RESPONSE AND ERRATA IN RESPONSE TO THE NATIONAL MARINE FISHERIES SERVICE'S (NMFS) JULY 23, 2010 LETTER REGARDING THE WATER YEAR (WY) 2011 INTERIM FLOWS PROJECT (PROJECT) BIOLOGICAL ASSESSMENT (BA)

In their July 23, 2010 letter, the NMFS provided five comments and requested additional information related to the WY 2011 Interim Flows Project BA. The five comments are provided below along with Reclamation's response to each comment. In response to the NMFS concerns, Reclamation also be adding information and/or making revisions to the WY 2011 Interim Flows Project BA. These additions and revisions are included below in the form of a series of errata. Two additional to revisions to the WY 2011 Interim Flows Project BA are added for Interrelated and Interdependent Effects and Temperature Effects of the Proposed Action based on input from NMFS' staff.

Item 1 – Recirculation and Recapture

Comment:
There must be more specific discussion regarding recirculation and recapture including recapture rates and timing, and which facilities will be utilized.

Estimated ranges at each facility are acceptable. This information must be in greater detail than what is in the BA, and must be consistent with Reclamation's Petitions to the State Water Resources Control Board for WY 2011 Temporary Transfer Permitted Applications 234, 1465, and 5638, if this consultation is intended to cover those petitions related to this project.

If screened facilities will be utilized for recapture, the following details for each specific screened diversion must be presented: whether or not the screens meet NMFS criteria, the current pumping capacity and current use, how proposed recapture would change current operations, if the proposed recapture falls within their project take limits, if there are existing biological opinions(s) for the facilities, and if any additional take is expected. Describe if the two proposed unscreened diversions are covered under any exiting biological opinions(s). If so, describe how of if the proposed recapture falls within their project and take limits. In addition, justification must be provided within the analysis why there will be no take of CV steelhead. The species account in the BA states that CV steelhead are present within the system at all times of the year, and yet, an assumption is made that no take would occur at the unscreened diversions. The information provided does not support this assumption.

If the Proposed Action will recapture water from upstream locations within the Restoration Area (i.e., Mendota Pool), how will needed monitoring occur in the lower reaches (3, 4 and 5). How will this purpose of the Project be fulfilled?

If, as stated in the project description, there is no Vernalis Adaptive Management Program (VAMP) flow contribution from the tributaries, contributions from the Project could allow less water to be released from New Melones Reservoir to meet Delta water quality objectives, set forth by the State Water Resources Control Board Decision-1641 and the 1995 Bay-Delta Water

Quality Control Plan. Would this water be considered part of the recaptured flows? The present analysis does not consider this potential effect on how such conditions would interface with the New Melones Dam operations covered by the NMFS Biological Opinion for the Long-term Operations Criteria and Plan (Operations BO) for the Central Valley Project (CVP) and State Water Project (SWP).

Response:
Additional information regarding the possible timing for recapture is provided below along with errata to the WY 2011 Interim Flows Project BA. In summary, the Proposed Action was modified to identify that water would only be diverted from the West Stanislaus Irrigation District's diversion and the Patterson Irrigation District's diversion with authority to take listed species under the Endangered Species Act. Additional clarity was added to the Proposed Action for Patterson Irrigation District's diversion to explain that the facility would only be used upon the installation of an operationally-compliant fish screen at the facility. The BA is revised, as specified below.

Section 3.3.2, Recapture and Recirculation
Page 3-13, Section is Removed and Replaced with the Following:
The Proposed Action includes potentially recapturing[1] WY 2011 Interim Flows, to the maximum extent possible, at locations along the San Joaquin River and/or in the Delta, consistent with and limited by existing operating criteria, prevailing and relevant laws, regulations, BO, and court orders in place at the time the water is recaptured. Although different terminology is used in different places thought the WY 2011 Interim Flows BA, all references to increases in exports at the Jones Pumping Plant and Banks Pumping Plant as a result of the Project would fall within the allowable pumping criteria of the 2009 NMFS Operations BO and the 2008 USFWS' Operations BO in place at the time of pumping.

Under the Proposed Action, the water released under WY 2011 Interim Flows that is available for recapture and recirculation[2] is estimated to equal to the amount of water that reaches the Mendota Pool at the downstream end of Reach 2B (e.g., the first location where water can be recaptured and recirculated). Flows that reach the Mendota Pool are not the same as those that reach the head of Reach 2B due to channel losses in Reach 2A. Therefore, the overall quantity of water available for recapture and recirculation is somewhat lower due to these losses. The estimated maximum water released for WY 2011 Interim Flows that could be available for recapture and recirculation under the Proposed Action is shown in Table 3-5b. This table has been updated from the WY 2010 to reflect the current understanding of Interim Flows implementation.

The furthest downstream location where WY 2011 Interim Flows could be recaptured would be at the Jones and Banks pumping plants. The Proposed Action includes potential recapture of Interim Flows at several diversion including: facilities downstream of the Restoration Reach in

[1] For the purposes of this document, recapture is defined as the point of rediversion of Interim Flows downstream of Friant Dam.

[2] For the purposes of this document, recirculation is defined as the conveyance of recaptured water to the Friant Division long-term water contractors.

the Delta, and in the San Joaquin River at the Banta-Carbona Irrigation District facility and the West Stanislaus Irrigation District facility downstream of the Stanislaus River confluence, and at the Patterson Irrigation District facility between the Tuolumne and Merced River confluences; and, facilities within the Restoration Reach including the East Bear Creek Unit of the San Luis National Wildlife Refuge (East Bear Creek Unit) in Eastside Bypass Reach 3, the Lone Tree Unit of the Merced National Wildlife Refuge (Lone Tree Unit) in Eastside Bypass Reach 2, Sack Dam at the downstream end of Reach 3, and the Mendota Pool at the downstream end of Reach 2B. WY 2011 Interim Flows recaptured along the San Joaquin River may provide deliveries in lieu of Delta-Mendota Canal (DMC) supplies. Recirculation would be subject to available capacity within CVP/SWP storage and conveyance facilities, including the Jones and Banks pumping plants, California Aqueduct, DMC, San Luis Reservoir, and related pumping facilities, and other facilities of CVP/SWP contractors. Available capacity is the capacity that is available after satisfaction of all statutory and contractual obligations to existing water service or supply contracts, exchange contracts, settlement contracts, transfers, or other agreements involving or intended to benefit CVP/SWP contractors served water through CVP/SWP facilities. Under the Proposed Action, recaptured water would be exchanged for a like amount of CVP water and/or would be recirculated and held in storage in San Luis Reservoir. Reclamation is working with the Friant Division long-term water contractors to prepare a separate Environmental Assessment to determine possible mechanisms to either exchange or deliver to the Friant Division long-term contractors recaptured water stored in San Luis Reservoir.

Table 3-5a provides an overview of each recapture location including the estimated range for recapture, estimated timing of recapture, and whether or not the facility is screened. It is important to note that at this time, the exact recapture rates, amounts, and timing at each facility are not known and would depend upon a variety of conditions, including water supply demand, operations of other facilities, impacts to endangered species, potential for seepage, and real time management strategies. Therefore, the estimated range for recapture at each facility is from zero to either the estimated maximum amount of Interim Flows during the spring pulse time at the facility or the estimated facility capacity. Additionally, to maintain the most flexibility in implementing the Project in order to respond to study needs and to avoid potential seepage and endangered species impacts, if any should arise based on Interim Flow monitoring, the Project includes all of the potential points of diversion in Table 3-5a. However, not all points may be used, nor is there any priority in which they would be used.

Table 3-5a. Overview of the Recapture Locations under the Proposed Project

Facility	Estimated Recapture Range (cfs)[1,2]	Estimated Recapture Timing[3]	Facility Screened
Facilities within the Restoration Area			
Facilities within the Mendota Pool			
Main Canal	0 – 1,500	During Interim Flows	No
Outside Canal	0 – 300	During Interim Flows	No
Columbia Canal	0 – 200	During Interim Flows	No
Helm Ditch	0 – 10	During Interim Flows	No
Firebaugh Canal Water District Canal	0 – 300	During Interim Flows	No
Arroyo Canal	0 – 800	During Interim Flows	No
Lone Tree Unit of the Merced NWR	0 – 20	During Interim Flows	No
East Bear Creek Unit of the San Luis NWR	0 –<60	During Interim Flows	No
Facilities downstream of the Restoration Area			
Patterson Irrigation District	0 – 195	During Interim Flows[4]	No
West Stanislaus Irrigation District	0 – 262	During Interim Flows[5]	No
Banta-Carbona Irrigation District	0 – 204	During Interim Flows	Yes
Jones Pumping Plant	0 – 1,300	During Interim Flows	Yes
Banks Pumping Plant	0 – 1,300	During Interim Flows	Yes

Note: Additional points of rediversion in Reclamation's petitions to the State Board allow for routing of Interim Flows into and through the Eastside and Mariposa bypasses.

cfs cubic feet per second

1. Estimated range for recapture at each facility is from zero to either the estimated maximum amount of Interim Flows during the spring pulse time at the facility or the estimated facility capacity in the event that the spring Interim Flows at the facility are estimated to be greater than the facility capacity.
2. Assumes a Wet Year Type. All based on Background Report maximum capacity except refuges.
3. Dependent on other regulations (i.e. pumping restrictions, etc).
4. WY 2011 Interim Flows may be diverted after the proposed fish screen is constructed and operationally compliant.
5. WY 2011 Interim Flows would only be diverted with authority to take listed species under the Endangered Species Act.

Implementing the Proposed Action could increase flows entering the Delta from the San Joaquin River. Delta export facilities would continue to operate consistent with existing operating criteria, and prevailing and relevant laws, regulations, BOs, and court orders in place at the time the water is recaptured. Water recirculation via the CVP/SWP facilities would be possible using south-of-Delta facilities. No additional agreements would be required to recapture flows in the Restoration Area. However, recirculation of recaptured water to the Friant Division could require mutual agreements between Reclamation, DWR, Friant Division long-term contractors, and other south-of-Delta CVP/SWP contractors. Reclamation would assist in developing these agreements. As previously described, recirculation would be subject to available capacity within

CVP/SWP storage and conveyance. Furthermore, implementation of the WY 2011 Interim Flows would remain consistent with the RPAs as required by the USFWS Delta Smelt BO of the Operating Criteria and Plan for the Continued Operations of the Central Valley Project and State Water Project (USFWS Operations BO) (USFWS 2008) and the NMFS Biological and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS Operations BO) (NMFS 2009), respectively or as amended by court action[3]. Continued implementation of the RPAs would avoid jeopardy of protected species, including Central Valley steelhead on the Stanislaus River and Delta, and spring- and winter-run Chinook salmon, green sturgeon, and Delta smelt in the Delta.

Recaptured water available for transfer to Friant Division long-term contractors would range from zero to the quantity of water under Interim Flows that reaches the Mendota Pool and would vary based upon the water year type. During a Critical-Low water year, the quantity of water available for recapture and transfer to the Friant Division long-term contractors would be zero, because there are no WY 2011 Interim Flow releases under this water year type. During Wet years, the water available for recapture and transfer to the Friant Division long-term contractors would range between zero and 321 thousand acre-feet (TAF) (as shown in Table 3-5b). Reclamation would identify actual delivery reductions to Friant Division long-term contractors associated with the release of WY 2011 Interim Flows.

Screened Diversions

As described in Table 3-5a, the Proposed Action would potentially utilize three existing screened recapture facilities downstream of the Merced River confluence. These are the Banta-Carbona Irrigation District's (BCID) facility on the San Joaquin River, the CVP Jones Pumping Plant, and the SWP Banks Pumping Plant. The BCID facility is described in more detail below. All proposed recapture at the facilities would occur within the facilities' operating criteria, including Biological Opinions in place at the time of recapture and no additional take would occur beyond that already allowed. Any increase in diversions at these facilities would occur within the allowable diversion rates in the applicable Biological Opinion.

BCID facility on the San Joaquin River is located at River Mile 63.5, about five miles north of Vernalis. The facility is the primary source of water for BCID and has been operational for approximately 5 years. The BCID holds water rights at this location and uses all of its pre-1914 water rights in order to irrigate lands within the district. The BCID has a contract with Reclamation for 20,000 acre-feet (AF)/year of CVP water. CVP water is used as a supplemental supply to the district's pre-1914 water supply for agricultural purposes (Reclamation 2010). BCID's current size is 14,000 acres and its annual water needs are 47,000 AF (Reclamation 2010). The BCID facility includes a 204 cubic feet per second (cfs) fish screen facility. The facility was constructed prior to NMFS' most recent fish screen design criteria. It consists of a vee-shaped screen located within the leveed canal and 18 panel screens installed vertically in a vee configuration with 9 panels to a side. Each panel is 6 feet, 1 inch tall and 11 feet and 6 inches wide. The fish pass the screens and are pumped through a Hidrostal fish pump to the fish return pipeline on the north levee. This pipeline returns fish back to the river downstream of the diversion point. NMFS's October 26, 2000 Biological Opinion, Proposed Fish Screen and Fish

[3] If conditions change as challenges to the USFWS and NMFS Operations BOs move forward, Reclamation will release WY 2011 Interim Flows in compliance with the regulations and legal requirements in place at that time

Bypass Facility at the Banta-Carbona Irrigation District Canal (NMFS 2000) authorizes incidental take of steelhead as a result of the operation of the BCID facility based on the percent of flow diverted into the facility. The proposed recapture at this facility would change the current operations in that BCID would divert some of the Project's flows at its facility in lieu of deliveries via the Delta-Mendota Canal. All proposed recapture would occur within the facilities operating criteria, including operations under the facilities' 2000 Biological Opinion issued by NMFS. No additional take would occur beyond that currently allowed at the facility.

Unscreened Diversions

Recapturing water downstream of the Restoration Reach at the unscreened diversions could increase fish entrainment risks. Both the Patterson Irrigation District and West Stanislaus Irrigation District facilities are currently unscreened. With regard to the Patterson Irrigation District facility, a fish screen that will meet NMFS and CDFG criteria for protecting salmonids is to be installed and ready for service in spring 2011. Recapture at Patterson Irrigation District facility would occur only after the screen is operationally compliant with NMFS criteria. The West Stanislaus Irrigation District facility is currently unscreened and will remain unscreened during WY 2011. This facility would only be used for the diversion of WY 2011 Interim Flows with authority to take listed species under the Endangered Species Act. Such authority is not being proposed to be provided as part of this BA, but may be proposed at some time in the near future as a separate project.

All recapture actions will be conducted in a manner consistent with Federal, State and local laws, and any agreements with downstream agencies, entities, and landowners. No additional steelhead take beyond that currently allowed or allowed at the time of recapture, if different from current take levels would occur at these facilities.

As described in the BA (Section 1.2), the purpose of the Interim Flows Project is to collect relevant data concerning flows, temperatures, fish needs, seepage, recirculation, recapture, and reuse. The Proposed Action includes the conveyance of Interim Flows through the upper San Joaquin River system from Friant Dam to at least the Merced River confluence. However, Reclamation recognizes that for a variety of reasons, including the need to avoid seepage and potential endangered species impacts (reaches 3, 4, 5), all or a portion of the flows may need to be recaptured before flows reach the confluence of the Merced River (i.e. Mendota Dam and Sack Dam). Although this has the potential to reduce the amount of data collected in the lower reaches (reaches 3, 4, and 5), it would not inhibit the ability to collect data in the upper reaches (reaches 1 and 2) where spawning habitat for reintroduced salmon would be present. The purpose of the Project would be fulfilled as valuable data would continue to be collected in the upper reaches.

New Melones Releases and Recaptured Interim Flows

Water recaptured under the Proposed Action would be limited to the amount of water released from Friant Dam under the Proposed Action minus losses. Water to be released from New Melones Reservoir to meet Delta water quality objectives is not part of the Proposed Action and would not be considered part of the recaptured flows.

Table 3-5b.
Estimated Maximum Water Available for Recapture and Recirculation Under the Proposed Action

Start Date	End Date	Example Interim Flow and Riparian Release Amount at the Head of Reach 2B (cfs)[1]	Riparian Release Amount at Head of Reach 2B (cfs)	Interim Flows at Mendota Pool Available for Transfer (cfs)
Oct. 1, 2010	Oct. 31, 2010	115	5	110
Nov. 1, 2010	Nov. 6, 2010	475	5	470
Nov. 7, 2010	Nov. 10, 2010	475	5	470
Nov. 11, 2010	Dec. 1, 2010	155	5	150
Dec. 2, 2010	Jan. 31, 2011	0[2]	5	0
Feb. 1, 2011	Feb. 28, 2011	175	5	170
Mar. 1, 2011	Mar. 15, 2011	285	5	280
Mar. 16, 2011	Mar. 31, 2011	1,225	5	1,220
Apr. 1, 2011	Apr. 15, 2011	1,300	5	1,295
Apr. 16, 2011	Apr. 30, 2011	1,300	5	1,295
May. 1, 2011	Jun. 30, 2011	1,300	5	1,295
Jul. 1, 2011	Aug. 31, 2011	45	5	40
Sep. 1, 2011	Sep. 30, 2011	65	5	60
Total amount of Interim Flows available for Recapture and Recirculation (Acre-feet)				**321,055**

1. Includes 5 cfs of riparian releases that must be maintained past Gravelly Ford.
2. No additional releases are to occur between Dec. 2 - Jan. 31

Key: cfs = cubic feet per second
TAF = thousand acre-feet
WY = Water Year

Section 8.0, References
The Following are added to the References Section:

United States Department of the Interior, Bureau of Reclamation (Reclamation). 2010. Draft Environmental Assessment - Five-year Warren Act Contracts for Banta-Carbona Irrigation District, Byron-Bethany Irrigation District, Patterson Irrigation District, and West Stanislaus Irrigation District. EA-09-156. January 2010. Available online at: http://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=5201 (Accessed July 22, 2010)

National Marine Fisheries Service (NMFS). 2000. Biological Opinion and Essential Fish Habitat Conservation Recommendations for the Proposed Fish Screen and Fish Bypass Facility at the Banta-Carbona Irrigation District Canal. October 26.

Item 2 – Hills Ferry Barrier (HFB) Operation and Effects on CV Steelhead

Comment:
In the BA, effects to adult CV steelhead from the Project are discounted due to the operation of the HFB. The analysis must be expanded beyond the time the HFB is in operation to include: (1) impacts due to delayed spawning in the Merced River or other tributaries as a result of straying into the lower Restoration Area; and (2) impacts to CV steelhead in the spring when the barrier is not in operation. There must be clarification in the effects analysis (page 6-4), where the argument states that the HFB is not operated in the spring time due to few juvenile CV steelhead being present upstream of the Merced River confluence, when in fact, the HFB is not operated due to high spring flows that exceed the barrier's capacity.

The area analyzed within the effects analysis for CV steelhead is not consistent with the action area. The analysis must include effects of the Project on the action area, including the San Joaquin River tributaries and the Delta.

Response:
Additional information regarding the operations of the Hills Ferry Barrier during the WY 2011 Interim Flows Project is provided as errata to the WY 2011 Interim Flows Project BA below. This information further clarifies the Proposed Action, the timing of Interim Flows in relation to the operation of the Hills Ferry Barrier, and the inclusion and implementation of a monitoring plan for Central Valley steelhead during the spring period, when the barrier is not operated. The WY 2011 Interim Flows Project BA has also been revised to remove language that refers to juvenile steelhead straying into the San Joaquin River.

Section 4.3.1, Aquatic Habitat Types, Page 4-4
The Following Language is added after the First Two Paragraphs in the Section:
The Hills Ferry Barrier is a type of resistance weir commonly used to exclude and/or trap anadromous fish in rivers. This barrier consists of panels aligned perpendicular to the flow of the river with evenly spaced pipes that allow water, small fish, and particles to pass but prevent larger anadromous fish such as Chinook salmon from passing upstream. Operated by DFG since 1992, the Hills Ferry Barrier is typically installed in mid-September and operated until it is removed in early December. DFG currently operates the Hills Ferry Barrier near the town of Newman, approximately 300 feet upstream from the confluence with the Merced River (in Reach 5).

The barrier's main purpose is to redirect upstream-migrating adult fall-run Chinook salmon into suitable spawning habitat in the Merced River and prevent migration into the mainstem San Joaquin River upstream, where conditions are currently unsuitable for Chinook salmon. Central Valley steelhead migrate during fall and winter in a manner similar to migration by fall-run Chinook salmon, and they have a similar body type; therefore, maintenance of the Hills Ferry Barrier would continue for the purpose of redirecting Chinook salmon during the fall WY 2011 Interim Flow period, through December 1, 2010, when the barrier is removed. The barrier is expected to be equally effective in redirecting any Central Valley steelhead.

