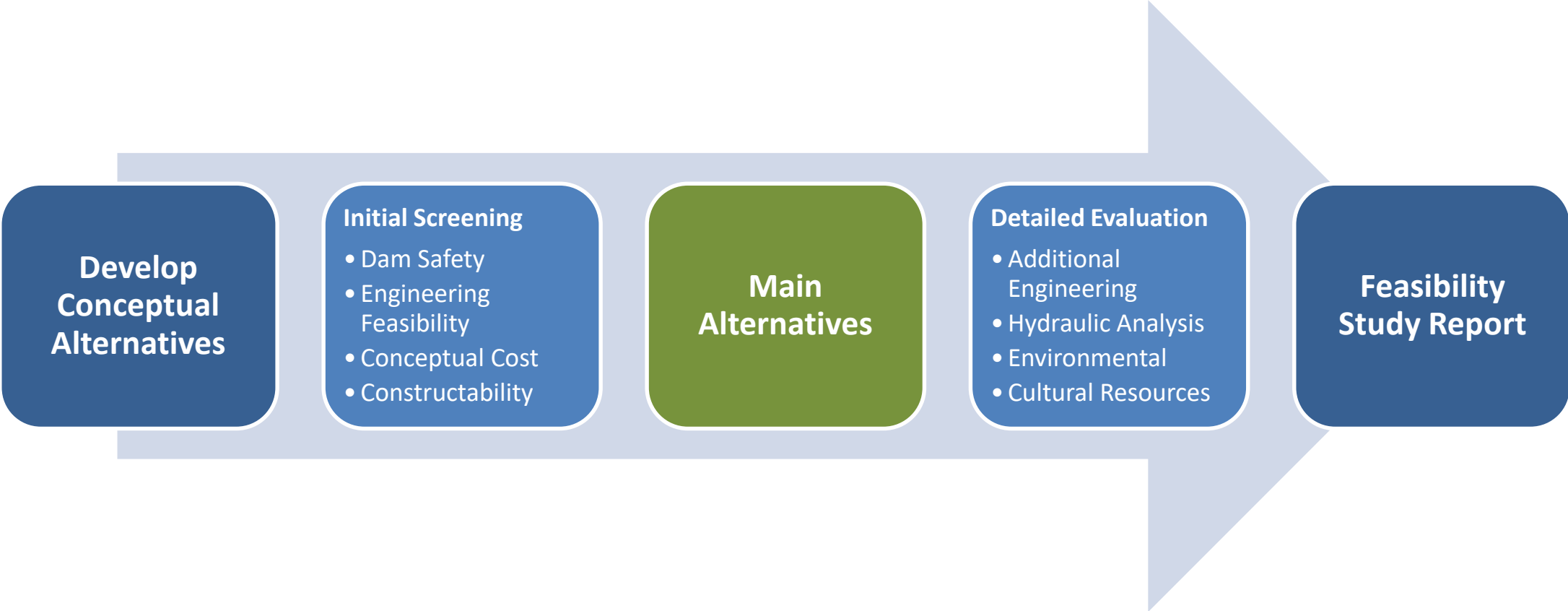
	Dredge Area (SF)	Dredge Volume (CY)	Project Total Cost
Area 1	23,500	3,560	\$840,000-\$980,000
Area 2	46,300	4,820	\$1,330,000
Area 3	34,000	2,940	\$970,000-\$990,000
Total	103,800	11,320	\$2,960,000 - \$3,150,000

