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Agency of Transportation

TO: Robert Klinefelter, Project Manager

CC: Julie Ann Held, Environmental Specialist

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DATE: November 8, 2024

SUBJECT: Poultney BF 0145(13), pin #21J164, Proposed and Temporary Floodplain Impacts
Poultney, VT-31 Bridge No. 4 over the Poultney River
Coordinates: [43.51304414033359, -73.23330854844026](#)

Project Purpose

The purpose of this study was to analyze and evaluate potential 100-yr (1% AEP) floodplain impacts due to the anticipated installation of temporary bridge at the Poultney VT31, BR-4 crossing over the Poultney River.

FEMA Special Flood Hazard Area

The Existing and Proposed VT-31 Crossing is located within a FEMA Zone AE with Base Flood Elevations which indicates that a detailed study was performed.

Available LiDAR data and conventional survey was used to develop a surface for the hydraulic analysis. This surface was then used to re-delineate the 100-yr Floodplain with the use of the published FEMA Base Flood Elevations (BFEs) to show differences between the original FEMA model/data and the data used for this analysis. Based on this comparison (Figure 2), there are many significant differences between the published floodplain boundaries and the re-delineated boundaries.

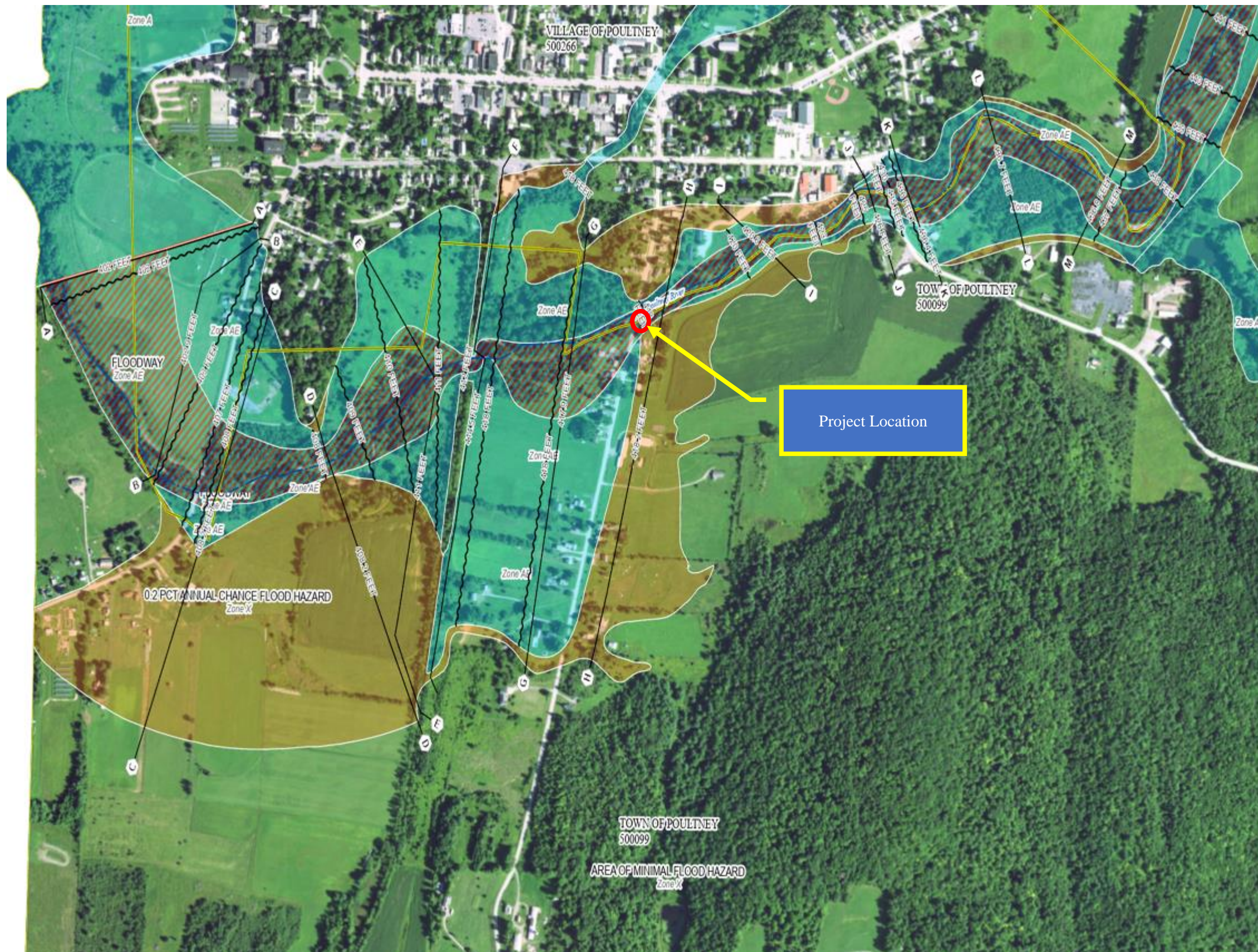


Figure 1 – FEMA SFHA

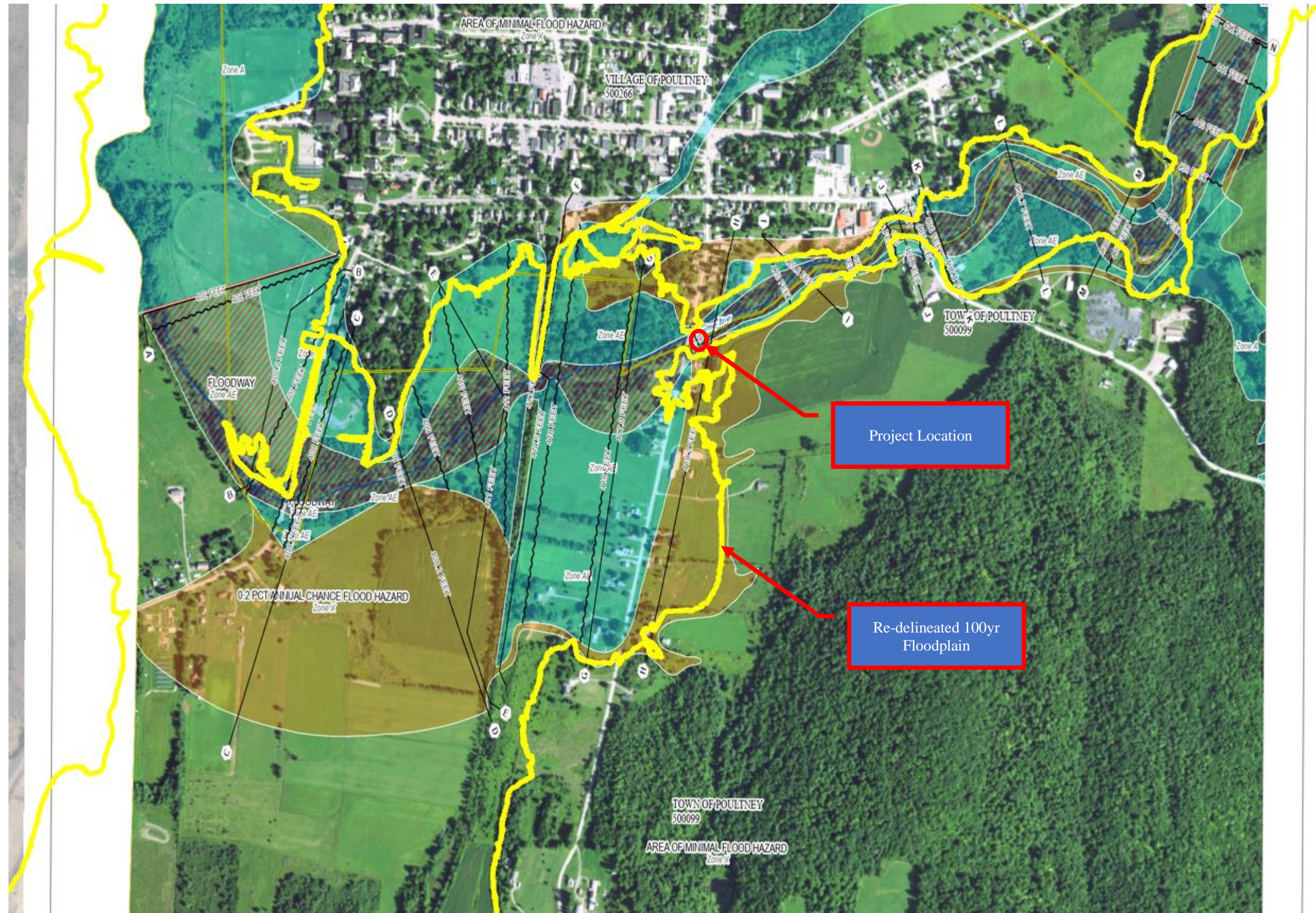


Figure 2 – Re-delineated 100yr FEMA SFHA

Proposed Construction Conditions

The proposed project includes rehabilitation of the existing steel truss, removal, replacement, and relocation of the existing abutments with related approach roadway and channel work. The proposed abutment locations are shown in Figures 3 and 4.