Section 6.1.1, Aquatic Species
Page 6-4, Central Valley Steelhead DPS, San Joaquin River Upstream from the Merced River Confluence
Entire Section is Removed and Replaced with the Following:

Central Valley Steelhead DPS

The geographic range and designated critical habitat of Central Valley steelhead overlap the Action Area in the south and central Delta, in the mainstem San Joaquin River downstream of the Merced River confluence, and in the San Joaquin River tributaries.

San Joaquin River Flow Upstream from the Merced River Confluence. Implementing the WY 2011 Interim Flows would increase flows in the section of the San Joaquin River from Friant Dam to the Delta. Segments of the San Joaquin River upstream from the Merced River were often dry prior to WY 2010 Interim Flows. The WY 2011 Interim Flows would occur from October 1 through December 1, 2010, and begin again on February 1, 2011.

Increased flows in the San Joaquin River downstream from the Merced River confluence should improve overall conditions for migrating adult and juvenile steelhead with the potential to improve water quality, and provide slightly higher water velocities. Improved conditions would likely reduce or prevent migration delays by both adults and juveniles.

It is not anticipated that WY 2011 Interim Flows would affect the migratory behavior of steelhead. Historic streamflow conditions upstream from the Merced River confluence during the spring averaged 119 cfs to 13,050 cfs, with peak flows reaching 59,000 cfs in 1997 under flood conditions, when flood flows were released from Friant Dam. During nonflood conditions in WY 2011, Interim Flows could increase flows by an average of up to 220 cfs at this location beginning on February 1, 2011. The average annual flows under the Proposed Action are within 7 percent of the average flow expected at this time and location under existing conditions. This small increase is not anticipated to trigger any change to Central Valley steelhead migration patterns in the San Joaquin River basin. Also, WY 2011 Interim Flows would not be released if natural flows approach channel capacity.

Increased flows upstream from the Merced River confluence may potentially trigger adult Central Valley steelhead, primarily those migrating toward the Merced River, to stray into the San Joaquin River upstream from the confluence. Straying could reduce the Merced River population. However, the WY 2011 Interim Flows would be provided primarily outside the November-through-January period of steelhead upstream migration. In addition, the Hills Ferry Barrier operations would continue in fall (during the WY 2011 Interim Flows) to prevent the unwanted upstream migration of Central Valley steelhead just past the Merced River confluence during mid-September through early December, when the barrier is operational.

The Hills Ferry Barrier is a type of resistance weir commonly used to exclude and/or trap anadromous fish in rivers. This barrier consists of panels aligned perpendicular to the flow of the river with evenly spaced pipes that allow water, small fish, and particles to pass but prevent larger anadromous fish such as Chinook salmon from passing upstream. Operated by DFG since 1992, the Hills Ferry Barrier is typically installed in mid-September and operated until it is removed in early December. DFG currently operates the Hills Ferry Barrier near the town of Newman, approximately 300 feet upstream from the confluence with the Merced River (in Reach 5).

The barrier's main purpose is to redirect upstream-migrating adult fall-run Chinook salmon into suitable spawning habitat in the Merced River and prevent migration into the mainstem San Joaquin River upstream, where conditions are currently unsuitable for Chinook salmon. Central Valley steelhead migrate during fall and winter in a manner similar to migration by fall-run Chinook salmon, and they have a similar body type; therefore, maintenance of the Hills Ferry Barrier would continue for the purpose of redirecting Chinook salmon during the fall WY 2011 Interim Flow period, through December 1, 2010, when the barrier is removed. The barrier is expected to be equally effective in redirecting any Central Valley steelhead.

NMFS permits the take of Federally listed threatened species for rescue and salvage by various State and nongovernmental agencies through the ESA Section 10a(1)A and 4(d) rules. In the unlikely event that ESA-listed anadromous fish, including Central Valley steelhead, stray into San Joaquin River reaches above the Merced River, these fish could be salvaged under these authorities. Additionally, DFG applies annually for an ESA Section 4(d) research permit and accompanying take limit for Central Valley steelhead from NMFS for operation of the barrier. If Central Valley steelhead are encountered at or above the Hills Ferry Barrier during fall WY 2011 Interim Flows, the Central Valley steelhead would be released downstream in suitable reaches, as would be required by permit. Salvaged fish will likely have genetic samples (i.e., fin clips) taken. Such recovery would be conducted under and consistent with DFG's ESA Section 4(d) research permit. DFG has confirmed that an ESA Section 4(d) research permit application for the 2011 operation of Hills Ferry Barrier will be submitted to NMFS.The Proposed Action includes development of a monitoring plan to check for Central Valley steelhead in the Restoration Area during spring Interim Flows and submit this plan to NMFS prior to February 1, 2011. In the event a steelhead is encountered in the Restoration Area, NMFS will be notified immediately.

Because of measures adopted to prevent straying of Merced River adult steelhead into the San Joaquin River upstream from the confluence, implementing the WY 2011 Interim Flows is not likely to adversely affect straying of Central Valley steelhead. Interim Flows are not released between December 1, 2011 and February 1, 2011, therefore, the Proposed Action would not create straying conditions for steelhead during that period.

Figure 6.0a and 6.0b below shows plots of San Joaquin River flows at the Merced River confluence for the past 20 years and in relation to actual WY 2010 Interim Flows. Figure 6.0a shows flows corresponding to year type designations. When comparing the 2010 Merced River confluence flow with the calculated average for normal-wet years and the SJRRP Interim Flow releases at Sack Dam, WY 2010 had slightly above average releases in April/May and early June. However, when compared to Figure 6.0b, which depicts flows on a per-year basis, the WY 2010 flows at the Merced River confluence fall well within the overall annual flow variations. It is anticipated that WY 2011 Interim Flows will behave similarly in the system and that the flows will continue to fall within a similar range to WY 2010. With the regular removal of Hill's Ferry

Barrier in December, there will be little chance for straying of steelhead as the flows present from the Proposed Action should not create a false attraction.

Figure 6.0a: Year Type Averages for a 20-Year Period at the Merced River Confluence

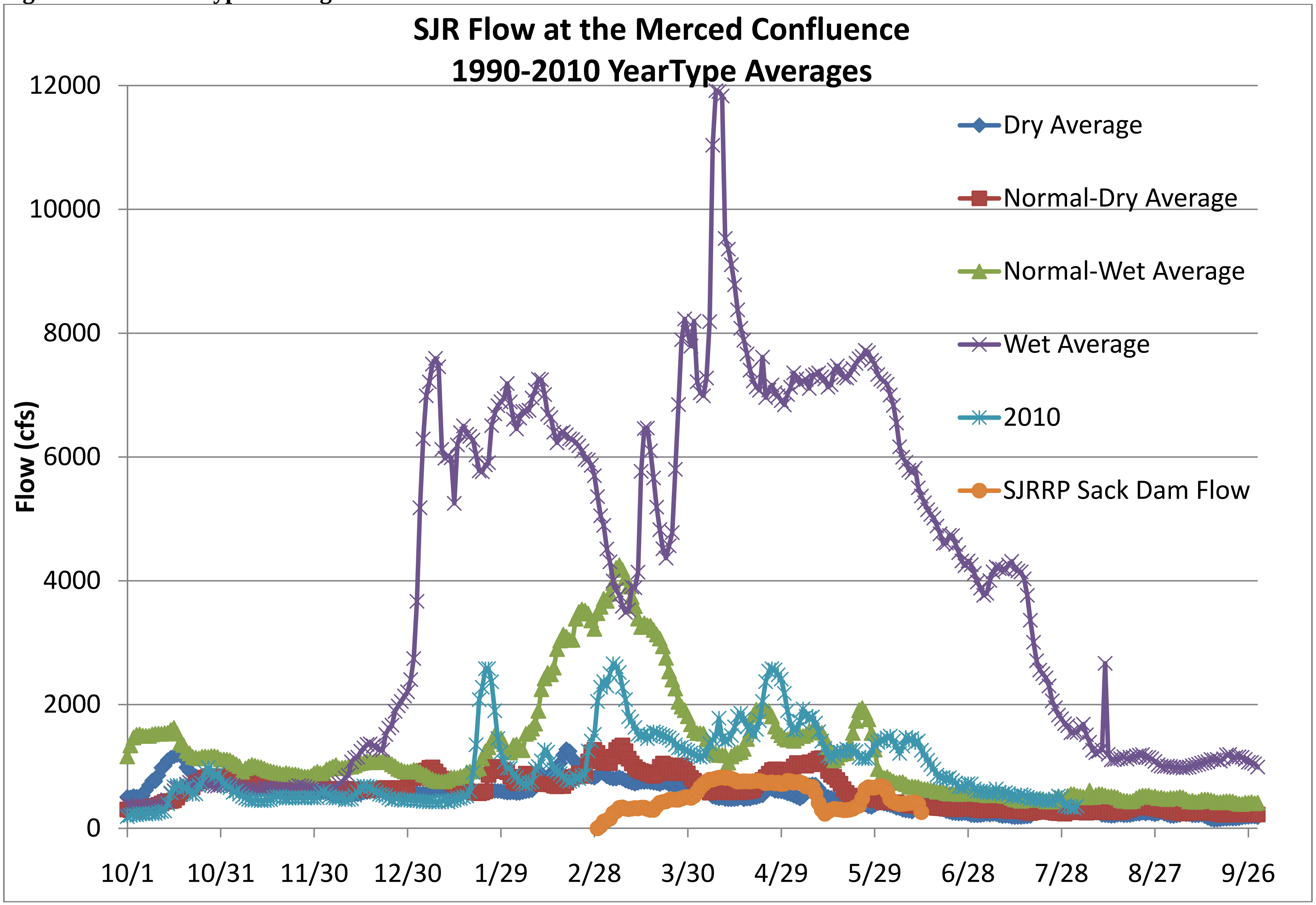
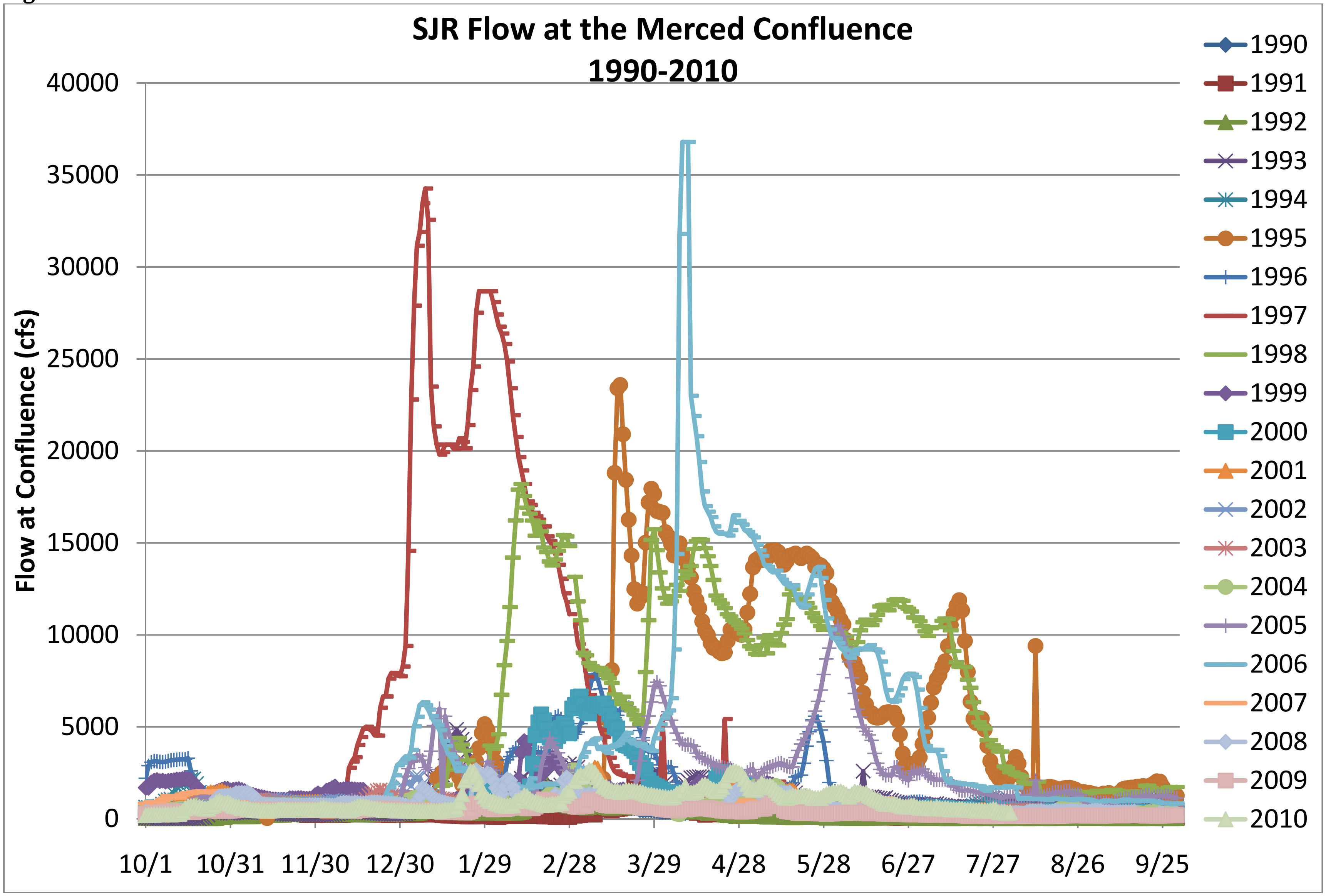


Figure 6.0b: Actual Flows for a 20-Year Period at the Merced River Confluence



Item 3 – Delta Operations and VAMP

Comment:
Please clarify the last paragraph on page 6-30 through the second paragraph on page 6-31. As it is written, it is stated that emigrating CV steelhead are at risk at upstream sections of the Old and Middle rivers. Provide justification for the may affect, but not likely to adversely affect determination if fish are "at risk" of entrainment. Also, it is states numerous times throughout the document that the U.S. Fish and Wildlife Service and NMFS Operations BOs and reasonable and prudent alternative (RPA) will be implemented. How then can there be an increased in pumping at the CVP/SWP Jones and Banks pumping facilities? This needs to be re-stated that recapture of interim flows at the pumps, lies within the levels specified by the Operations BOs.

This BA and determination relies heavily on Delta operations according to the Operations BOs and implementing the RPA (reference sections 3.9.3 and 3.9.4). Consequently, should the Federal Court vacate or modify the Operations BOs/RPA such an action may trigger the need for reinitiating of consultation for the Project.

The environmental baseline in the Operations BO consultations, as well as the WY 2010 Interim Flows project, assumes that the VAMP, or VAMP-like, flows will be implemented. The baseline in this document includes language that the VAMP agreement has expired. While this is true, on pages 642-3 of the NMFS Operations BO, NMFS expects tributary contributions from the Merced and Tuolumne rivers to continue through 2011, and that Reclamation shall seek supplemental agreement with the San Joaquin River Group Authority for tributary contributions so as to not rely on New Melones Reservoir to meet required flows at Vernalis, California. The BA does not identify this condition or the effect the Project might have in that potential scenario. Therefore, there must be further analysis on the affects to the tributary flows and corresponding listed species/critical habitat as a result of the Project in the context of the analysis done for the WY 2010 Interim Flows project consultation.

Because the agreement for 2011 tributary contributions does not yet exist and because time is of the essence with respect to implementing the Project as identified in the Settlement, NMFS recommends that Reclamation's analysis should evaluate the effects of a range of possible flow conditions from the tributaries that could be affected by the Project in spring 2011. The analysis must include a discussion of how the Project could change the amount of flow required from the Stanislaus River to meet Vernalis water quality objectives and provide potential beneficial / negative effects. For example, how will the Project modify water quality release and related storage in New Melones Reservoir and the effects on CV steelhead in the Stanislaus River?

Response:
Additional information regarding the interaction of the Proposed Action and VAMP or a VAMP-like action is provided as errata to the WY 2011 Interim Flows Project BA below. This information includes a description of VAMP-like conditions and additional confirmation that Reclamation considers VAMP or a VAMP-like action as part of the environmental baseline for the purposes of the effects analysis, with the understanding that the future of VAMP or a VAMP-

like action is currently uncertain. Additional information has also been added to the BA to address these uncertainties regarding the status of VAMP during the WY 2011 Interim Flows.

Section 3.3.2, Recapture and Recirculation
As described in Response to Item 1 Above, the following has been added to the BA:
Although different terminology is used in different places thought the WY 2011 Interim Flows BA, all references to increases in exports at the Jones Pumping Plant and Banks Pumping Plant as a result of the Project would fall within the allowable pumping criteria of the 2009 NMFS Operations BO and the 2008 USFWS' Operations BO in place at the time of pumping.

Section 3.9.3, Vernalis Adaptive Management Program
Pages 3-42 to 3-43, Section is Deleted and Replaced with the Following:
The Merced, Tuolumne, and Stanislaus rivers are the three main tributaries to the San Joaquin River. Releases from major reservoirs on these tributaries are made in response to multiple operational objectives, including flood management, downstream diversions, instream fisheries flows, instream water quality flows, and releases to meet water quality and flow objectives at Vernalis as part of requirements under Water Right Decision 1641 (D-1641) including the Vernalis Adaptive Management Program (VAMP). VAMP is an experimental program to determine how salmon survival rates change in response to alterations in flow releases (primarily from tributary reservoirs), and alterations in CVP/SWP export levels that are based on flow conditions in the San Joaquin River at Vernalis.

VAMP was established as a 12-year program in 2000, to protect juvenile Chinook salmon emigrating through the San Joaquin River and the Delta, and to evaluate how Chinook salmon survival rates change in response to alterations in San Joaquin River flows and exports at the CVP and SWP facilities in the south Delta when the Head of Old River Barrier is installed.

VAMP includes a 31-day pulse flow period in April and May of up to 110 TAF depending on the flow conditions. Water needed to create the pulse flow is obtained by Reclamation through performance-based agreements that require the release of water or reduction of delivery from reservoirs on the Merced, Stanislaus, and Tuolumne rivers and from the Exchange Contractors at Mendota Pool, to meet the flow target requirements. The San Joaquin River Agreement (SJRA) establishes the structure for VAMP by identifying where water to support VAMP flow objectives would be obtained, specifically from the San Joaquin River Group Authority (SJRGA), whose members make water available. The SJRA precludes the use of water released from Friant Dam that is otherwise intended for use within the Friant Division of the CVP, other than water acquired from willing sellers. As part of the Central Valley Project Improvement Act (CVPIA) (Reclamation 1997), Reclamation leads the VAMP planning process, setting VAMP targets and flow conditions in coordination with SWRCB and other agencies. Although the SJRA identifies general parameters for VAMP experiments, in past years, the participating entities have adapted the specific experimental design to accommodate real-time conditions, applying mutually agreed-on flexibility for the experimental program.

Section 6.1.1, Aquatic Species
The Following Section under Central Valley Steelhead DPS – Flow in the Lower San Joaquin River and Tributaries, Page 6-4 and 6-5 is Deleted and Replaced with:
WY 2011 Interim Flows could increase flows in the San Joaquin River, at the confluence of the Merced River, by up to 1,300 cfs. VAMP expires in WY 2010. NMFS expects tributary contributions from the Merced and Tuolumne rivers to continue through 2011, and that Reclamation shall seek supplemental agreement with the SJRGA for tributary contributions so as to not rely on New Melones Reservoir to meet required flows at Vernalis, California. Reclamation is working with the SJRGA to address the requirements of the NMFS Operations BO. However, at this time, no agreement has been reached on any future VAMP action and although it is reasonable to assume that VAMP or a VAMP-like action would occur in WY 2011, there is no information as to how this action would be implemented. Therefore, the BA included an analysis assuming that any future implementation of VAMP or a VAMP-like action would be similar to historical implementation.

