Memorandum

Date:	Wednesday, October 29, 2025
Project:	Placerville Drive at Hangtown Creek Bridge Replacement
To:	Jeff Elmensdorp and Anthony Boyes – Dewberry
From:	Wana Chiu and Chris Sewell – HDR
Subject:	**Construction Season Flow Bypass Analysis Technical Memorandum**

Introduction

The City of Placerville (City) proposes to replace the existing Placerville Drive Bridge crossing Hangtown Creek (Existing Bridge No. 25C0029) with a new bridge (Proposed Bridge No. 25C0152). The Placerville Drive at Hangtown Creek Bridge Replacement Project (Project) is located in Placerville within El Dorado County, approximately 0.7 miles (mi) west of the Placerville Drive undercrossing and 0.5 mi north of United States Highway 50.

The purpose of this memorandum is to present the results of the hydrologic and conceptual hydraulic analyses associated with the flow rates during the anticipated construction period. As part of the Project, the existing bridge would be removed; the new bridge would be constructed; and in-stream activities are anticipated. A temporary creek diversion system (TCDS) would be necessary for the construction of the Project.

Construction Season Stream Diversion Analysis

Construction is typically done in the summer months, when storm flows within the channel are less than they are during the wet season. The following assumptions, provided by Dewberry, are included in the construction season analysis:

- The in-water creek work window when the pipes would be in place is anticipated to be 1 May through 31 October.
- The temporary diversion pipes would be in place during one construction season.

With a construction duration of one season, the 2-year flow is typically used to design a temporary diversion structure. A 2-year recurrence interval has a 1-in-50 chance of occurrence in any given year.

The 2-year flow for the construction period was estimated for the Project. A Storm Water Management Model (SWMM) was developed to represent the Project watershed. The sources for the variables used in the model are listed in Table 1. Calibration for the SWMM was based on the watershed characteristics from the United States Geological Survey's (USGS) StreamStats and design flows that were used for the bridge replacement design for the Project. The 10-year, 25-year, 50-year, and 100-year flows were reported in the *Hangtown Creek Comprehensive Watershed Plan* study (RBF Consulting 2012). The 5-year and 2-year flows were extrapolated using a logarithmic

best fit of the 10-year, 25-year, 50-year, and 100-year flows. The statistical analysis tool in SWMM was used to calculate the 5-year peak flow rate, which was used to calibrate the model.

The watershed width variable was modified, and the statistical analysis, repeated until the resulting 5-year peak flow rate was similar to the extrapolated flow rate based on the RBF design flows. A summary of the SWMM and RBF peak flow rates is included in Table 2.

Table 1. Sources of SWMM Variables

Variable	Source
Watershed area	USGS StreamStats
Percentage slope	
Percentage impervious area	
Manning's n for impervious surfaces	EPA SWMM Manual[1] Table A.6: *Manning's n - Overland Flow*
Manning's n for pervious surfaces	
Storage depth for impervious surfaces	EPA SWMM Manual[1] Table A.5: *Depression Storage*
Storage depth for pervious surfaces	
Percentage of impervious area with no storage	SWMM default
Subarea routing and percentage routed	
Curve number	Natural Resources Conservation Service (NRCS) Web Soil Survey
Watershed width	Variable value used for calibration
Precipitation intensity time series	National Oceanic and Atmospheric Administration (NOAA) precipitation data

Note: [1] From the 2015 edition of the Environmental Protection Agency's (EPA) SWMM Manual

Table 2. Comparison of Peak Flows from SWMM and RBF

Return Period (year)	RBF Flow (cfs)*	SWMM Peak Flow (cfs)	Percentage Difference Between SWMM and RBF Flows
5	1,366	1,368	0%

Notes:
* The 5-year flow was extrapolated based on the RBF study
cfs = cubic feet per second

SWMM was used to determine the annual peak flow rates during the construction season (1 May through 31 October). Those annual peak flow rates were then used in the USACE Bulletin 17B Log Pearson Type III distribution analysis to calculate the 2-year construction season flow. The computed 2-year flow was estimated to be 341 cubic feet per second (cfs), and the computed 1-year flow was estimated to be 181 cfs. As previously stated, when the construction duration is one season, the 2-year flow is typically used to design a temporary diversion structure. However, preliminary analyses indicated that the construction of a pipe system large enough to pass the 2-year flow would be challenging due to the site constraints with the low existing bridge profile and pier. Therefore, the 1-year flow was also considered for the design of the TCDS.

Conceptual analyses were conducted using the United States Army Corps of Engineers (USACE) Hydraulic Hydrologic Engineering Center's River Analysis System (HEC-RAS) to estimate the number and sizes of pipes that would be required for a dewatering/bypass facility necessary to convey the calculated 2-year flow. HEC-RAS modeling software version 5.0.7 was used for the analysis to be consistent with the model version that was used for the hydraulic model for the bridge design (HDR 2025).

The hydraulic analysis for the proposed TCDS sizing was performed assuming circular and smooth pipe (plastic) with an average culvert slope of 0.4%. Calculations with multiple culverts included the culverts modeled at varying invert elevations following the existing grade. The culvert system was modeled as 105 feet (ft) long. As part of the design, coffer dams would also be utilized. The coffer dams were modeled as levees in the model spaced 15 ft apart and extending approximately 120 ft upstream of the temporary culverts (starting near the outlet of the upstream box culvert) and approximately 120 ft downstream of the temporary culverts.

The analysis shows that three 5-ft-diameter pipes would be required to pass the 2-year storm event but that the flow would be pressurized, which is not recommended. In addition, three 5-ft-diameter pipes would also be challenging to fit within the constraints of the construction footprint with the existing pier and the low existing bridge soffit. Therefore, the 1-year storm event was also analyzed. However, as previously stated, the 2-year storm event is typically used for TCDS sizing, and the 1-year storm event has a greater chance of occurrence.

Two 5-ft-diameter pipes would pass the 1-year storm event flow within the inlet top of culvert. A berm height of approximately 7 ft would be required (with at least 2 ft above the top of the highest pipe).

References

Environmental Protection Agency (EPA)

2015 Storm Water Management Model User's Manual. Version 5.1. EPA/600/R-14/413b. Accessed October 1, 2025. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100N3J6.TXT.

Federal Highway Administration (FHWA), United States Department of Transportation

2012 "Hydraulic Design of Highway Culverts." Hydraulic Design Series Number 5 (HDS 5). Publication No. FHWA-HIF-12-026. (Third Edition).

HDR

2025 *Bridge Design Hydraulic Study*. Placerville Drive at Hangtown Creek Bridge Replacement. Placerville, El Dorado County, California. Federal-Aid No. BRLS-5015(024). Existing Bridge No. 25C0029. Proposed Bridge No. 25C0152.

National Oceanic and Atmospheric Administration (NOAA)

No Date Precipitation 15 Minute Station Details. Name: PLACERVILLE DISP. PLANT, CA US. Network:ID: COOP:046964. Latitude/Longitude: 38.7311°, -120.8469°. Accessed October 29, 2025. https://www.ncdc.noaa.gov/cdo-web/datasets/PRECIP_15/stations/COOP:046964/detail.

Natural Resources Conservation Service (NRCS)

No Date Web Soil Survey. Accessed October 29, 2025. https://websoilsurvey.nrcs.usda.gov/app/.

RBF Consulting

2012 *Hangtown Creek Comprehensive Watershed Plan*.

United States Geological Survey (USGS)

2019 StreamStats. Accessed March 4, 2019. http://streamstats.usgs.gov/ss.