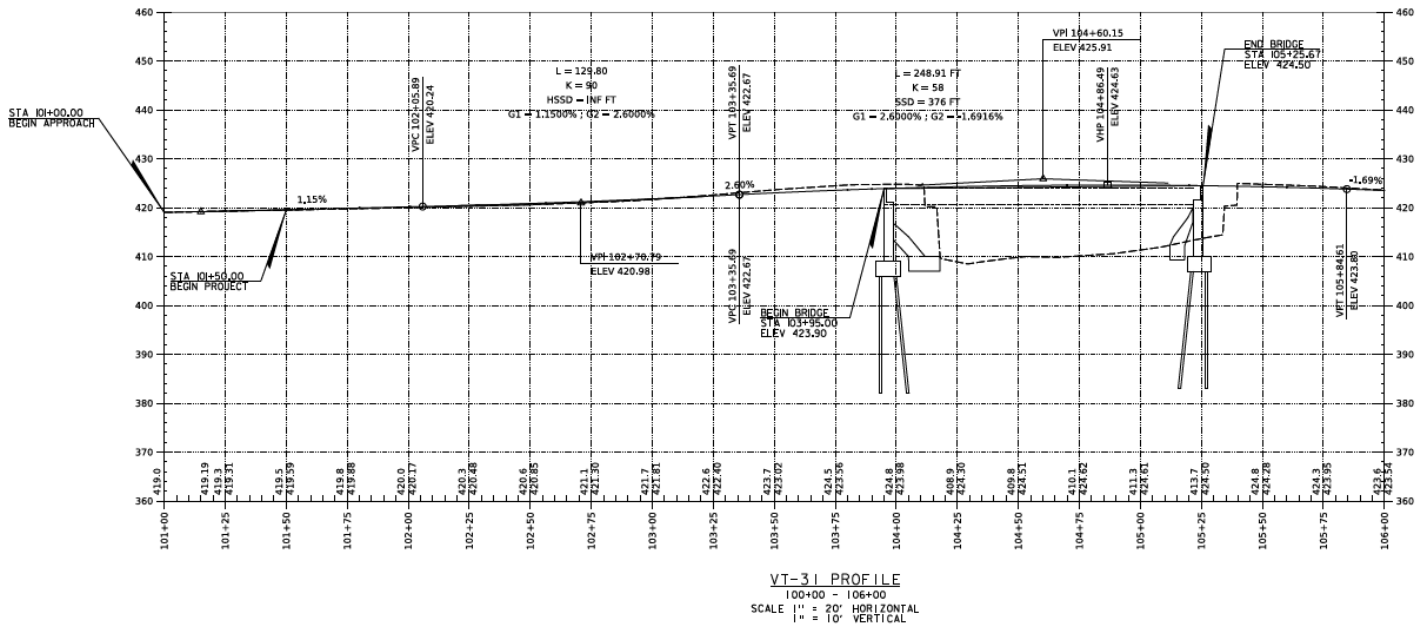


Figure 3 – Approximated Proposed Bridge Profile

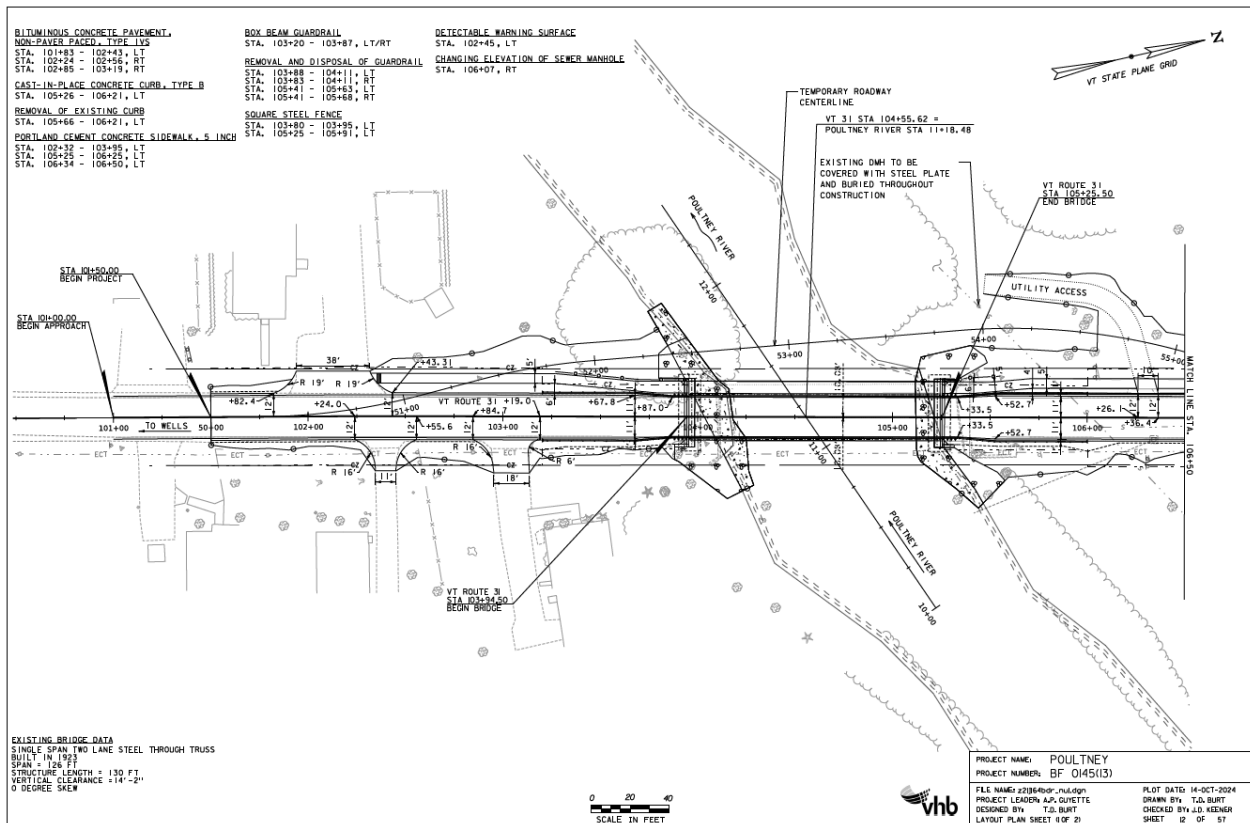


Figure 4 – Approximated Proposed Bridge Alignment

Temporary Construction Conditions

For this project, 170-ft Temporary bridge is anticipated to be installed downstream of the existing alignment. The Temporary Roadway Profile and Alignment are shown in Figures 5 and 6, respectively. To mitigate flooding to upstream properties, a temporary flood bench will be constructed to increase conveyance through the temporary bridge as shown in Figure 5.