In response to WY 2011 Interim Flows, tributary releases to meet VAMP water quality objectives at Vernalis could be affected. The Settlement does not provide guidance on coordination with VAMP flows. However, flows for both the VAMP and the Proposed Action would occur during similar times of the year and have the potential to overlap in time. For WY 2011 Interim Flows, the SJRRP would meet flow targets at Vernalis under the existing VAMP agreement by contributing to the baseline that determines tributary contributions. Tributary releases to meet VAMP and water quality objectives at Vernalis would be affected in one of two ways. In conditions where WY 2011 Interim Flows contribute toward meeting the same VAMP flow threshold that would have otherwise been in place, required releases from tributary reservoirs could be reduced. In conditions where WY 2011 Interim Flows cause a higher VAMP flow threshold than would have otherwise been in place, required releases from tributary reservoirs would be made to achieve the higher threshold. As a result, tributary flows would increase in some years and decrease in other years. Changes in VAMP contribution releases from tributary reservoirs would not affect the ability to meet instream fish and water quality minimum flow requirements in the Merced, Tuolumne, Stanislaus, or mainstem San Joaquin rivers. However, it is possible that flows in the tributaries could be less because of VAMP operations with WY 2011 Interim Flows than they would be without the WY 2011 Interim Flows.

The following analysis compares the flows from the major San Joaquin River tributaries (Merced, Tuolumne and Stanislaus rivers) to the San Joaquin River from CalSim simulations performed for the for the No Action and Proposed Project for the WY 2011 Interim Flows Project. These flows result in increased flows along the San Joaquin River downstream from the Merced River which would be included in the Vernalis Adaptive Management Plan's (VAMP) "Existing Flows". Because the tributary rivers share the responsibility of meeting any VAMP flow requirements at Vernalis, this increase in the "Existing Flows" would cause changes in tributary operations and inflows to the San Joaquin River.

The changes in tributary flows under the Proposed Action include both increases and decreases. Generally, flows shift to later in the year with a decrease during the WY 2011 Interim Flow pulse period (February 1 through May 28) as the additional San Joaquin River flow allows a reduction in releases from the tributary reservoirs. The water that is stored on the tributaries is then released at a later date to meet water supply demands, causing tributary flow increases during those periods. The magnitude of the changes is different between the tributaries because of the sharing agreement for meeting the VAMP requirements. Tables 6.0a through 6.0c contain the mean monthly tributary flows, by D-1641 San Joaquin Valley Water Supply Index, and the predicted change in these flows due to the WY 2011 Interim Flows.

Table 6.0a. Merced River Inflows to the San Joaquin with the Proposed Action

	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff
		0%		0%		0%		0%		0%		0%		-10%		3%		1%		0%		0%		6%
Above Normal	536	4%	438	0%	606	0	900	1%	1487	2%	784	0%	602	-4%	1105	2%	835	0%	619	2%	481	0%	270	6%
Below Normal	335	0%	394	0%	515	0	522	0%	729	0%	504	1%	805	-11%	822	0%	793	2%	674	0%	389	0%	213	0%
Dry	311	0%	385	0%	385	0	798	1%	1188	0%	884	0%	976	-5%	1352	5%	908	-1%	714	0%	623	0%	397	0%
Critical	277	0%	333	0%	357	0	419	0%	443	0%	601	0%	374	-6%	444	8%	812	0%	647	0%	315	0%	199	0%

Table 6.0b. Tuolumne River Inflows to the San Joaquin with the Proposed Action

	Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep	
	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff
		0%		0%		0%		0%		0%		0%		-3%		0%		1%		0%		0%		0%
Above Normal	662	0%	593	1%	853	0	1023	-1%	1803	1%	2387	1%	2135	-2%	1524	1%	1704	1%	1039	0%	473	0%	492	0%
Below Normal	497	0%	385	0%	749	0	788	0%	875	0%	1285	1%	1956	-3%	1675	-2%	1309	0%	1110	0%	440	0%	438	0%
Dry	403	0%	380	0%	397	0	1176	1%	2015	1%	2337	0%	2544	-2%	2156	1%	1848	0%	1145	0%	468	0%	618	0%
Critical	302	0%	317	0%	312	0	378	0%	416	0%	874	0%	1133	-1%	1488	1%	1028	0%	918	0%	411	0%	355	0%

Table 6.0c. Stanislaus River Inflows to the San Joaquin with the Proposed Action

	Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep	
	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff	avg. cfs	% Diff
		0%		1%		1%		0%		2%		-3%		0%		0%		0%		0%		0%		0%
Above Normal	685	0%	451	3%	410	0	395	1%	612	-1%	557	-10%	1275	1%	1265	2%	991	0%	557	0%	514	0%	547	1%
Below Normal	655	1%	434	1%	593	0	537	1%	545	-7%	413	-15%	1098	-3%	1096	2%	888	-2%	697	4%	659	0%	657	0%
Dry	578	0%	396	0%	372	0	378	0%	1064	-3%	1090	-9%	1417	0%	1273	3%	1188	3%	634	0%	643	0%	813	5%
Critical	463	1%	355	1%	335	0	248	1%	284	4%	261	-37%	648	-1%	682	5%	369	6%	353	0%	361	1%	366	0%

Figures 6.0a through 6.0o show the minimum and maximum flows from the No Action scenario and the mean flow for both the No Action and Proposed Action for tributaries for different year types. The bars for minimum and maximum identify the historical range of flows. The columns for the means allow a comparison between alternatives.

The figures show that the change in the flows is small relative to the magnitude of the flows. They also show that the flow under the Proposed Action is within the same range of the monthly variation found in the No Action scenario.

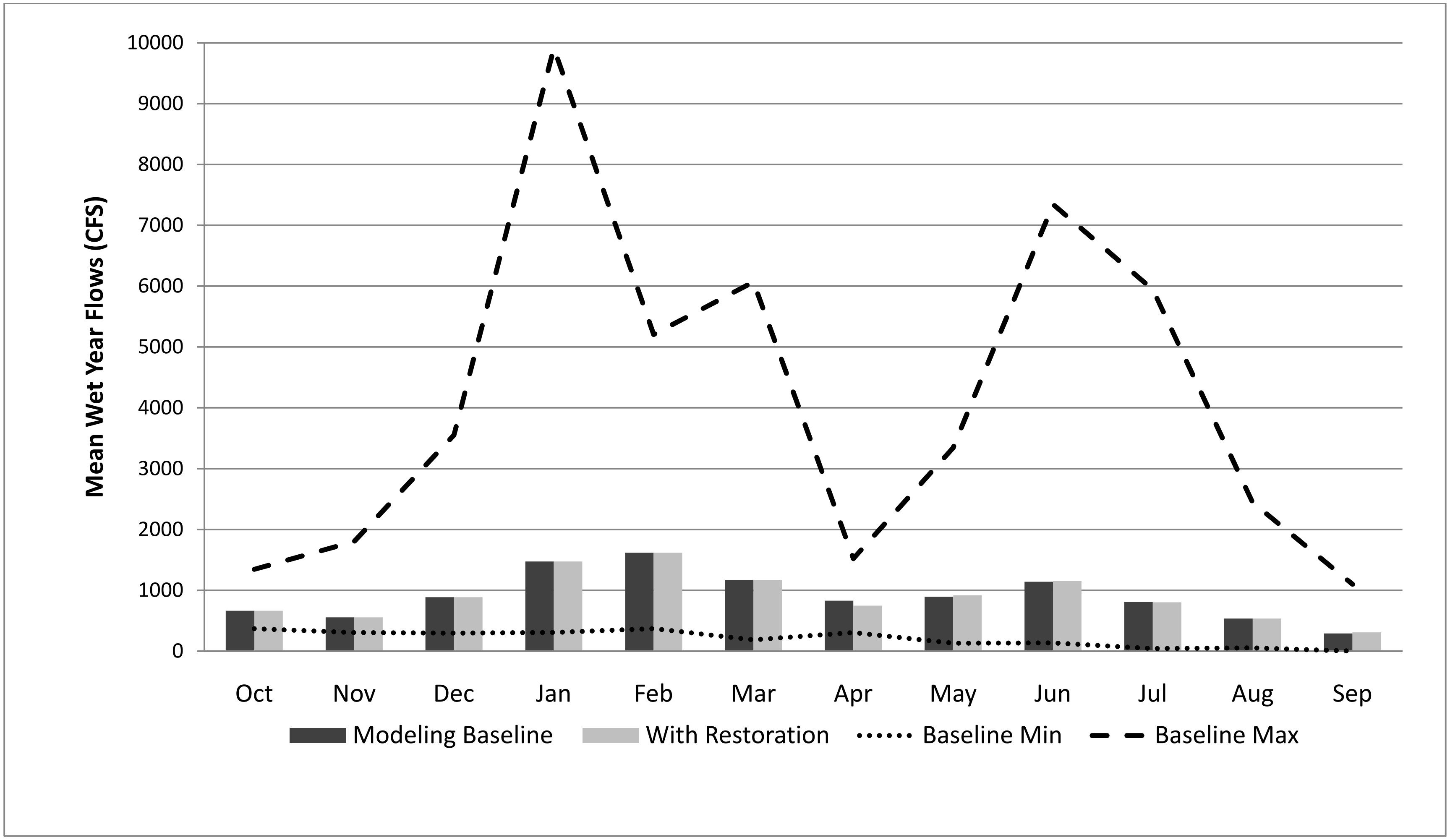


Figure 6.0a. Wet Year Comparison of No Action and Proposed Project Merced River Flows

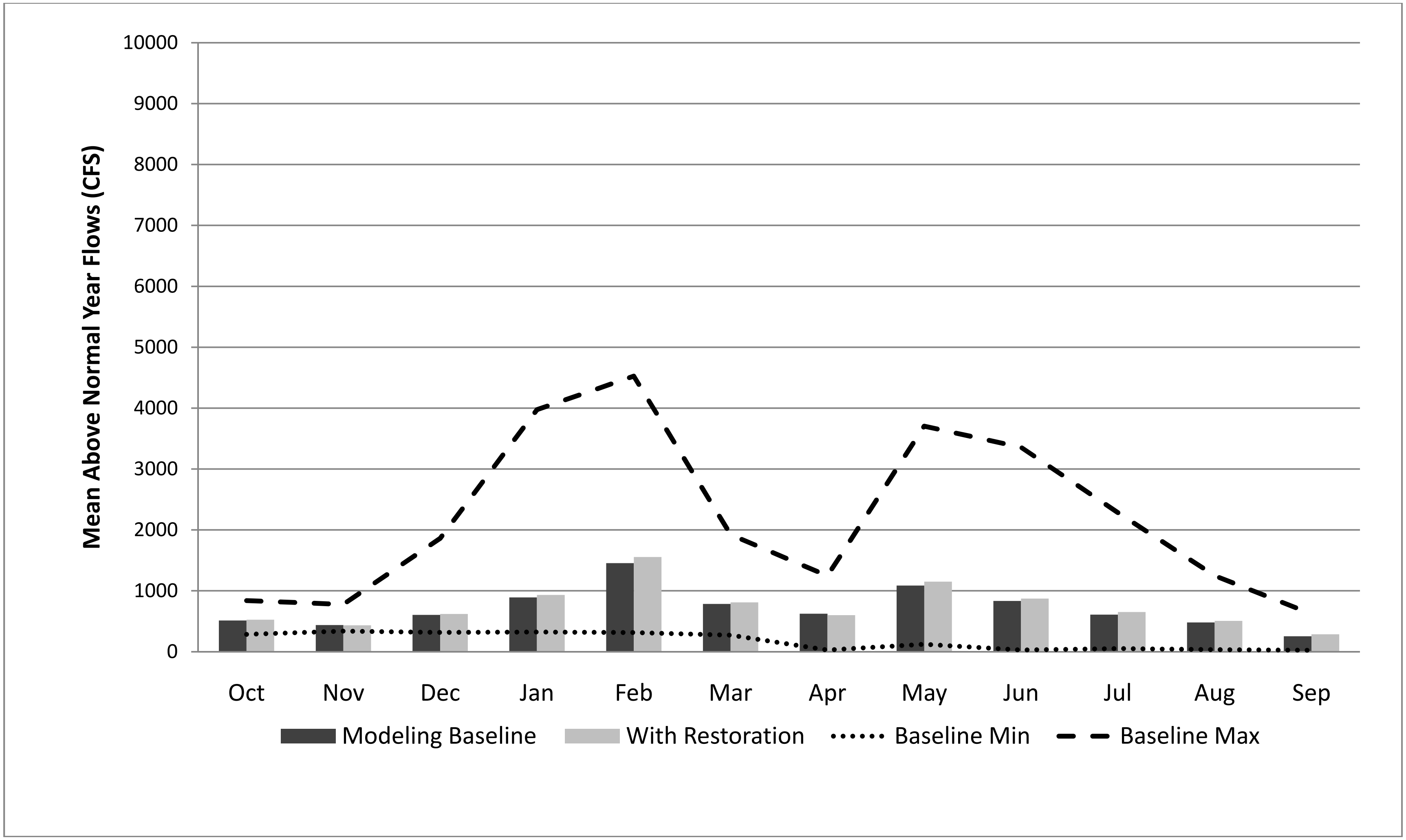


Figure 6.0b. Above Normal Year Comparison of No Action and Proposed Project Merced River Flows

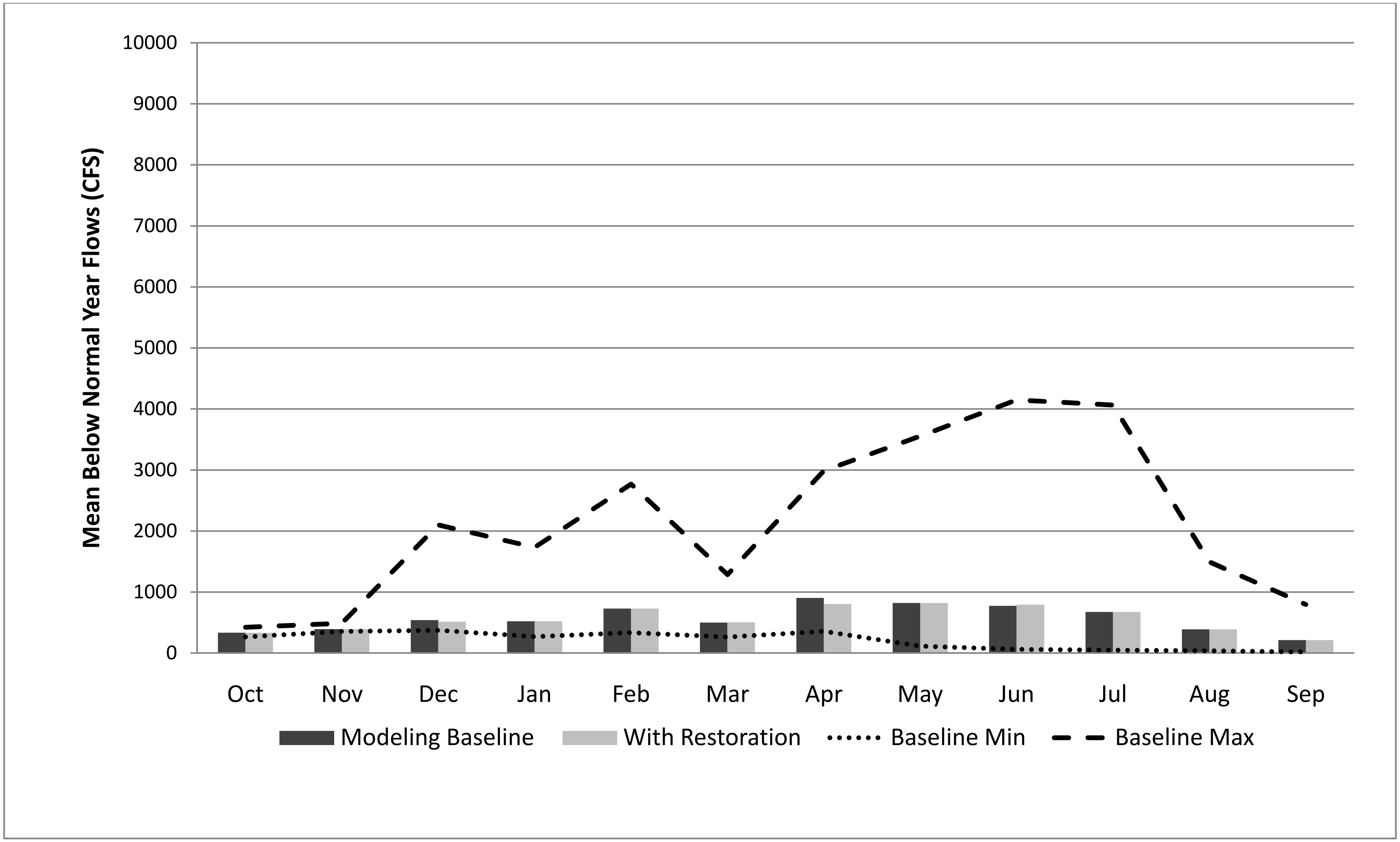


Figure 6.0c. Below Normal Year Comparison of No Action and Proposed Project Merced River Flows

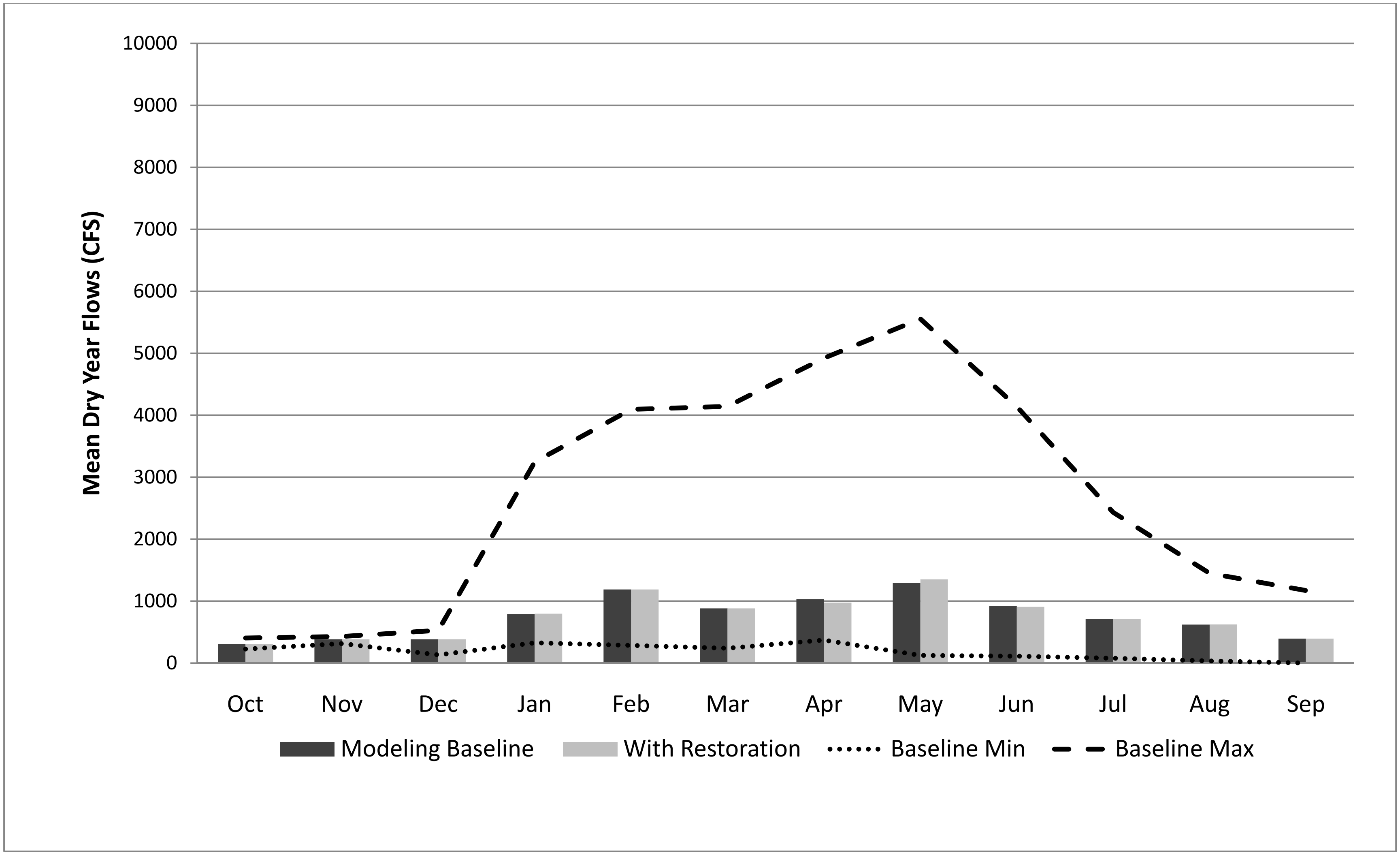


Figure 6.0d. Dry Year Comparison of No Action and Proposed Project Merced River Flows

