



M E M O R A N D U M

DATE: July 30, 2026

TO: Tennessee Department of Transportation

FROM: Gresham Smith

RE: TDOT Timber Bridge Bundle #2 – Bridge 55 (PIN: 137109.13) 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 55 (Bridge over Overflow, PIN: 137109.13). 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. The modeling was conducted using Aquaveo SRH-2D within the SMS platform which allowed detailed simulation of flow and hydraulic conditions. Discharges were obtained from StreamStats mean discharge data. Site topography was based on field survey, and where available, Tennessee USGS 2015 LiDAR. Superstructure elevations were recorded from field survey data.

Existing Conditions: The existing structure was modeled as a three-span bridge with assumed span lengths of 18 ft, 17 ft, and 18 ft for an overall structure length of 51 ft and a clear span of 49 ft between front faces of the piles at the abutments. The structure was modeled with an out-to-out width of 28.5 ft. The piers consist of timber caps on piles with dimensions of 12"x12" for the caps and 12" diameter for the piles. The structure depth was modeled at 2.13 ft, measured from profile grade to the bottom of the beam.

Natural Conditions: The natural conditions were modeled by duplicating the existing terrain, removing SR 138, and removing 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 3.78 ft and a total length of 60 ft. The structure was modeled with a clear span of 54 ft and 3 ft wide abutments. The proposed roadway profile was increased 4.73 ft compared to existing condition. This structure depth is a deviation from the concept report and utilizes 30"x36" box beams instead of 33" box beams as the concept report proposed. Given the 60 total structure length, a box beam configuration can provide adequate strength and serviceability while also providing the necessary clearance as discussed below with the 4.73' proposed grade raise. The out-to-out bridge width was modeled as 29.25 ft. The model shows minor grading at the ends of the bridge to accommodate the longer bridge in the concept design. The hydraulic model represents clean conditions and does not account for debris accumulation or blockage within the bridge opening.

Hydraulic Summary: The proposed structure results in a backwater of 0.79 ft, which does not exceed TDOT's recommended 1 ft maximum per THM-03. The proposed structure has increased velocities compared to the existing and has a clearance of 2.82 ft above the proposed 50-year water surface elevation, which satisfies the 1' minimum TDOT requirement.



Hydraulic Summary Table

	Natural	Existing	Proposed
Drainage Area		23.7 mi ²	
Design Discharge (50 Year)		5,390 cfs	
Span Arrangement	-	18'-17'-18'	60'
Structure Depth	-	1.53'	3.78'
Out-To-Out Width	-	28.50'	29.25'
Finish Grade Elevation at Sta. 108+01.00	-	339.23'	344.04'
Low Girder Elevation at Sta. 108+01.00	-	337.70'	340.26'
Profile Grade Increase	-	-	4.81'
50 Year WSEL Under Bridge	-	337.32'	337.44'
50 Year Clearance Under Bridge	-	0.38'	2.82'
50 year WSEL-Upstream Face	337.28'	337.83'	338.07'
100 year WSEL-Upstream Face	337.51'	338.15'	338.42'
50 Year Freeboard at Upstream Face	-	-0.13'	2.19'
Water Area Provided Below 50 yr WSEL	-	312.69 ft ²	245.76 ft ²
50 Year Velocity	1.87 fps	2.15 fps	3.26 fps
50 Year Bridge Backwater	-	0.55 ft @ El. 337.83'	0.79 ft @ El. 338.07'
100 Year Discharge		6,110 cfs	
Roadway Overtopping El.	-	338.12'	338.37'

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