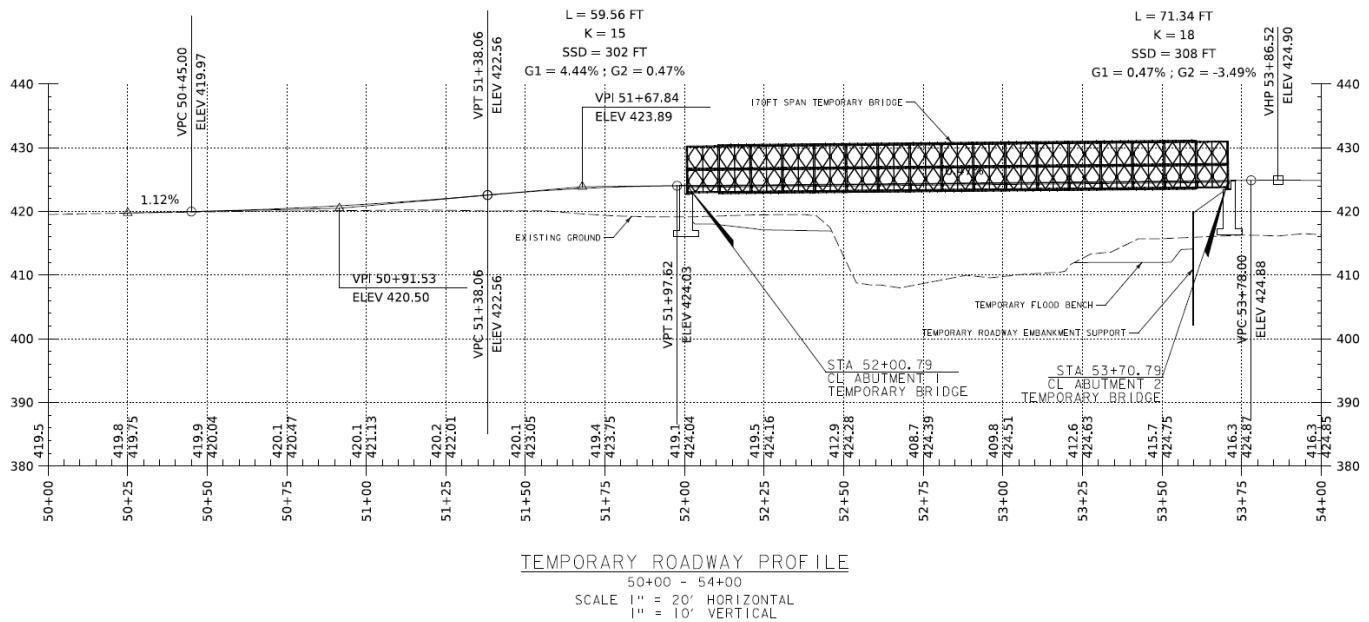
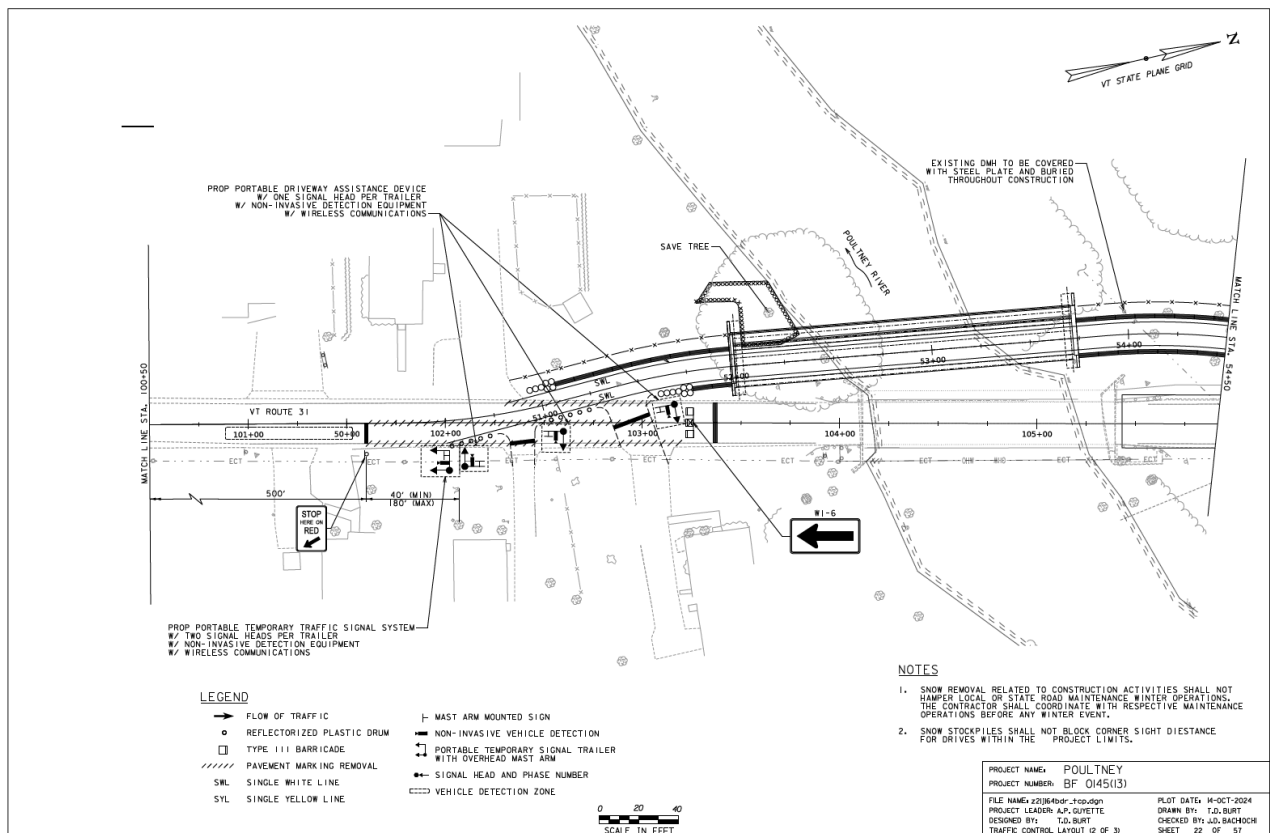


