Jackson Dam

Dam Removal Feasibility Analysis

Hardwick, Vermont

March 26, 2026

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Agenda

- Background
- Existing Conditions
- Alternatives and Concept Design
- Next Steps
- Discussion and Questions

Jackson Dam

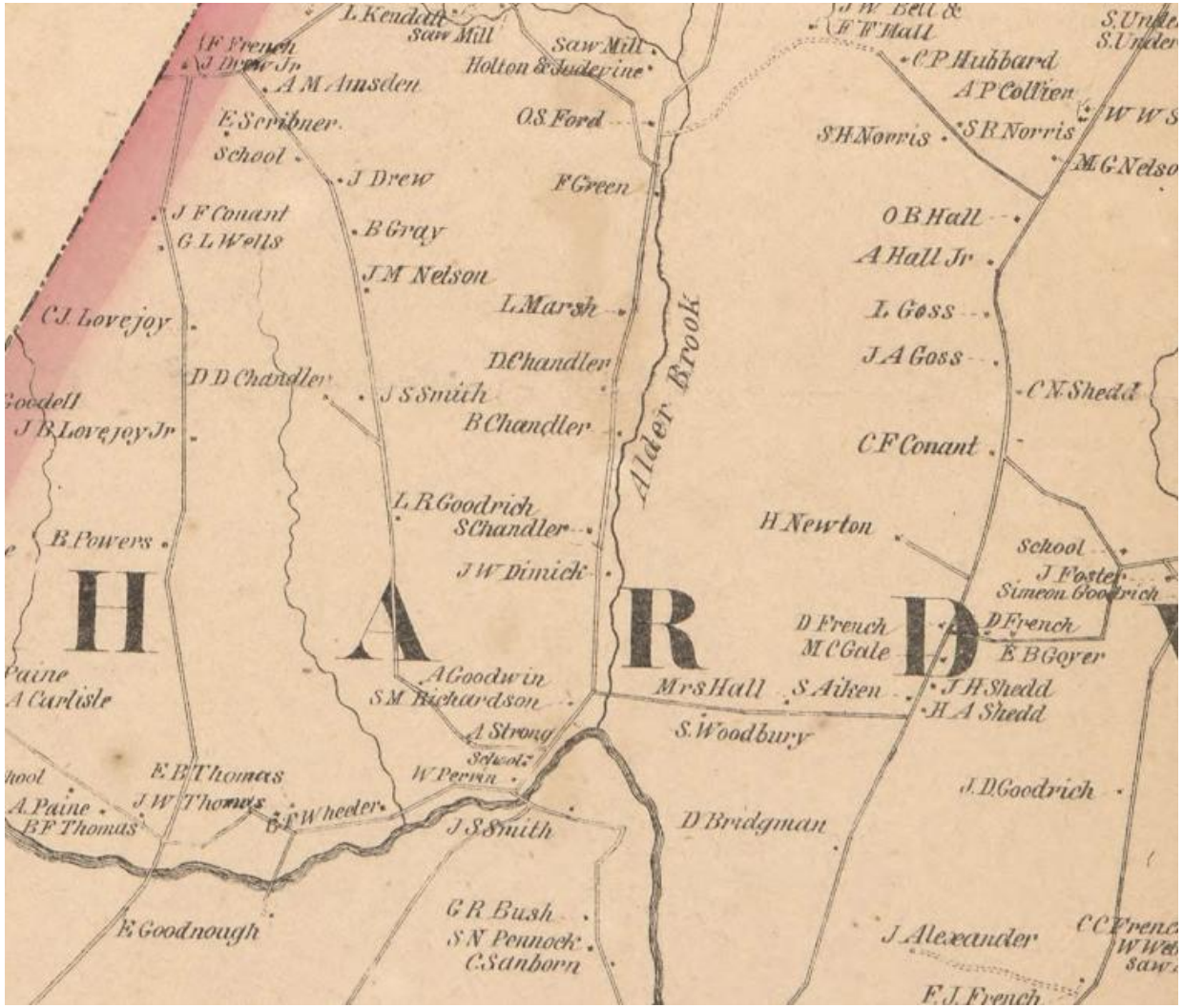
- Owned by Hardwick Electric Department
- Located ~50 ft upstream of Rt 15 Bridge
- Impounds sections of the Lamoille River and Alder Brook

History of Jackson Dam

Hardwick Historical Society, 1912

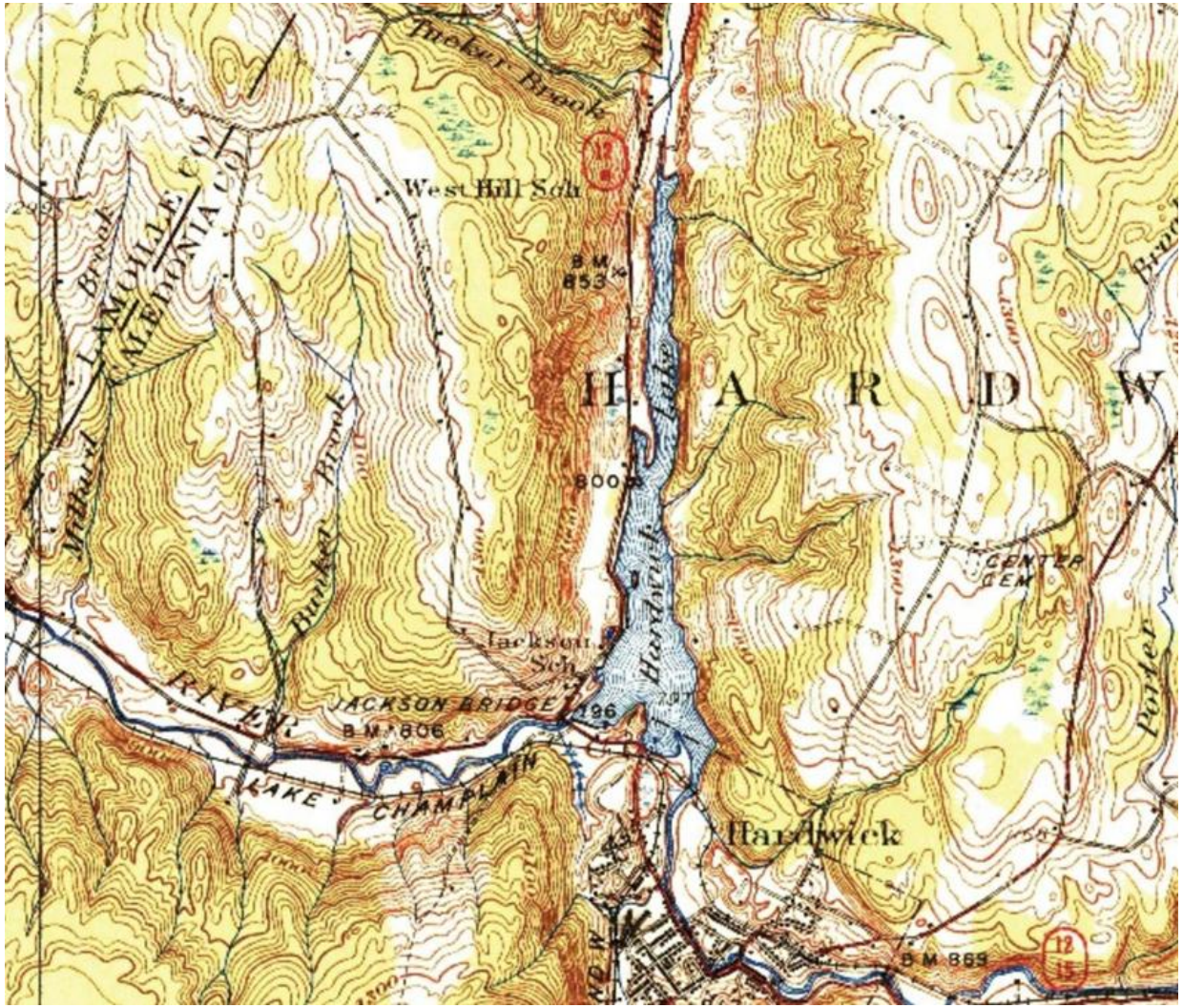
- Built in 1920
- Rebuilt in 1952
- Original purpose: store water to support hydropower at downstream Wolcott Dam (also owned by HED)
- No longer used in hydropower operations

