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Lyndon Flood Reduction Scoping Study

Doug Osborne, PE &

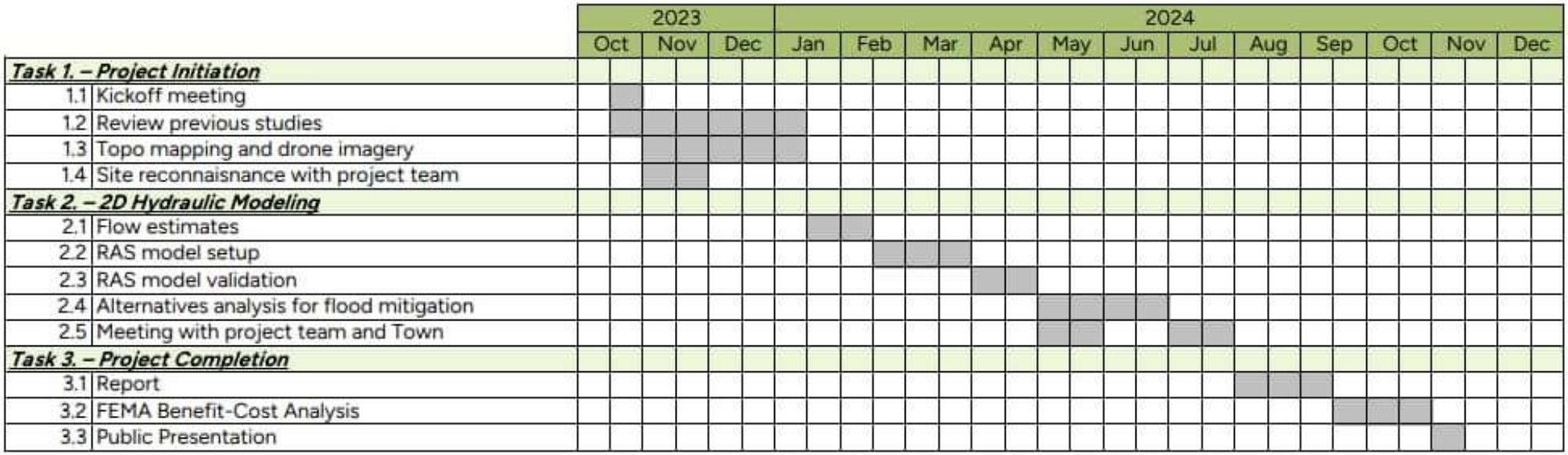
Jessica Louisos, PE

July 2024

SLR

Timeline

- SLR today to review additional alternatives
- Team today to review alternatives and select preferred alternative
- FEMA funding HMGP pre-application for selected project due August 30
  - https://vem.vermont.gov/funding/mitigation



May Meeting Recap: Hydraulic Modeling Setup

100-Year Flood Depth

US 5-Route 122-Route 114 Intersection

- Flood depth is generally shallow around homes and buildings
- 1-3 feet of water on the road at the intersection
- 1-2 feet of water on VT 122 heading west from the intersection

100-Year Flood Depth

Center Street Bridge

- Up to 3 feet of water on the road on each side of the bridge
- Up to 4 feet of water flooding adjacent homes
- Dry culvert is quickly overtopped

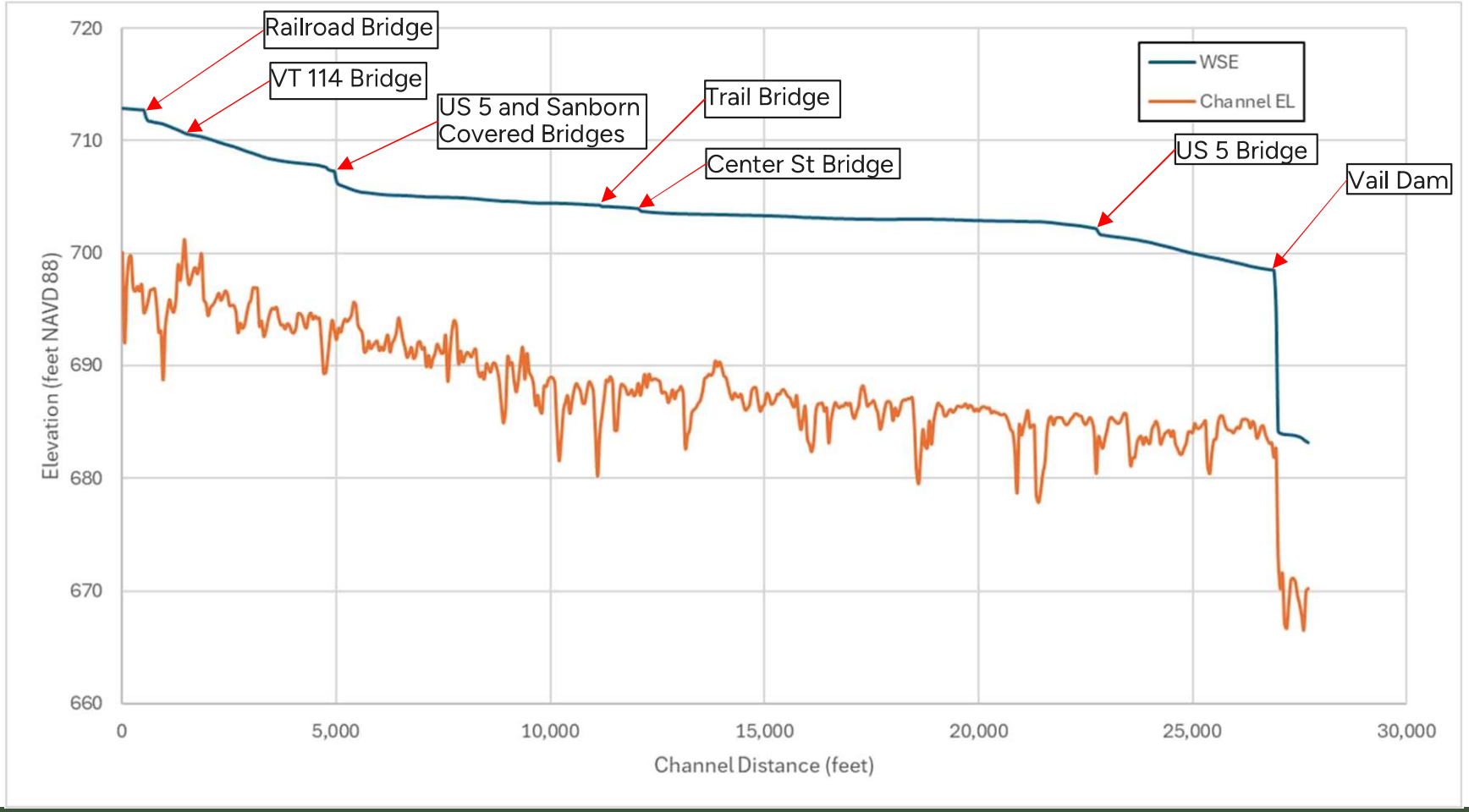
July 2024 Flood Validation

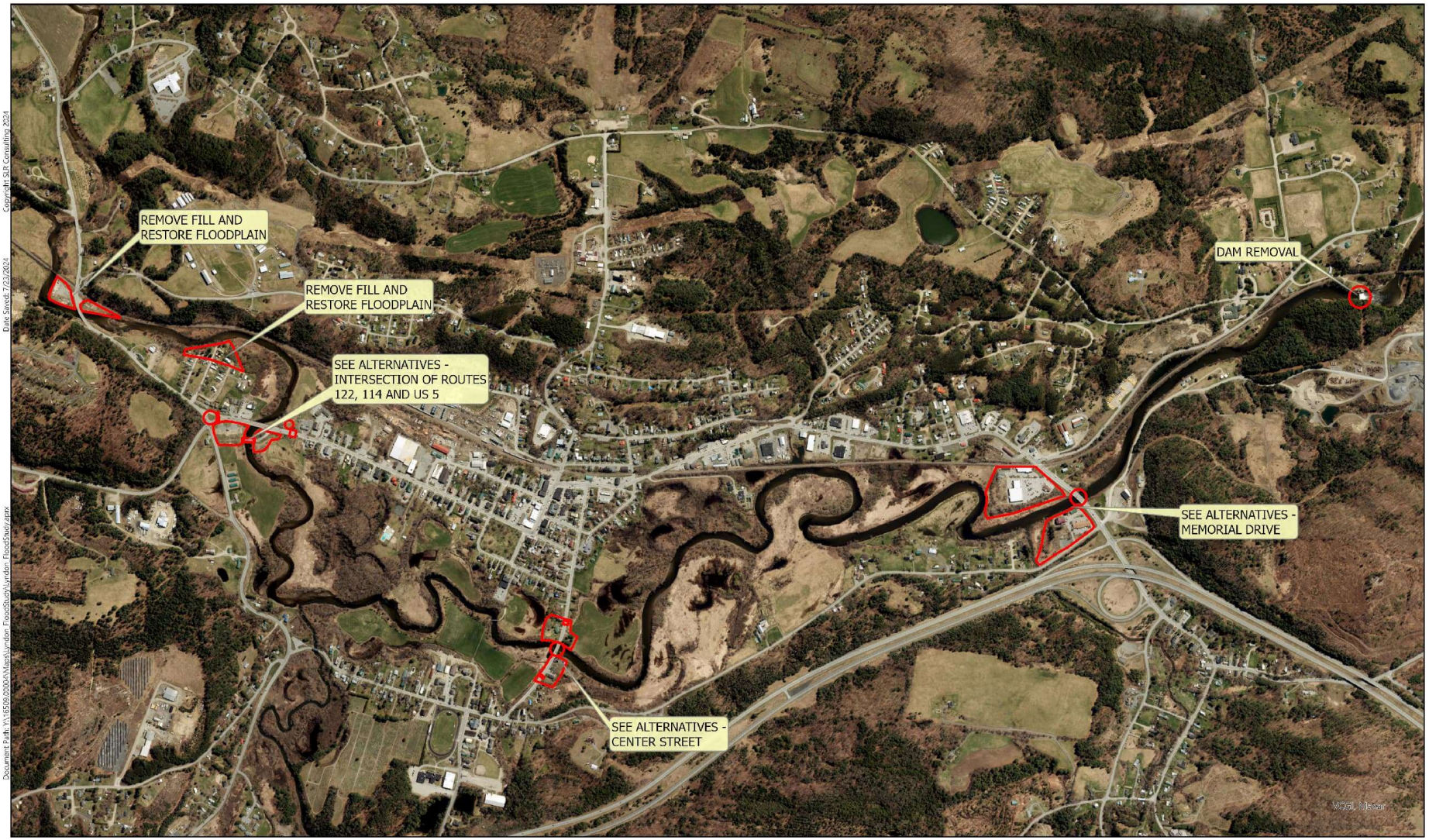
July 2024 – Mobile Home Park

500-year model depth results

July 2024 Flood Profile

Bumps in the profile are typically at constrictions causing increased flood depths upstream. These are opportunities to explore lower flood levels by reducing the constrictions.