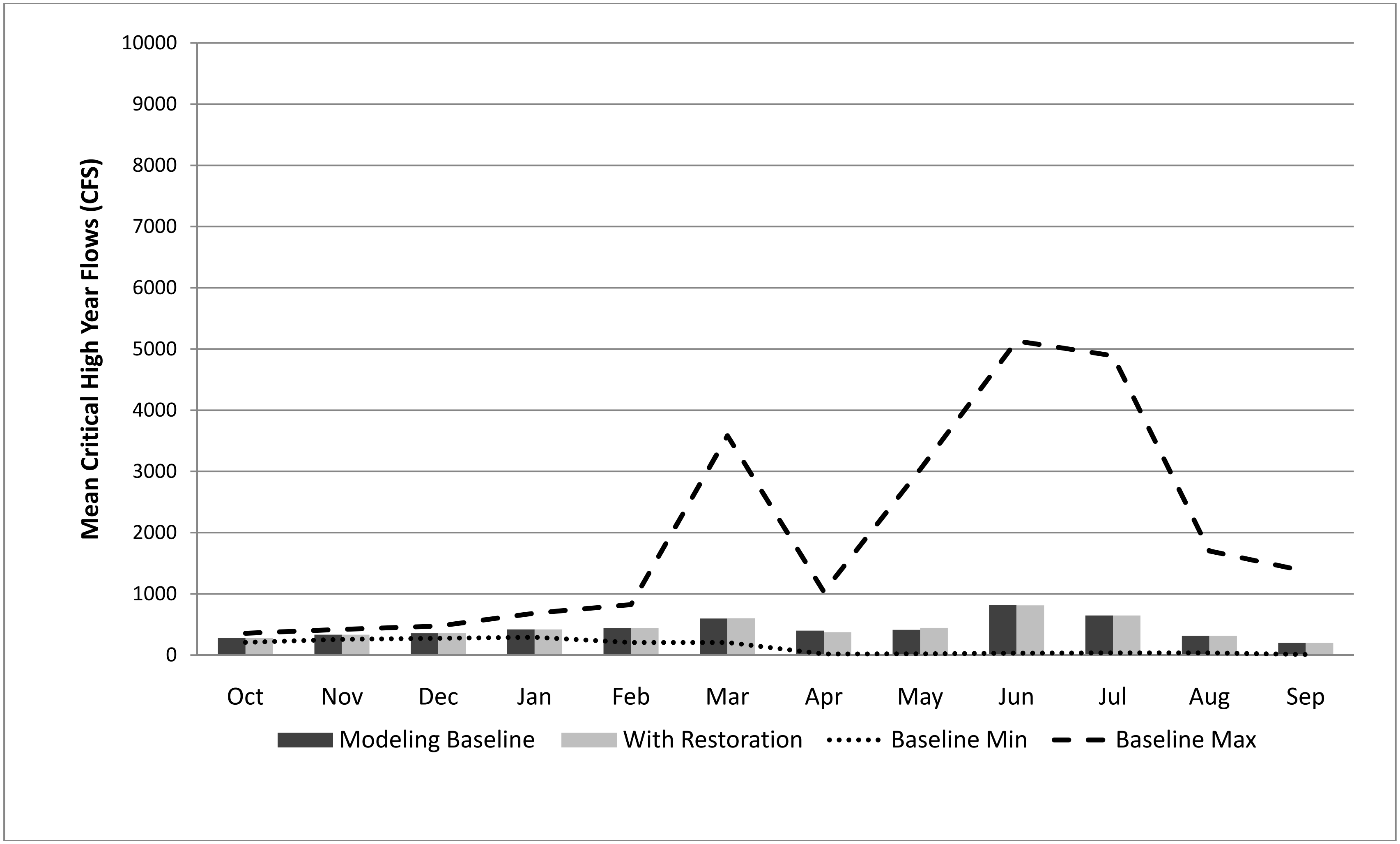


Figure 6.0e. Critical Year Comparison of No Action and Proposed Project Merced River Flows

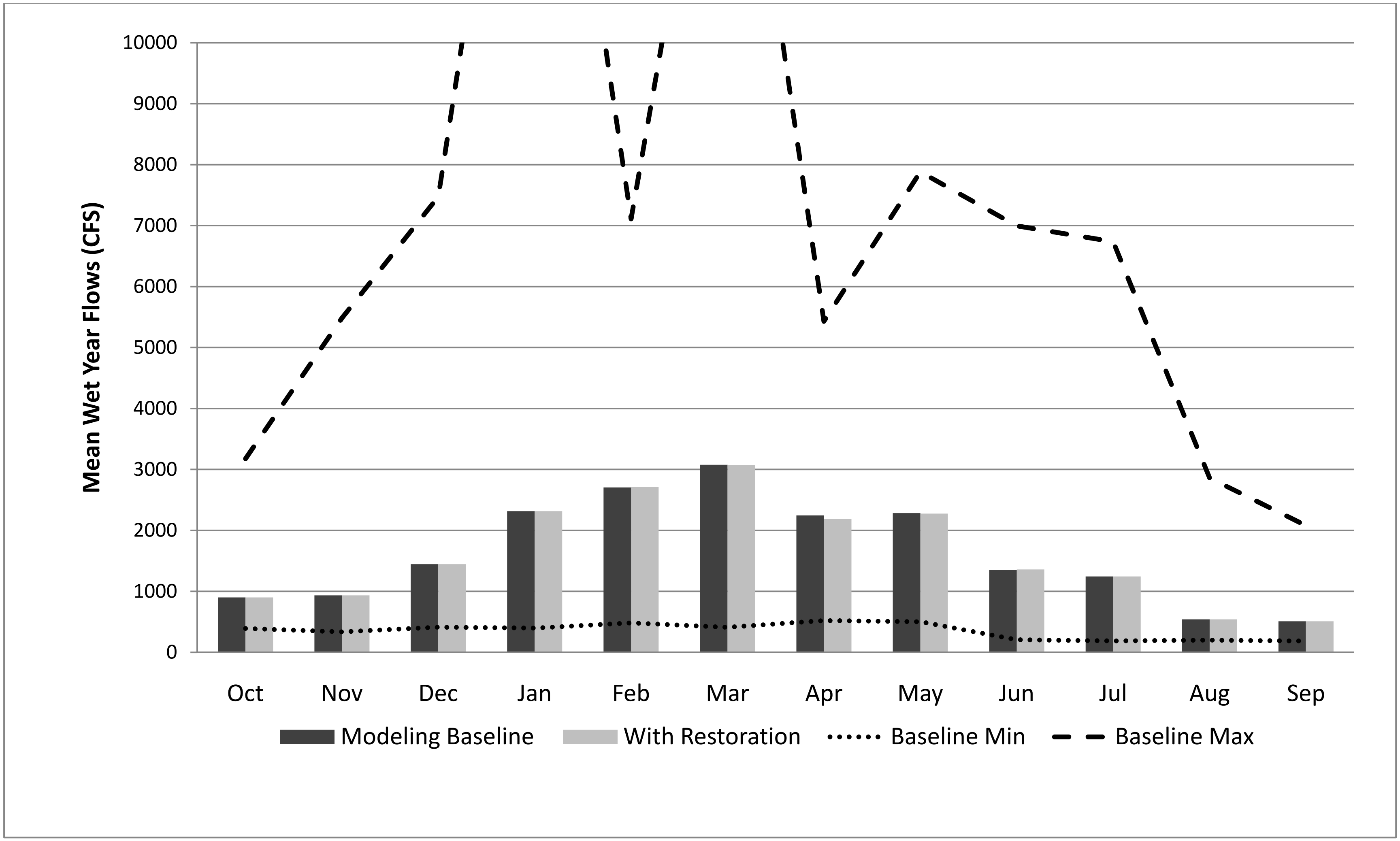


Figure 6.0f. Wet Year Comparison of No Action and Proposed Project Tuolumne River Flows

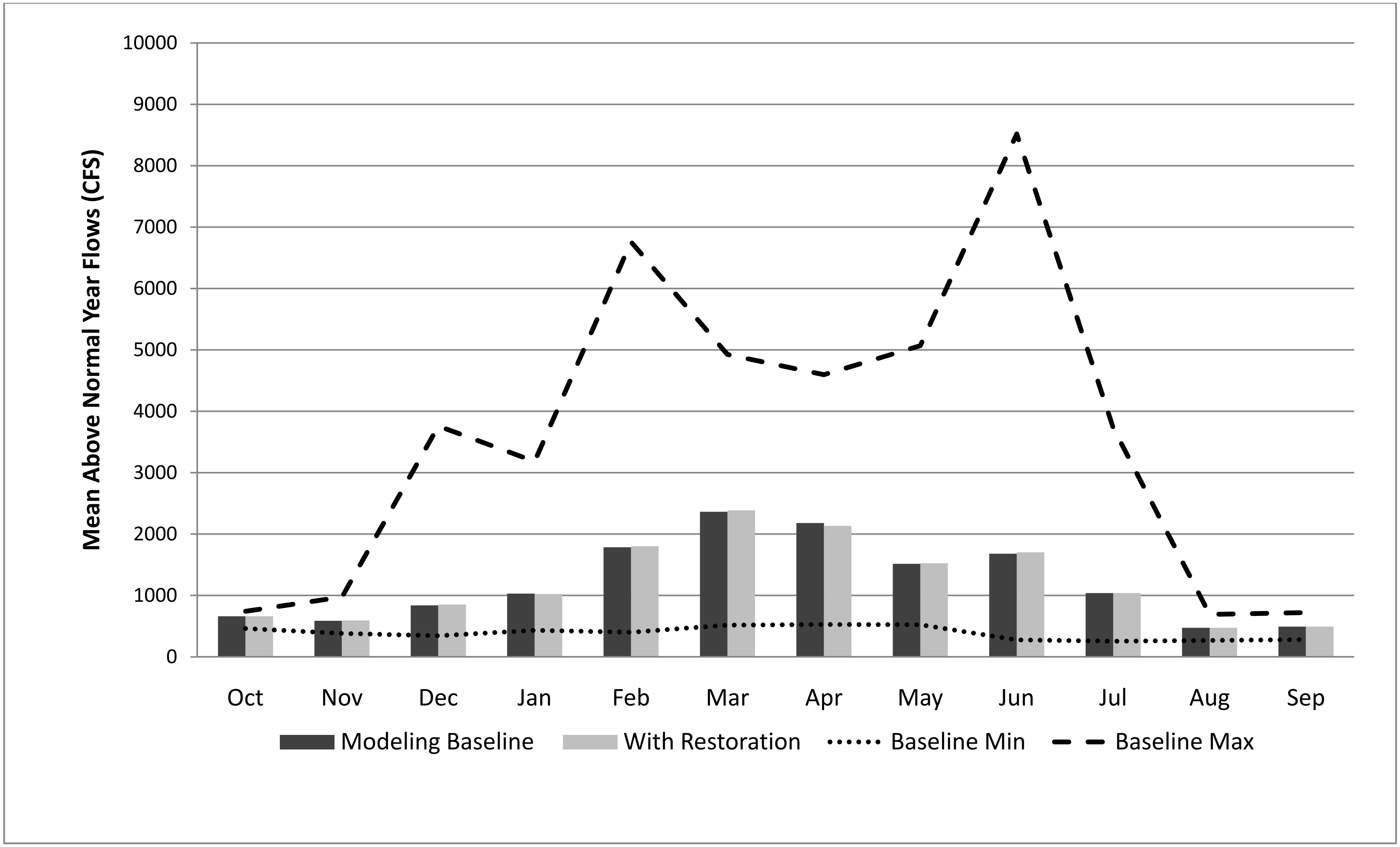


Figure 6.0g. Above Normal Year Comparison of No Action and Proposed Project Tuolumne River Flows

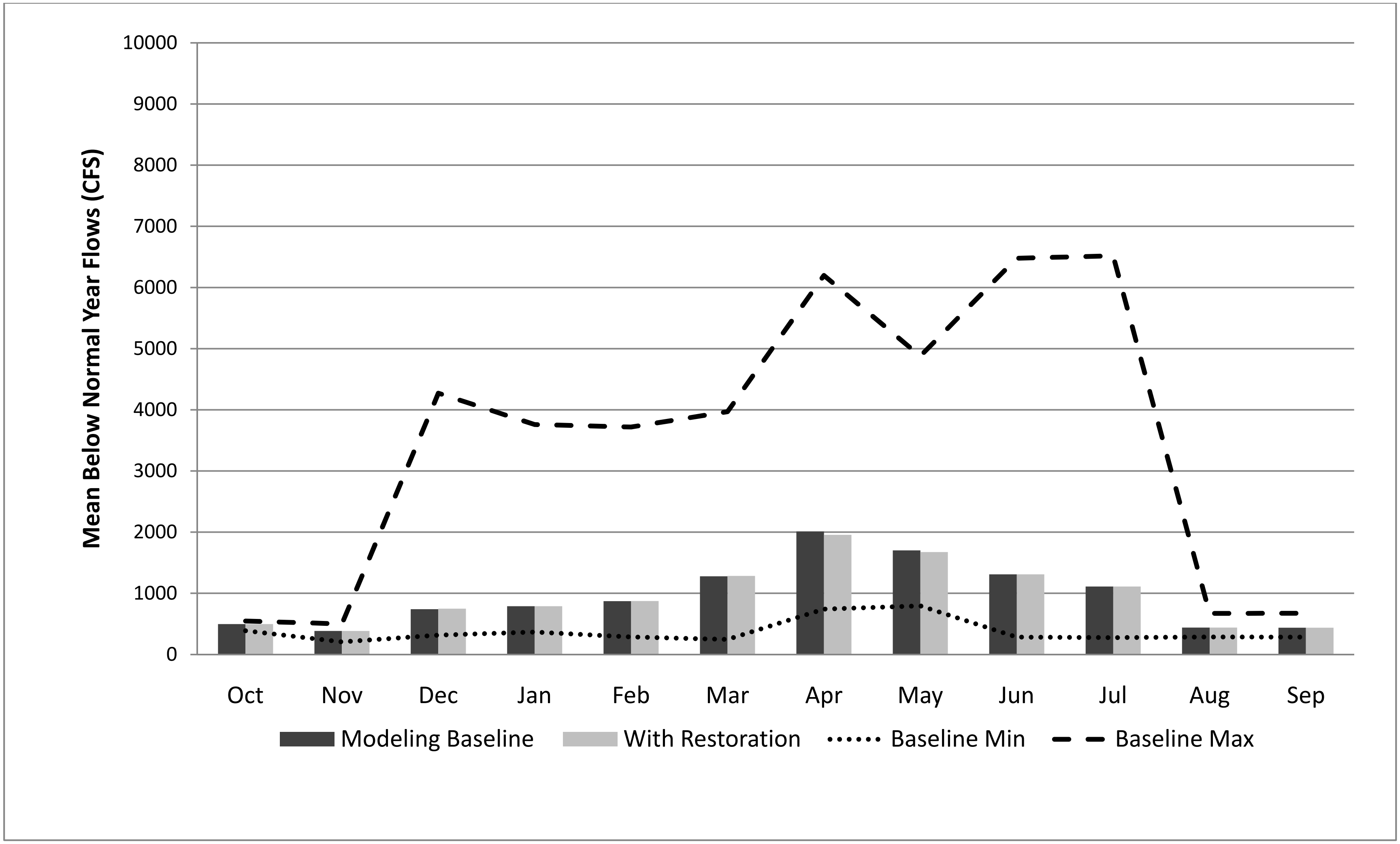


Figure 6.0h. Below Normal Year Comparison of No Action and Proposed Project Tuolumne River Flows

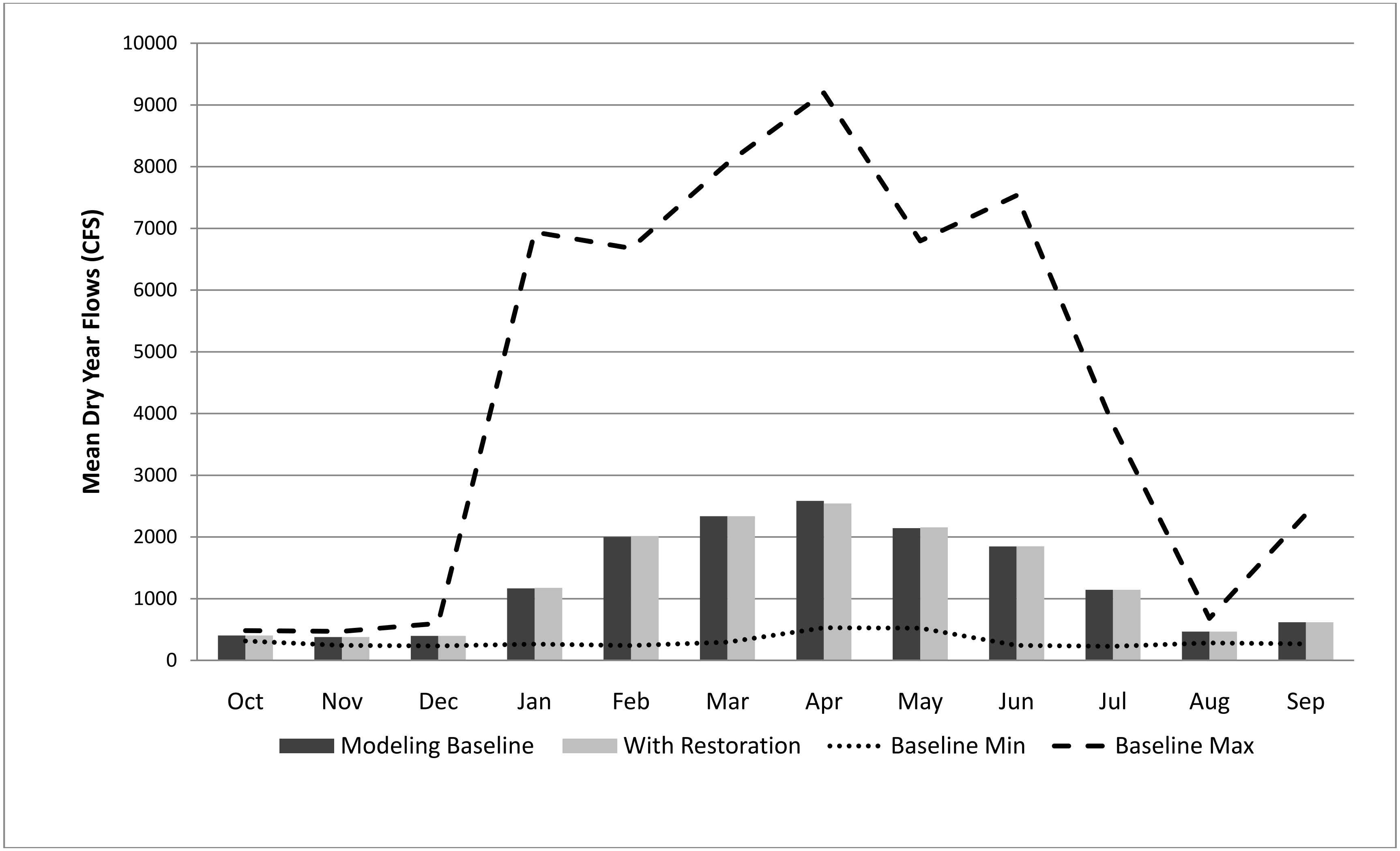


Figure 6.0i. Dry Year Comparison of No Action and Proposed Project Tuolumne River Flows

