Technical Memorandum

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HSI Hydrologic Systems
936B 7th Street, Suite 303
Novato, California 94945
Phone:(415) 454-6056
Fax: (415) 454-6057

To: **Jeanne M. Zolezzi, Herum Crabtree & Suntag,**
S. Dean Ruiz, Esq., Harris, Perisho & Ruiz

From: **Tom Burke, Hydrologic Systems**

Subject: **WSID Diversion Analysis**

Effect of Withdrawal At The WSID Point of Diversion

Method of Analysis

Using the DSM2 model developed by DWR (DWR 2013), we analyzed the impact is on Old River as a result of diversions at the West Side Irrigation District's (WSID) Point of Diversion (POD) of 8 cubic feet per second (cfs) or 14 cfs. The location of the WSID POD is shown in Figure 1.

The diversion was analyzed by developing 3 separate DSM2 model scenarios. The first represented a condition where no diversion existed at the WSID POD. The second and third scenarios were DSM2 model runs with an applied 8 cfs and 14 cfs diversion at the POD respectively. The difference in water surface elevation between the no-diversion scenario and the 8 and 14 cfs diversion scenarios was evaluated to determine the effect that each diversion had on the water in the river.

The DSM2 model was run from January 2012 through the end of the 2015 water year. The water surface elevation comparison was conducted for the June 1 through June 15 period. The Old River at Tracy (ORT) Barrier was in place during this period. The location of the ORT Barrier to the WSID diversion point is shown in Figure 1. The DSM2 channel network, showing the nodes adjacent to the diversion point are also shown on Figure 1.

The Old River Barrier is part of the South Delta Barriers Project, which was initiated to evaluate the effects that flow barriers may have on mitigating the water level and quality impacts that result from the SWP and CVP export pumping operations. The purpose of the barriers is to increase the "irrigation season" water levels and hopefully water quality, in areas of the Delta that have been impacted by pumping from the State and Federal water projects. The ORT barrier is typically installed in the spring and removed in the fall when water flow in the Delta is at its lowest.

WSID CDO/BBID ACL
WSID0125

Figure 2 is a plot of the Sacramento River Unimpaired Runoff. This index is a good indicator for evaluating historic wet and dry conditions in the Delta. As can be seen in the figure the 2014 and 2015 water years, although not the driest years, were among the driest over the 94 year period of record.

Stage Response To The Diversion

For the 2015 period, based on the results of the DSM2 model, the 14 cfs diversion reduced the water level in the channel at the diversion point by an average of average of 0.005 ft, with a maximum difference of 0.008 ft. The 8 cfs diversion reduced the water level in the channel by an average of 0.003 ft. and a maximum of 0.005 ft. A reduction in the water surface elevation for anything less than 0.01 ft. is essentially zero. This is below the accuracy level for the model to accurately compute, and impossible to accurately measure in the field without taking extraordinary measures.

Figure 3 is a close-up plot of the river stage at the WSID POD comparing the no-diversion scenario to the 14 cfs diversion scenario in early June 2015. The no-diversion scenario is plotted beneath the 14 cfs-diversion scenario so that both lines can be seen. As can be seen in the figure, the water levels are basically indistinguishable.

Figure 4 shows the water surface at the WSID POD for the no-diversion and the 14 cfs diversion scenario. This plot shows the full depth of the4 channel. The channel bottom in this reach is approximately -6.5, providing for a rough depth of 10 feet. Given a depth of 10 feet, the reduction in water surface due to the two diversion scenarios of less than one hundredth of a foot is insignificant.

As can be seen from the results, the diversion of 14 cfs and 8 cfs had no impact to the available water in the channel. Therefore, I conclude that, for these diversion rates, there would have been no impact to the available water in the channel during 2015 and the subject time frame relative to the draft CDO.

