



Water Resources ♦ Flood Control ♦ Water Rights

TECHNICAL MEMORANDUM

DATE: October 21, 2019
TO: Lewis Bair, Reclamation District 108; Thad Bettner, Glenn-Colusa Irrigation District
PREPARED BY: Lee Bergfeld, P.E.
SUBJECT: Revised Tisdale Weir Notch Assumptions

The purpose of this technical memorandum is to document the revised analysis and data used to develop assumptions for modeling the Tisdale Weir with an operable notch in CalSim II and SacWAM. The construction of an operable notch in the Tisdale Weir (Tisdale Weir Project) was committed to as part of the Sacramento River Voluntary Settlement Agreement (VSA). The assumptions, described below, are based on the most current understanding of the Tisdale Weir Project and are appropriate for modeling the effects of the project as part of the VSA alternative. This technical memorandum is an update to our August 20, 2019 technical memorandum on the same subject.

The existing Tisdale Weir begins spilling at a flow of approximately 23,000 cubic feet per second (cfs), or at a stage of approximately 45.5 feet, in the Sacramento River at Wilkins Slough. Both CalSim II and SacWAM include assumptions that spills begin to occur at an average monthly flow greater than 18,000 cfs. The difference between the actual flow, and the model simulated flow when spills begin over the existing weir, is due to the monthly time-step in the models. A review of historical daily data for the period water year 1970 through June 2019 shows that when the Tisdale Weir spills, the average monthly flow in the Sacramento River at Wilkins Slough is typically 18,000 cfs or more, as shown in **Figure 1**.

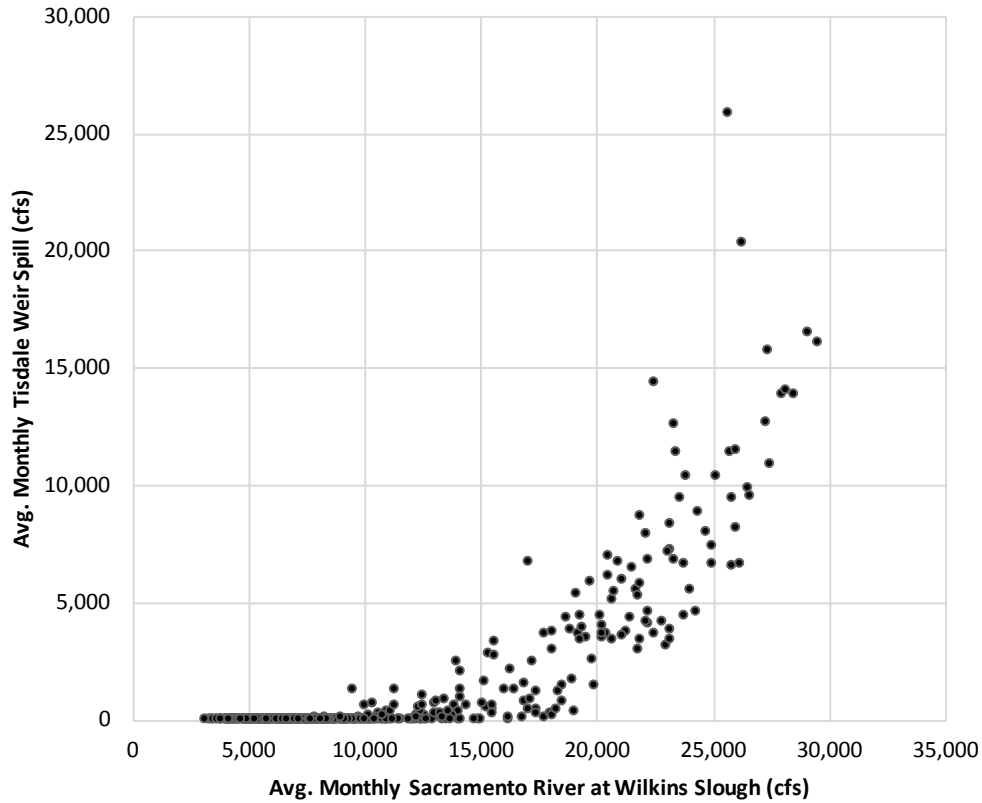


Figure 1. Average Monthly Observed Sacramento River Flow versus Tisdale Weir Spill

CalSim II and SacWAM assume approximately 75% of the flow above a monthly average flow of 18,000 cfs spills over the Tisdale Weir and into the Sutter Bypass. This assumption results in approximately the same volume and frequency of Tisdale Weir spill occurring in the model as historically observed.