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ALTERNATIVES OVERVIEW

LYNDON FLOOD STUDY
TOWN OF LYNDON

0 500 1,000 Feet

N

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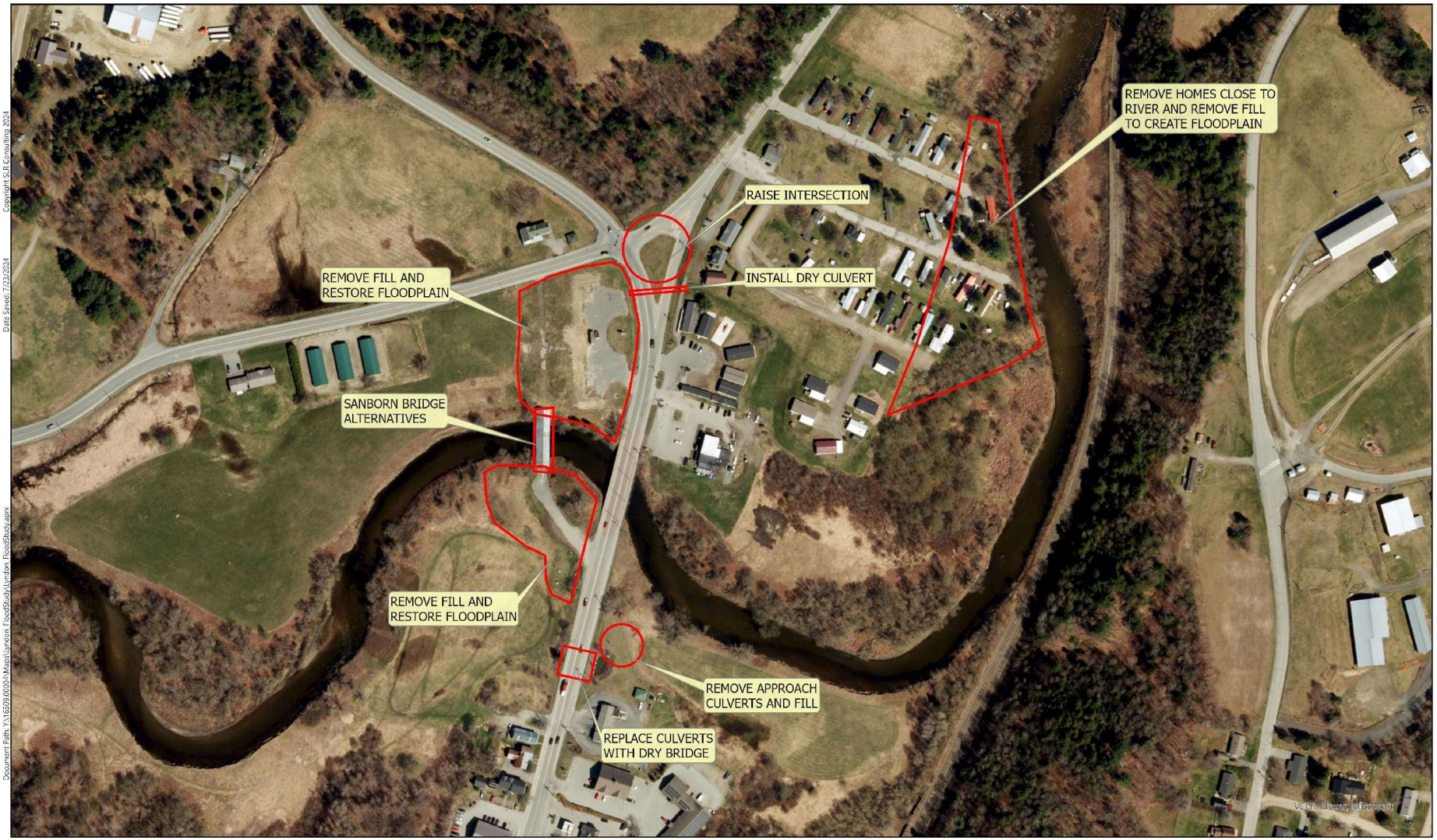
1 SO MAIN ST, 2ND FLOOR
WATERBURY, VT 05676
802.882.8335

Alternatives

Location	Alternative	Description
Main St	1	Remove approach culverts and fill
	2	Replace culverts with dry bridge and remove approach culverts
	3	Raise intersection
	4	Floodplain restoration at former motel and dry culvert installation
	5	Raise intersection, floodplain restoration at former motel and dry culvert installation
	6	Remove Sanborn covered bridge
	7	Proposed Sanborn covered bridge
	8	Remove Sanborn covered bridge and approach fill
	9	Install dry bridge, remove Sanborn covered bridge, Raise intersection, floodplain restoration at former motel and dry culvert installation
	10	Floodplain restoration and home removal at mobile home park
Former Garage Site	11	Floodplain restoration at former highway garage site
Center St	12	Upsize existing dry culvert and install new dry culvert to the west
	13	Remove Center St bridge and nearby homes and fill
Memorial Dr	14	Floodplain restoration, building and fill removal, and bridge replacement



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ALTERNATIVES - INTERSECTION OF ROUTES 122, 114 AND US 5

LYNDON FLOOD STUDY
TOWN OF LYNDON

0 100 200 Feet

N

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Main St Culverts

- Alternative 1 – Remove approach culverts and fill
- Alternative 2 – Replace culverts with dry bridge and remove approach culverts

Table 1: Change in WSE (ft) upstream of Main St Bridge

Alternative	10-Yr Flood	500-Yr Flood
1	-0.1	0.0
2	-0.1	-0.5

Table 2: Change in WSE (ft) at Mobile Home Park

Alternative	10-Yr Flood	500-Yr Flood
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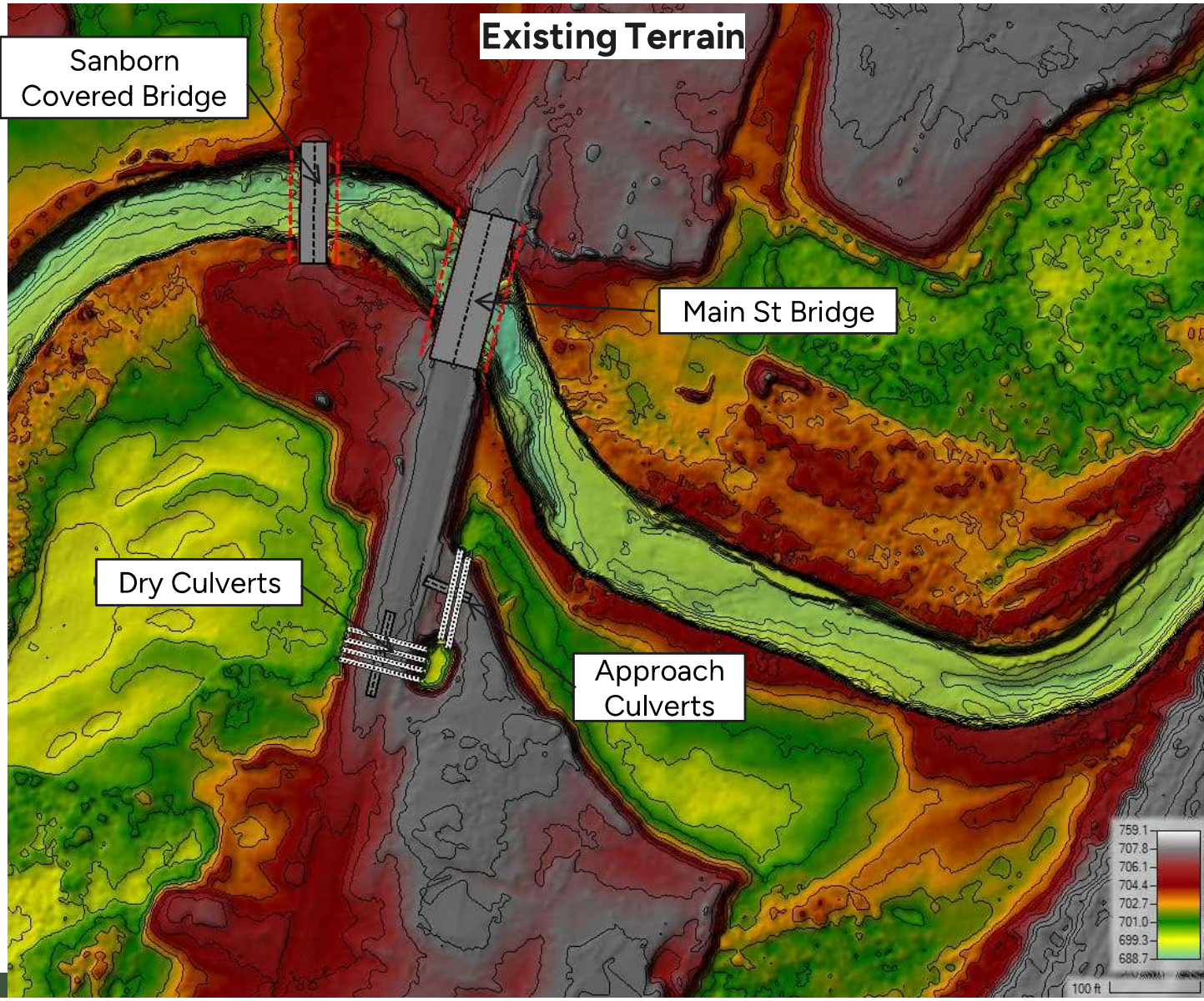

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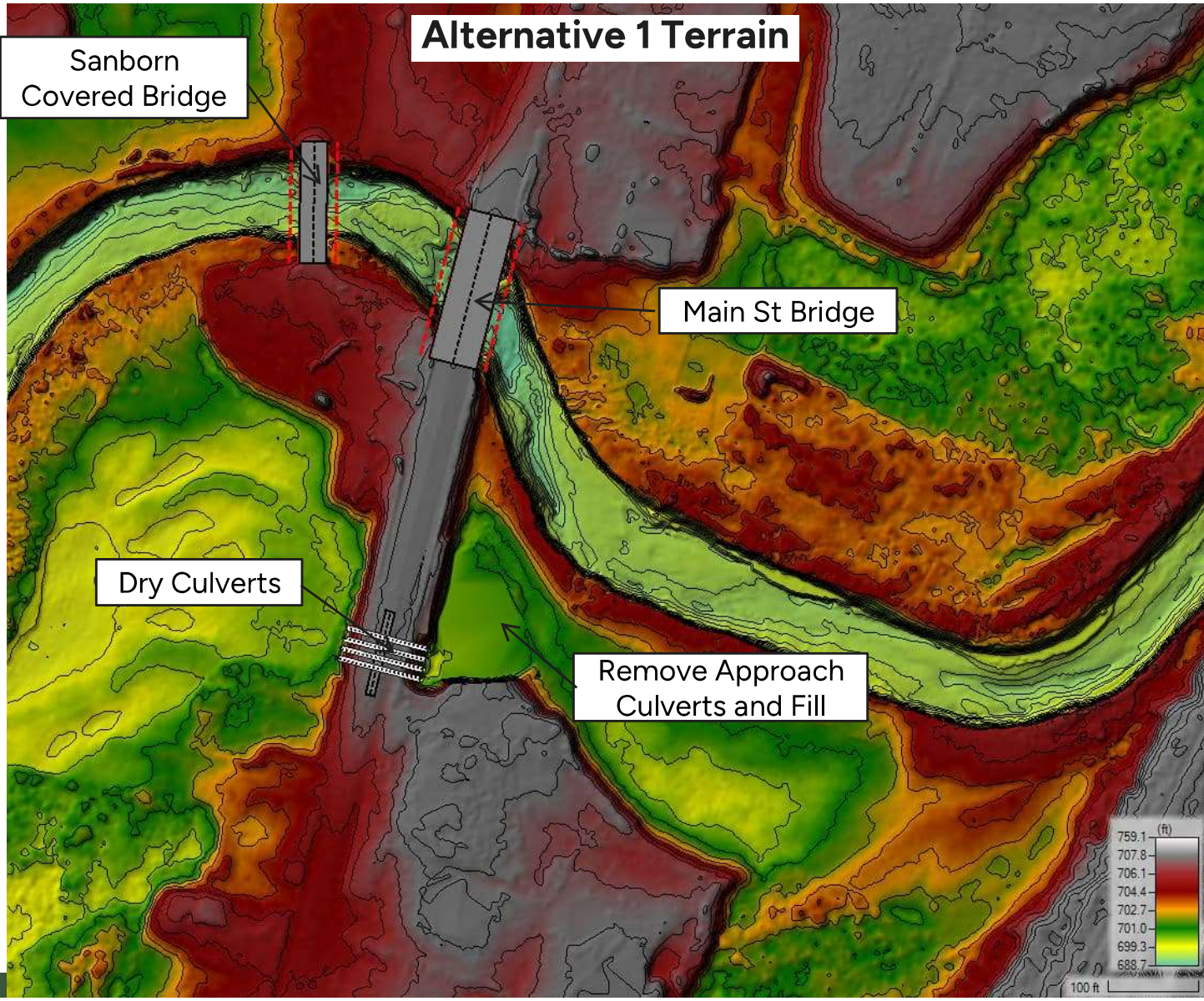