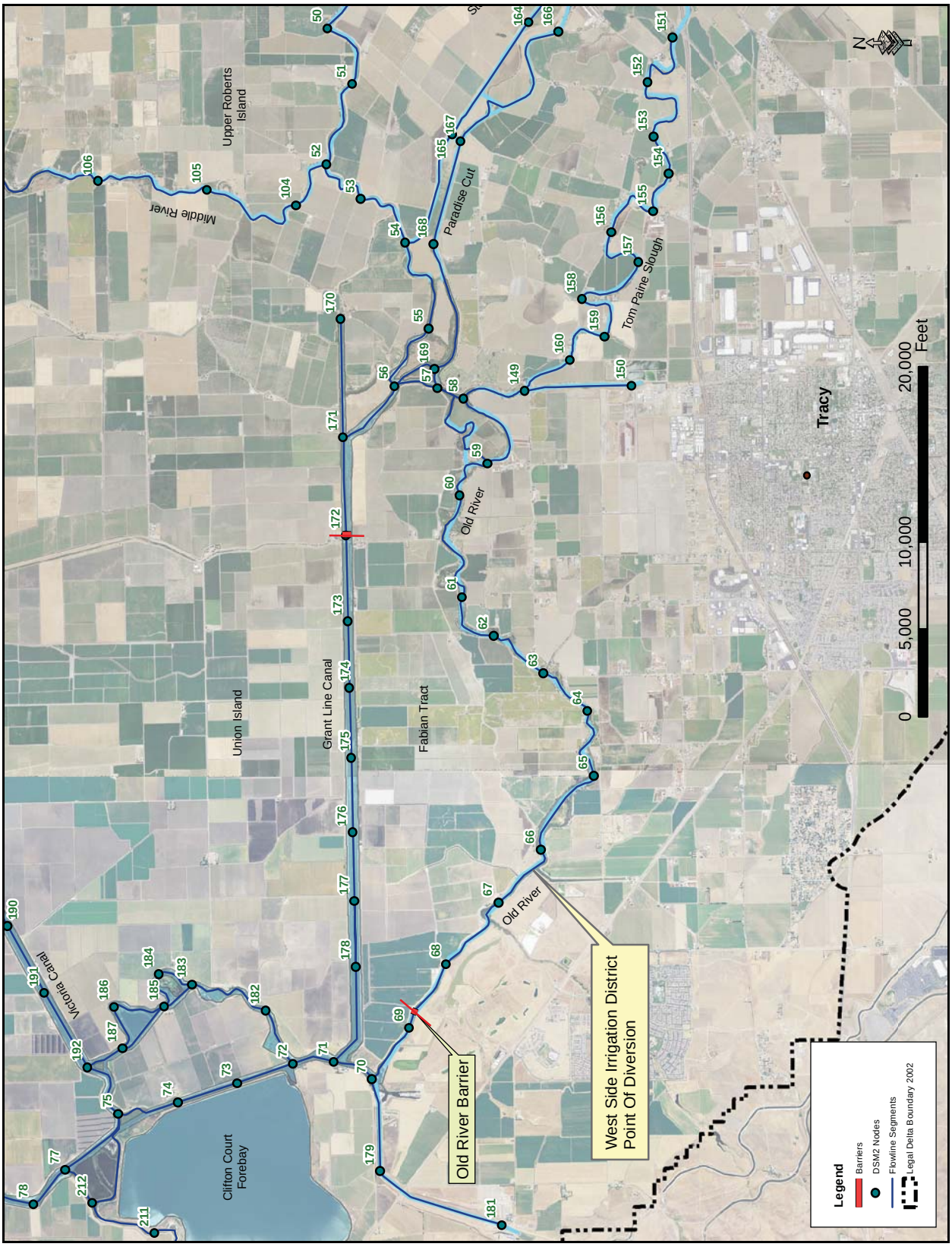

Figure 1 Location of WSID Diversion Point With DMS2 Model Node Locations