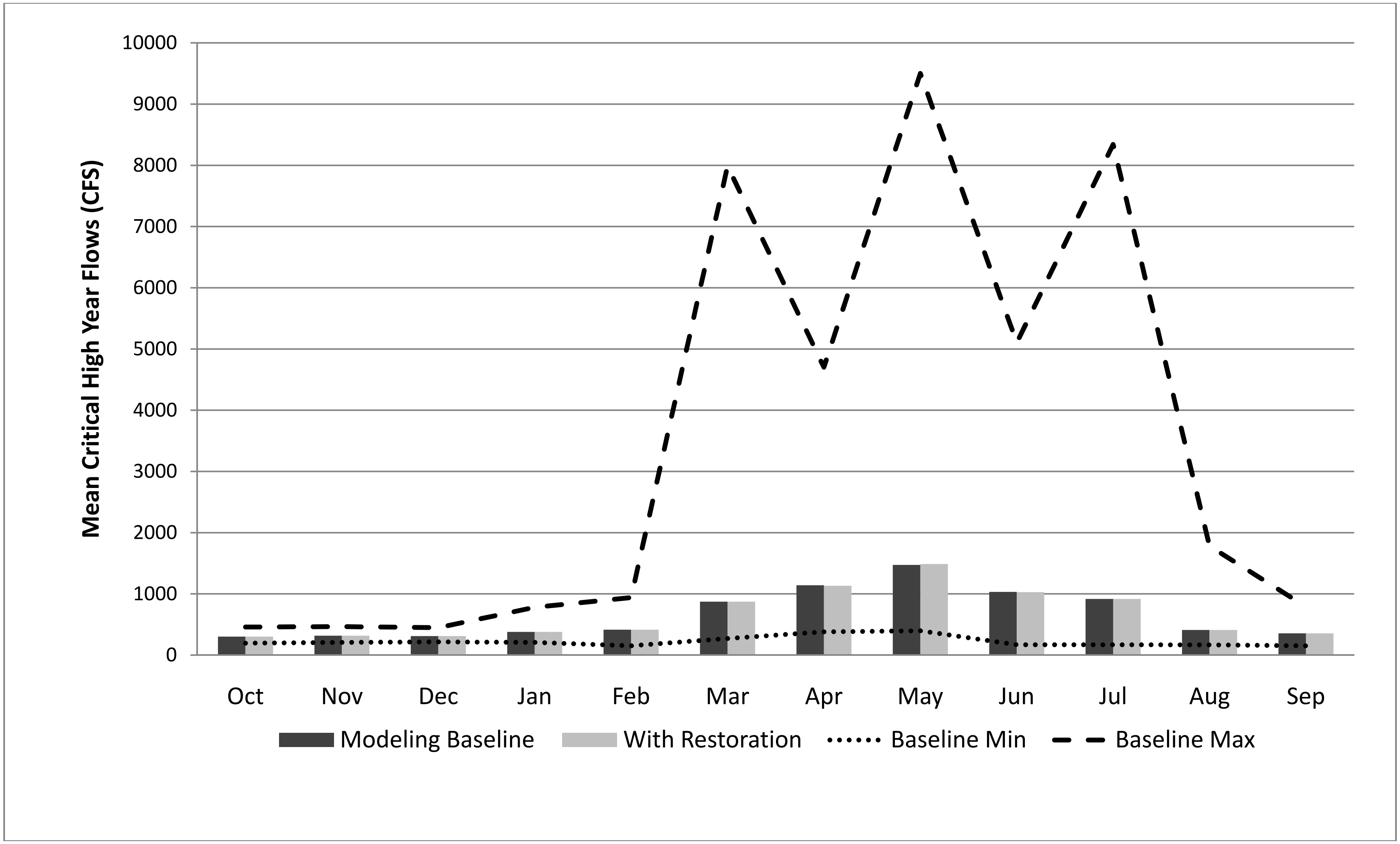


Figure 6.0j. Critical High Year Comparison of No Action and Proposed Project Tuolumne River Flows

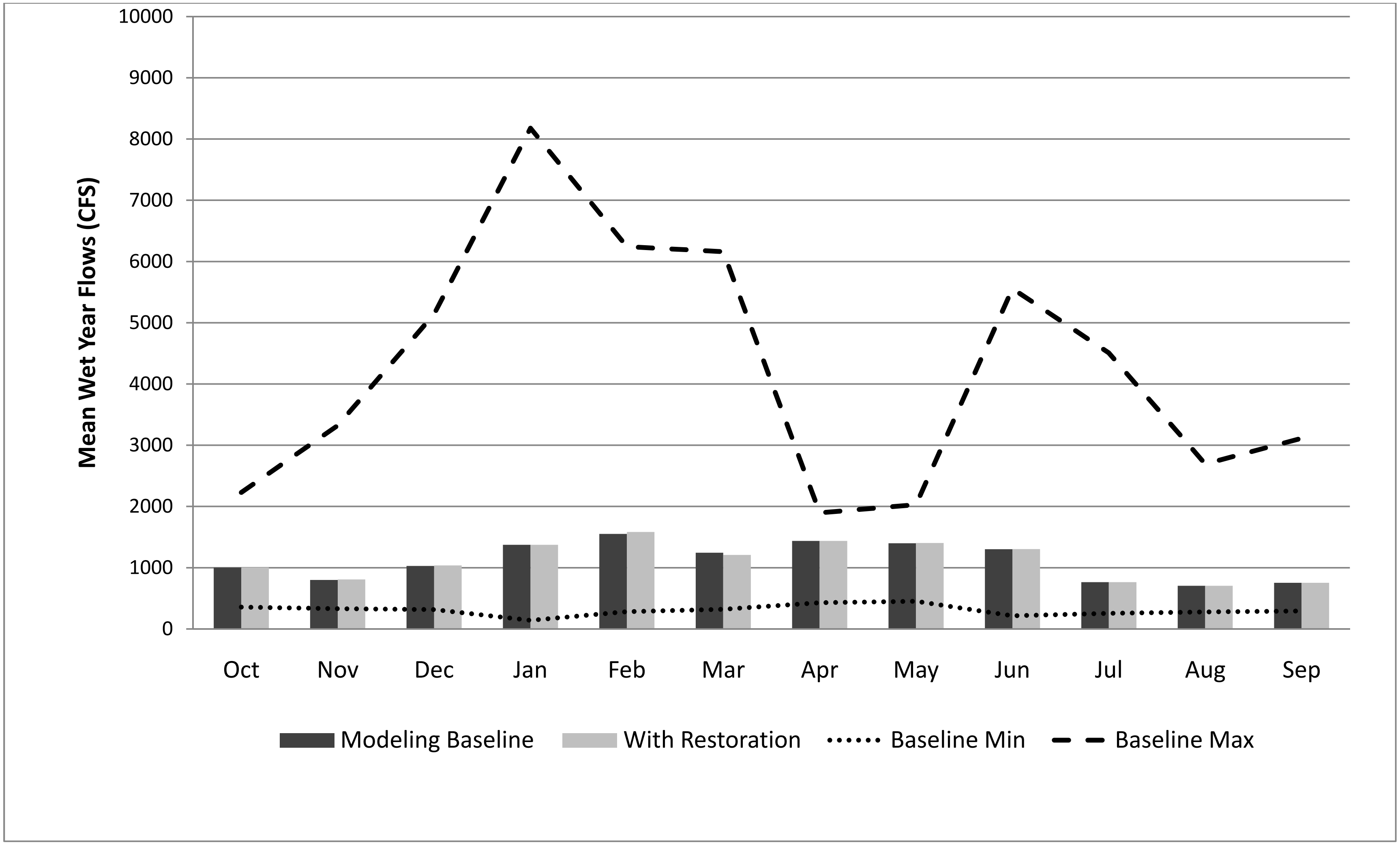


Figure 6.0k. Wet Year Comparison of No Action and Proposed Project Stanislaus River Flows

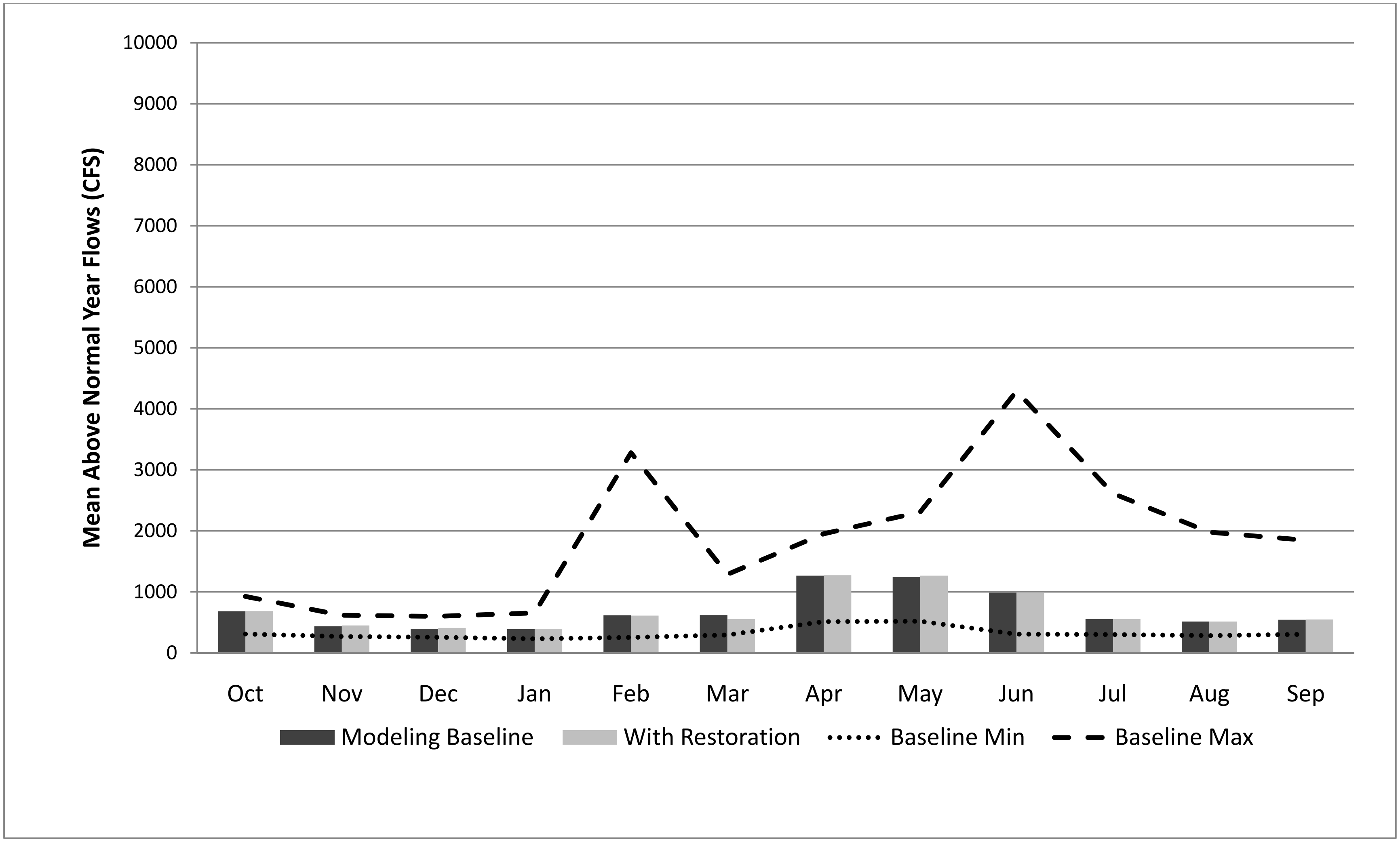


Figure 6.0l. Above Normal Year Comparison of No Action and Proposed Project Stanislaus River Flows

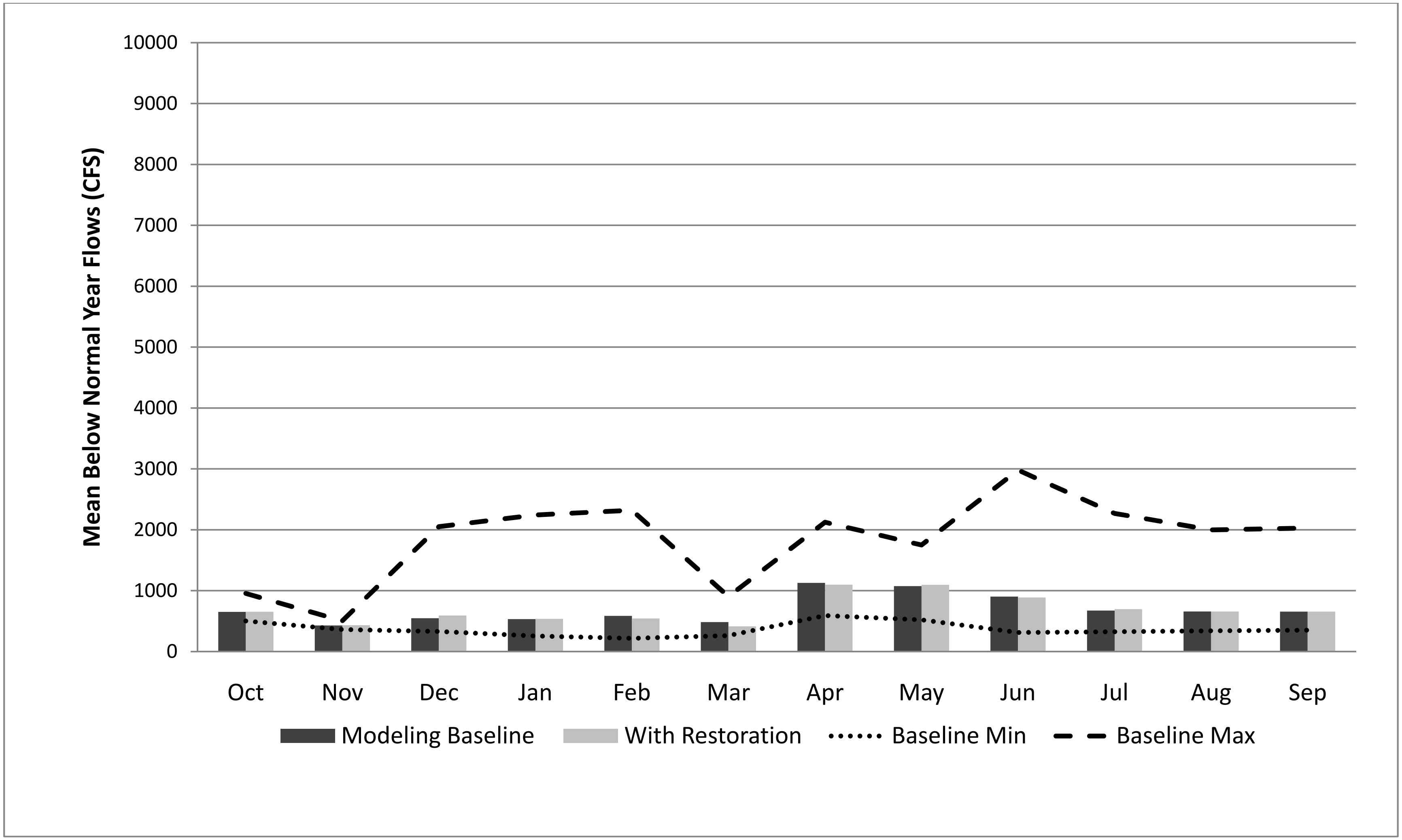


Figure 6.0m. Below Normal Year Comparison of No Action and Proposed Project Stanislaus River Flows

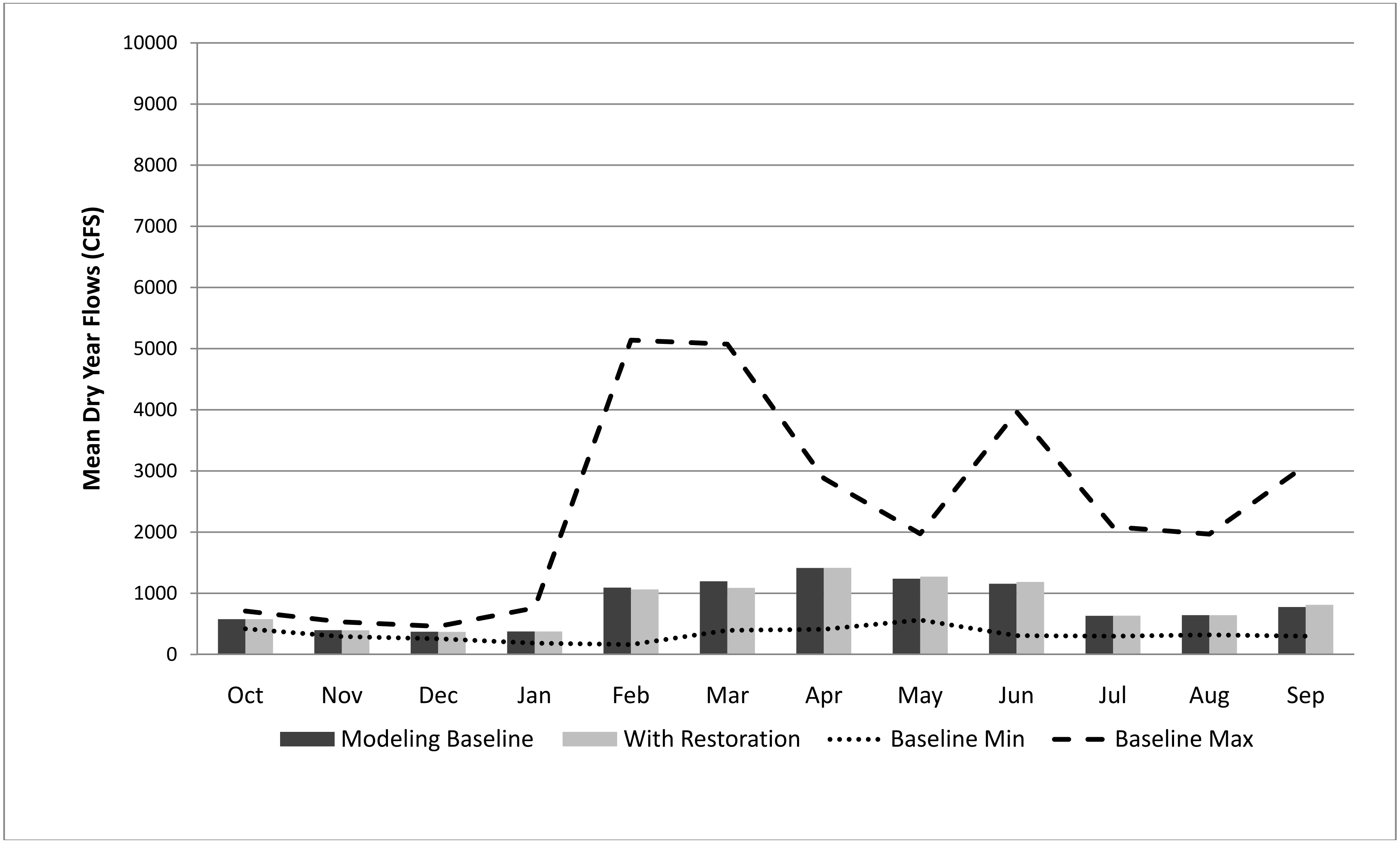


Figure 6.0n. Dry Year Comparison of No Action and Proposed Project Stanislaus River Flows

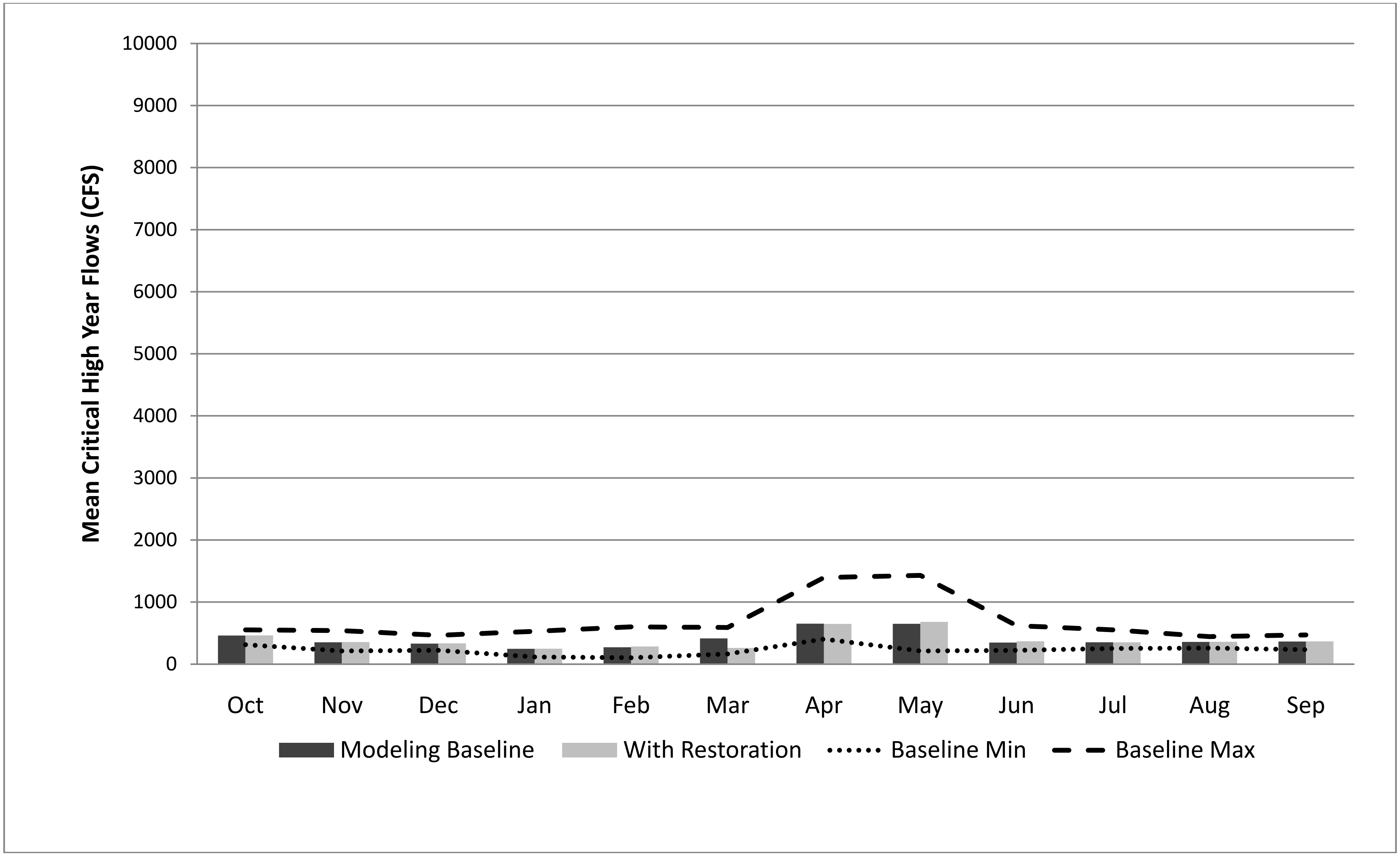


Figure 6.0o. Critical High Year Comparison of No Action and Proposed Project Stanislaus River Flows

The Vernalis water quality requirement is an electrical conductivity (EC) requirement of 700 and 1000 micromhos/cm for the irrigation (April to August) and non-irrigation (September to March) seasons, respectively. This is modeled in CalSim by estimating the water quality at Vernalis using a link-node salinity algorithm, consisting of a series of EC mass balance equations, covering the San Joaquin River from Lander Avenue to Vernalis. The computed EC from an upstream node is used as the input EC of a downstream node. Flow-EC regressions are used for the San Joaquin River at Lander Avenue, Merced River near Stevinson, and the Tuolumne River near Modesto. Mud and Salt sloughs, both return flow and accretion EC, use monthly average values. If the estimated EC does not meet the standard at Vernalis, higher quality releases are made from New Melones Reservoir on the Stanislaus River to mix with the San Joaquin River to meet the standard.