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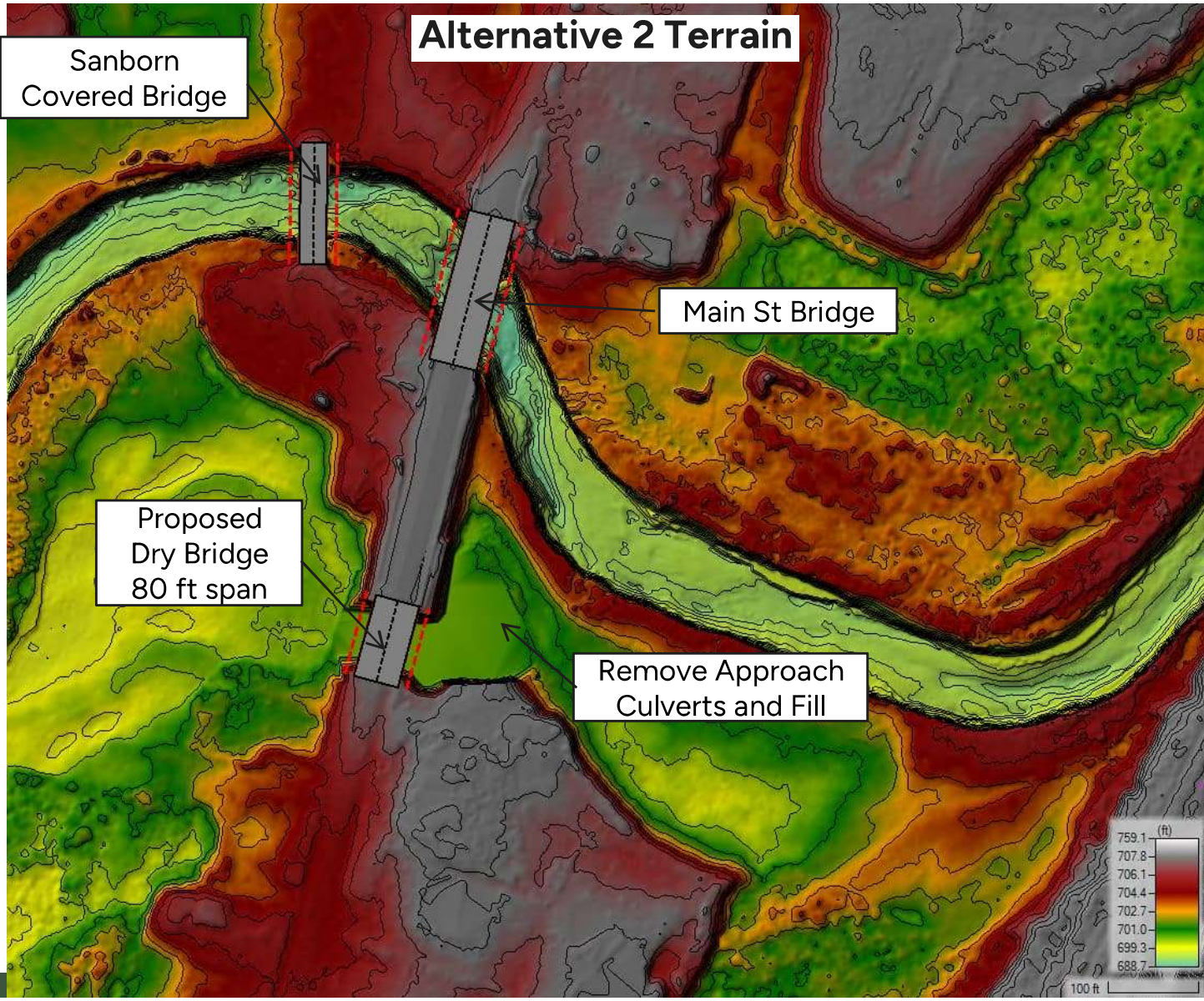

Main St Intersection

- Alternative 3 – Raise intersection
- Alternative 4 – Floodplain restoration at former motel and dry culvert installation
- Alternative 5 – Raise intersection, floodplain restoration at former motel and dry culvert installation

Table 1: Change in WSE (ft) upstream of Main St Bridge

Alternative	10-Yr Flood	500-Yr Flood
3	0.0	0.04
4	-0.1	-0.3
5	-0.1	-0.2

Table 2: Change in WSE (ft) at Mobile Home Park

Alternative	10-Yr Flood	500-Yr Flood
3	0.0	0.02
4	-0.1	-0.2
5	-0.1	-0.1

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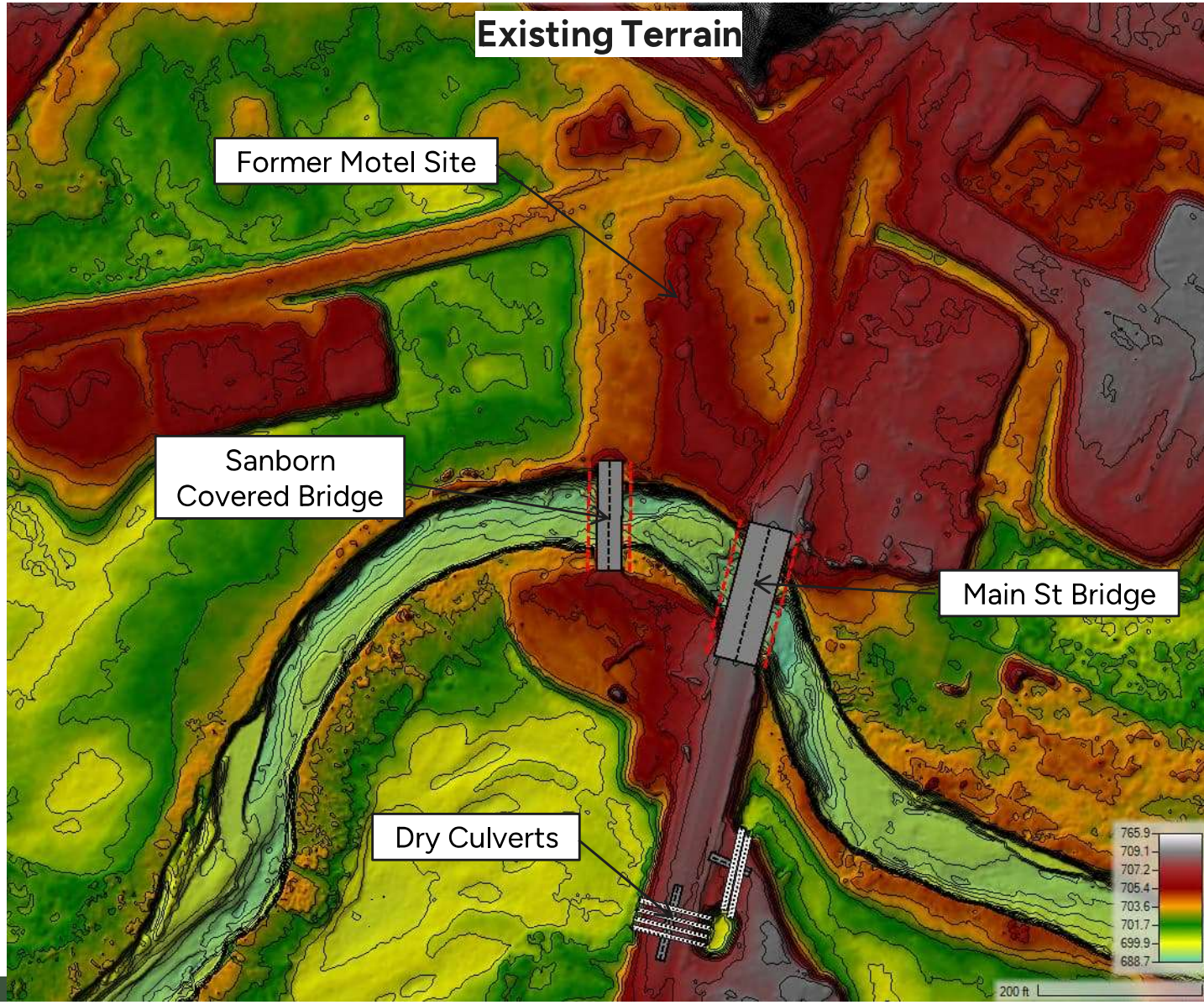

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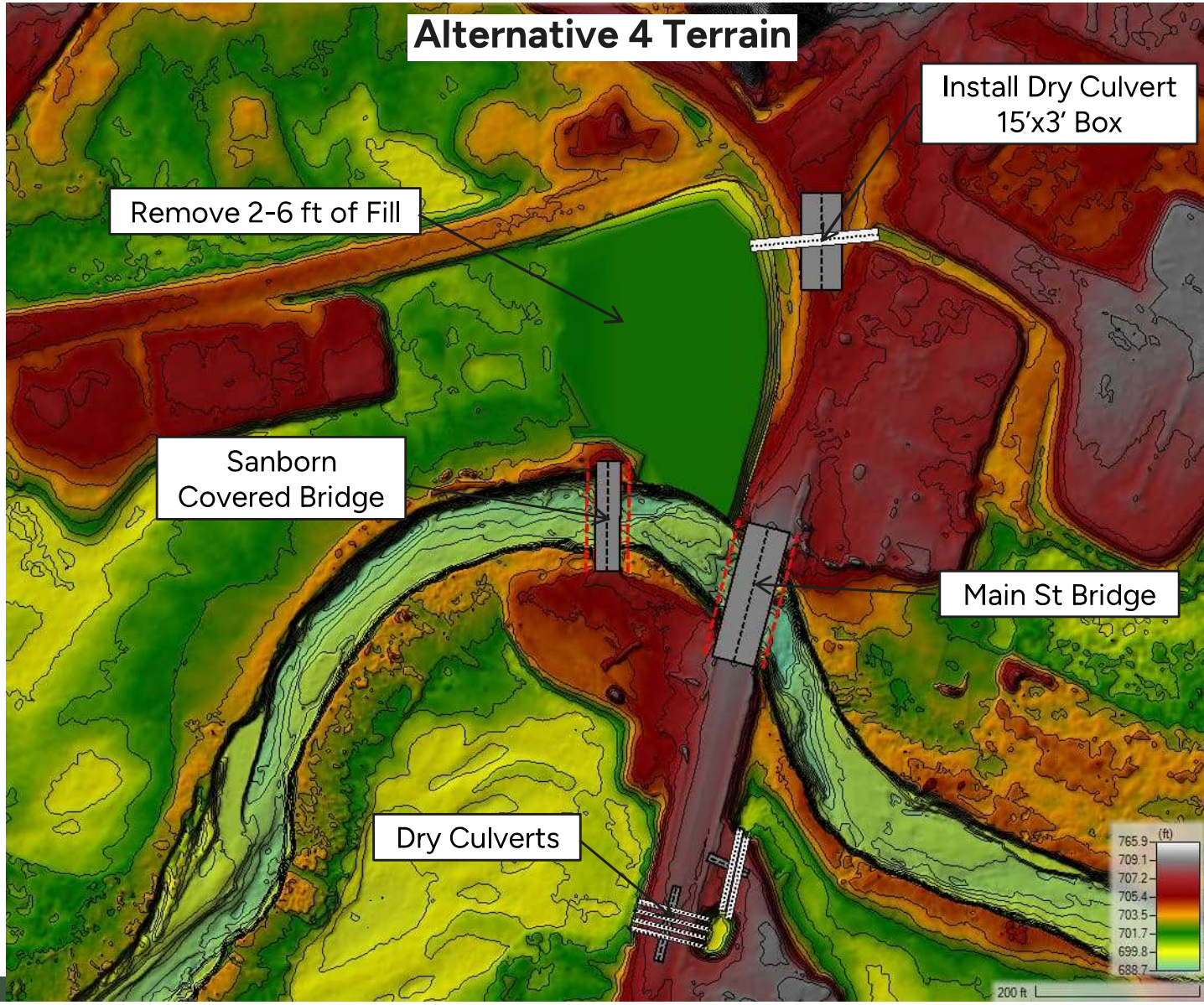