Figure 5 – Approximated Temporary Bridge Profile



Hydrology

The peak flows reported in the Flood Insurance Study (50021CV001A) “Table 3 – Summary of Discharges, Poultney River at Approximately 2,048 feet downstream of Granville Street”, were used for this analysis.

Table 1 – FIS Peak Flows

Flooding Source and Location	Drainage Area (sq. mi.)	Peak Flows (cfs)			
		10% AEP	2% AEP	1% AEP	0.2% AEP
Poultney River <i>Approximately 2,048 feet downstream of Granville Street</i>	48.9	3,250	6,670	8,720	14,800

Hydraulic Analysis

The flood analysis was performed using United States Bureau of Reclamation’s (USRB) Sedimentation and River Hydraulics – Two-Dimension ([SRH-2D](#)) and is a two-dimensional (2D) flow hydraulic and mobile-bed sediment transport model for river systems. Two-dimensional models compute local velocities (depth averaged), flow direction, flow depths and varying water surface elevation (WSE). In comparison, 1D models generate average cross-sectional velocity, hydraulic depth and constant WSEs. Surface-water Modeling System (SMS) was used to develop the existing and construction condition SRH-2D models. SMS was utilized as preprocessor and postprocessor to develop the mesh and input (boundary conditions, material properties, etc.) needed to execute and view results from SRH-2D. The analysis results are summarized herein.