NMFS Operations BO and RPAs addressing San Joaquin and Stanislaus River effects on steelhead establish conditions that include those contained in VAMP, exclusive of requirements to meet Vernalis flows, per D-1641, with releases from the Merced and Tuolumne Rivers. Per Appendix 5 of the NMFS BO, the following RPA specifies actions to be taken to accommodate uncertainties regarding the status of VAMP experiments during 2010 and 2011.

Phase I: *pertains to the interim operations period and is implemented during 2010 and 2011. From April 1 through May 31:*

1. Flows at Vernalis (7-day running average shall not be less than 7 percent of the target requirement) shall be based on the New Melones Index[4]. In addition to the Goodwin flow schedule for the Stanislaus River prescribed in Action III.1.3 and Appendix 2-E, Reclamation shall increase its releases at Goodwin Reservoir, if necessary, in order to meet the flows required at Vernalis, as provided in the following table. NMFS expects that tributary contributions of water from the Tuolumne and Merced rivers, through the SJRA, will continue through 2011 and that the installation of a fish barrier at the Head of Old River will continue to occur during this period as permitted.

New Melones Index (TAF)	*Minimum flow required at Vernalis (cfs)*
0-999	*No new requirements*
1,000-1,399	*D1641 requirements or 1,500, whichever is greater*
1,400-1,999	*D1641 requirements or 3,000, whichever is greater*
2,000-2,499	*4,500*
2,500 or greater	*6,000*

2. Combined CVP and SWP exports shall be restricted through the following:

Flows at Vernalis (cfs)	*Combined CVP and SWP Export*
0-6,000	*1,500 cfs*
6,000-21,750[5]	*4:1 (Vernalis flow:export ratio)*
21,750 or greater	*Unrestricted until flood recedes below 21,750*

[4] The New Melones Index is a summation of end of February New Melones Reservoir storage and forecasted inflow using 50% exceedance from March through September

[5] Flood warning stage at Vernalis is 24.5 feet, flow is 21,750 cfs at this point. Flood stage is 29 feet with a corresponding flow of 34,500 cfs. Data from CDEC looking at April 8-9, 2006 period. As such, recognizing that the flows associated with these stages do vary, the trigger allowing unrestricted exports will be a Vernalis stage of 24.5 feet.

In addition:
1. *Reclamation/DWR shall seek supplemental agreement with the SJRGA as soon as possible to achieve minimum long term flows at Vernalis (see following table) through all existing authorities.*

San Joaquin River Index (60-20-20)	*Minimum long-term flow at Vernalis (cfs)*
Critically dry	*1,500*
Dry	*3,000*
Below normal	*4,500*
Above normal	*6,000*
Wet	*6,000*

Although the NMFS Operations BO and RPAs state that agreements for VAMP-like conditions will be pursued, the future of VAMP is uncertain, and Reclamation and SJRA participants are discussing the future approach for VAMP. No decisions on the future of VAMP have been made at the time of preparation of this BA. However, because of the requirements in the NMFS Operations BO, it is reasonable to assume that VAMP or a VAMP-like action would occur in the future.

Flow in the Lower San Joaquin River and Tributaries. During the WY 2010 Interim Flows Project, tributary releases to meet VAMP water quality objectives at Vernalis could have been affected if Interim Flows reached Vernalis during the VAMP period. Since releases from tributary streams under VAMP were tied to flow and water quality conditions at Vernalis, changes in those conditions at Vernalis due to WY 2010 Interim Flows would have allowed reductions in tributary flows. In response to WY 2011 Interim Flows, tributary releases to meet VAMP water quality objectives at Vernalis could be affected. As in WY 2010, Reclamation would routinely coordinate with NMFS regarding flows at Vernalis and will take actions necessary to prevent WY 2011 Interim Flows from reducing tributary flows subject to VAMP or VAMP-like conditions. Furthermore, flow requirements in the Stanislaus River are now subject to the NMFS operations BO RPAs, and flows and water quality at Vernalis, export/inflow requirements and OMR flows are subject to both D-1641 and the operation BOs RPAs. Since WY 2011 Interim Flows will be managed to comply with these regulations and others in effect at the time, implementation of the Proposed Action will maintain conditions that avoid adverse effects to protected fish resources in the lower San Joaquin River and tributaries. In addition, when flows in the Stanislaus River are increased above those required by the NMFS BO and RPAs to accommodate water quality and flow requirements at Vernalis, Interim Flows could contribute to the baseline condition at Vernalis and reduce flows in the Stanislaus River to those required by the RPAs. The reduction in flow could save coldwater in New Melones Reservoir for release later in the season that could improve instream habitat conditions for CV steelhead and Chinook salmon.

Increased flow between the Merced River confluence and the Delta also has the potential to improve water quality conditions within the lower San Joaquin River to the benefit of listed fish species in the Action Area. To assure that water quality is improved or, at worst, not degraded, the Interim Flows water quality monitoring plan will be in effect, including monitoring for targeted contaminants and a contingency to alter flows as necessary to avoid any adverse effect on water quality.

Item 4 – Effects of Proposed Action on Essential Fish Habitat (EFH)

Comment:

No evidence is provided to support the conclusion that there would be no adverse effect to Pacific salmonids or starry flounder. Furthermore, the no-effect EFH determination may not be true in the tributaries if VAMP-like flows are reduced as a result of the increase in San Joaquin River baseline contributions. Increased pumping could entrain eggs, larvae, and juvenile starry flounder. Reclamation's assessment contends that the 2008 delta smelt protections will add additional protections for starry flounder by does not explain how. The BA states that the actions include an increase in exports at the Jones and Banks facilities, but at the same time the document indicates the intent to operate in the Delta within the existing conditions and regulatory environment, specifically including the implementation of the NMFS 2009 Operations BO. It is imperative that this analysis is clear that any increase in pumping falls within the allowable pumping criteria of the Operations BOs. Given the reliance of this EFH consultation on the Operations BO, this EFH consultation should identify what method of analysis will be provided should the NMFS Operations BO/RPA be vacated or modified by the Federal Court.

Response:

Effects discussions regarding Pacific salmonids or starry flounder were inadvertently omitted from the WY 2011 Interim Flows Project BA. Descriptions of EFH and subsequent effects analysis have been added to the BA via the errata language provided below. The errata further explains that any changes to Delta operations resulting from WY 2011 Interim Flows will stay within the existing RPAs, and therefore, will not incur additional effects to EFH.

Section 6.2.1, EFH
Entire Section has been Removed from Section 6.2 Interrelated and Interdependent Effects
New Section 6.1.3, EFH, Is Added and Reads:

6.1.3 Essential Fish Habitat

As described for delta smelt above, the increased inflows in the San Joaquin River and Delta are also expected to reduce the straying of starry flounder into the south Delta, and the increase in exports within the allowable pumping criteria of the 2009 NMFS Operations BO and the 2008 USFWS' Operations BO may increase entrainment. However, the regulatory requirements embodied in the 2009 NMFS Operations BO and the 2008 USFWS' Operations BO would be applicable to the WY 2011 Interim Flows Project. These regulatory requirements would ensure that allowable take limits at the Delta export facilities would not be exceeded, which would provide additional protection for starry flounder.

NMFS did not establish any measures in the 2009 Operations BO for the protection of starry flounder, however, for the reasons described below, restrictive measures identified in the USFWS 2008 Operations BO to protect larval delta smelt would also protect starry flounder. Starry flounder spend most of their life downstream of the Action Area, in San Francisco Bay and the Pacific Ocean. Spawning occurs in the ocean generally near the mouth of San Francisco

Bay. Starry flounder spawn typically between February and April, while delta smelt spawn between February and June. Because of the common spawning times, the restrictive measures identified in the USFWS BO on Delta diversions to protect larval delta smelt would also protect larval starry flounder. The majority of yearling and older starry flounder live in bay and ocean environs, which is outside of the Action Area.

Starry flounder primarily occur within the Action Area during the early part of their juvenile life stage as young-of-the-year. After hatching, young starry flounder begin to move upstream, toward and into the Delta as their swimming ability improves. Small (20 millimeters fork length [mm FL]) starry flounder have been found as far upstream as Rio Vista on the Sacramento River. These smaller, younger juvenile starry flounder primarily occupy shallow habitats, often less than 60 cm deep. Larger juveniles (> 100 mm FL) tend to move into deeper habitats downstream of the riverine areas (Orcutt 1950). The majority of the young-of-the-year starry flounder appear to move out of the Delta in spring (March through June).

Starry flounder that use the interior Delta deeper habitats downstream of the riverine areas are primarily young-of-the-year. They use shallow habitats during the period when the USFWS 2008 Operations BO and RPAs in that BO reduce entrainment risks and should have a low vulnerability to entrainment due to both their habitat preference and the conditions established to reduce the risk of entrainment for delta smelt. The RPAs in the USFWS 2008 Operations BO that protect delta smelt and that will also be protective of starry flounder include, but are not limited to:

1. To protect adults delta smelt, daily Old and Middle River (OMR) flow requirements must be no more negative than the required OMR flow for a 14-day average, and no more than 25 percent negative than the requirement when there is a 5-day running average.

2. To protect adult delta smelt, Delta operations should maintain OMR flows no more negative than -2,000 cfs (14-day average) with a simultaneous 5-day running average flow no more negative than -2,500 cfs to protect adult delta smelt for 14 days.

3. To protect delta smelt larvae and juveniles, the CVP and SWP shall operate to maintain OMR flows no more negative than 1,250 to -5,000 cfs based on a 14-day running average with simultaneous 5-day running average within 25 percent of the applicable 14-day OMR flow requirements.

4. The Spring Head of Old River shall be installed only if USFWS determines delta smelt entrainment is not a concern.

5. Restoration of a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh shall be implemented.

Food sources are likely similar for larval and small juvenile starry flounder and delta smelt (Emmet et al. 1991, Bennet 2005), so protective measures for delta smelt food resources would also protect food resources for starry flounder. In addition, starry flounder salvage numbers are historically low indicating that entrainment has not been a major influence on starry flounder even before the USFWS 2008 Operations BO and RPAs have taken effect. Although different terminology is used in different places thought the WY 2011 Interim Flows Biological Assessment, all references to increases in exports at the Jones and Banks facilities as a result of the Project would fall within the allowable pumping criteria of the Operations BOs in place at the time of pumping. It is too speculative at this time to determine what method of analysis will be conducted in the event that the NMFS Operations 2009 BO or the USFWS 2008 Operations BO are vacated or modified by the Federal Court as it would depend on the modifications and any subsequent direction by the Court related to Delta operations. However, in the event that this where to happen, Reclamation would work with NMFS as to what, if any, additional actions would need to be taken. Overall, there would be no adverse effect to starry flounder EFH.

As described above, protective measures in the 2009 NMFS Operations BO would protect Pacific salmon. Therefore, there would be no adverse effect on Pacific salmon EFH. Increased flows in the Restoration Area, the San Joaquin River from its confluence with the Merced River to the Delta, and inthe San Joaquin River tributaries will directly benefit EFH for Pacific salmon in the Action Area in the same manner as described above for all ESUs of Chinook salmon. Potential changes in flows on the tributaries as a result of the WY 2011 Interim Flows vary based on the implementation of VAMP or a VAMP-like action and also by hydrologic conditions and time of year and include potential increases and decreases in flows in the same tributary. While this approach results in changes to water supply and habitat conditions related to flow on the tributaries, these changes are within the simulated historical range of variability in flows on the tributaries. Potential changes in flows on the tributaries as a result of the WY 2011 Interim Flows could be limited to the Stanislaus River as described above in Section 3.2. With VAMP or a VAMP-like action, there is a 60 to 90 percent chance flows will not be reduced in the tributaries as a result of the Proposed Action during the VAMP period. These changes range from flow increases as high as 6 percent and flow decreases as high as 11 percent during the VAMP period.

Flow from the Stanislaus River potentially used to meet flow and water quality conditions at Vernalis could exceed those required to protect CV steelhead per the 2009 NMFS Operations BO. When WY 2011 Interim Flows are sufficient to allow Stanislaus River releases to be reduced to the RPA required conditions, coldwater would be saved in New Melones Reservoir and become available to improve habitat for salmonids in the Stanislaus River later in the season, which would not occur without the contribution of WY 2011 Interim Flows to the baseline conditions at Vernalis.

Overall, changes in habitat conditions within the San Joaquin River, its tributaries and in the Delta attributable to WY 2011 Interim Flows are not likely to adversely affect EFH for starry flounder and Pacific salmon.

Item 5 – Delta Stewardship Council and CALFED Bay-Delta Program

Comment:
Section 4.4.4 blends the Delta Stewardship Council and the CALFED Bay-Delta Program, which is not correct. The Delta Stewardship Council will take over the governance role and some implementation roles for CALFED; but the CALFED Bay-Delta Program is essentially a 25-year program, defined by a Record of Decision (ROD) signed by the consortium of agencies referenced, including all the San Joaquin River Restoration Program settling parties. The ROD has not been vacated, nor necessarily modified. Reclamation has specific Congressional authorities to implement CALFED, but no specific authorities at this time to implement directives of the Delta Stewardship Council, which is authorized by state legislation. This section needs clarification to explain the program accurately in light of Reclamation's authorities to implement in relation to the Project.

Response:
Reclamation recognizes the distinction between the Delta Stewardship Council and CALFED and that the CALFED Bay Delta Program is a long-term program defined by a ROD. Reclamation also recognizes that the State of California passed legislation (SBX7 1) to reform state policies, programs and governance for the Sacramento-San Joaquin Delta, and establish guidelines for developing a new Delta Plan, including establishment of the Delta Stewardship Council to assist state and federal implementing agencies with tracking and reporting of performance measures associated with the Sacramento-San Joaquin Delta. The Delta Stewardship Council utilizes a collaborative management approach to work closely with partner agency staff, program stakeholders and other parties interested in the overall ecosystem health, water supply reliability and beneficial uses of the Delta.

Section 4.4.4, Delta Stewardship Council (CALFED Bay-Delta Program)
Additional Clarification is Added at the End of Paragraph as Follows:
Authority for implementation of the Settlement, including Interim Flows and associated studies is provided in Public Law 111-11. Implementation requires accommodating applicable State and Federal laws and agreements that would include such requirements affirmed per CALFED and any resulting from the Delta Stewardship Council-assisted, collaborative process described above.

Additional Item 6 – Interrelated and Interdependent Effects
Although not specifically requested in the July 23, 2010 letter from NMFS, the following revision to the Interrelated and Interdependent Effects Section of the WY 2011 Interim Flows Project BA are proposed based on discussions with NMFS' staff.

Section 6.2, Interrelated and Interdependent Effects
Page 6-30, Section is Removed and Replaced with the Following:
Interrelated actions are those that are part of a larger action and depend on the larger action for their justification (50 CFR 402.02). Interdependent actions are those that have no significant independent utility apart from the action that is under consultation. Interrelated and interdependent actions are activities that would not occur "but for" the WY 2011 Interim Flows.

Because the CVP and SWP operations, including export activities, affect fish and wildlife in the Central Valley, Reclamation consulted with both USFWS and NMFS under Section 7 of the ESA. The most recent consultations have been the USFWS OCAP BO for delta smelt (USFWS 2008) and the NMFS OCAP BO (NMS 2009) for Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, Central Valley steelhead DPS, and North American green sturgeon. Therefore, any adverse effects from increased pumping would be limited by regulatory restrictions included in these BOs. The WY 2011 Interim Flows would not increase take above acceptable limits established by the NMFS OCAP BO for Banks and Jones pumping plants. Therefore, the Proposed Action is not likely to adversely affect Central Valley steelhead, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook DPS, and North American green sturgeon.

Additional Item 7 – Temperature Data

Although not specifically requested in the July 23, 2010 letter from NMFS, the following Temperature Effects of the Proposed Action Section is added to the WY 2011 Interim Flows Project BA and are based on discussions with NMFS' staff.

Section 6.1.1, Direct and Indirect Effects, Aquatic Species
Page 6-8, The Following Language is Inserted at the end of the Section

Temperatures on the San Joaquin and Merced Rivers

Table 6.0d below reports modeled temperatures on the San Joaquin River at the Merced River confluence for WY 2010 and the results for the period 1981-2003. The actual results were collected from the United States Geological Survey real-time stream gage located just upstream from the San Joaquin River's confluence with the Merced River. The modeled results were obtained through use of the RMA model of the San Joaquin River, SJR5Q. The SJR5Q includes a representation of operations on the San Joaquin River, and a boundary condition for the Merced River operations. This allows the model to investigate changes in temperatures on the San Joaquin River as a result of operations at Friant Dam, and holds operations on the Merced River constant. Table 6.0d showing modeled data and Figure 6.0p plotting modeled versus actual data are represented below. Table 6.0e represents modeled data and actual WY 2010 collected data at the SMN (San Joaquin River near Newman) stream gage. Generally, the trend line for WY 2010 mimics the modeled data, although real water temperatures were colder than the modeled average for a similar water year type. It is important to note that WY 2010 was considered a normal wet year water type classification and that temperatures remained cooler than average.