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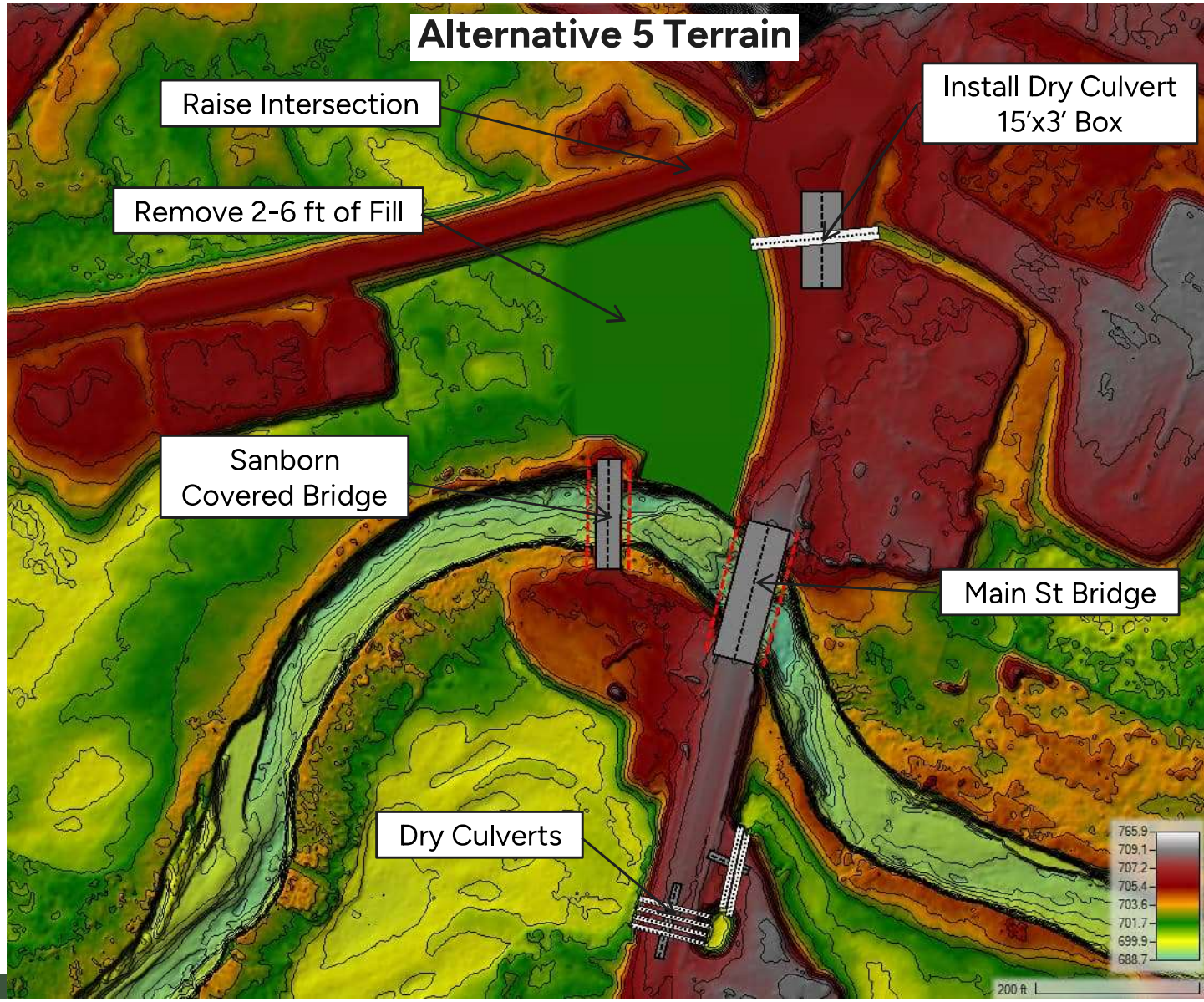

Sanborn Covered Bridge

- Alternative 7– Replace covered bridge with proposed bridge
- Alternative 8 – Remove covered bridge and approach fill

Table 1: Change in WSE (ft) upstream of Main St Bridge

Alternative	10-Yr Flood	500-Yr Flood
7	0.0	-0.5
8	-0.5	-1.0

Table 2: Change in WSE (ft) at Mobile Home Park

Alternative	10-Yr Flood	500-Yr Flood
7	0.0	-0.3
8	-0.3	-0.6

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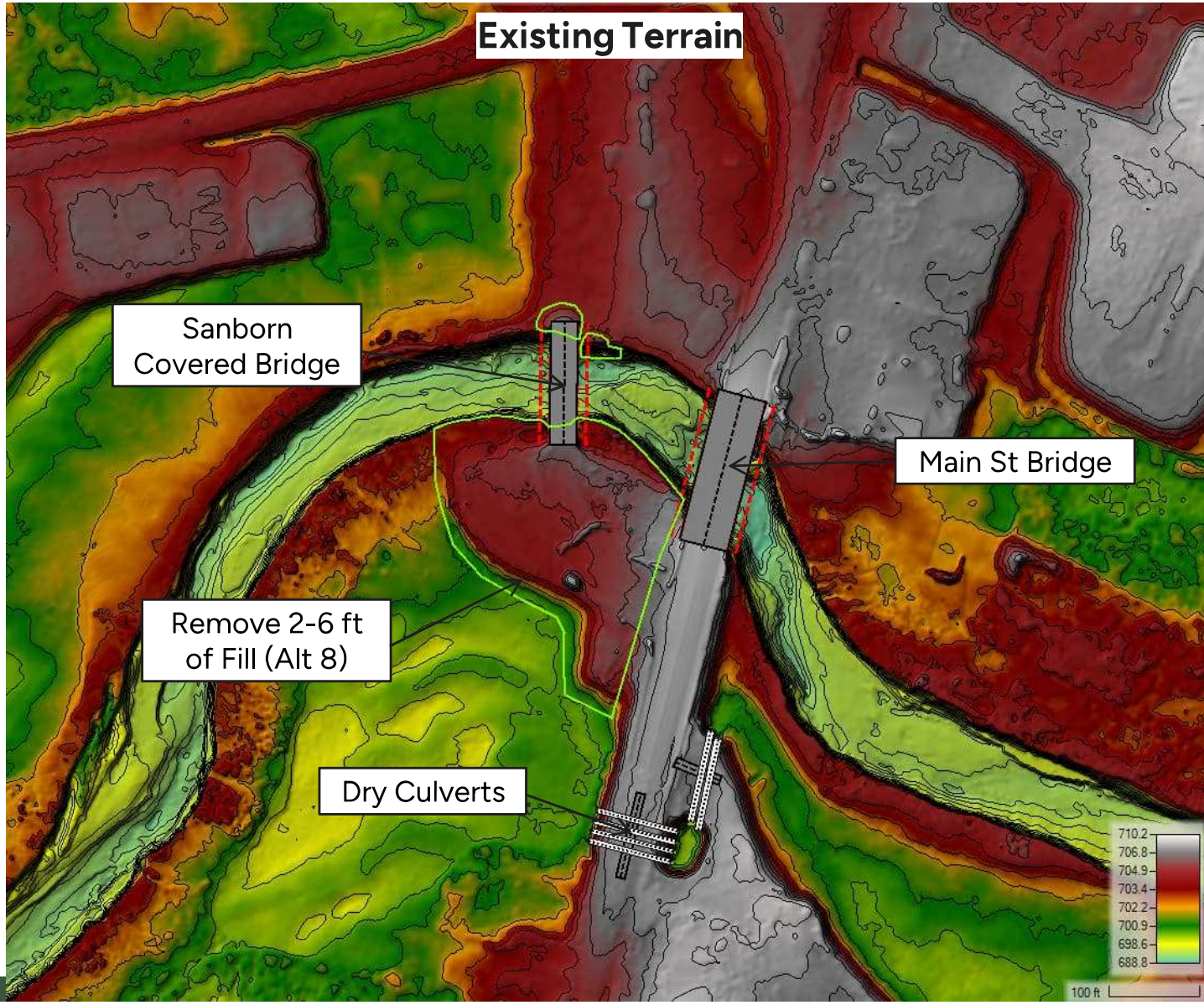

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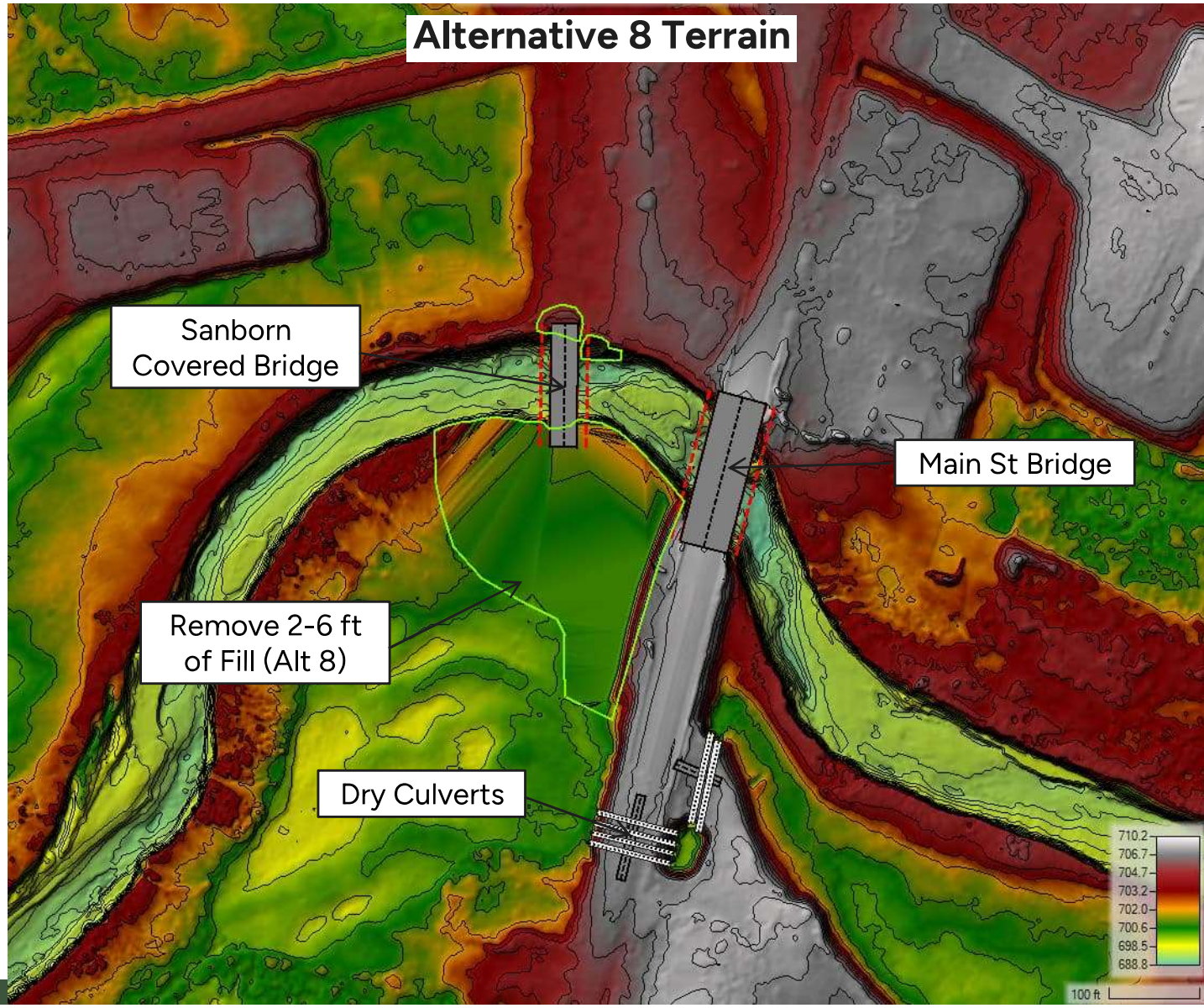

Main St Combined Alternatives

- Alternative 9 – Install dry bridge, remove Sanborn covered bridge, raise intersection, floodplain restoration at former motel and dry culvert installation

