



M E M O R A N D U M

DATE: July 17, 2026
TO: Tennessee Department of Transportation
FROM: American Structurepoint, Inc.
RE: TDOT Timber Bridge Bundle #2 – Bridge 17 (PIN: 137109.02) 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 17 (SR 193 over Branch, PIN: 137109.02). 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 is in accordance with the 2012 Design Procedures for Hydraulic Structures, consisting of Tennessee Hydraulics Memorandum (THM)-01 through THM-10. Modeling software used was HEC-RAS 6.6. Discharges were obtained from StreamStats mean discharge data. Site topography was based on field survey provided by HMB on 02/15/2026, where available, and Tennessee USDA 2015 LiDAR. Low girder elevations were recorded from field survey data.

Existing Conditions: The existing structure was modeled as a four-span bridge with span lengths of 19.5 ft, 19 ft, 19 ft, and 19.5 ft, for an overall structure length of 77 ft and a clear span of 75 ft between front faces of the abutments. The structure was modeled with an out-to-out width of 21.58 ft. The piers consist of timber caps on piles with assumed dimensions of 12"x14" for the caps and 12" diameters for the piles. The structure depth was modeled at 1.63 ft, measured from profile grade to the low chord.

Natural Conditions: The natural conditions were modeled by duplicating the existing terrain, removing SR 193, 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 4.30 ft and an overall length of 90 ft, with 3 ft wide abutments and an 84 ft clear span between faces of the abutments. The proposed roadway profile was increased 2 ft compared to the existing condition. This grade raise will result in an estimated length to tie back in to existing of 390 ft for the south approach and 490 ft for the north approach. This structure depth is a deviation from the concept report and utilizes 39"x48" box beams instead of 54" bulb-tees as the concept report proposed. Given the 90 ft total structure length, a box beam configuration can provide adequate strength and serviceability while also providing the necessary freeboard as discussed below with the 2' proposed grade raise. The out-to-out bridge width was modeled as 31.25 ft. The bridge was modeled with riprap spillslopes along each abutment with assumed 4 ft berms and 2:1 slopes down to flat riprap shelves at El. 355. It is assumed that debris removal and minor channel clearing within the bridge opening will take place as part of the new bridge construction.

Hydraulic Summary: The recommended structure results in a backwater of 1.46 ft, which does exceed TDOT's recommended 1 ft maximum per THM-03. The recommended structure is expected to have reduced velocities over the existing and has a freeboard of 1.02 ft above the proposed 50-year water surface elevation, which satisfies the 1' minimum TDOT requirement. While this proposed structure's backwater does provide improvement over the existing backwater, the proposed structure still creates an adverse hydraulic effect upstream and downstream of the structure. A more detailed hydraulic analysis is recommended with refined modeling methods, additional channel clearing, and structure re-sizing if necessary.



Hydraulic Summary Table

	Existing	Proposed
Drainage Area	4.66 mi ²	
Design Discharge (50 Year)	2,320 cfs	
50 Year Water Surface Elevation ⁽¹⁾	360.75	
100 Year Discharge	2,610 cfs	
100 Year Water Surface Elevation ⁽¹⁾	360.92	
Span Arrangement	19.5', 19', 19', 19.5'	90'
Finish Grade Elevation	365.03 (west end)	367.03 (east end)
Low Chord Elevation ⁽²⁾	363.40 (west end)	362.73 (east end)
Structure Depth	1.63 ft	4.30 ft
50 Year Headwater Elevation ⁽³⁾	363.06	361.71
Freeboard Provided Above 50 Yr Headwater ⁽⁴⁾	0.34 ft	1.02 ft
Water Area Provided Below El. 360.75	345.77 ft ²	570.61 ft ²
50 Year Velocity	6.71 ft/s	4.32 ft/s
50 Year Bridge Backwater	2.31 ft @ El. 363.06	1.46 ft @ El. 362.86
Roadway Overtopping Elevation	362.66	364.66

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

⁽¹⁾ Elevation taken at 1st cross section upstream of bridge in natural condition

⁽²⁾ Elevation taken as minimum allowed

⁽³⁾ Elevation taken at 1st cross section upstream of bridge

⁽⁴⁾ Freeboard = Low Chord Elevation – 50 Year Headwater Elevation