Jackson Dam Creates Hardwick Lake



1858

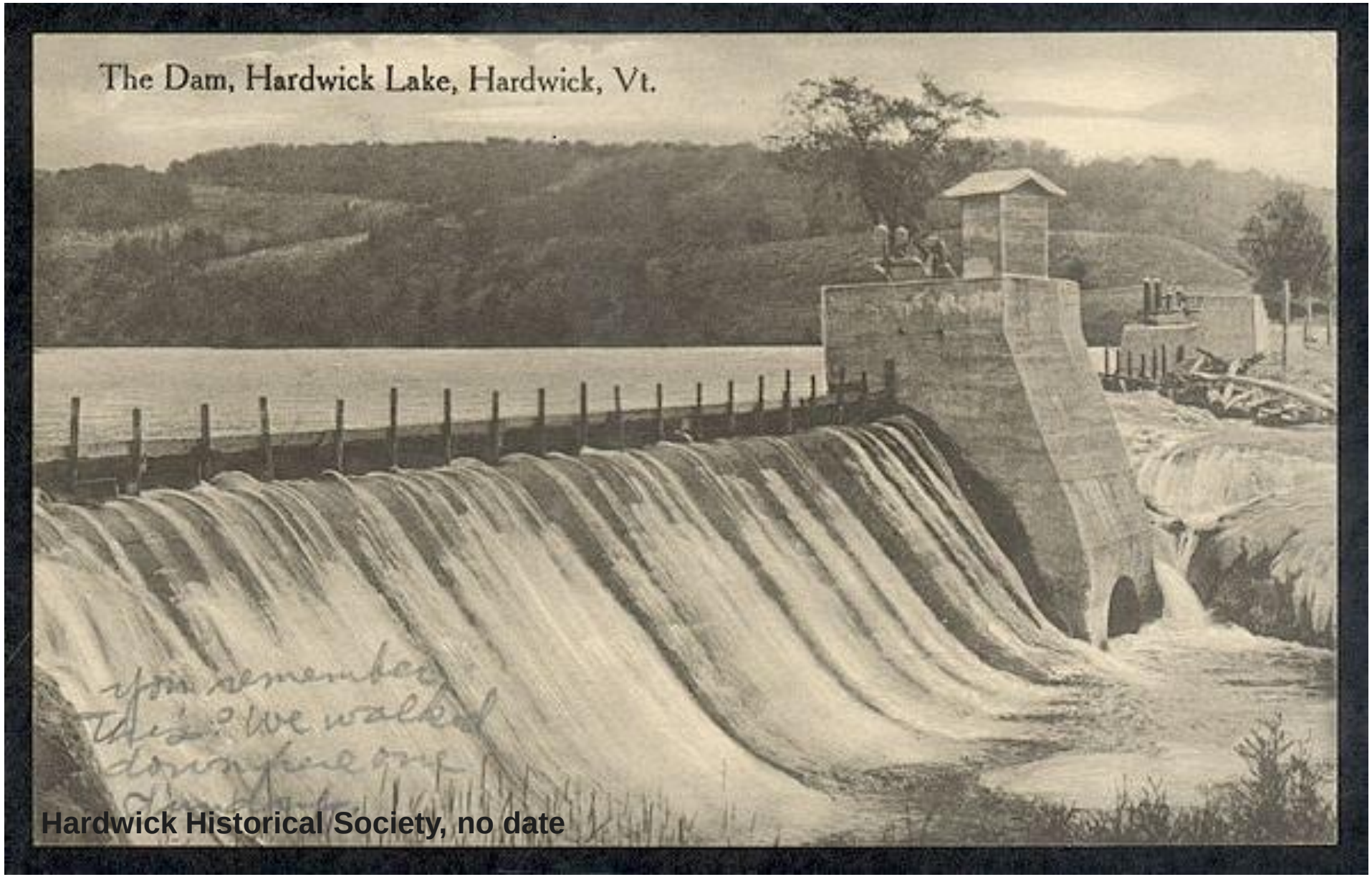
H. F. Walling



1938

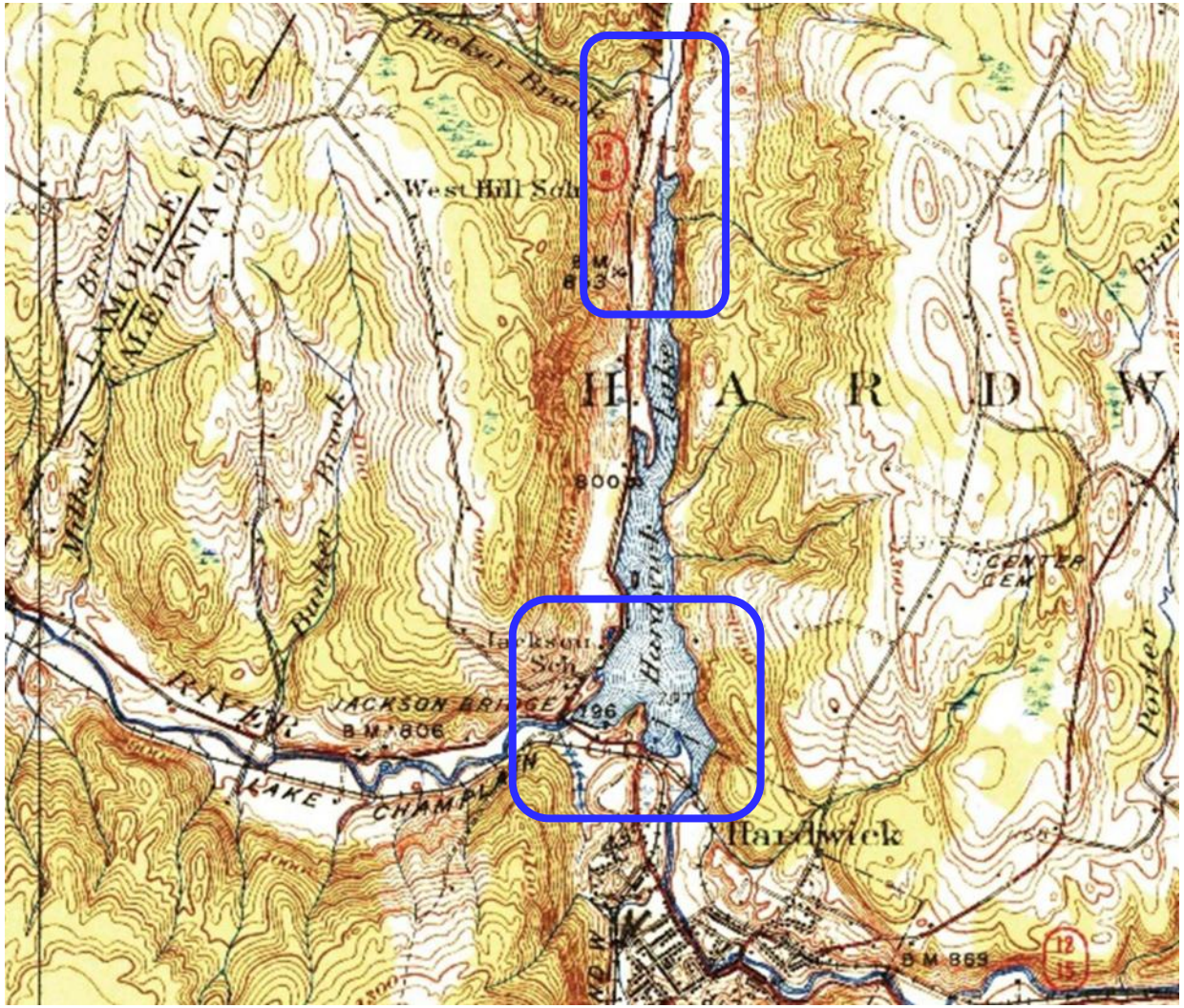
USGS

Jackson Dam Creates Hardwick Lake

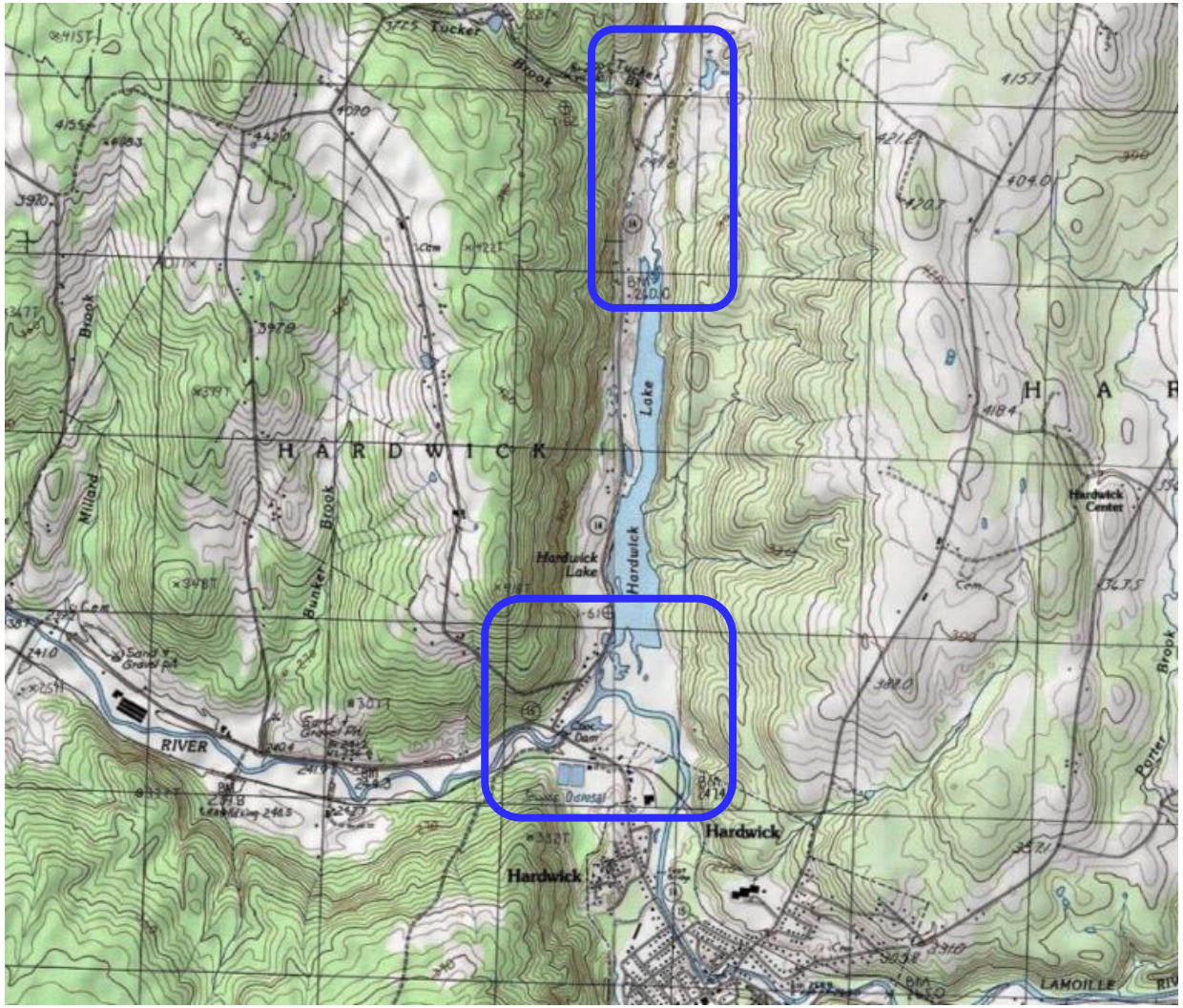


Hardwick Historical Society, no date

Changes to Hardwick Lake

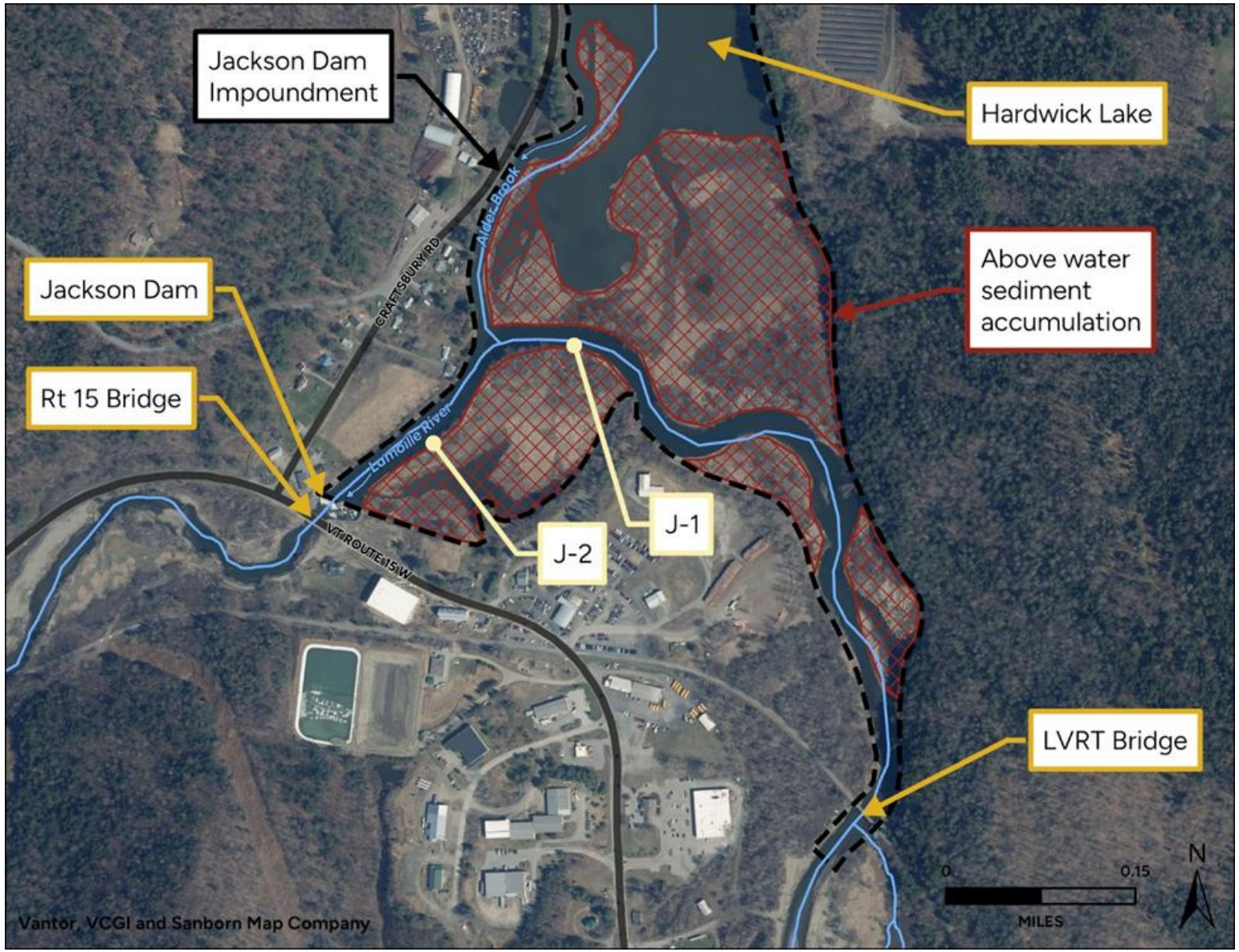


1938
USGS



2011
USGS

Existing Conditions of Hardwick Lake

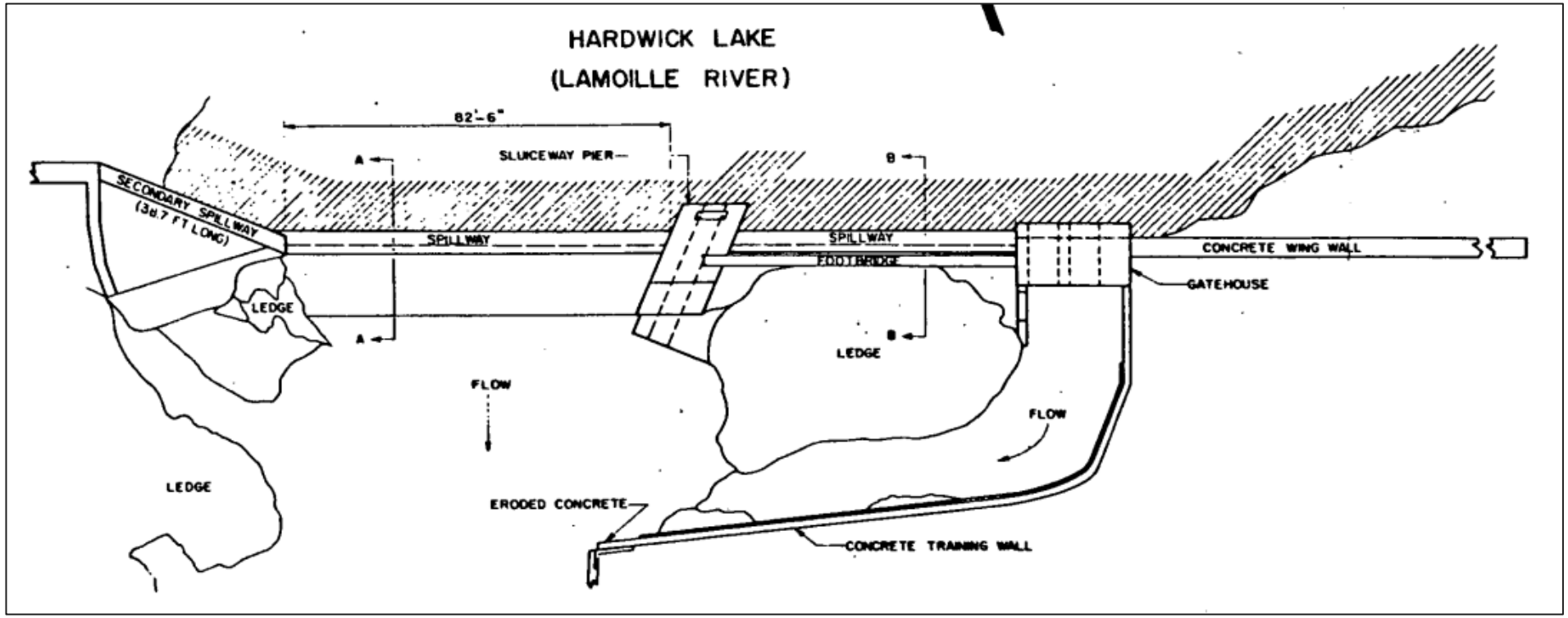


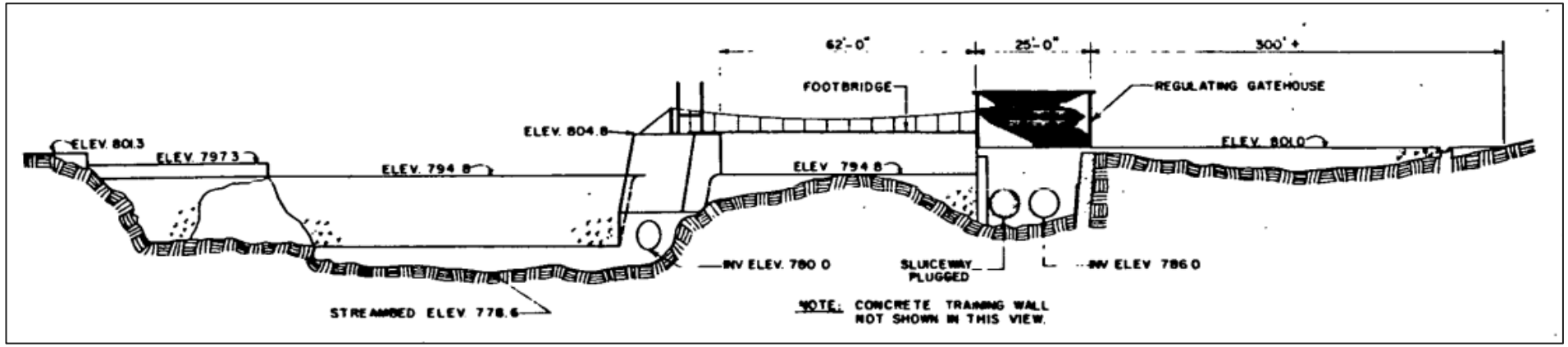
- Extensive sediment deposition
- Deep sediment-filled channel on the Lamoille
- Lake has a max depth of ~7 feet