Table 1: Change in WSE (ft) upstream of Main St Bridge

Alternative	10-Yr Flood	500-Yr Flood
9	-0.6	-1.3

Table 2: Change in WSE (ft) at Mobile Home Park

Alternative	10-Yr Flood	500-Yr Flood
9	-0.3	-0.7

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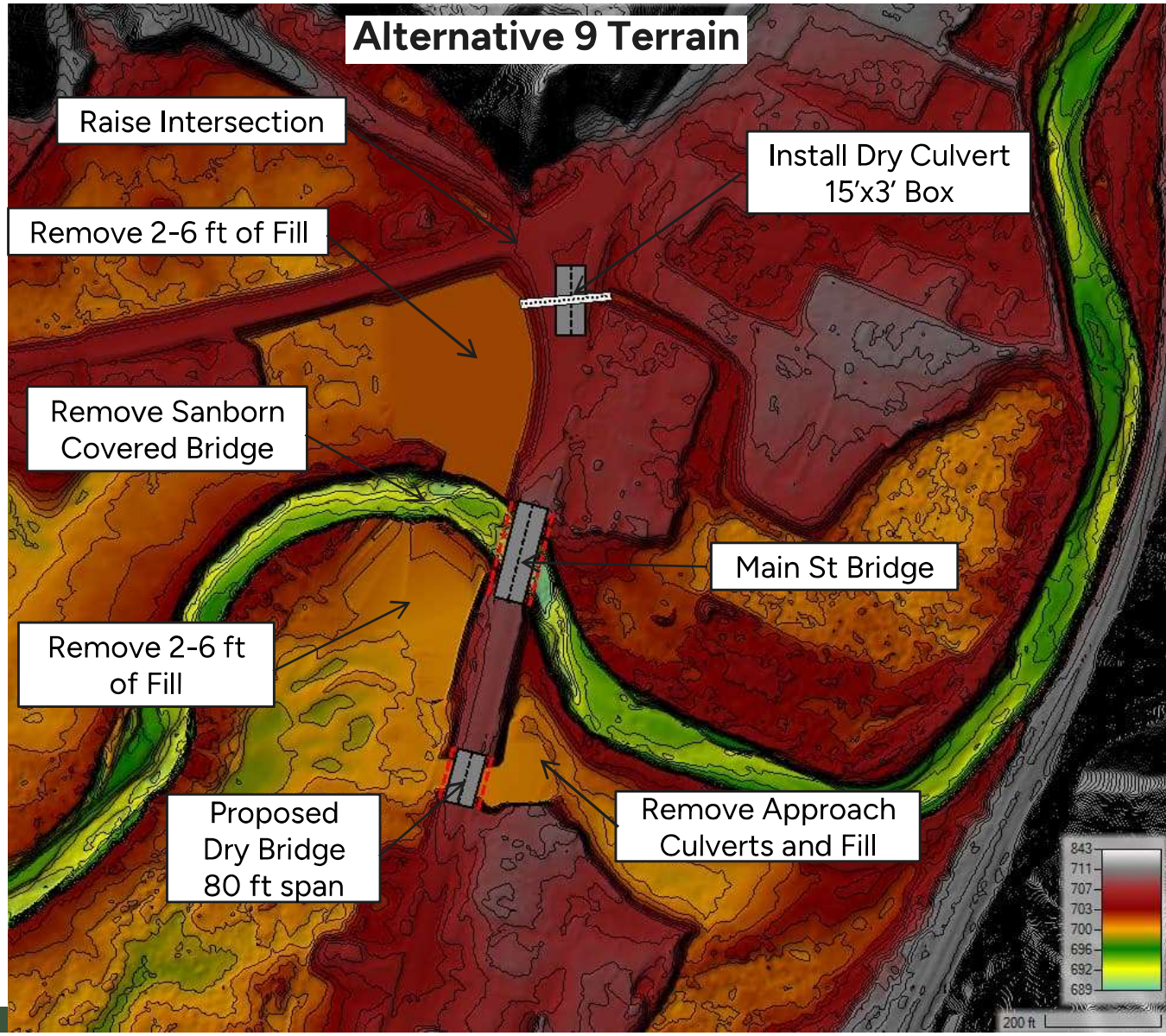
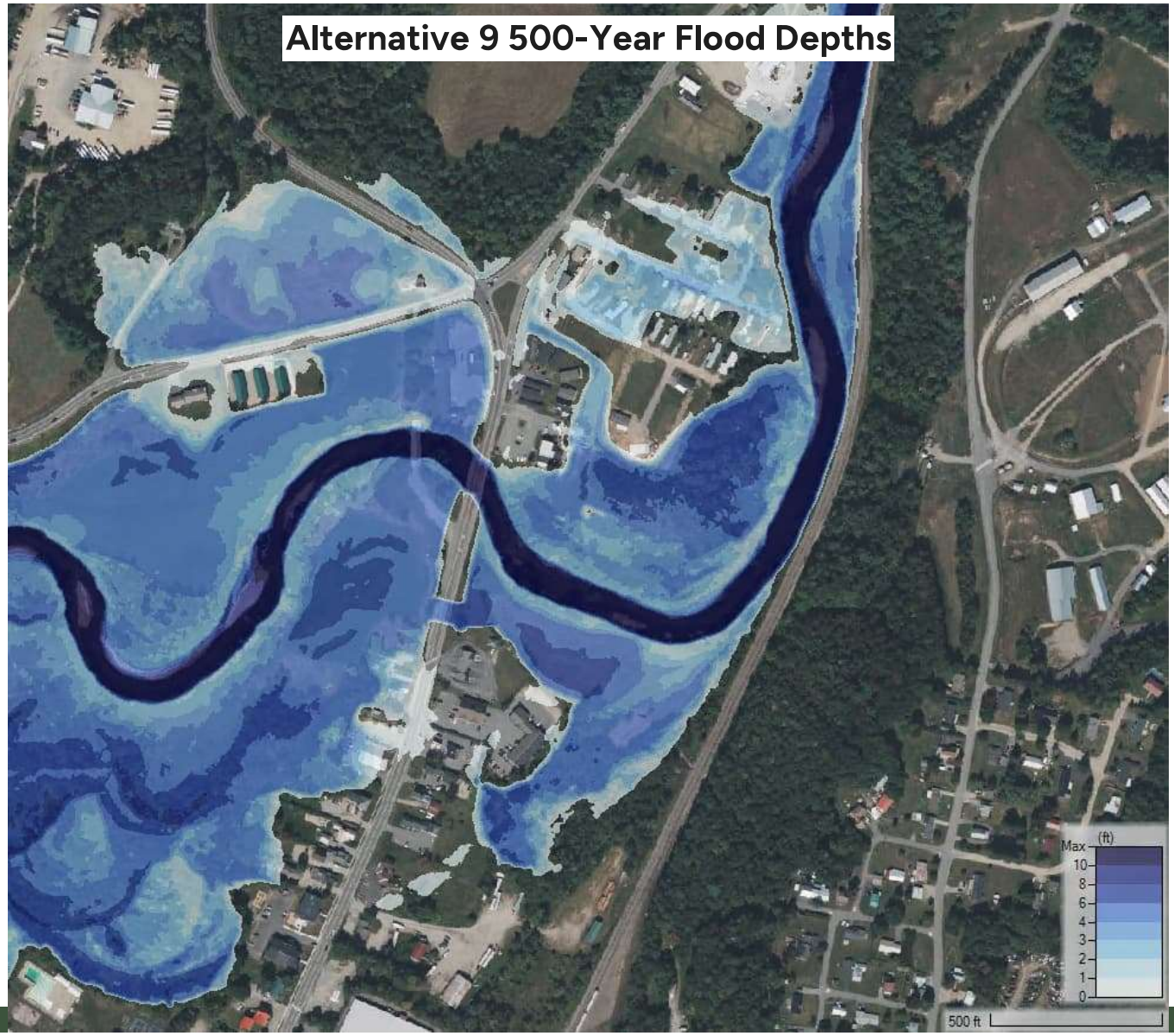


Main Street Summary

Alternative	Change in WSE (ft) upstream of Main St Bridge		Change in WSE (ft) at Mobile Home Park		Description
	10-yr	500-yr	10-yr	500-yr	
1	-0.1	0.0	-0.1	0.0	Remove approach culverts and fill
2	-0.1	-0.5	-0.1	-0.3	Replace culverts with dry bridge and remove approach culverts
3	0.0	0.0	0.0	0.0	Raise intersection
4	-0.1	-0.3	-0.1	-0.2	Floodplain restoration at former motel and dry culvert installation
5	-0.1	-0.2	-0.1	-0.1	Raise intersection, floodplain restoration at former motel and dry culvert installation
6	0.0	-0.6	0.0	-0.4	Remove Sanborn covered bridge
7	0.0	-0.5	0.0	-0.3	Proposed Sanborn covered bridge
8	-0.5	-1.0	-0.3	-0.6	Remove Sanborn covered bridge and approach fill
9	-0.6	-1.3	-0.3	-0.7	Install dry bridge, remove Sanborn covered bridge, raise intersection, floodplain restoration at former motel and dry culvert installation

Existing 500-Year Flood Depths

Alternative 9 500-Year Flood Depths



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ALTERNATIVES - CENTER STREET

LYNDON FLOOD STUDY
TOWN OF LYNDON

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1 SO MAIN ST, 2ND FLOOR
WATERBURY, VT 05676
802.882.8335

Center Street

- Alternative 12 – Upsize existing dry culvert and install new dry culvert to the west
- Alternative 13 – Remove Center St bridge and nearby homes and fill

Table 1: Change in WSE (ft) upstream of Center St Bridge

Alternative	10-Yr Flood	500-Yr Flood
12	0.0	0.0
13	-0.4	-0.3

Table 2: Change in WSE (ft) at Lyndon Municipal Office Building

Alternative	10-Yr Flood	500-Yr Flood
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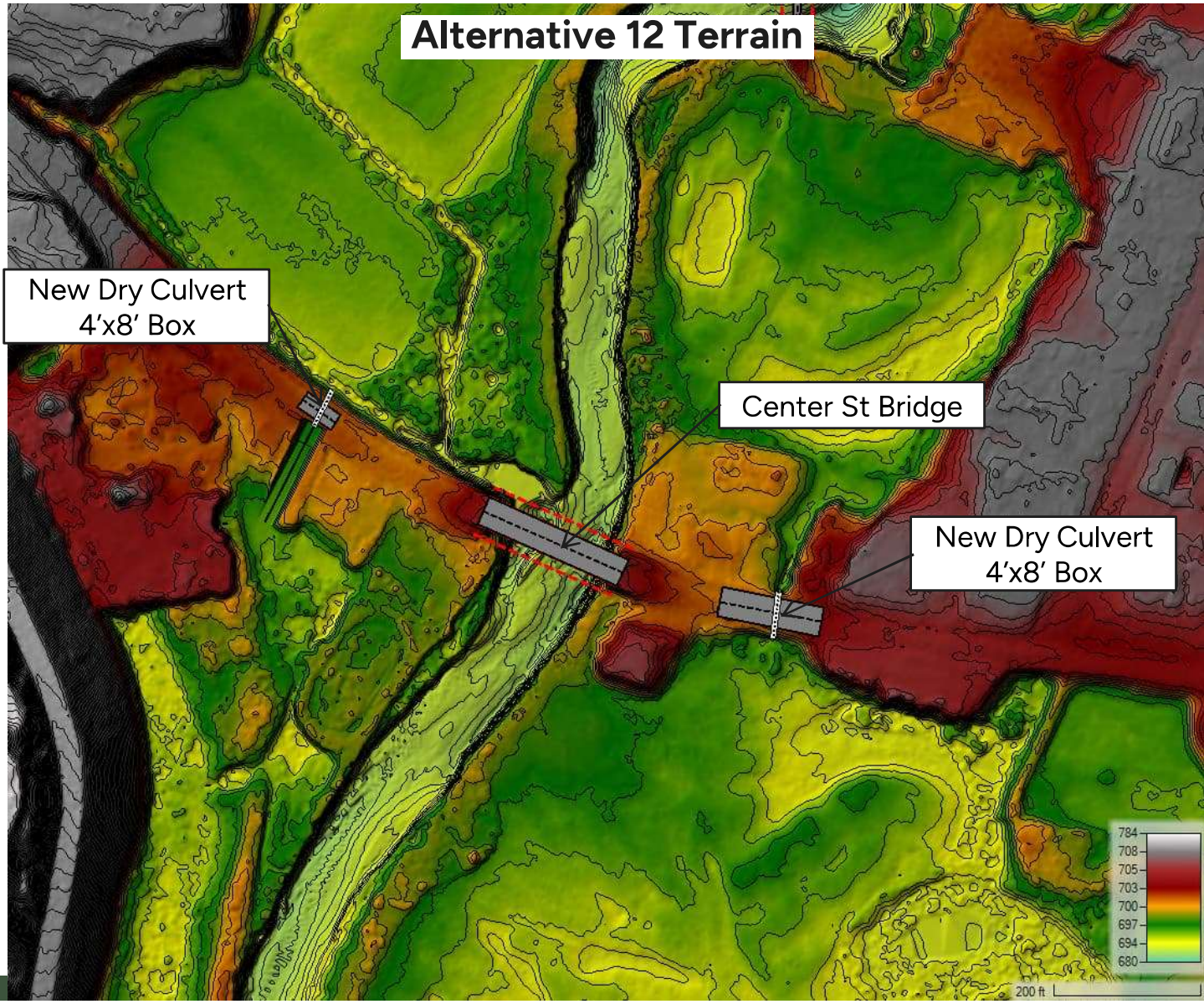