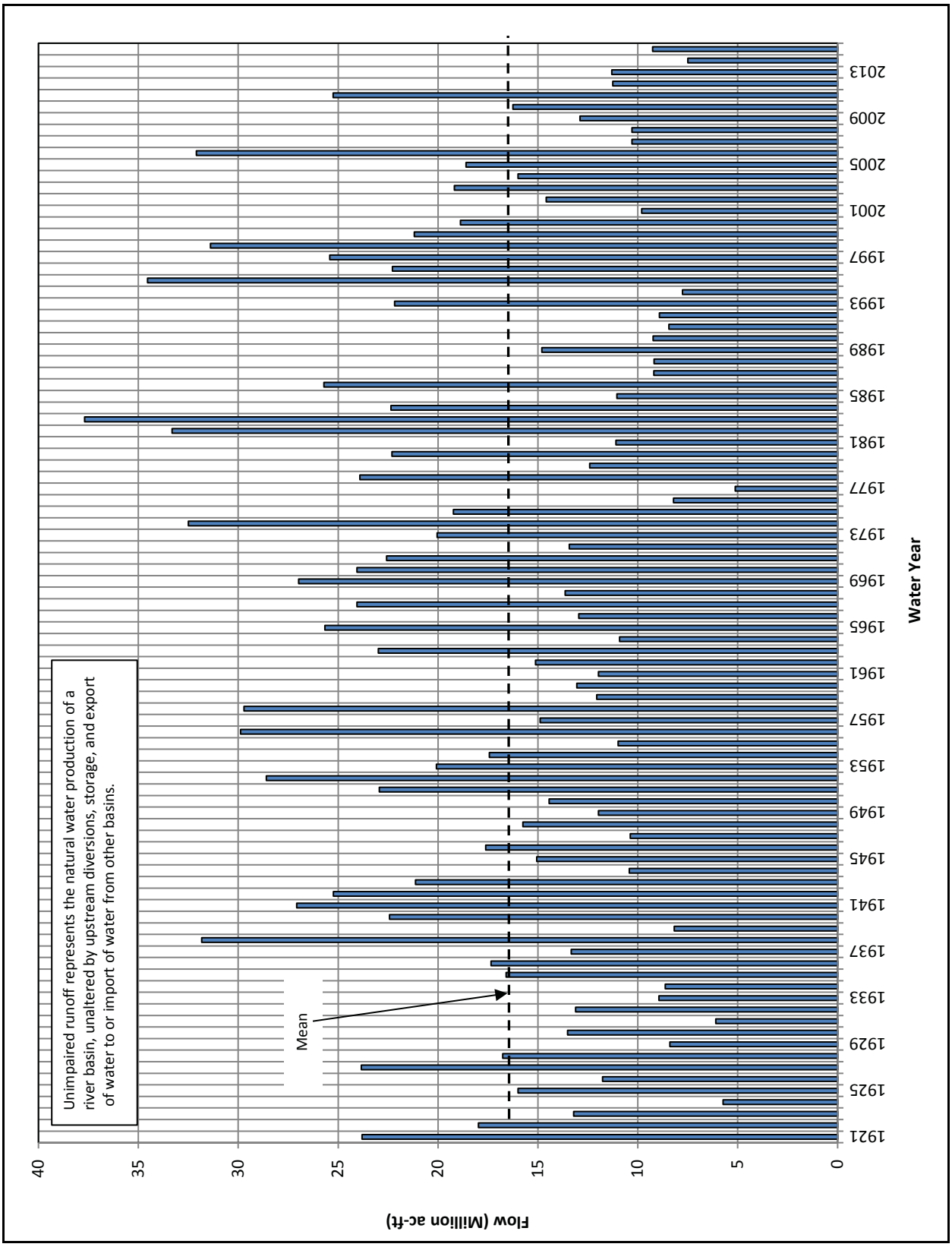

Figure 2 Sacramento River Unimpaired Runoff.