Existing Conditions of Jackson Dam

- Concrete gravity dam founded on bedrock
- Spillways
- Low and mid-level outlets
- Concrete wall extending ~300 feet to the east
- Training wall directs flow through Rt 15 bridge

Existing Conditions of Jackson Dam



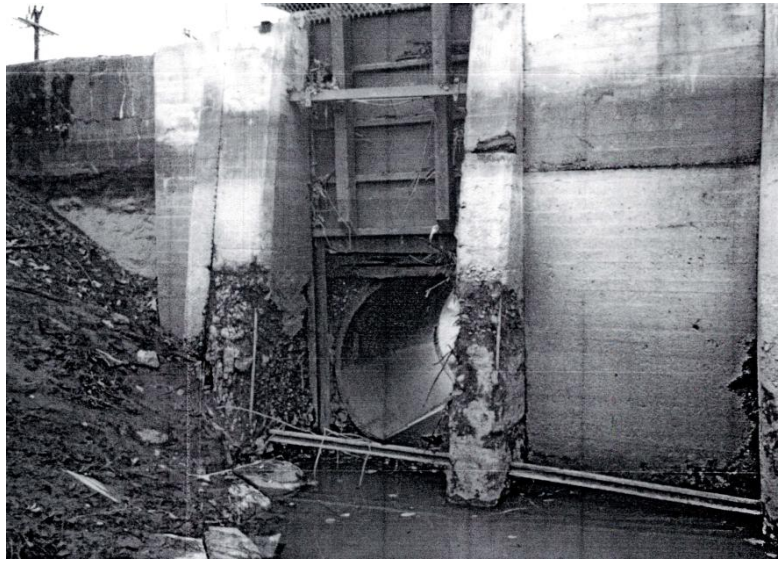


- Total length ~523 feet
- Max height ~23 feet

USACE, 1980 from the 1952 repairs

Existing Conditions of Jackson Dam

- Dam inspection in 2001
- Horizontal crack on US and DS face
- Concrete cap from 1952 repairs is failing
- Surface deterioration
- Undermining to the foundation in certain areas



