



M E M O R A N D U M

DATE: July 31, 2026

TO: Tennessee Department of Transportation

FROM: American Structurepoint, Inc.

RE: TDOT Timber Bridge Bundle #2 – Bridge 38 (PIN: 134883.00) Hydraulic Summary

CC: Steve Sellers – Tennessee Department of Transportation
Derek Link – Tennessee Department of Transportation
David Flanders – HNTB
File

This memo presents the preliminary hydraulic modeling analysis findings for TDOT Timber Bridge Bundle #2 Contract DB2601, Bridge 38 (SR 054 over Little Nixon Creek, PIN: 134883.00). The goal of the analysis was to determine the approximate hydraulic impacts of performing a bridge replacement. All geometric structure data utilized in the modeling originated from the Bridge Concept Report unless noted otherwise.

Modeling Methodology: The hydraulic modeling (HEC-RAS version 6.6) is in accordance with the 2012 Design Procedures for Hydraulic Structures, consisting of Tennessee Hydraulics Memorandum (THM)-01 through THM-10. Site topography was based on field survey, and where available, Tennessee USDA 2015 LiDAR. Super structure elevations were recorded from field survey data. Structure located in zone AE with no floodway. Not enough flow information was available from FEMA so StreamStats mean discharge flows have been used for the analysis of Bridge 38. Existing conditions were modeled to best match the FEMA FIS report results.

Existing Conditions: The existing structure was modeled as a two-span bridge with equal spans of 18 ft, for an overall structure length and clear span of 36 ft between abutment faces. The structure was modeled with an out-to-out width of 21.3 ft. The piers consist of 12"x12" timber caps on 12" diameter timber piles, and the structure is 1.96 ft deep measured from profile grade to the bottom of beam.

Natural Conditions: The natural conditions were modeled by duplicating the existing terrain, removing SR 54, and eliminating the existing structure to simulate the floodplain without the influence of the roadway and structural components.

Proposed Conditions: The proposed structure was modeled as a single span bridge with a structure depth of 3.40 ft. The structure was modeled with a clear span of 56 ft, assuming 2:1 sloping abutments and a 29.32 ft channel width. The proposed roadway profile was increased 1.65 ft compared to existing condition. The out-to-out bridge width was modeled as 31.25 ft.

Hydraulic Summary: The proposed structure results in a backwater of 0.59 ft, which satisfies TDOT's recommended 1 ft maximum per THM-03. The proposed structure also has improved velocities (4.37 ft/s) compared to existing (4.90 ft/s), but a freeboard of -1.49 ft which does not meet the 1 ft minimum TDOT requirement. The structure is not anticipated to cause an adverse effect to base flood elevations, however given that the 2-YR is the only storm that does not overtop, the proposed structure should be re-analyzed and/or re-sized using more refined methods.



Hydraulic Summary Table

	Existing	Proposed
Drainage Area	1.58 mi ²	
Design Discharge (50 Year)	2,700 cfs	
50 year Natural WSEL ¹	335.24	
Span Arrangement	3 - 17'	56'
Finish Grade Elevation	336.09	337.74
Low Girder Elevation ²	334.34	334.34
50 year WSEL ¹	335.99	335.83
100 year WSEL ¹	336.08	335.93
Water Area Provided Below 50 yr WSEL	686.58 ft ²	669.45 ft ²
50 Year Velocity	4.9 fps	4.37 fps
50 Year Bridge Backwater Above El. 335.24	0.75 ft @ El. 335.99	0.59 ft @ El. 335.83
100 Year Discharge	3,030 cfs	
Roadway Overtopping El.	335.01	335.01
Freeboard Provided Above 50 yr Headwater ³	-1.65 ft	-1.49 ft

Note: Elevations provided are in feet in the NAVD88 vertical datum.

¹Elevation taken at 1st cross section upstream of bridge

²Elevation taken at Abutment

³Freeboard = 50 Year Headwater Elevation – Low Girder Elevation