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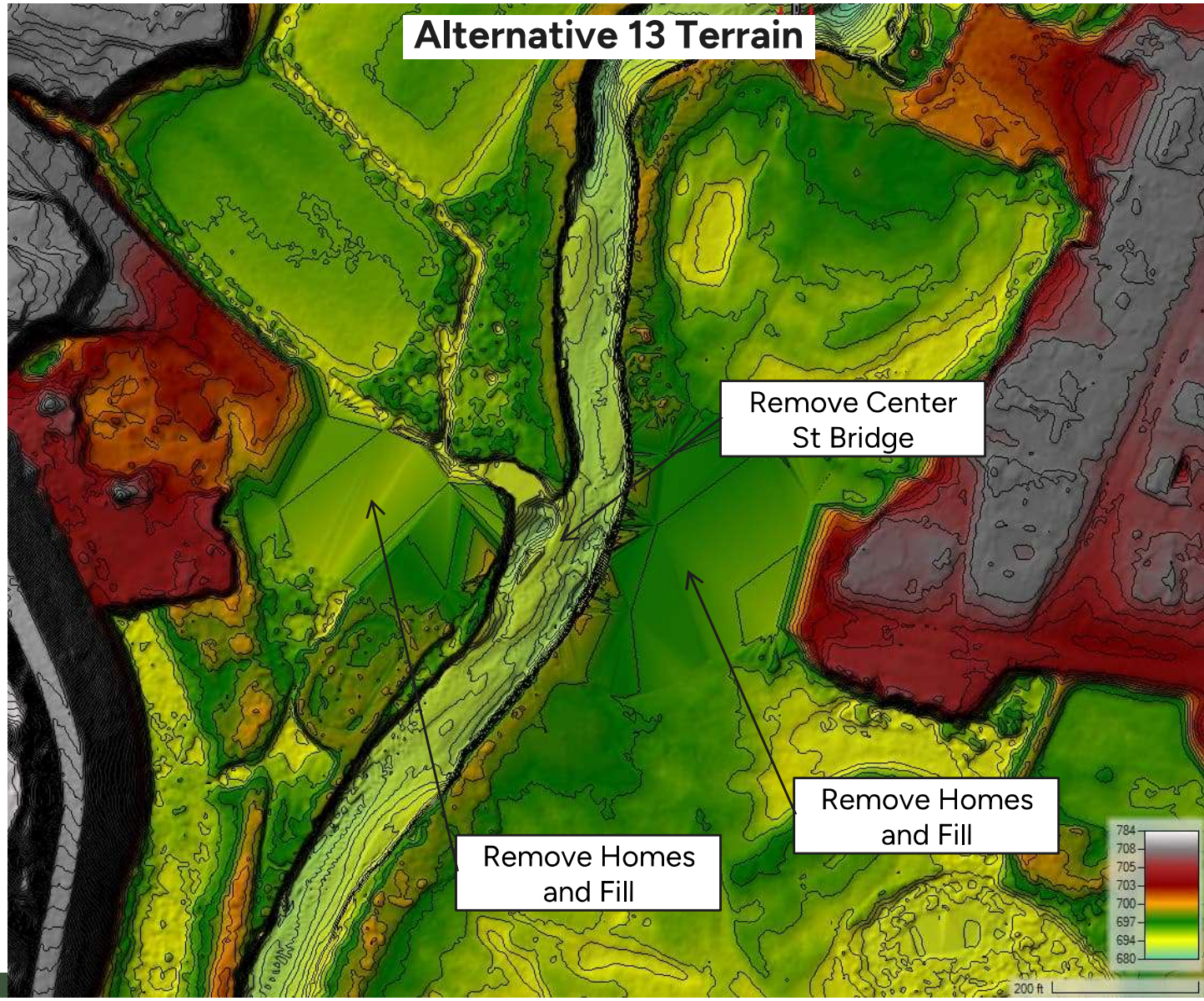
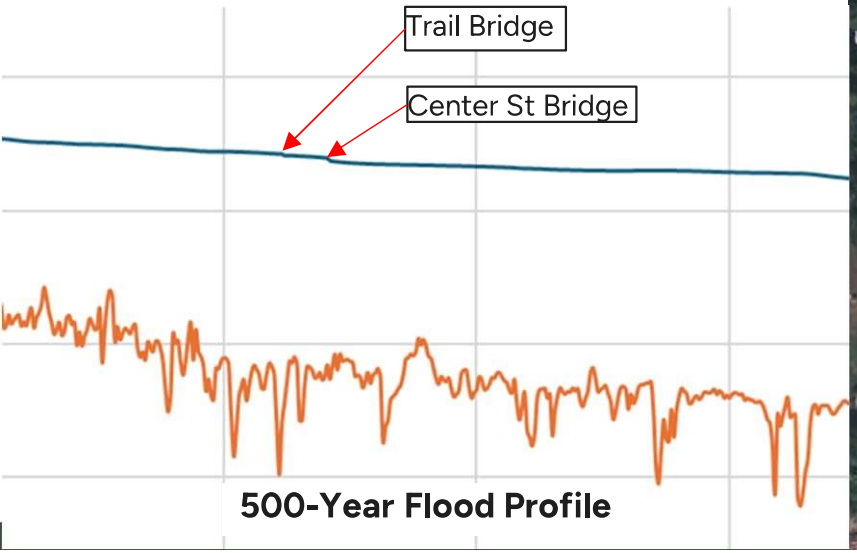
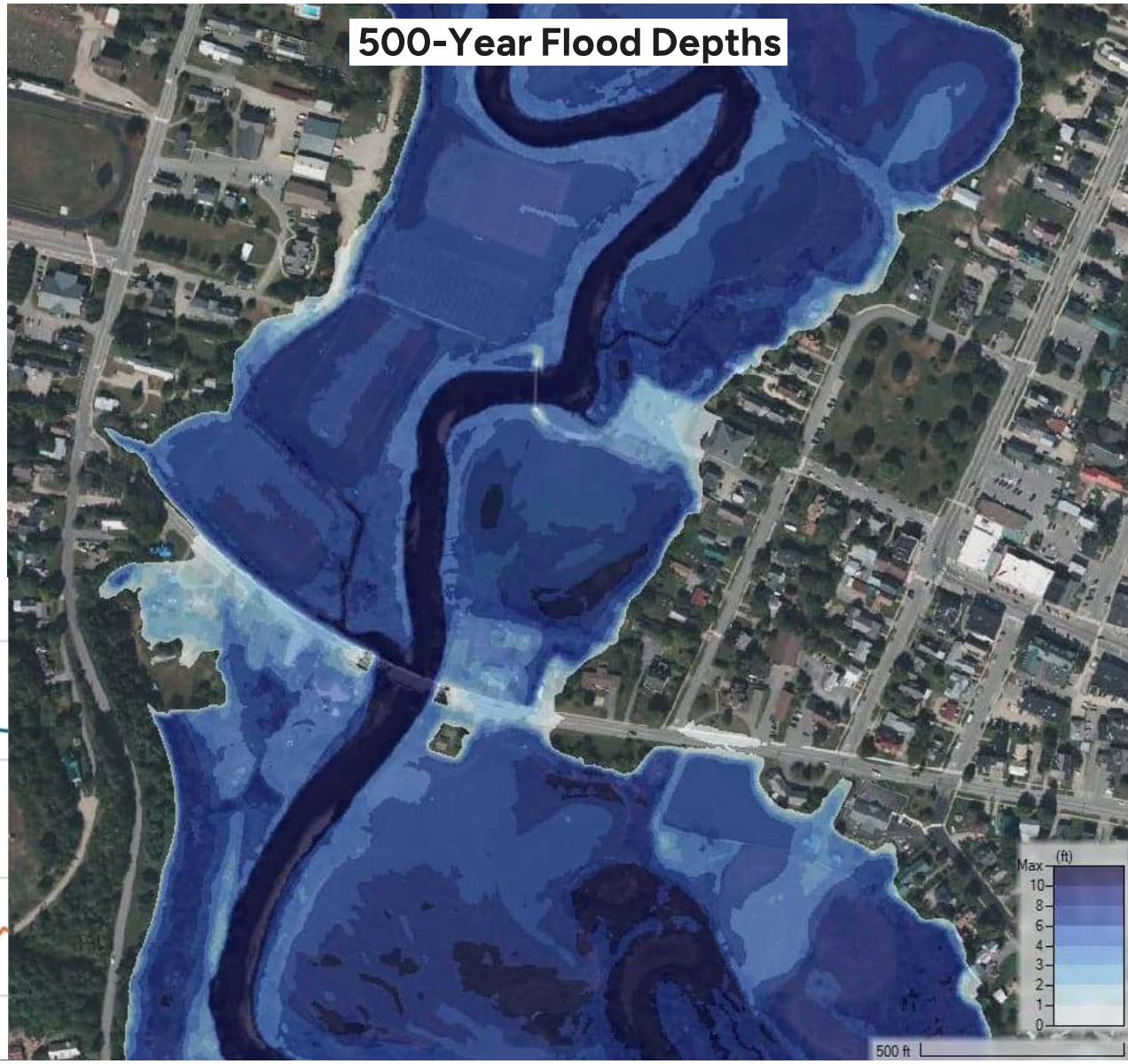


Center Street Summary

- Broad floodplains store water up and downstream of Center Street.
- Road begins to overtop around the 10-year flood and modeled dry culverts offer no relief.
- Six homes sit low and begin flooding with the 10-year flood.
- Major reductions in flooding on road and around homes are not feasible.



500-Year Flood Profile



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ALTERNATIVES - MEMORIAL DRIVE

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TOWN OF LYNDON

0 100 200 Feet

N

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Memorial Drive

- Alternative 14 – Floodplain restoration, building and fill removal, and bridge replacement

Table 1: Change in WSE (ft) at Broad St (Mt View Auto Sales & Service)