Knight, 2001

Existing Conditions of Jackson Dam

- Engineers at DuBois & King Inc. recommended repair of the dam based on deficiencies identified in the dam inspection
- Repairs include:
  - Remove the concrete cap and repair the foundation in the main spillway
  - Repairs to the 300-foot non-overflow wall
  - Structural concrete repairs to the mid-level outlet structure
  - Repairs of the outlet gate

2001 Repair Cost Estimate
~$600,000

Repair costs would be significantly higher today

Knight, 2001

Dam Safety Assessment

- Classified as a **Significant Hazard** Dam
  - Dam failure = property losses and damage to downstream infrastructure
- Dam rated as **POOR** in dam safety inspections in 2010, 2011, 2015, 2019, 2023, and 2024
- **Significant repairs** and **modifications** are required to restore dam to safe operating conditions and to meet dam safety requirements
- Operation at the lower-level year-round was recommended for consideration **until a permanent solution can be pursued**

Based on the studies and analysis recommended above, repair, rehabilitate, or replace the dam to bring it into compliance with current dam safety rules and guidance. Alternatively, consider pursing dam removal.

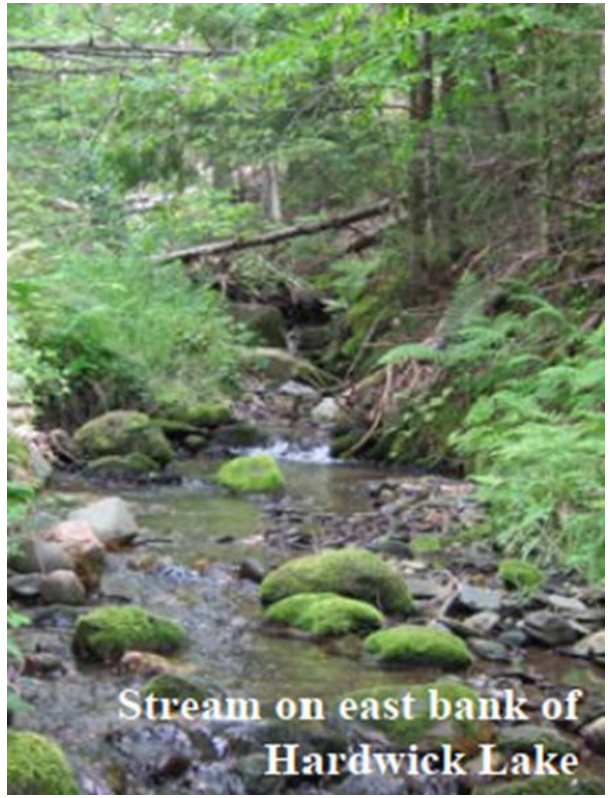
Dam Safety Program, 2024

Ecosystem and Wildlife


Tracks along Hardwick Lake


Columbine Hardwick Lake

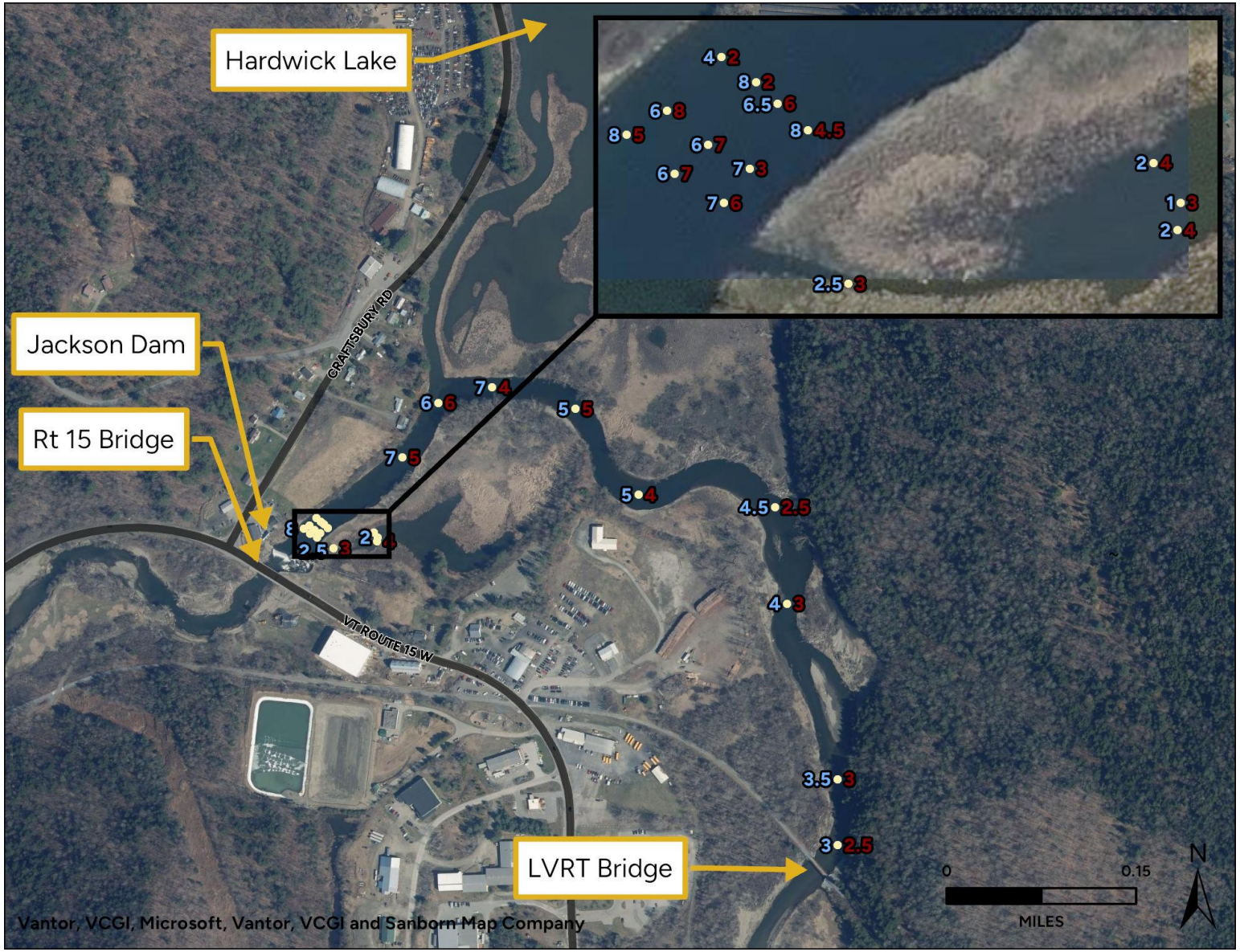

Sedge meadow along Hardwick Lake shore


Stream on east bank of Hardwick Lake

Brown, 2013

- Current ecosystem created by the dam and lake support a variety of plants and animals
- Dam acts as a barrier preventing fish passage and natural sediment transport
- Annual drawdown creates unstable upstream ecosystem and has released fine sediment downstream smothering habitat