Table 6.0d: Simulated Water Temperatures in San Joaquin River Downstream from Merced River During Water Year 2011 Interim Flows and the Difference from Existing Conditions

Water Year	October		November		Decem-ber		January		February		March		April		May		June		July		August		Septem-ber	
	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff	°F	Diff
1981	65	0.7	56	0.5	48	0.0	48	0.0	55	0.5	60	0.4	69	0.9	73	1.1	81	0.7	82	0.4	81	0.4	77	0.5
1982	66	0.6	56	0.6	48	0.0	46	0.1	53	0.3	58	0.1	61	0.0	67	-0.2	74	-0.3	79	0.1	80	0.3	73	0.3
1983	62	0.3	52	-0.1	48	-0.2	46	0.0	52	0.1	57	0.0	60	0.0	67	0.1	70	0.1	73	0.0	77	0.1	71	0.0
1984	62	0.2	55	0.1	49	-0.1	49	0.0	53	0.1	63	0.8	66	1.0	75	1.1	79	0.5	83	0.4	81	0.3	77	0.4
1985	64	0.4	54	0.3	50	-0.2	46	0.0	54	0.3	61	0.8	69	1.0	72	1.1	79	0.5	82	0.3	80	0.3	74	0.3
1986	65	0.6	53	0.5	46	0.1	49	0.0	54	0.3	59	0.3	63	0.0	70	-0.1	77	0.1	82	0.1	80	0.2	73	0.2
1987	66	0.4	56	0.7	46	0.0	46	0.0	54	0.4	61	0.6	71	0.9	74	0.7	78	0.5	80	0.3	80	0.3	76	0.5
1988	69	0.9	54	0.6	48	0.1	48	0.0	57	0.6	64	1.2	67	1.1	71	0.7	77	0.4	83	0.3	81	0.3	76	0.4
1989	68	0.7	55	0.9	48	0.0	48	0.0	54	0.3	61	1.2	70	1.5	73	1.2	77	0.5	81	0.3	80	0.2	75	0.3
1990	67	0.6	57	0.7	47	0.1	48	0.0	51	0.0	62	1.3	69	1.4	72	0.7	77	0.4	83	0.2	82	0.2	77	0.2
1991	69	0.8	55	0.9	46	0.0	48	0.0	55	0.7	61	1.2	67	1.5	73	1.6	78	0.5	83	0.3	81	0.2	78	0.4
1992	69	1.0	56	1.0	48	0.1	46	0.0	55	0.3	63	1.2	70	1.1	76	0.9	79	0.4	81	0.2	82	0.2	76	0.3
1993	69	0.6	55	1.1	47	0.1	48	0.0	54	0.0	64	0.6	64	-0.1	70	0.1	76	0.8	81	0.1	76	0.3	72	0.4
1994	64	0.5	56	0.5	48	0.0	48	0.0	53	0.1	63	1.4	67	1.1	71	0.7	79	0.4	80	0.3	82	0.2	77	0.2
1995	66	0.5	52	0.4	47	0.0	50	0.0	55	0.6	58	0.1	62	0.0	66	0.0	68	-0.9	76	-0.1	80	0.1	75	0.3
1996	62	0.4	60	0.7	52	0.1	50	0.0	55	0.0	60	0.1	66	0.8	68	-0.2	78	-0.2	82	0.2	81	0.1	75	0.2
1997	65	0.3	56	0.3	50	0.1	50	0.0	53	0.0	61	0.6	66	1.5	74	1.3	79	1.1	83	0.3	82	0.1	78	0.2
1998	67	0.3	58	0.7	48	0.1	50	0.0	53	0.3	60	0.0	63	0.0	65	0.1	70	-0.2	77	0.2	79	0.2	71	0.3
1999	63	0.5	56	0.4	48	0.2	49	0.0	54	0.1	60	0.6	63	1.5	70	1.2	79	0.4	83	0.3	81	0.1	77	0.3
2000	69	0.5	58	0.7	50	0.1	51	0.0	54	0.1	58	0.5	68	2.0	72	1.2	79	0.1	80	0.2	81	0.2	75	0.3
2001	65	0.4	53	0.1	50	0.0	49	0.0	52	0.2	63	0.9	66	1.7	74	1.6	79	0.4	80	0.2	79	0.2	77	0.3
2002	67	0.5	57	0.6	48	0.0	49	0.0	55	0.4	61	0.9	68	1.9	70	1.2	77	0.5	82	0.3	80	0.3	79	0.3
2003	67	0.5	56	0.7	51	0.1	51	0.0	56	0.4	63	1.0	66	2.0	71	1.3	79	0.4	82	0.3	79	0.3	76	0.3

Source: Water Year 2010 Interim Flows Draft Environmental Assessment/Initial Study

Key: °F = degrees Fahrenheit; Diff = difference in water temperatures (Interim Flow minus No Action)

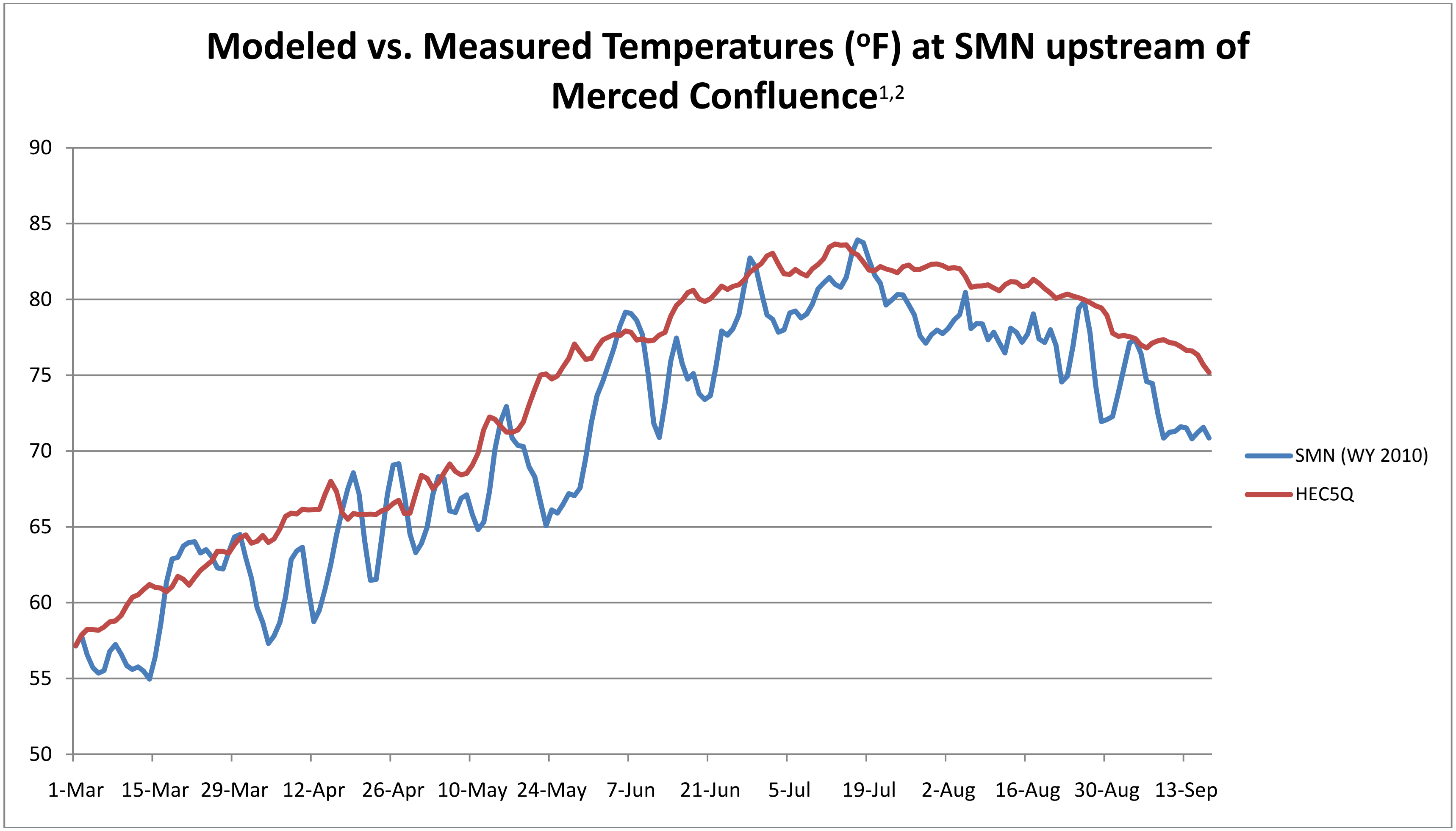
Table 6.0e: Modeled HEC(SJR)5Q Results in Comparison to Actual WY 2010 Temperature Data Upstream from Merced River Confluence[1,2]

Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q	Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q	Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q	Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q	Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q	Date	Actual WY 2010 Temp. (°F)at SMN	Modeled Temp from HEC5Q
1-Mar	57.14	57.17725	3-Apr	58.694375	64.42825	8-May	66.88625	68.43125	13-Jun	73.16	77.81975	18-Jul	83.744375	82.463	22-Aug	74.553125	80.216
2-Mar	57.850625	57.86175	4-Apr	57.310625	63.96825	9-May	67.113125	68.53375	14-Jun	75.925625	78.89325	19-Jul	82.610968	81.94175	23-Aug	74.939375	80.356
3-Mar	56.575745	58.23625	5-Apr	57.809375	64.20275	10-May	65.8025	69.08	15-Jun	77.459375	79.60525	20-Jul	81.595625	81.892	24-Aug	76.955	80.22325
4-Mar	55.724375	58.22475	6-Apr	58.671875	64.84325	11-May	64.82	69.86875	16-Jun	75.794375	79.954	21-Jul	81.059375	82.16725	25-Aug	79.428125	80.111
5-Mar	55.356875	58.18075	7-Apr	60.3575	65.68625	12-May	65.313125	71.4185	17-Jun	74.74617	80.445	22-Jul	79.626875	82.007	26-Aug	79.865	79.975
6-Mar	55.5275	58.397	8-Apr	62.8325	65.906	13-May	67.33625	72.244	18-Jun	75.11	80.60125	23-Jul	79.95875	81.9115	27-Aug	77.800625	79.78875
7-Mar	56.795	58.7355	9-Apr	63.404375	65.85125	14-May	70.14875	72.099	19-Jun	73.78625	80.03675	24-Jul	80.315	81.76025	28-Aug	74.31875	79.58025
8-Mar	57.245	58.7965	10-Apr	63.65375	66.16625	15-May	71.96375	71.6425	20-Jun	73.4	79.86275	25-Jul	80.30375	82.15775	29-Aug	71.94125	79.44275
9-Mar	56.616875	59.15425	11-Apr	61.015625	66.122	16-May	72.933125	71.25225	21-Jun	73.65875	80.0515	26-Jul	79.65875	82.273	30-Aug	72.078125	78.95025
10-Mar	55.848125	59.82425	12-Apr	58.758125	66.134	17-May	70.863125	71.23625	22-Jun	75.576875	80.4425	27-Jul	78.985625	81.9705	31-Aug	72.284375	77.76825
11-Mar	55.593125	60.35425	13-Apr	59.525	66.16075	18-May	70.375625	71.39175	23-Jun	77.91875	80.8795	28-Jul	77.601875	81.98075	1-Sep	73.832391	77.57625
12-Mar	55.761875	60.52125	14-Apr	60.88129	67.14625	19-May	70.29875	71.922	24-Jun	77.645	80.6585	29-Jul	77.114375	82.1475	2-Sep	75.515	77.61875
13-Mar	55.480625	60.87475	15-Apr	62.489375	68.006	20-May	68.965106	73.04125	25-Jun	78.081875	80.86075	30-Jul	77.6675	82.324	3-Sep	77.15375	77.5415
14-Mar	54.965	61.2005	16-Apr	64.435625	67.34275	21-May	68.30375	74.069	26-Jun	78.963125	80.9615	31-Jul	77.98625	82.3375	4-Sep	77.316875	77.416
15-Mar	56.384375	61.014	17-Apr	66.048125	65.93125	22-May	66.6575	75.00875	27-Jun	80.87	81.2925	1-Aug	77.740625	82.23725	5-Sep	76.443125	76.99475
16-Mar	58.589375	60.96075	18-Apr	67.525625	65.49875	23-May	65.076875	75.0815	28-Jun	82.738478	81.8045	2-Aug	78.1025	82.04725	6-Sep	74.586875	76.805
17-Mar	61.330625	60.719	19-Apr	68.571875	65.8775	24-May	66.1175	74.7555	29-Jun	82.146875	82.0915	3-Aug	78.633696	82.10175	7-Sep	74.45375	77.12775
18-Mar	62.88875	61.05125	20-Apr	67.1675	65.81475	25-May	65.916875	74.94875	30-Jun	80.504375	82.3675	4-Aug	78.9975	82.01825	8-Sep	72.40625	77.274
19-Mar	62.984375	61.73625	21-Apr	64.045625	65.82	26-May	66.49625	75.561	1-Jul	78.96875	82.8745	5-Aug	80.470769	81.5055	9-Sep	70.85033	77.3495
20-Mar	63.734375	61.544	22-Apr	61.473125	65.84375	27-May	67.19375	76.11775	2-Jul	78.695	83.04925	6-Aug	78.085625	80.804	10-Sep	71.24	77.158
21-Mar	63.978125	61.15175	23-Apr	61.533125	65.8205	28-May	67.05875	77.0605	3-Jul	77.83625	82.33325	7-Aug	78.411875	80.8855	11-Sep	71.301875	77.09925
22-Mar	64.011875	61.66275	24-Apr	64.278125	66.06875	29-May	67.555625	76.54525	4-Jul	77.995625	81.6885	8-Aug	78.3875	80.8915	12-Sep	71.6	76.8875
23-Mar	63.284375	62.12875	25-Apr	67.135625	66.199	30-May	69.53375	76.05225	5-Jul	79.11125	81.65225	9-Aug	77.335625	80.96625	13-Sep	71.526875	76.63875
24-Mar	63.4925	62.4375	26-Apr	69.070625	66.53825	31-May	71.894375	76.11625	6-Jul	79.236875	81.9735	10-Aug	77.83625	80.7605	14-Sep	70.805	76.608
25-Mar	63.03125	62.7445	27-Apr	69.1625	66.751	1-Jun	73.66625	76.807	7-Jul	78.78125	81.72675	11-Aug	77.14625	80.5685	15-Sep	71.223125	76.34775
26-Mar	62.299362	63.3975	28-Apr	67.051613	65.8775	2-Jun	74.598125	77.335	8-Jul	79.041875	81.5495	12-Aug	76.47125	80.97525	16-Sep	71.571875	75.6805
27-Mar	62.22875	63.37825	29-Apr	64.51625	65.90675	4-Jun	76.80125	77.6905	9-Jul	79.694375	82.01775	13-Aug	78.096875	81.174	17-Sep	70.856774	75.1785
28-Mar	63.344375	63.27025	30-Apr	63.303125	67.20325	5-Jun	78.205625	77.60825	10-Jul	80.699375	82.30425	14-Aug	77.830625	81.141			
29-Mar	64.335435	63.84775	1-May	63.895625	68.40175	6-Jun	79.158125	77.91775	11-Jul	81.093125	82.69375	15-Aug	77.178125	80.8425			
30-Mar	64.495625	64.27875	2-May	64.97375	68.19675	7-Jun	79.075625	77.8315	12-Jul	81.441875	83.44625	16-Aug	77.72	80.92025			
31-Mar	62.969375	64.46975	3-May	67.13	67.521	8-Jun	78.62	77.32575	13-Jul	81.00125	83.658	17-Aug	79.0475	81.33425			
1-Apr	61.626875	63.93	4-May	68.320625	67.899	9-Jun	77.688125	77.403	14-Jul	80.79875	83.5775	18-Aug	77.39375	81.06325			
2-Apr	59.66375	64.0505	5-May	68.185625	68.56575	10-Jun	75.12125	77.25575	15-Jul	81.47375	83.60325	19-Aug	77.162391	80.71025			
			6-May	66.044375	69.15475	11-Jun	71.825	77.31575	16-Jul	83.065625	83.119	20-Aug	78.005	80.4245			
			7-May	65.945	68.6485	12-Jun	70.89875	77.65525	17-Jul	83.9225	82.94225	21-Aug	76.983125	80.0645			

[1] Actual WY 2010 Temperatures are a daily average (gage is on a 15-minute increment sampling schedule)

[2] Modeled HEC5Q results are an annual average for normal wet year designations based on data collected between 1980 and 2005

Figure 6.0p. Plotted HEC(SJR)5Q Results in Comparison to Actual WY 2010 Temperature Data Upstream from Merced River Confluence



[1]HEC 5Q San Joaquin River upstream of Merced Confluence, daily average for Normal-Wet years
[2] SMN- Daily average 2010 Interim Flows temperatures at SJR near Newman

Data
Tables 6.0f through 6.0j report flows and temperatures at three locations, as reported by SJR-5Q.

1. On the San Joaquin River, just upstream of its confluence with the Merced (without Flows)

2. On the San Joaquin River, just upstream of its confluence with the Merced (with Interim Flows)

3. On the Merced River, just upstream of its confluence with the San Joaquin

4. On the San Joaquin River, just downstream of its confluence with the Merced (without Interim Flows)

5. On the San Joaquin River, just downstream of its confluence with the Merced (with Interim Flows)

6. Differences between #4 and #5, above

Differences between #4 and #5 are the topic of Table 6.0k below.

Table 6.0f. Monthly San Joaquin River Flows and Temperatures, Upstream from the Merced River Confluence (without Interim Flows)

Existing-Base Flow (CFS) Upstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	142	97	116	98	104	407	287	148	162	232	257	176
Average	553	555	1090	1939	2519	2473	2248	2108	1595	1471	587	542
Max	2388	2658	8423	16659	15241	16539	13477	11523	12838	9738	1452	1639

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	477	286	309	486	704	959	543	410	310	389	410	367
1982	314	359	447	1066	2802	3433	8353	7456	2973	1280	754	1019
1983	1142	2229	8423	9822	15241	16539	13477	11523	12838	9738	1452	1639
1984	2388	2658	6118	5801	879	859	717	550	558	538	627	602
1985	620	218	128	295	503	711	676	488	482	545	603	572
1986	407	269	402	545	5080	9187	6063	3823	3329	1190	874	793
1987	558	366	359	417	561	868	587	461	478	552	544	423
1988	299	374	282	479	447	611	493	358	433	415	537	448
1989	339	174	238	295	344	417	514	351	370	434	484	433
1990	425	391	394	359	425	407	329	273	277	377	421	303
1991	210	161	116	98	104	592	316	158	162	232	257	176
1992	142	111	118	163	485	460	287	148	195	237	274	246
1993	193	97	150	1556	1256	1042	1273	1338	791	878	475	399
1994	418	468	457	445	730	533	332	223	271	333	403	351
1995	281	232	292	1608	2445	6537	6409	7525	3084	6347	957	785
1996	652	483	523	634	1870	2836	778	2338	1333	613	735	617
1997	533	703	3110	16659	11725	1511	463	1163	395	434	536	473
1998	547	458	609	1070	8383	4905	7800	7996	6378	7076	861	822
1999	913	705	605	441	896	888	560	412	402	505	583	528
2000	588	470	290	415	1285	1264	595	531	573	530	495	401
2001	535	575	525	628	680	947	487	382	398	417	452	380
2002	389	517	446	669	546	612	316	299	313	379	378	351
2003	352	468	732	654	547	762	337	288	355	394	396	343

Existing-Base Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	65	53	46	44	51	57	61	67	73	75	80	74
Average	68	56	48	48	54	61	67	73	78	82	81	76
Max	70	60	52	52	57	64	71	78	80	83	83	79

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	68	56	47	47	55	61	69	73	80	82	81	77
1982	66	56	48	46	54	59	63	71	77	81	81	74
1983	66	53	48	45	52	57	61	68	73	75	80	75
1984	66	55	48	48	53	63	66	75	79	83	81	77
1985	65	53	46	44	54	61	69	72	79	82	80	74
1986	66	53	46	49	53	60	66	72	78	82	80	74
1987	67	56	47	46	54	61	71	75	78	80	80	75
1988	69	55	49	48	56	64	66	71	77	83	80	76
1989	68	55	48	48	54	61	69	74	78	81	80	75
1990	67	57	48	48	51	61	69	72	78	83	82	77
1991	69	56	46	47	54	62	67	73	79	83	82	78
1992	70	57	48	46	55	63	70	77	79	81	82	77
1993	70	56	47	48	55	64	68	74	79	83	81	77
1994	69	56	48	48	53	62	67	73	80	83	82	77
1995	68	53	46	50	55	58	64	69	76	79	83	78
1996	69	60	52	50	57	62	67	71	78	82	81	75
1997	66	56	50	49	53	62	66	76	78	83	82	78
1998	67	58	48	50	52	62	64	67	74	80	83	78
1999	67	56	47	48	55	61	65	72	79	83	81	77
2000	69	58	50	51	55	61	68	73	79	80	81	75
2001	66	54	50	49	53	63	68	78	79	80	80	77
2002	68	57	47	49	55	61	68	73	78	83	81	79
2003	68	57	51	52	56	62	66	73	79	82	80	77

Table 6.0g. Monthly San Joaquin River Flows and Temperatures, Upstream from the Merced River confluence (with Interim Flows)

Existing-Interim Flow (CFS) Upstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	256	319	154	100	275	1073	590	261	245	293	314	264
Average	681	766	1008	1884	2337	2895	2756	2028	1568	1496	659	631
Max	2492	2904	7662	16286	14212	16504	13467	10748	12312	9658	1484	1640