A similar assumption was developed for spills through a notched weir. The estimated spill is based on the assumption that the notch would have a bottom elevation at 33 feet. An elevation of 33 feet is a daily flow of approximately 9,000 cfs in the Sacramento River at Wilkins Slough. The average monthly flow at Wilkins Slough was compared with the number of days for each month when the daily flow exceeded 9,000 cfs. These data are presented as **Figure 2**.

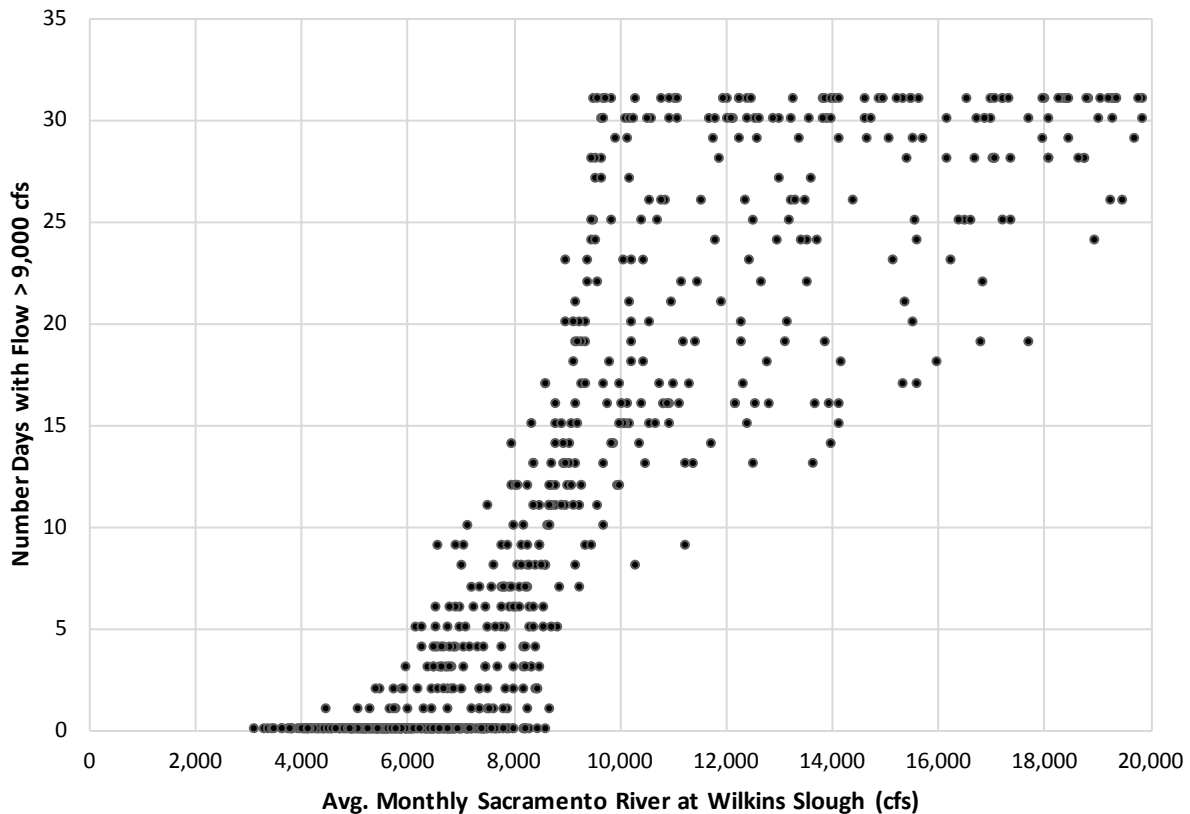


Figure 2. Historical Average Monthly Flow and Number of Days in Month when Flow Exceeds 9,000 cfs

Data illustrated in **Figure 2** show that for an average monthly flow of 9,000 cfs there are at least seven days within the month when the daily flow exceeded 9,000 cfs and water would spill through a notched Tisdale Weir.