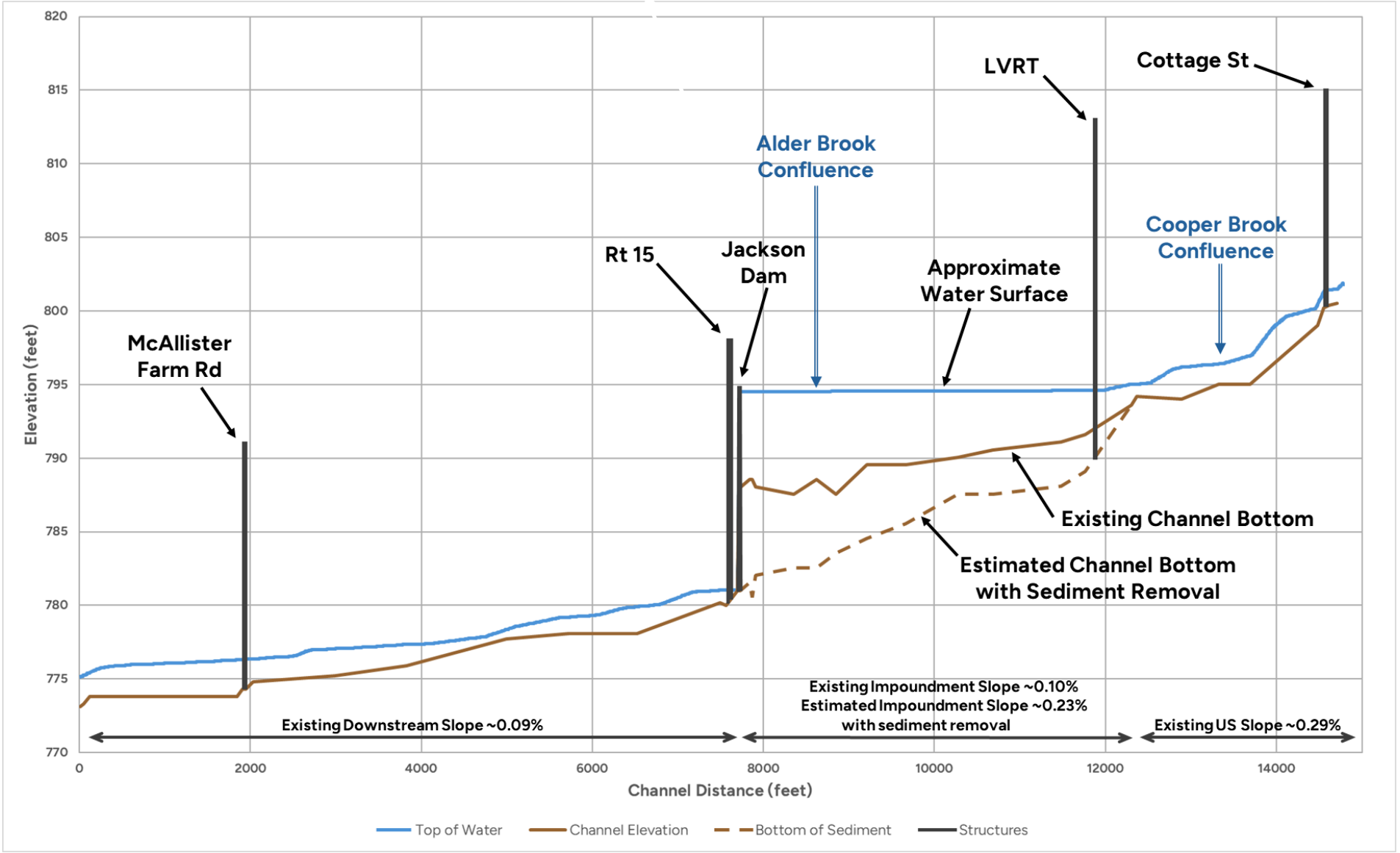
Sediment Assessment



- Sediment probing upstream of dam
- Measures water and fine sediment depth
- Water depth ~1-8 feet
- Sediment thickness ~2-8 feet

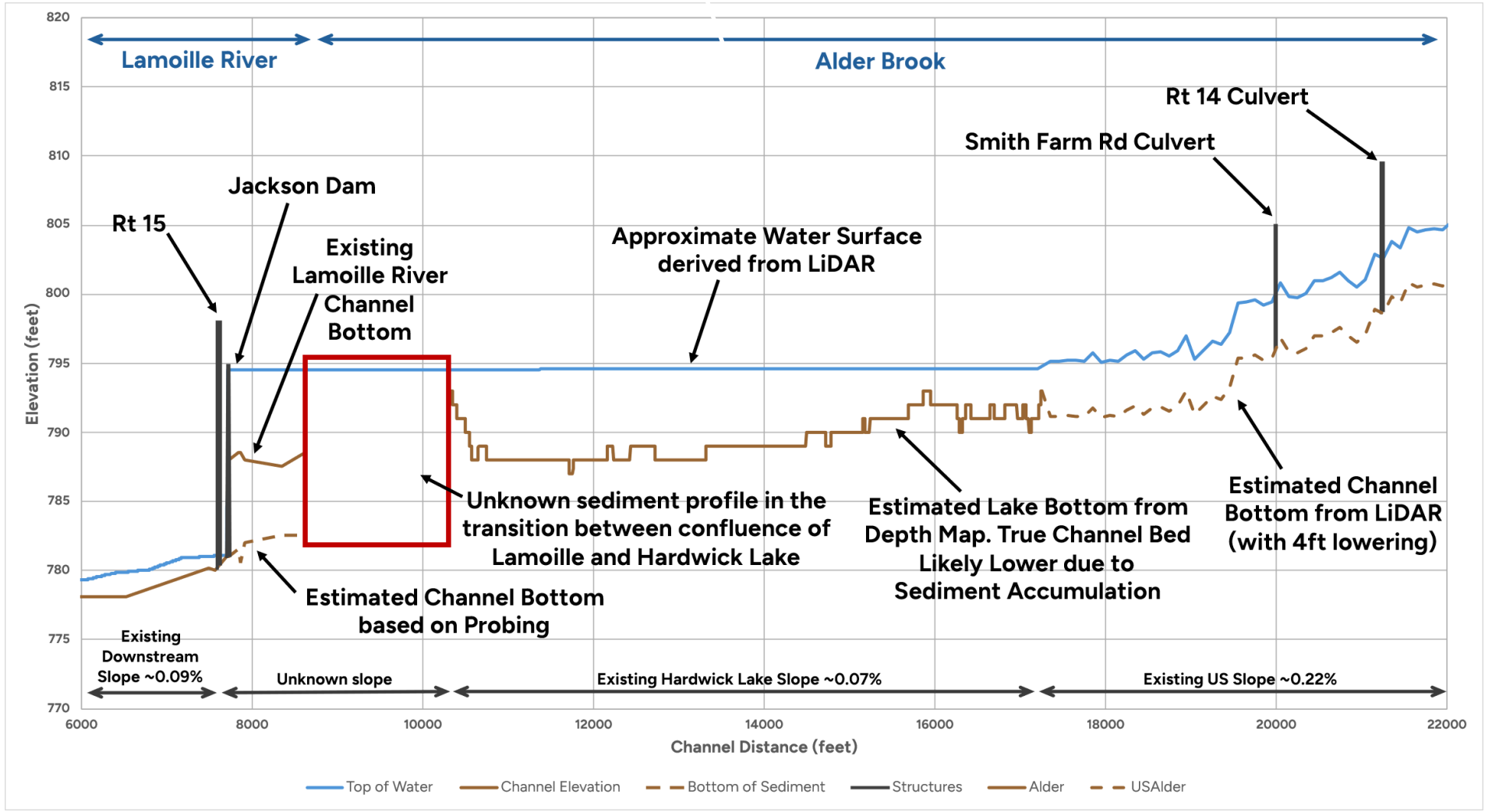
Sediment Assessment

- Lamoille River profile
- Wedge of sediment behind the dam
- Bottom of probing points indicates historic channel slope



Sediment Assessment

- Alder Brook Profile
- Lake bottom estimated from depth map
- Data gap in confluence area due to lack of probe points

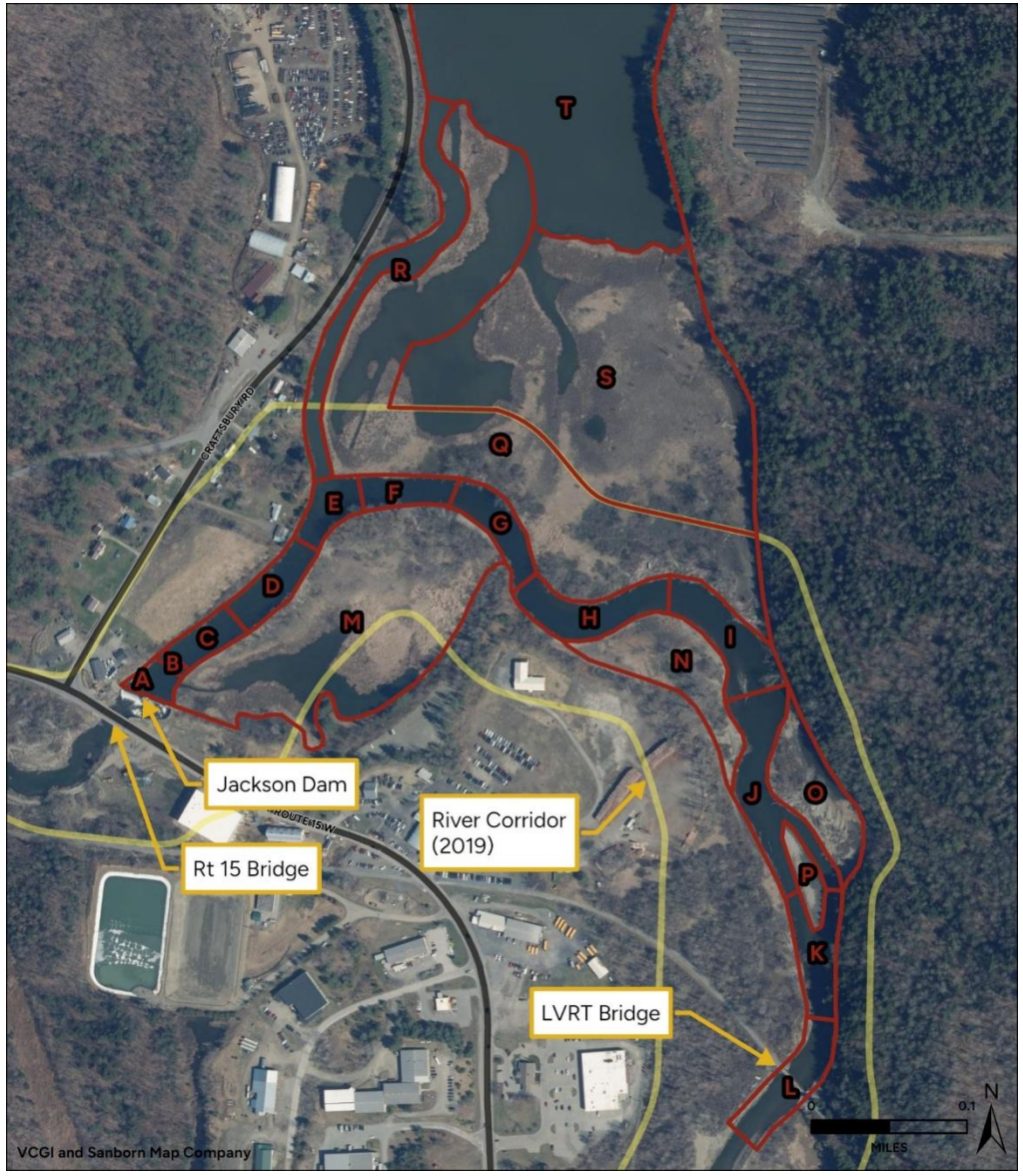


Sediment Assessment

- From probing, sediment volume estimate is approximately 640,000 cubic yards
  - Likely an underestimate of total impounded sediment
  - Does not include sediment upstream in Hardwick Lake
- Report from 1949 estimates 2,520,000 cubic yards
  - Unclear how this was estimated
- Analysis of mean annual sediment yield in the upstream watershed estimates 620,000 cubic yards

Total impounded sediment estimated in the range of:

