



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 22 (PIN: 137109.06) 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 22 (SR 194 over Black Ankle Creek, PIN: 137109.06). 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. Field survey within the limits of the existing structure were included in the scope of services at the time the hydraulic analysis was performed. Site topography was based on field survey provided by HMB on 02/19/2026, 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 single-span bridge with a total length of 29 ft and a 27 ft clear span with 3 ft wide abutments. The structure was modeled with an out-to-out width of 35.75 ft. The abutments consist of a timber vertical retaining wall and timber caps on piles with dimensions of 12"x14" for the caps and 12" diameters for the piles. The structure depth was modeled at 1.95 ft, measured from profile grade to the low girder.

Natural Conditions: The natural conditions were modeled by duplicating the existing terrain, removing SR 194, 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 2.94 ft and an overall length of 50 ft, with 3 ft wide abutments and a 44 ft clear span between faces of abutments. The proposed roadway profile matches existing per the Bridge Concept Report. The out-to-out bridge width was modeled as 35.25 ft. The bridge was modeled with vertical wall abutments.

Hydraulic Summary: The recommended structure results in a backwater of 3.15 ft, which is an improvement over the existing backwater of 3.99 ft but still exceeds TDOT's recommended 1 ft maximum per THM-03. The proposed structure has a freeboard of 3.92 ft, which satisfies the TDOT requirement of 1' minimum. The proposed structure also has improved velocities over the existing structure as described in the table below. While the proposed stream velocities are lower than existing, they are still high, therefore a detailed scour analysis should be performed during final design in accordance with THM-08.

Due to a steep channel bed slope and the terrain that is present to the northeast of the structure, the model primarily defaults to critical depth flow when selecting a subcritical flow regime. While this is conservative when setting the low chord elevation, it does not conservatively calculate stream velocities. Because XS 4 indicates a valid subcritical flow answer, the entire reach is not in supercritical flow. Therefore, a mixed flow regime was also considered for proposed, existing, and natural conditions to reasonably compare results. The subcritical flow regime was utilized to determine freeboard clearances.



Hydraulic Summary Table

	Existing	Proposed
Drainage Area	1.55 mi ²	
Design Discharge (50 Year)	1,930 cfs	
50 Year Water Surface Elevation ⁽¹⁾	346.96	
100 Year Discharge	2,160 cfs	
100 Year Water Surface Elevation ⁽¹⁾	347.28	
Span Arrangement	29'	50'
Finish Grade Elevation	355.44 (southeast end)	355.42 (southeast end)
Low Chord Elevation ⁽²⁾	353.49 (southeast end)	352.48 (southeast end)
Structure Depth	1.95 ft	2.94 ft
50 year Headwater Elevation ⁽³⁾	350.43	348.56
Freeboard Provided Above 50 Yr Headwater ⁽⁴⁾	3.06 ft	3.92 ft
Water Area Provided Below El. 346.96	146.19 ft ²	167.07 ft ²
50 Year Velocity	17.54 ft/s*	11.67 ft/s*
50 Year Bridge Backwater	3.99 ft @ El. 351.03	3.08 ft @ 350.19
Roadway Overtopping El.	348.10	348.10

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