Alternative	10-Yr Flood	500-Yr Flood
14	-0.2	-0.4

Table 2: Change in WSE (ft) upstream of Center St Bridge

Alternative	10-Yr Flood	500-Yr Flood
14	0.0	-0.2

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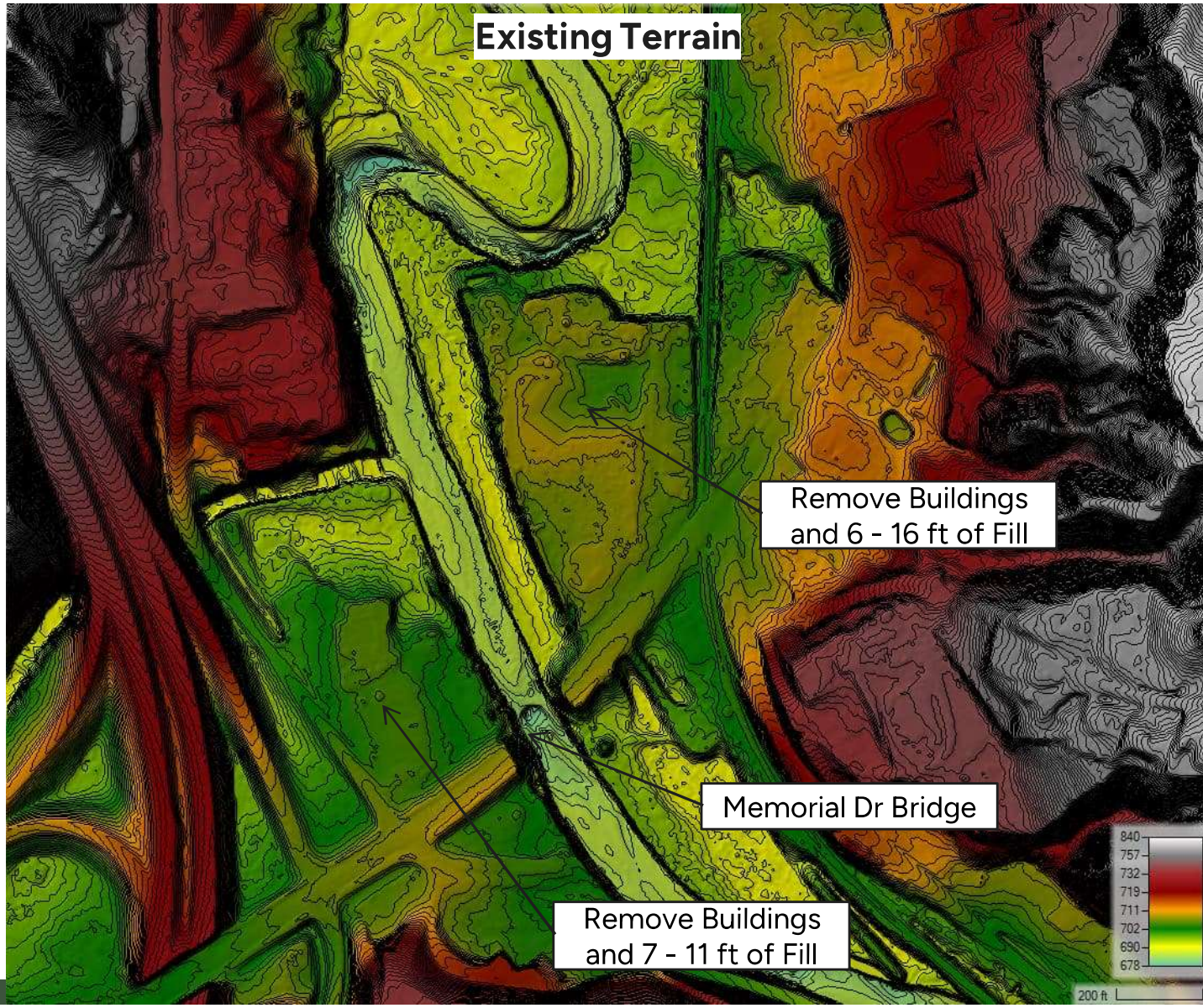

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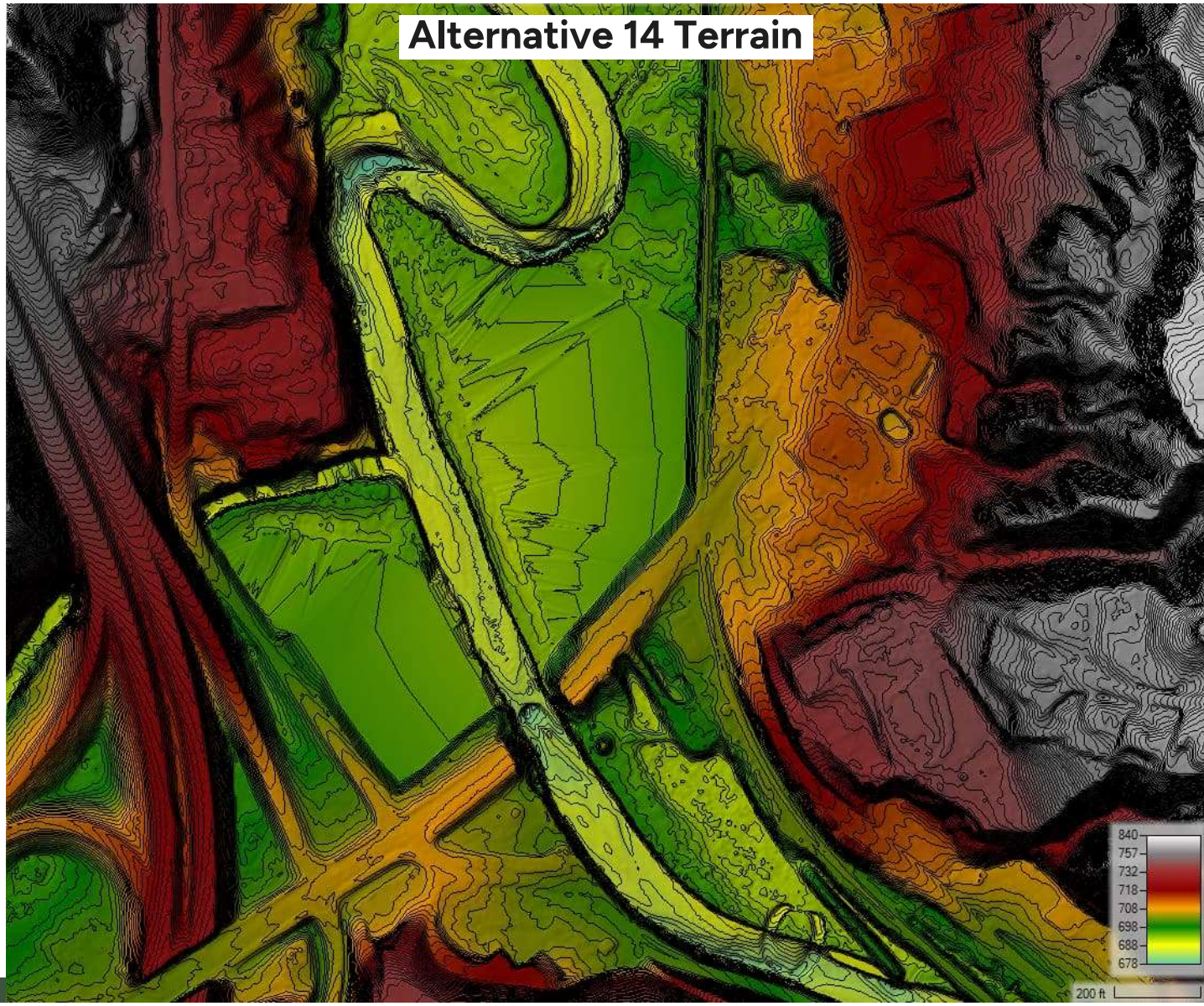

Natural Flood Profile

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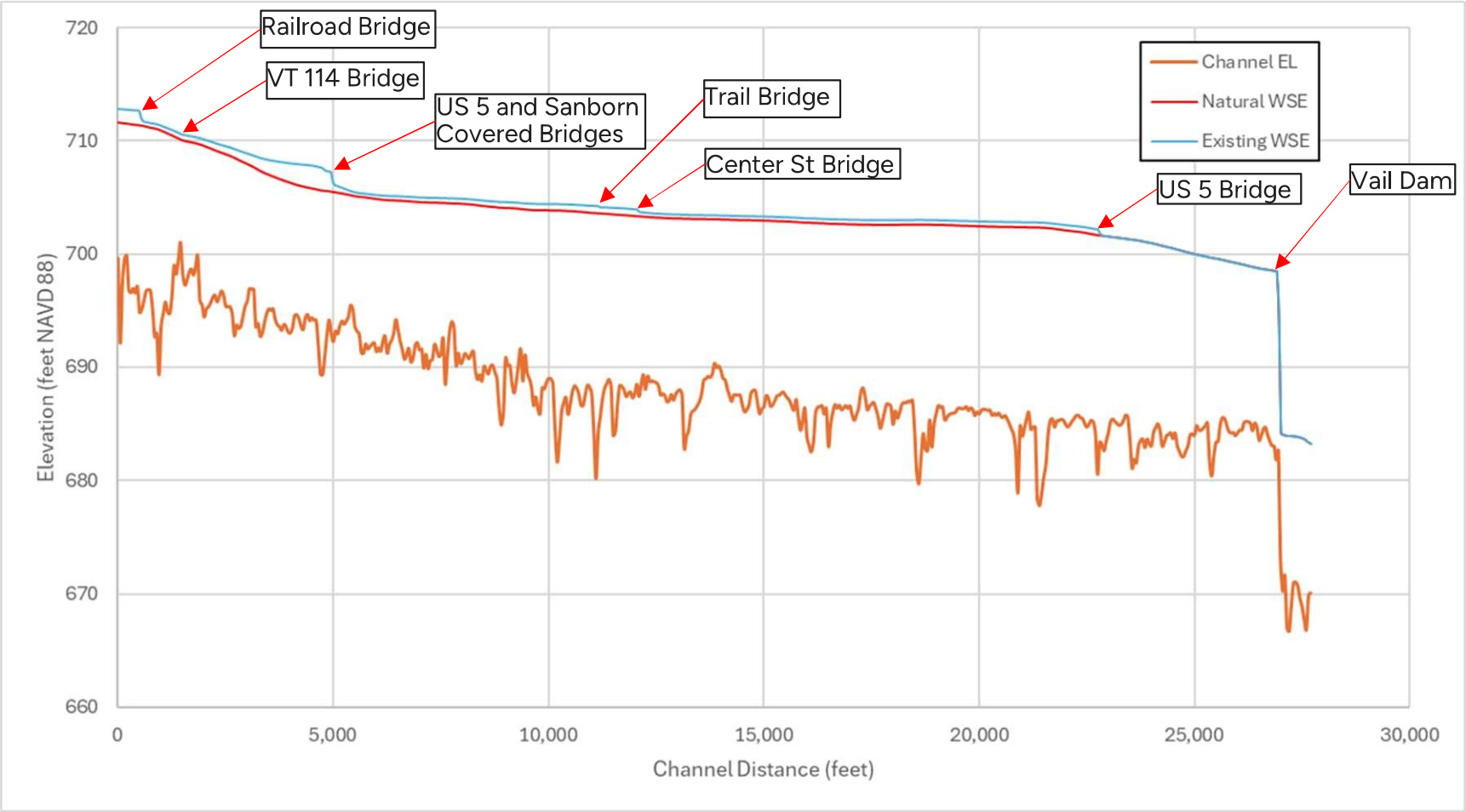

Natural Conditions

- Remove all bridge and associated fill from the floodplain

Table 1: Change in WSE (ft) at Key Locations in Project Area

Location	10-Yr Flood	500-Yr Flood
Mobile Home Park	-0.4	-1.1
Main St Bridge	-0.7	-2.0
Center St Bridge	-0.5	-0.6
Broad St Businesses	-0.1	-0.4

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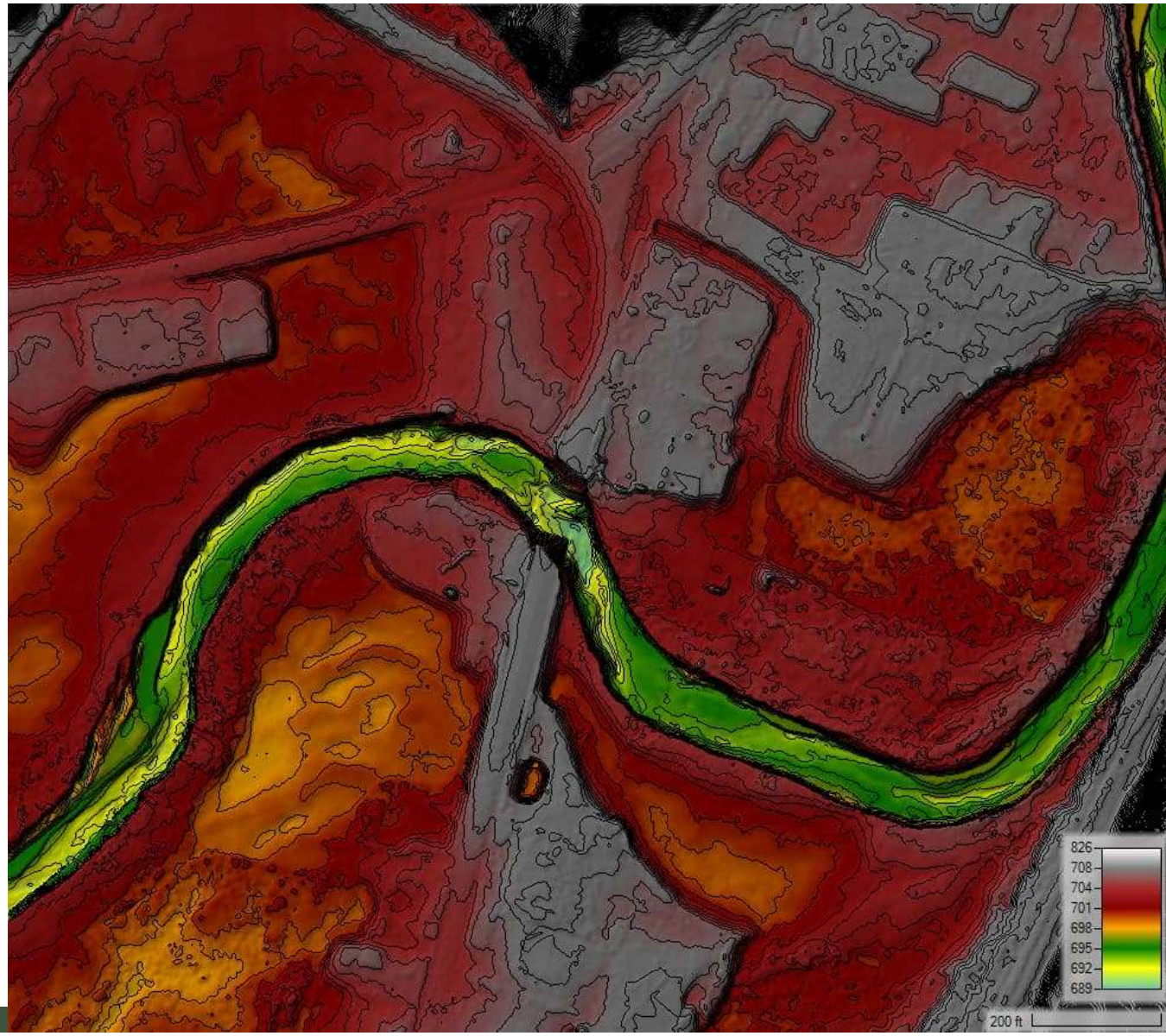