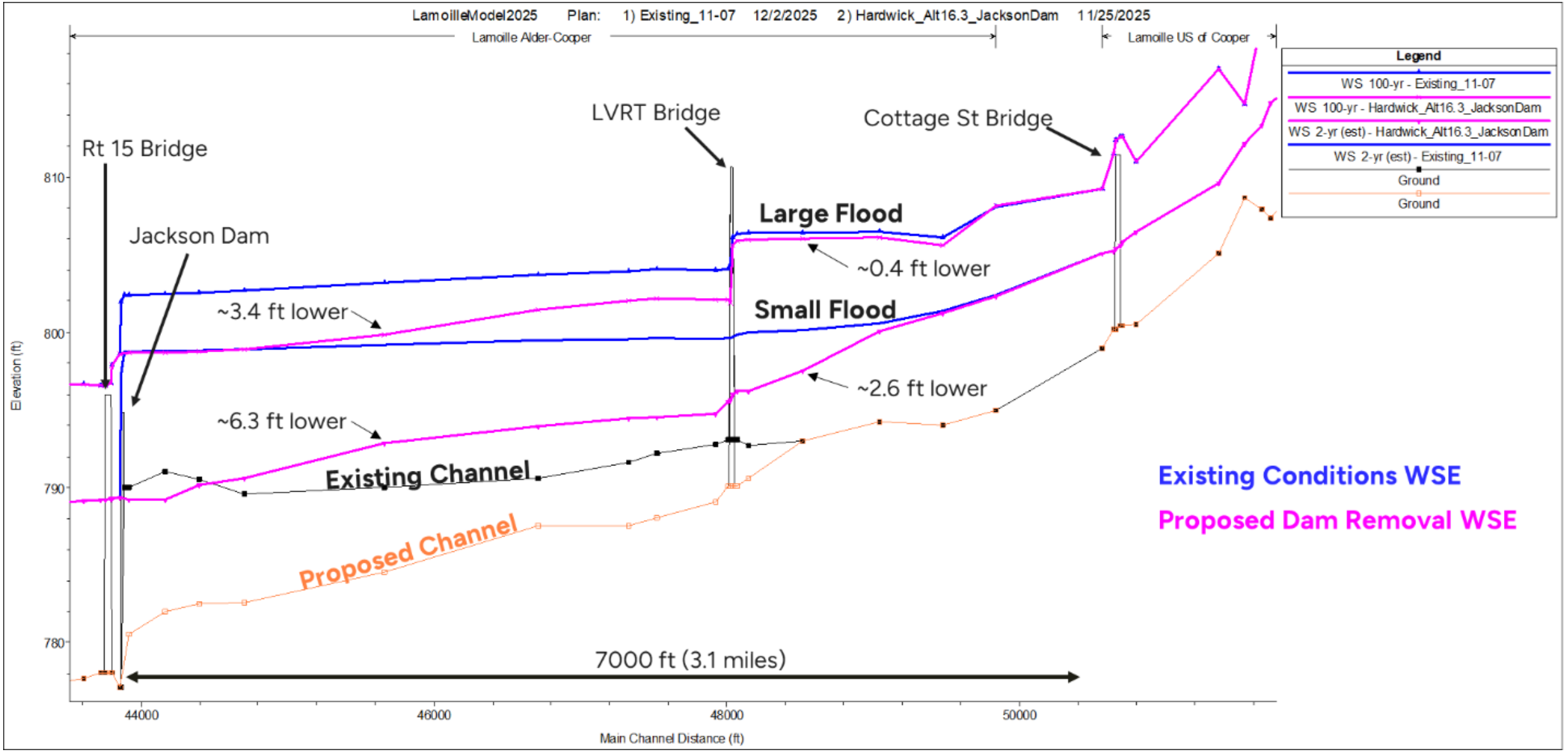
620,000 – 2,520,000 CY

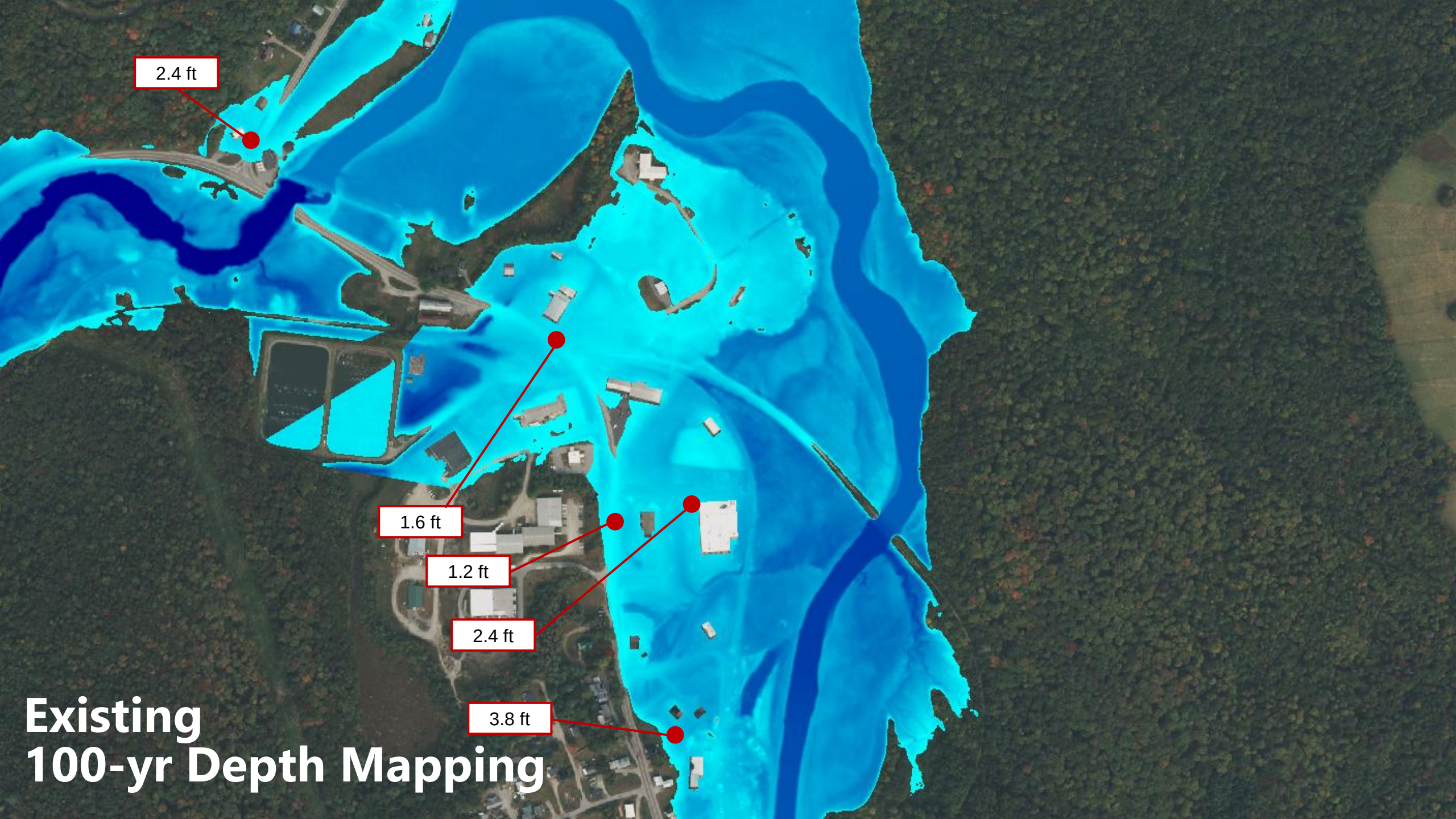


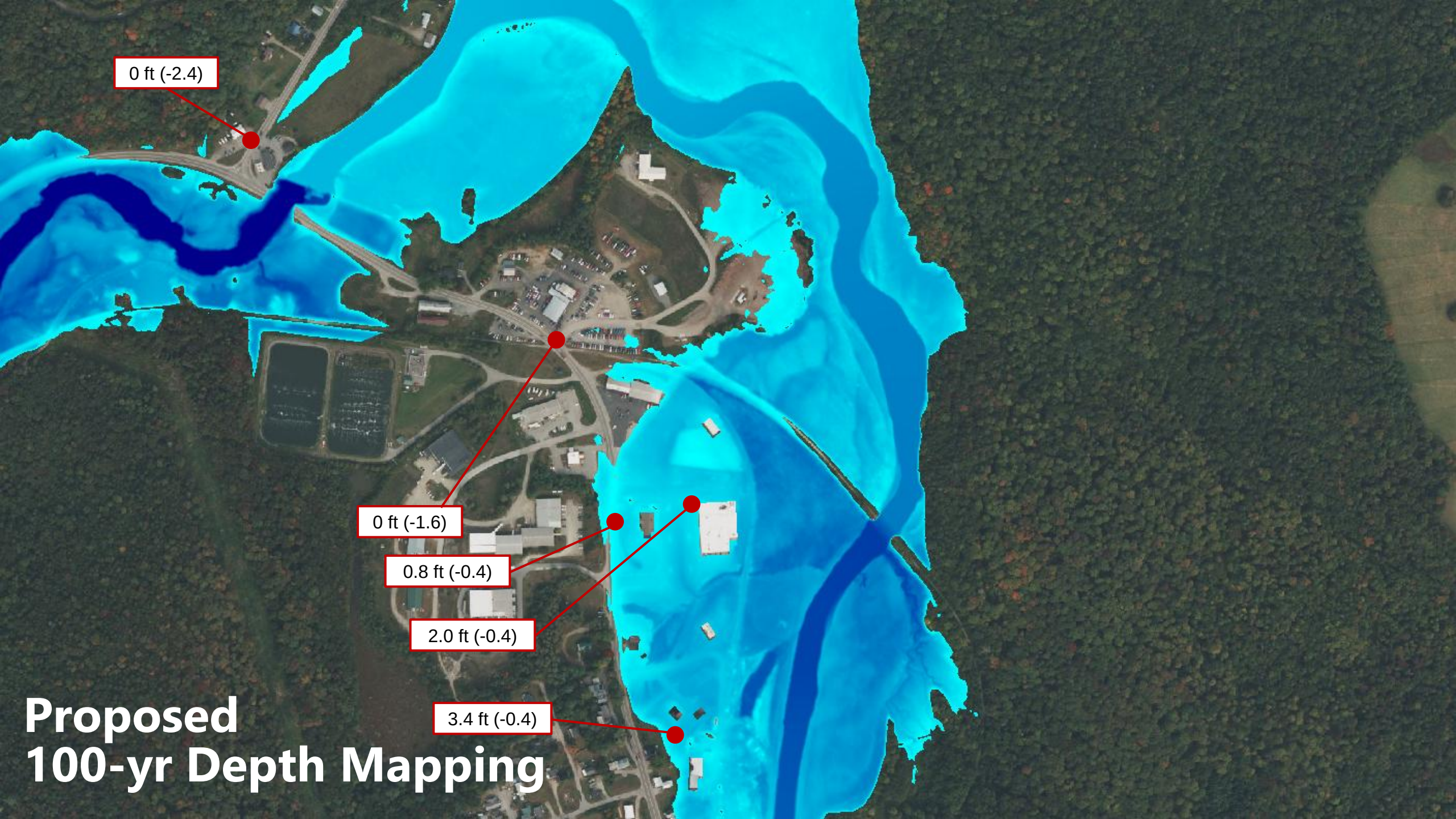
Flood Mitigation

AOT, 7/11/2024

Flood Mitigation




2.4 ft
1.6 ft
1.2 ft
2.4 ft
3.8 ft
Existing
100-yr Depth Mapping



Proposed 100-yr Depth Mapping

Flood Mitigation

- How does velocity change?

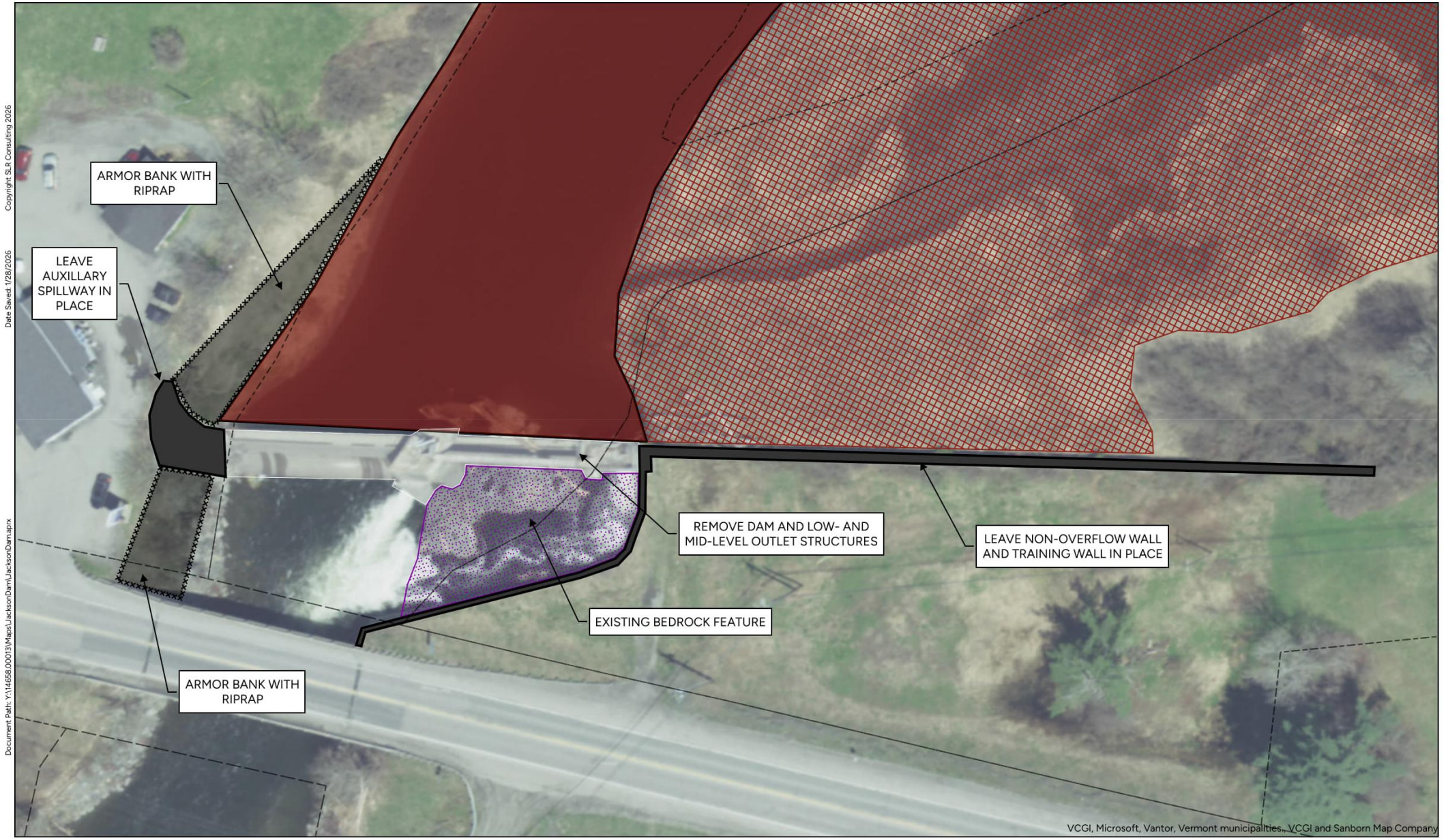
Location	Cross-Section	Medium Flood (10-year)		Large Flood (100-year)	
		Existing Velocity (ft/s)	Proposed Change (ft/s)	Existing Velocity (ft/s)	Proposed Change (ft/s)
RT 15 Bridge	11.164	5.7	+0.0	7.7	+0.0
Jackson Dam	11.23	3.0	+1.7	3.2	+2.0
500 ft Upstream of Dam	11.19	1.7	+4.5	2.6	+1.6
1500 ft Upstream of Dam	11.21	2.8	+6.6	3.4	+3.1
LVRT Bridge	11.244	6.2	+4.3	6.6	+4.4

- Is the dam providing flood storage?

Ice Jam Flood Mitigation

Google, 11/2015

Dam Removal



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Jackson Dam Removal Concept Design - Dam

Jackson Dam Removal Feasibility Analysis

Caledonia County Natural Resources Conservation District

Channel Sediment Removal Depth (ft)

- 0-3
- 0-4
- 0-5
- 0-8

- Floodplain Sediment Removal
- Sediment to Stabilize in Place
- Proposed Riprap
- Existing Bedrock