Existing Conditions

Discrepancies in water surface elevations between the FEMA and current analysis are most likely related to how hydraulic losses were computed at the confluence in addition to topographic data used during the original analysis. The variances in FEMA and this Analysis’s WSEs found in Table 2 are most likely attributed to the different data sets and hydraulic models used.

Proposed Bridge Conditions

A detailed hydraulic model was developed to determine the influence the abutment relocation has on BFEs. The results shown in Table 3 compare the BFEs between the existing model and the proposed condition as shown in Figures 4 and 5.

Temporary Bridge Conditions

A detailed hydraulic model was developed to determine the influence the Temporary Bridge has on BFEs. The results shown in Table 4 compare the BFEs between the existing model and the proposed condition as shown in Figures 4 and 5.

Results

Table 2 – Water Surface Elevation Comparison (FEMA vs. Existing Conditions Model)

FEMA XS	FEMA WSE	Existing Model WSE	WSE Difference (ft)
L	436.7	434.0	2.7
K	436.4	432.5	3.9
J	426.0	427.6	-1.6
I	420.6	422.9	-2.3
H	418.2	417.8	0.4
*	-	416.2	-
G	417.9	415.3	2.6
F	414.5	414.9	-0.4
E	411.0	410.0	1.0
D	408.2	409.5	-1.3
C	408.2	406.9	1.3
B	402.9	403.2	-0.3
A	402.0	402.4	-0.4

Upstream

Project Site

Downstream

*Cross-section located immediately downstream of Bridge

Table 3 – Water Surface Elevation Comparison (Existing Conditions Model vs. Proposed)

FEMA XS	Existing Model WSE	Proposed Model WSE	WSE Difference (ft)
L	434.0	434.0	0.0
K	432.5	432.5	0.0
J	427.6	427.6	0.0
I	422.9	422.9	0.0
H	417.8	417.8	0.0
*	416.2	416.1	-0.1
G	415.3	415.3	0.0
F	414.9	414.9	0.0
E	410.0	410.0	0.0
D	409.5	409.5	0.0
C	406.9	406.9	0.0
B	403.2	403.2	0.0
A	402.4	402.4	0.0

Upstream

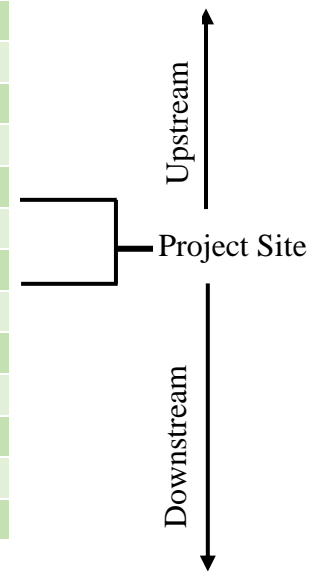
Project Site

Downstream

*Cross-section located immediately downstream of Bridge

Table 4 – Water Surface Elevation Comparison (Existing Conditions Model vs. Temporary)

FEMA XS	Existing Model WSE	Temp. Model WSE	WSE Difference (ft)
L	434.0	434.0	0.0
K	432.5	432.5	0.0
J	427.6	427.6	0.0
I	422.9	422.9	0.0
H	417.8	417.7	-0.1
*	416.2	416.1	-0.1
G	415.3	415.3	0.0
F	414.9	414.9	0.0
E	410.0	410.0	0.0
D	409.5	409.5	0.0
C	406.9	406.9	0.0
B	403.2	403.2	0.0
A	402.4	402.4	0.0