A standard weir equation was used to estimate flow through a notched weir for a range of Sacramento River stages, assuming a 32-foot wide notch. This information was used to estimate a relationship between average monthly flow and weir spills, similar to the existing weir flow assumptions in CalSim II and SacWAM. Based on the analysis, it is estimated that approximately 45% of the Sacramento River flow greater than 9,000 cfs would spill through a notch.

The most current plans for the Tisdale Weir Project include an operable gate to provide some measure of flow control. This will allow the notch to be operated to manage flow into the Sutter Bypass. The preliminary operations plan would target approximately 3,000 cfs into the bypass based on preliminary estimates of habitat in the lower Sutter Bypass. A flow of approximately 3,000 cfs could be provided through the notch and over the existing weir when average monthly Sacramento River flows are between approximately 15,500 cfs and 22,000 cfs. The revised relationship between Sacramento River flow and spill through and over a notched Tisdale Weir, operated to target 3,000 cfs, is illustrated in **Figure 3**. **Figure 3** also includes the initial relationship between Sacramento River flow and a notched Tisdale Weir from our August 20, 2019 technical memorandum for the purpose of comparison.

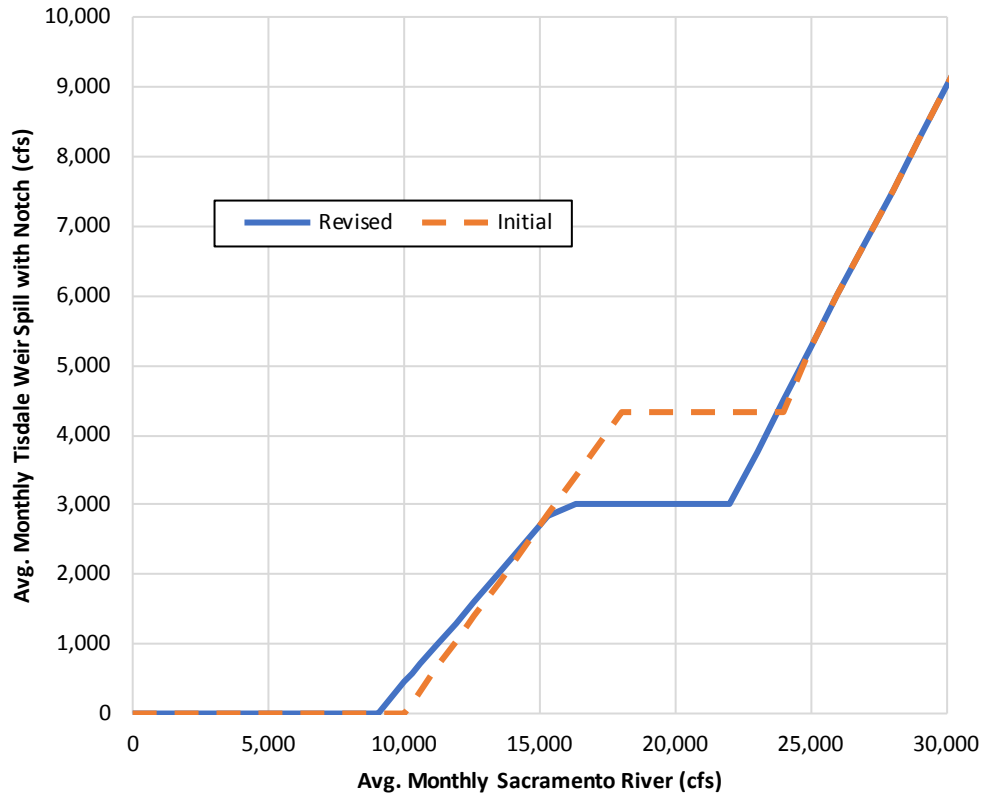


Figure 3. Sacramento River Flow versus Notched Tisdale Weir Spill for Modeling Purposes

The current plan for when the Tisdale Weir Project would open/operate the notch is from December 1 through March 15 each year. The revised relationship illustrated in **Figure 3** should be applied to model the Tisdale Weir Project in the VSA alternative in CalSim II and SacWAM for the December 1 through March 15 period, this includes applying a day-weighted approach for the month of March. The assumptions for the existing Tisdale Weir that are already in both models should be used for the period of March 16 through November 30 in the VSA alternative.