- Vermont Parcels

0 40 80

FEET

1 IN = 40 FT

N

SLR

1 SOUTH MAIN STREET
WATERBURY VT, 05676

Sediment Management Alternatives

Brown, 2013

Sediment management strategy is more complex

- **Alt 1: No Sediment Removal**
- **Alt 2: Full Sediment Removal**
- **Alt 3: Targeted Sediment Removal**

No Sediment Removal

- Leave all sediment in place to erode naturally
- Not recommended due to downstream environmental impacts
- Likely regulators would not permit this approach
- Could impact storage and operation of downstream dams

This alternative is not recommended

Full Sediment Removal

- Excavate and remove all sediment in channel and floodplains
- Significant volume of impounded sediment makes this cost prohibitive (~$13-50 million)
- Full removal would be extremely invasive and would disturb areas that are vegetated and stable

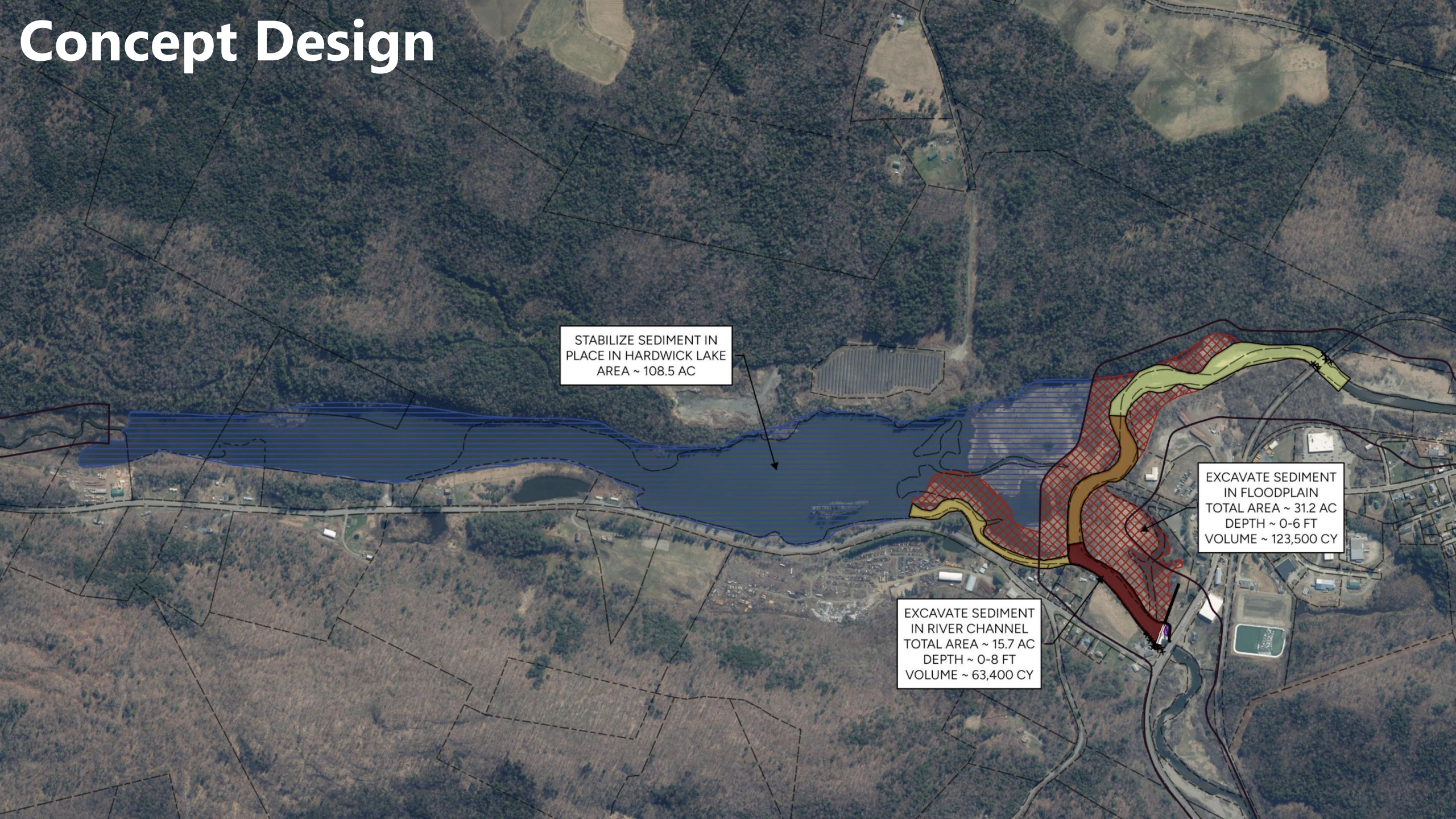
This alternative is not recommended

Targeted Sediment Removal and Stabilization in Place

- Excavate and remove sediment in channel and floodplains to prevent downstream environmental impacts
- Stabilize in place sediment that is least likely to mobilize
- Phased approach would allow for natural site stabilization paired with target sediment removal