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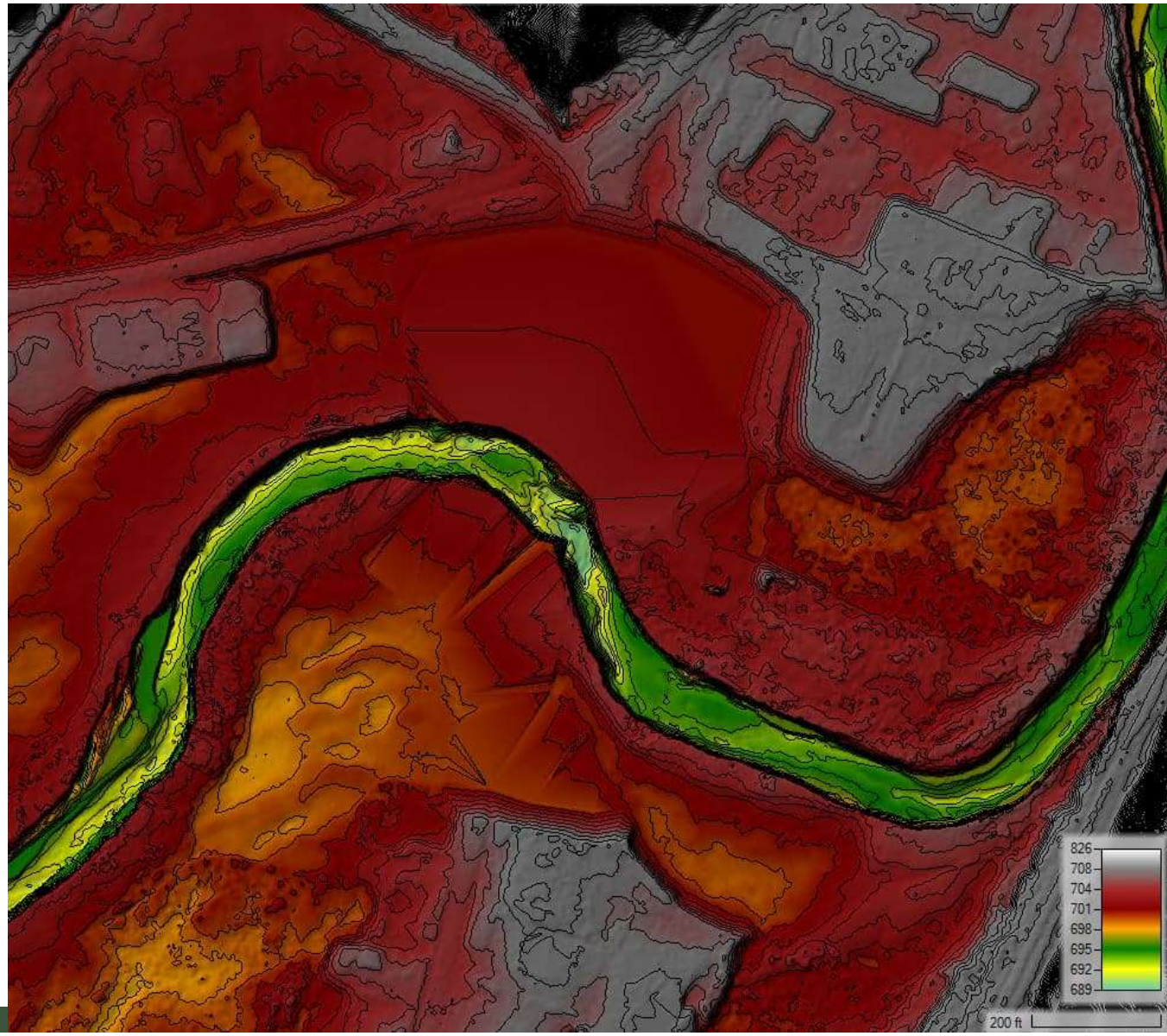


Vail Dam

- 1+ feet of flood reduction at Broad Street based on current model and green lidar collected
- Possibly more with sediment removal depending on sediment depths and underlying bedrock
- Feasibility work would need to be completed to confirm the extent of flood reduction
- 2006 Gomez & Sullivan report lays out next steps for further analysis

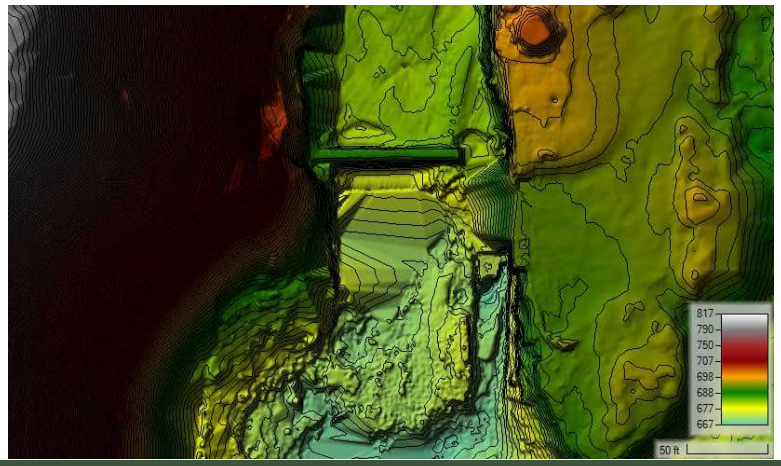
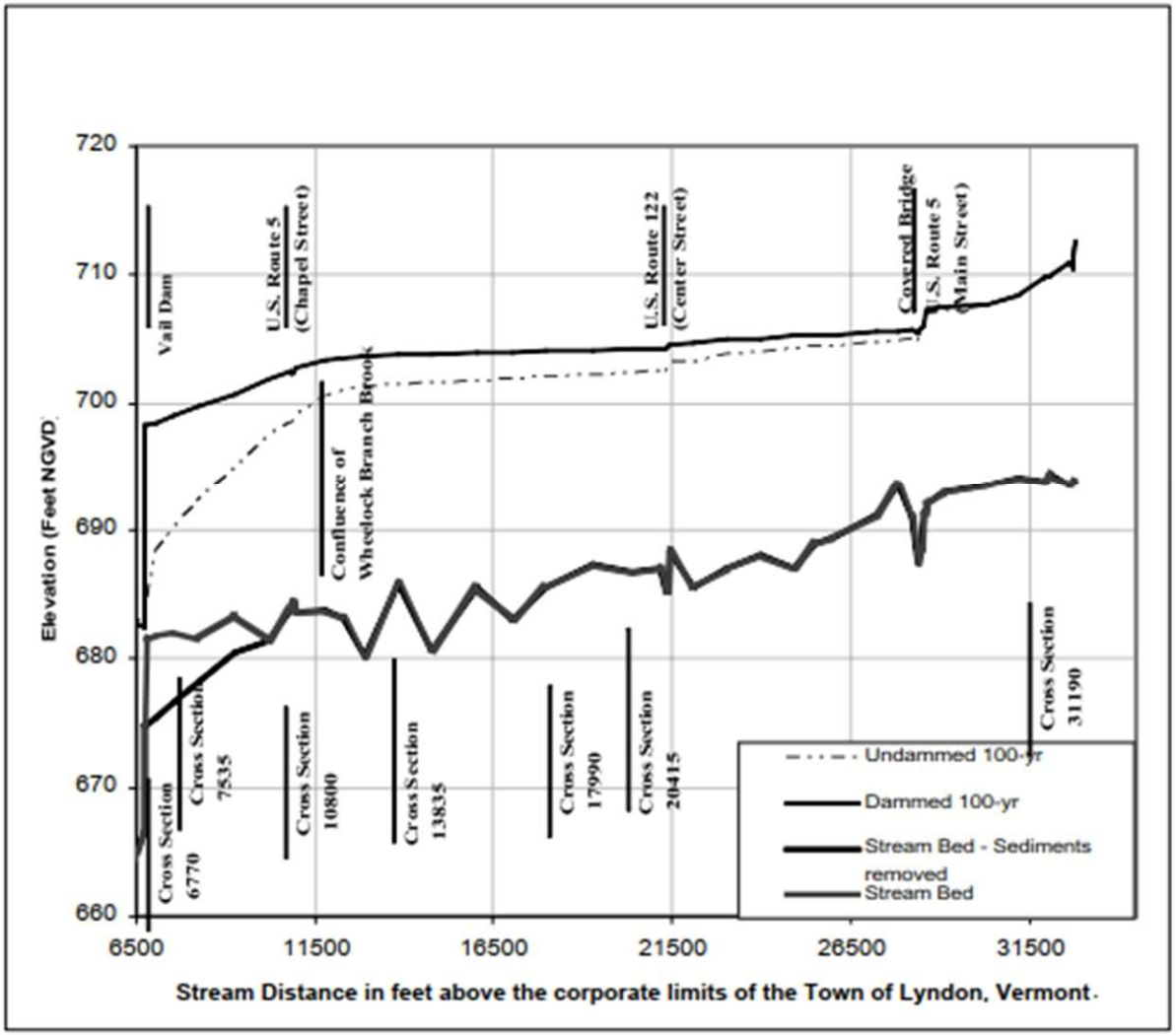


Figure 6.1.2-2. Comparison of dam-in and dam-out 100-year flood water surface elevation for the Passumpsic River (Source: FERC, Environmental Assessment, Vail Dam, March 2004)



Near Village Floodplain Restoration Locations

- Remove fill in floodplain at former garage and/or edge of mobile home park
- Locations small and do not provide enough flood storage volume to change peak flows downstream
- Are expected to catch ice and debris that would otherwise move downstream

Alternatives

Location	Alternative	Description
Main St	1	Remove approach culverts and fill
	2	Replace culverts with dry bridge and remove approach culverts
	3	Raise intersection
	4	Floodplain restoration at former motel and dry culvert installation
	5	Raise intersection, floodplain restoration at former motel and dry culvert installation
	6	Remove Sanborn covered bridge
	7	Proposed Sanborn covered bridge
	8	Remove Sanborn covered bridge and approach fill
	9	Install dry bridge, remove Sanborn covered bridge, Raise intersection, floodplain restoration at former motel and dry culvert installation
	10	Floodplain restoration and home removal at mobile home park
Former Garage Site	11	Floodplain restoration at former highway garage site
Center St	12	Upsize existing dry culvert and install new dry culvert to the west
	13	Remove Center St bridge and nearby homes and fill
Memorial Dr	14	Floodplain restoration, building and fill removal, and bridge replacement

Do you have any questions?

Input Needed to Move Forward

- Committee identification of mitigation actions to evaluate through benefit-cost analysis
- Discussion on grant opportunities and how we want to frame our application.
- FEMA funding HMGP pre-application for selected project due August 30