*Cross-section located immediately downstream of Bridge

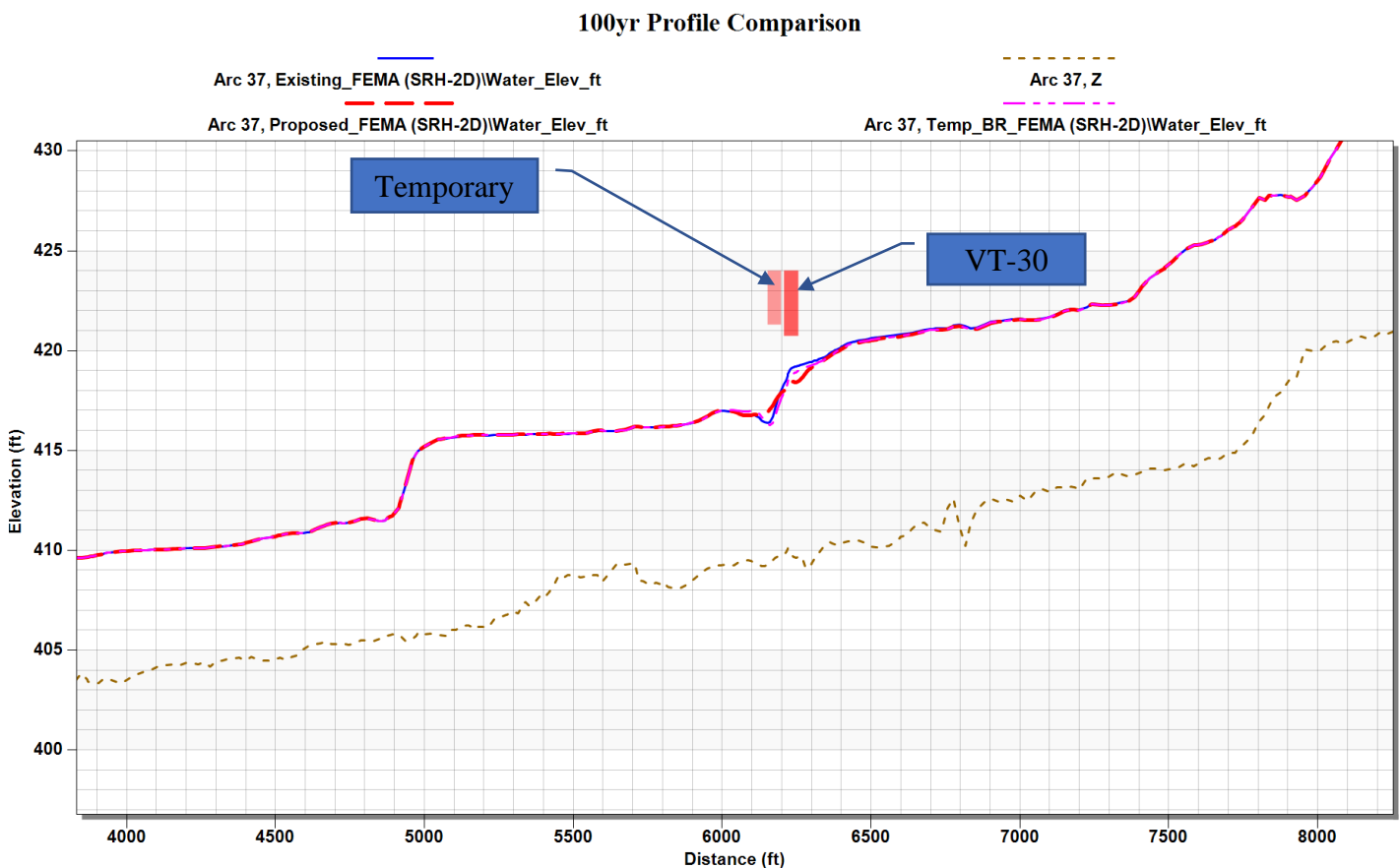


Figure 7 – 100-yr Flood Profile comparison

Floodplain Impact Discussion & Summary

Figure 7 compares the existing, proposed and construction water surface elevations. Tables 2 through 4 compares the average water surface elevations (FIS, Existing, Proposed, and Temporary) at the FEMA cross-section locations. Figure 7 and Tables 2 through 4 can aid in assessing the potential impacts due to the installation of the proposed and temporary bridge conditions. Base Flood Elevations are expected to either decrease or remain the same with the installation of the temporary bridge and the proposed structure.