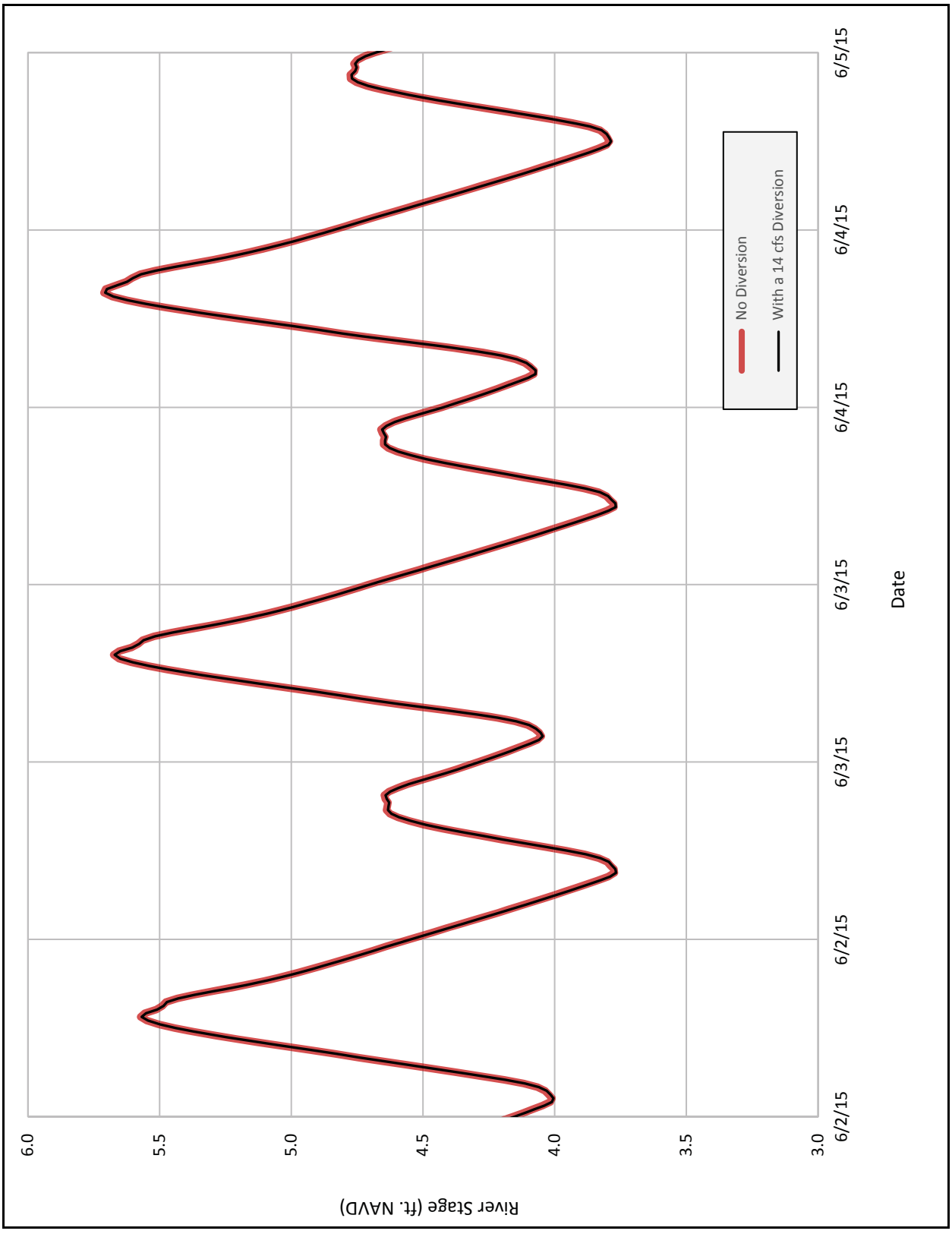

Figure 3 Detail of the River Stage at the WSID Diversion Point With and Without the 14 cfs Diversion.