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 feasibility undetermined.*

Next Steps

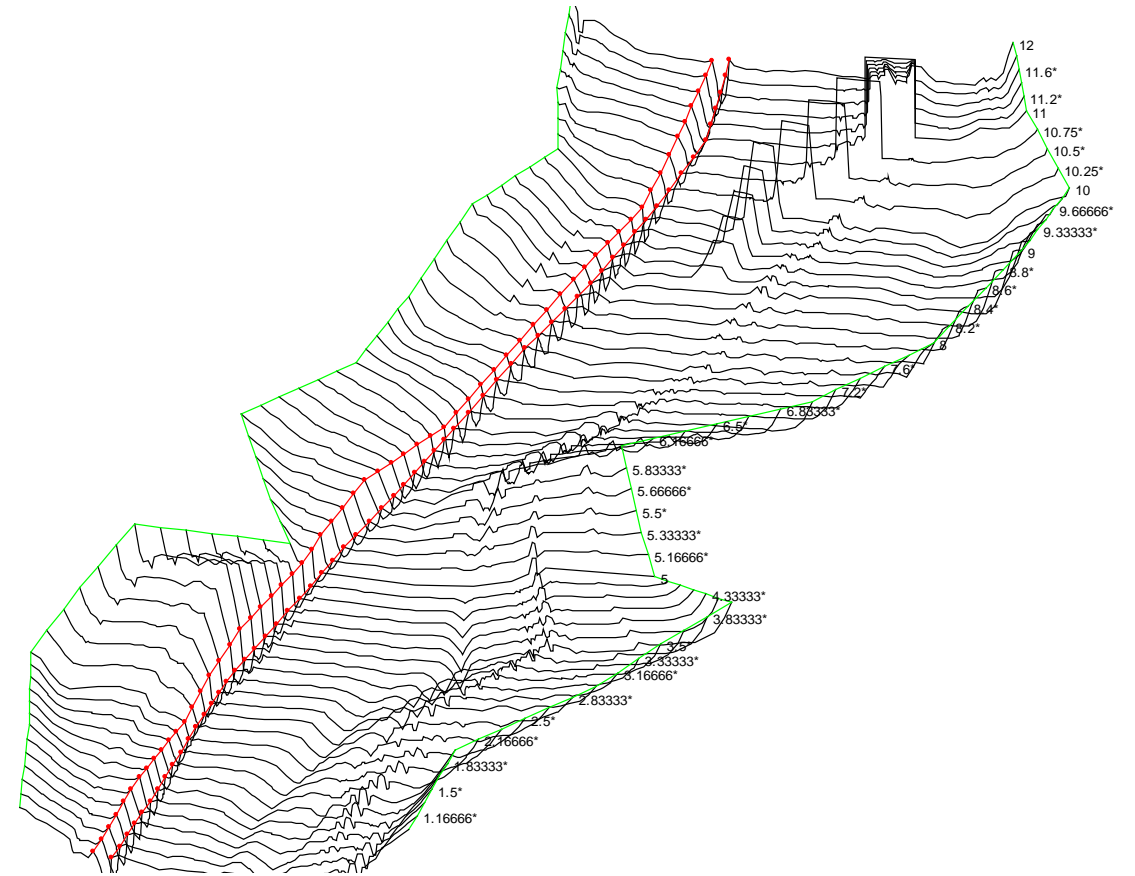
Study Process



Hydrological & Hydraulic Model (HEC-RAS)

What will the model tell us?

- How will river and pond **Depths** change adjacent to river (horizontal and vertical)?
- How would **Wetlands** and **Wildlife** be affected?
- Would **Groundwater** conditions be affected?
- How would **Sediment Transport** (i.e., erosion and deposition) change?



Sediment & Water Quality Evaluation

- **Sediment Sampling & Evaluation**
 - Chemical analysis of sediment to supplement previous data
- **Water Quality Evaluation**
 - Using existing data, identify the effects of the dam on water quality
 - How would various alternatives benefit or impact water quality?



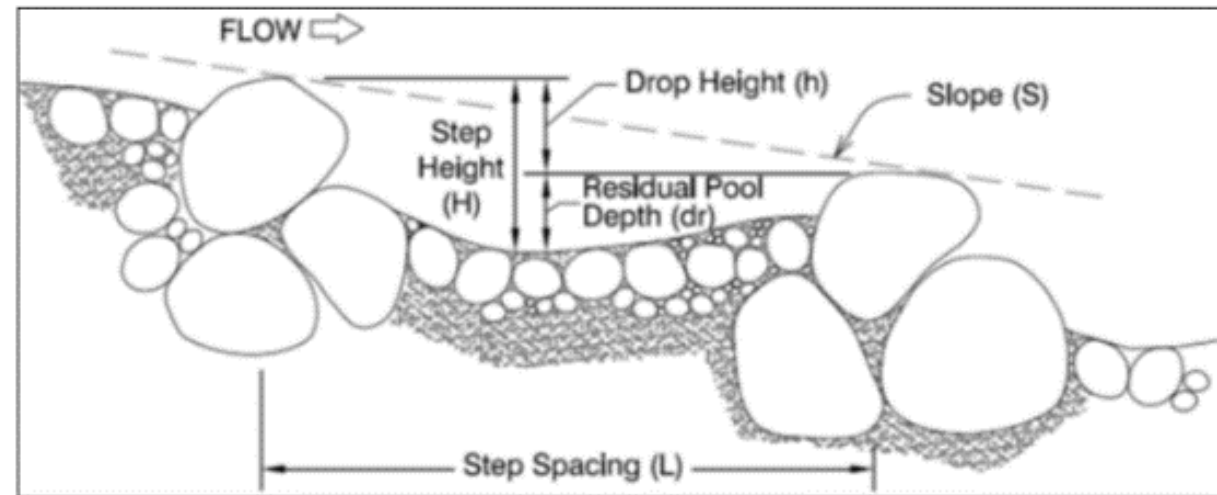
Wildlife & Natural Communities

- State and federally-listed threatened and endangered species
- Consultation with:
 - NHNHB
 - NHF&G
 - USFWS
 - NMFS



Fisheries

- Mill Pond Dam impacts diadromous fish migration
- Blueback herring monitoring numbers have been falling dramatically
- Impoundment impacts habitat and water quality



Cultural Resources

- Coordination with NHDHR and the Durham Historic District Commission
- Determination of Effects
- Identify Mitigation Measures



Visual Assessment

- A view upstream from the Mill Pond Park
- A view looking upstream from the NH 108 Bridge
- A view from a location to be determined



Schedule

Project Schedule

Task	Timeline
Field Surveys	Fall-Winter 2019-2020
Develop Conceptual Alternatives	Winter 2020
Preliminary Analysis of Alternatives	Winter-Spring 2020
Public Information Meeting	June 15, 2020
Draft Feasibility Report	Late Summer 2020
Public Information Meeting	Fall 2020
Final Feasibility Report Issued	Fall 2020



Thank you! Questions?

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