This alternative is recommended

Concept Design



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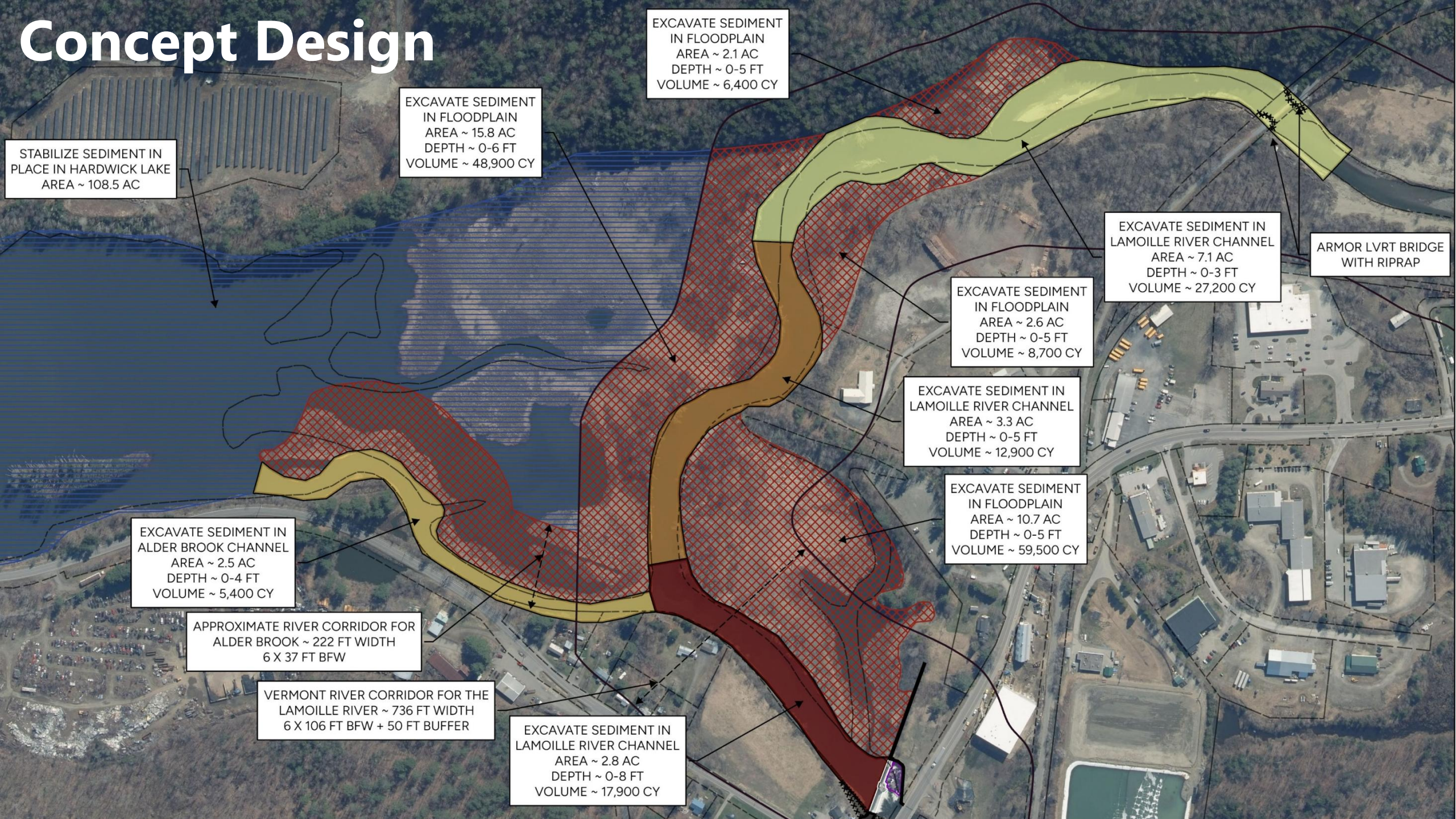

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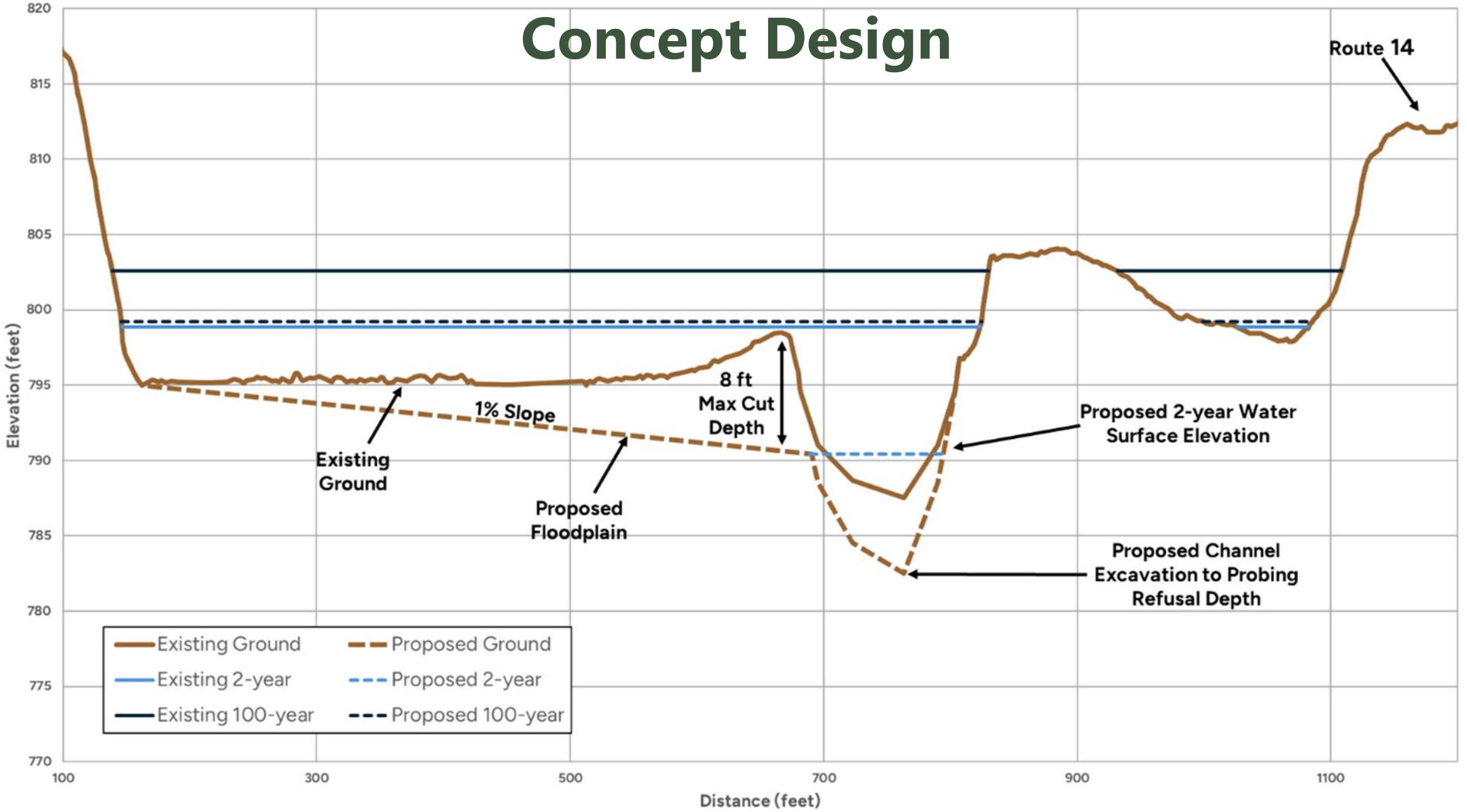

Cost Estimate

Cost of dam removal construction is between $4-9 million

- Costs include site preparation, removing the dam, infrastructure protection, engineering design and permitting

- Project cost driven by level of sediment removal and site restoration approach
  - Sediment removal costs range $1,500,000-$4,500,000
  - Site restoration costs range $50,000-$1,500,000

Concept Design Summary

- This is a large scale and more complex project than other dam removal projects in Vermont
- Phased drawdown with adaptive management approach is recommended
- The “do nothing” approach is not recommended
- Given the dam’s deteriorating condition and hazard classification action must be taken to avoid the risks associated with an uncontrolled failure
- Dam removal would reduce risks, increase flood resilience, restore ecological function, and improve long-term river stability

Next Steps

- Outreach and discussion with owners, partners, and stakeholders
- Additional site assessment and data collection
- Discussions with regulators about design approach – the following steps may be phased depending on these discussions
- Engineering design and permitting
- Construction and site restoration

Questions?