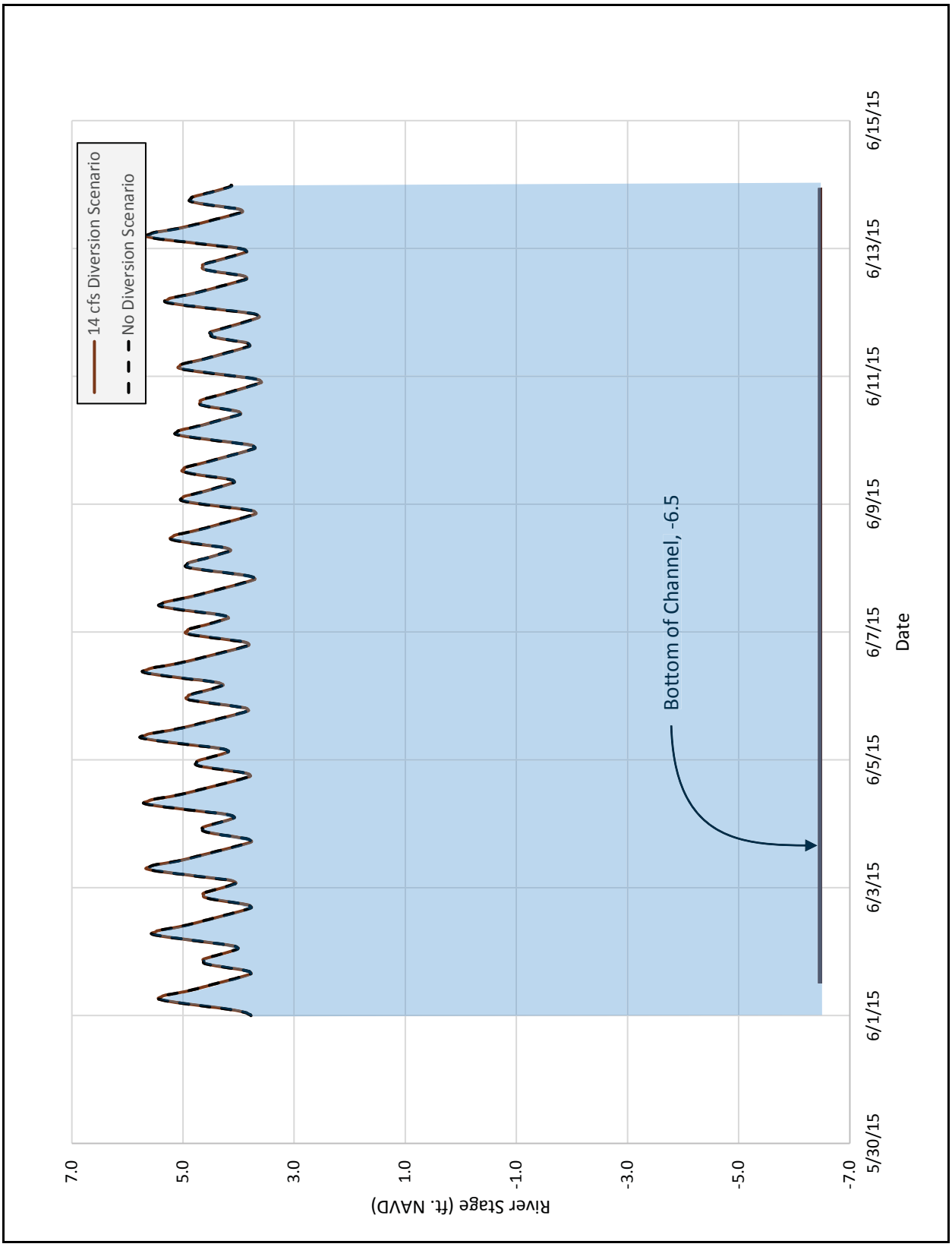

Figure 4 Comparison of the No-Diversion Water Surface at the WSID POD with the Water Surface Resulting From a 14 cfs Diversion.

Flow Response To The Diversion

It is important and necessary to emphasize how the Delta conditions are unique and so very different than the normal conditions evaluated in other streams. In those streams and rivers upstream of the Delta, diversions will necessarily result in a decrease in the flow of the stream which decreases the flow of water and the water level downstream of the diversion point. Absent any sort of substantial accretions to the stream not associated with the diversion, the effect of the diversion is to impact the supply of and perhaps the ability to divert by down stream interests.

In the Delta that is not the case. Because the Delta is an interconnected network of channels, a diversion from one point creates a small depression in the immediate area of the diversion. This depression is then replenished by water flowing towards that depression. The diversion simply, but slightly alters the direction or rate at which the ever-present supply refills the depression. As described above, given the vast quantity of water in the Delta itself, and the effect of the tides reversing the normal concept of upstream and downstream four times a day, small local diversions have no meaningful, and often no measurable effect on the supply of any neighboring diverter or the ability to divert from nearby locations.

If you have any questions about the above analysis, please don't hesitate to call me.

Sincerely,

Thomas K. Burke

Thomas Burke P.E.
Principal