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	659	548	384	495	911	1675	1343	697	445	478	527	498
1982	490	605	515	993	1639	2644	8013	6272	2197	1315	875	1157
1983	1184	1881	7662	9420	14212	16504	13467	10748	12312	9658	1484	1640
1984	2492	2904	5149	5519	1051	1579	1899	979	690	659	745	736
1985	799	497	205	304	715	1445	1456	768	599	657	723	705
1986	571	536	476	473	4142	8270	5717	3458	3083	1315	993	925
1987	744	635	422	425	760	1565	914	597	605	661	652	555
1988	459	639	348	483	629	1280	806	500	545	502	621	558
1989	479	404	295	305	532	1123	1270	623	475	505	548	533
1990	569	624	434	368	617	1073	631	385	362	436	475	384
1991	331	384	154	100	275	1297	1087	416	245	293	314	264
1992	256	334	157	164	664	1130	590	261	277	295	327	317
1993	304	319	189	1550	1211	1543	1369	1431	1697	1093	529	470
1994	531	695	497	447	899	1199	634	339	353	392	456	422
1995	393	455	331	1536	1393	6714	5913	5817	2245	6130	999	862
1996	764	705	562	635	1917	2984	1634	1112	1042	674	789	691
1997	645	934	1945	16286	10886	1799	1705	1714	1560	782	589	544
1998	659	679	648	1014	6481	4953	7528	6857	4988	6028	913	893
1999	1025	896	643	441	1059	1613	1810	817	498	576	636	599
2000	704	710	343	418	1479	1750	1754	950	536	589	552	472
2001	647	797	564	630	850	1652	1248	653	480	478	506	451
2002	500	739	485	671	716	1306	1068	554	400	439	438	427
2003	464	691	771	656	714	1483	1544	688	436	453	455	414

Existing-Interim Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	65	53	46	44	51	57	61	68	73	76	80	74
Average	68	56	48	48	54	62	68	73	78	82	81	77
Max	71	61	52	52	57	65	72	79	81	84	83	79

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	68	57	47	47	55	61	69	74	81	83	81	77
1982	66	57	48	46	54	60	64	72	77	82	81	75
1983	66	53	48	45	52	57	61	68	73	76	80	75
1984	67	55	48	48	54	63	67	76	80	84	81	78
1985	65	54	46	44	54	62	70	74	80	83	80	74
1986	66	54	46	49	54	60	66	73	78	82	80	74
1987	67	57	47	46	55	62	72	75	79	80	80	76
1988	70	55	49	48	57	65	68	72	77	83	81	76
1989	68	55	48	48	54	62	70	75	78	81	80	75
1990	68	58	48	48	51	62	70	73	78	83	82	77
1991	70	56	46	47	55	62	68	74	79	83	82	78
1992	70	58	48	46	55	64	71	78	80	81	83	77
1993	71	57	47	48	54	65	68	74	78	83	81	77
1994	70	57	48	48	53	64	69	74	80	84	82	78
1995	68	53	46	50	55	58	64	70	77	79	83	78
1996	69	61	52	50	57	62	67	72	78	82	82	75
1997	66	56	49	49	53	63	67	76	79	83	83	79
1998	67	58	48	50	53	61	64	68	74	81	83	78
1999	67	57	47	48	55	61	65	73	80	83	81	78
2000	70	59	50	51	55	61	70	74	79	81	81	76
2001	66	54	50	49	53	64	68	79	80	80	80	77
2002	68	58	47	49	56	62	69	73	78	83	81	79
2003	68	58	51	52	56	63	67	73	80	82	80	77

Table 6.0h. Monthly Merced River Flows and Temperatures, Upstream from the San Joaquin River confluence (identical with and without Interim Flows)

Existing-Base Flow (CFS) Upstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	63	181	160	148	119	186	149	142	71	52	46	24
Average	522	331	538	842	1158	1081	1144	1012	631	441	173	246
Max	2156	868	2031	7648	6785	4401	4619	3702	4083	2772	707	1118

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	539	500	445	279	188	268	158	143	89	63	65	67
1982	74	195	194	291	1239	1711	4619	3702	1097	693	250	520
1983	1359	868	2030	2199	3677	4401	4119	3013	4083	2772	693	1118
1984	2156	655	1810	3098	1051	423	297	273	224	115	75	90
1985	211	506	1167	605	238	189	199	220	150	74	67	123
1986	219	188	247	159	551	2943	2854	1735	539	103	80	123
1987	325	181	160	175	193	217	152	193	151	80	64	66
1988	77	195	187	204	194	186	149	170	112	57	59	24
1989	63	190	212	216	218	254	222	201	138	60	54	42
1990	72	206	204	204	228	200	201	189	127	56	46	40
1991	71	204	210	148	119	330	151	142	71	52	55	82
1992	87	248	257	251	306	257	159	146	79	52	55	54
1993	243	275	225	337	273	269	1488	1339	660	404	707	690
1994	1304	220	231	239	265	265	389	441	137	365	57	63
1995	350	237	235	338	226	2291	3371	3680	3080	2486	423	636
1996	1618	461	480	292	2169	2640	840	1134	259	103	96	143
1997	429	291	2031	7648	6785	1588	669	603	146	83	79	111
1998	155	253	229	781	4618	2525	2896	2672	2469	1981	648	1096
1999	1101	321	468	824	1614	735	1124	769	195	107	61	111
2000	280	269	282	288	1735	2349	792	577	190	123	103	172
2001	531	406	321	277	254	324	553	617	149	102	76	95
2002	408	470	518	298	248	247	391	664	186	94	82	78
2003	333	264	235	209	241	252	510	649	181	108	94	104

Existing-Base Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	57	50	45	47	50	54	55	59	61	65	71	64
Average	63	54	48	49	53	58	62	67	73	77	77	72
Max	66	57	51	51	55	61	67	73	78	81	79	76

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	62	55	48	48	54	58	65	70	78	80	78	74
1982	63	53	48	47	52	56	56	59	68	73	76	70
1983	59	51	50	49	52	54	55	60	61	65	71	64
1984	57	53	51	50	53	60	63	71	76	80	78	75
1985	62	52	50	47	54	58	66	69	77	80	77	71
1986	62	52	45	49	53	56	58	63	73	79	77	71
1987	63	54	46	47	53	59	67	70	76	78	77	73
1988	66	52	48	48	55	61	64	68	75	81	78	75
1989	65	52	48	48	53	59	66	69	75	79	78	74
1990	64	54	46	48	51	59	66	69	75	81	79	75
1991	65	53	46	49	54	55	63	67	75	80	78	76
1992	66	55	48	47	55	61	67	73	76	79	79	73
1993	65	54	46	48	53	61	60	65	71	77	71	68
1994	62	53	47	49	52	60	64	69	76	77	79	75
1995	64	50	47	51	55	56	57	59	62	66	75	70
1996	59	57	51	50	54	56	63	65	76	80	79	72
1997	62	54	51	50	52	59	63	70	76	80	78	75
1998	64	56	48	51	52	57	58	59	62	67	74	66
1999	59	54	49	50	54	58	60	67	76	80	78	74
2000	65	55	49	51	54	57	64	68	77	78	78	72
2001	63	53	49	48	50	60	62	68	75	78	77	74
2002	65	55	49	48	54	58	64	66	74	79	77	75
2003	64	54	49	50	54	60	62	67	76	79	76	73

Table 6.0i. San Joaquin River Flows and Temperatures, Downstream from the Merced River confluence (without Interim Flows)

Existing-Base Flow (CFS) Downstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	228	359	326	247	223	608	448	294	233	284	312	259
Average	1075	886	1622	2776	3676	3555	3393	3124	2227	1920	761	788
Max	4539	3307	10399	24247	18943	20943	17611	14550	16873	12613	2147	2753

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	1020	785	754	761	897	1227	703	554	400	452	475	433
1982	389	551	642	1355	4022	5137	12934	11197	4085	1987	1003	1533
1983	2489	3095	10399	11964	18943	20943	17611	14550	16873	12613	2147	2753
1984	4539	3307	7875	8940	1934	1285	1015	823	781	654	701	692
1985	832	723	1295	901	742	897	877	708	632	618	669	694
1986	628	456	651	700	5587	12123	8941	5566	3882	1298	955	916
1987	885	548	519	592	754	1084	741	653	629	633	607	490
1988	375	571	469	682	641	798	642	527	545	472	595	474
1989	402	365	449	512	562	670	734	555	508	494	538	476
1990	497	597	599	563	653	608	530	460	405	433	467	343
1991	280	365	326	247	223	920	470	300	233	284	312	259
1992	228	359	375	415	790	716	448	294	274	289	328	300
1993	436	372	375	1891	1521	1312	2755	2689	1448	1285	1181	1091
1994	1723	689	689	684	993	800	722	666	408	699	460	415
1995	631	470	526	1932	2673	8783	9789	11205	6190	8844	1384	1419
1996	2273	945	1002	924	4024	5481	1630	3471	1596	717	831	761
1997	961	995	5095	24247	18617	3135	1136	1769	542	516	615	584
1998	702	710	839	1841	12957	7442	10701	10670	8835	9108	1509	1917
1999	2017	1027	1075	1264	2507	1628	1682	1183	599	611	643	639
2000	868	740	572	702	3001	3629	1381	1113	764	653	598	573
2001	1062	983	847	904	932	1275	1040	1001	547	520	528	475
2002	794	987	963	974	794	859	707	965	499	473	461	429
2003	685	732	964	865	786	1015	847	939	535	502	491	447

Existing-Base Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	62	52	46	46	51	57	60	65	69	73	75	71
Average	65	55	48	48	54	60	65	70	77	81	80	75
Max	68	59	51	51	56	63	70	75	80	83	82	78

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	65	55	48	48	55	60	68	72	80	82	80	76
1982	65	55	48	46	53	58	61	67	74	79	79	73
1983	62	52	48	46	52	57	60	67	70	73	77	71
1984	62	54	49	49	53	62	65	74	78	83	81	77
1985	64	53	50	46	54	60	68	71	78	82	80	73
1986	65	53	46	49	53	59	63	70	77	82	80	73
1987	66	56	46	46	54	61	70	73	78	80	79	75
1988	68	54	48	48	56	63	66	70	76	83	80	76
1989	67	54	48	48	54	60	68	72	77	81	80	75
1990	67	56	47	48	51	60	68	71	77	83	82	77
1991	68	54	46	48	54	59	66	71	78	82	81	77
1992	68	55	48	46	55	62	69	75	78	81	82	76
1993	68	54	47	48	54	63	64	70	75	81	75	72
1994	64	55	48	48	52	62	66	70	78	80	82	77
1995	66	52	47	50	55	58	62	66	69	76	80	74
1996	62	59	51	50	55	59	65	68	78	82	81	75
1997	64	55	50	50	53	61	64	73	77	82	82	78
1998	66	57	48	50	52	60	63	65	71	77	79	71
1999	62	56	48	49	54	60	61	69	78	83	81	77
2000	68	57	50	51	54	58	66	70	79	80	80	75
2001	64	53	50	49	52	62	65	73	78	79	79	76
2002	67	56	48	49	55	60	66	69	77	82	80	78
2003	66	56	51	51	55	62	64	69	78	82	79	76

Table 6.0j. San Joaquin River Flows and Temperatures, Downstream from the Merced River confluence (with Interim Flows)

Existing-Interim Flow (CFS) Downstream from Merced

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	342	582	366	249	391	1273	753	407	316	345	369	347
Average	1203	1096	1541	2721	3494	3974	3903	3045	2199	1944	832	876
Max	4642	3554	9643	23875	17919	20899	17603	13777	16347	12531	2178	2755

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	1201	1047	831	769	1101	1940	1504	843	535	542	592	565
1982	564	797	711	1283	2865	4344	12594	10016	3303	2021	1124	1671
1983	2541	2738	9643	11561	17919	20899	17603	13777	16347	12531	2178	2755
1984	4642	3554	6907	8655	2104	2002	2197	1258	913	774	820	826
1985	1010	1002	1374	910	953	1629	1658	990	749	730	790	827
1986	792	723	725	629	4650	11206	8594	5201	3634	1423	1073	1048
1987	1070	817	582	600	951	1780	1070	789	756	741	716	622
1988	535	836	535	686	821	1466	957	669	657	560	679	583
1989	541	595	508	521	748	1374	1491	829	612	565	601	575
1990	640	830	639	572	843	1273	834	573	490	492	521	424
1991	402	588	366	249	391	1623	1243	560	316	345	369	347
1992	342	582	415	416	967	1385	753	407	356	348	382	371
1993	547	594	414	1885	1475	1812	2854	2781	2345	1511	1234	1162
1994	1836	916	729	686	1160	1464	1026	782	490	758	513	486
1995	742	693	566	1862	1623	8956	9300	9500	5347	8623	1426	1496
1996	2385	1168	1042	924	4069	5626	2490	2249	1302	777	885	834
1997	1072	1226	3946	23875	17780	3417	2375	2320	1709	868	669	655
1998	813	931	879	1786	11059	7485	10432	9534	7472	8028	1561	1988
1999	2129	1218	1114	1264	2668	2349	2932	1592	694	682	697	709
2000	984	980	627	704	3193	4116	2537	1536	727	712	656	644
2001	1174	1205	886	906	1100	1977	1802	1275	630	580	582	546
2002	905	1210	1002	977	962	1552	1460	1223	587	533	520	504
2003	796	955	1004	867	952	1733	2055	1343	616	561	549	518

Existing-Interim Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	62	52	46	46	51	57	60	65	68	73	76	71
Average	66	55	48	48	54	61	66	71	77	81	80	75
Max	69	60	52	51	57	64	71	76	81	83	82	79

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	65	56	48	48	55	60	69	73	81	82	81	77
1982	66	56	48	46	53	58	61	67	74	79	80	73
1983	62	52	48	46	52	57	60	67	70	73	77	71
1984	62	55	49	49	53	63	66	75	79	83	81	77
1985	64	54	50	46	54	61	69	72	79	82	80	74
1986	65	53	46	49	54	59	63	70	77	82	80	73
1987	66	56	46	46	54	61	71	74	78	80	80	76
1988	69	54	48	48	57	64	67	71	77	83	81	76
1989	68	55	48	48	54	61	70	73	77	81	80	75
1990	67	57	47	48	51	62	69	72	77	83	82	77
1991	69	55	46	48	55	61	67	73	78	83	81	78
1992	69	56	48	46	55	63	70	76	79	81	82	76
1993	69	55	47	48	54	64	64	70	76	81	76	72
1994	64	56	48	48	53	63	67	71	79	80	82	77
1995	66	52	47	50	55	58	62	66	68	76	80	75
1996	62	60	52	50	55	60	66	68	78	82	81	75
1997	65	56	50	50	53	61	66	74	79	83	82	78
1998	67	58	48	50	53	60	63	65	70	77	79	71
1999	63	56	48	49	54	60	63	70	79	83	81	77
2000	69	58	50	51	54	58	68	72	79	80	81	75
2001	65	53	50	49	52	63	66	74	79	80	79	77
2002	67	57	48	49	55	61	68	70	77	82	80	79
2003	67	56	51	51	56	63	66	71	79	82	79	76

Table 6.0k. Differences in San Joaquin River Flows and Temperatures, Downstream from the Merced River Confluence (Interim Flows minus Existing Condition)

Difference (Interim-Base) Flow (CFS)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	52	-357	-1149	-403	-1898	-917	-489	-1706	-1362	-1081	31	1
Average	128	210	-81	-55	-183	419	510	-79	-27	24	71	89
Max	185	279	78	9	210	731	1250	551	1167	353	121	137

Water Yea	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	181	262	76	8	205	714	801	290	134	90	117	132
1982	176	246	69	-71	-1158	-793	-340	-1181	-782	34	121	137
1983	52	-357	-756	-403	-1024	-44	-7	-774	-526	-82	31	1
1984	103	247	-968	-286	170	717	1182	434	132	120	119	134
1985	178	279	78	9	210	731	781	282	117	112	121	133
1986	163	267	74	-70	-937	-917	-347	-365	-248	125	119	132
1987	185	269	64	8	197	695	329	136	127	109	108	132
1988	160	265	67	4	180	668	315	142	112	88	84	110
1989	139	230	59	9	186	704	757	274	104	71	63	100
1990	143	233	41	9	191	664	304	113	85	59	54	81
1991	121	222	40	2	169	703	772	260	83	61	57	88
1992	114	222	40	1	177	668	305	113	82	59	53	71
1993	111	222	40	-6	-46	500	99	92	897	226	53	71
1994	113	228	41	2	167	665	304	116	82	59	53	71
1995	111	222	40	-70	-1050	172	-489	-1706	-843	-221	42	76
1996	111	222	40	0	45	145	859	-1222	-294	61	54	73
1997	111	231	-1149	-371	-837	282	1239	551	1167	353	53	71
1998	111	221	40	-55	-1898	43	-269	-1137	-1362	-1081	53	71
1999	111	191	39	0	161	721	1250	409	95	71	53	71
2000	116	240	55	2	192	487	1155	423	-37	59	57	71
2001	111	222	40	2	168	702	762	274	83	60	54	71
2002	111	222	40	2	168	693	754	258	88	60	60	76
2003	111	223	40	2	165	719	1208	404	81	59	58	71

Difference (Interim-Base) Temp (Deg F)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Min	0	0	0	0	0	0	0	0	-1	0	0	0
Average	1	1	0	0	0	1	1	1	0	0	0	0
Max	1	1	0	0	1	1	2	2	1	0	0	1

Water Yea	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1981	0.7	0.5	0.0	0.0	0.5	0.4	0.9	1.1	0.7	0.4	0.4	0.5
1982	0.6	0.6	0.0	0.1	0.3	0.1	0.0	-0.2	-0.3	0.1	0.3	0.3
1983	0.3	-0.1	-0.2	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0
1984	0.2	0.1	-0.1	0.0	0.1	0.8	1.0	1.1	0.5	0.4	0.3	0.4
1985	0.4	0.3	-0.2	0.0	0.3	0.8	1.0	1.1	0.5	0.3	0.3	0.3
1986	0.6	0.5	0.1	0.0	0.3	0.3	0.0	-0.1	0.1	0.1	0.2	0.2
1987	0.4	0.7	0.0	0.0	0.4	0.6	0.9	0.7	0.5	0.3	0.3	0.5
1988	0.9	0.6	0.1	0.0	0.6	1.2	1.1	0.7	0.4	0.3	0.3	0.4
1989	0.7	0.9	0.0	0.0	0.3	1.2	1.5	1.2	0.5	0.3	0.2	0.3
1990	0.6	0.7	0.1	0.0	0.0	1.3	1.4	0.7	0.4	0.2	0.2	0.2
1991	0.8	0.9	0.0	0.0	0.7	1.2	1.5	1.6	0.5	0.3	0.2	0.4
1992	1.0	1.0	0.1	0.0	0.3	1.2	1.1	0.9	0.4	0.2	0.2	0.3
1993	0.6	1.1	0.1	0.0	0.0	0.6	-0.1	0.1	0.8	0.1	0.3	0.4
1994	0.5	0.5	0.0	0.0	0.1	1.4	1.1	0.7	0.4	0.3	0.2	0.2
1995	0.5	0.4	0.0	0.0	0.6	0.1	0.0	0.0	-0.9	-0.1	0.1	0.3
1996	0.4	0.7	0.1	0.0	0.0	0.1	0.8	-0.2	-0.2	0.2	0.1	0.2
1997	0.3	0.3	0.1	0.0	0.0	0.6	1.5	1.3	1.1	0.3	0.1	0.2
1998	0.3	0.7	0.1	0.0	0.3	0.0	0.0	0.1	-0.2	0.2	0.2	0.3
1999	0.5	0.4	0.2	0.0	0.1	0.6	1.5	1.2	0.4	0.3	0.1	0.3
2000	0.5	0.7	0.1	0.0	0.1	0.5	2.0	1.2	0.1	0.2	0.2	0.3
2001	0.4	0.1	0.0	0.0	0.2	0.9	1.7	1.6	0.4	0.2	0.2	0.3
2002	0.5	0.6	0.0	0.0	0.4	0.9	1.9	1.2	0.5	0.3	0.3	0.3
2003	0.5	0.7	0.1	0.0	0.4	1.0	2.0	1.3	0.4	0.3	0.3	0.3

Sensitivity of Temperatures on the Merced, Tuolumne, and Stanislaus Rivers to Changes in Flow

Plots of water temperature and mean daily flow were evaluated to identify potential linkages between flow rates and temperature conditions in the Merced, Tuolumne, and Stanislaus rivers for March and April. Measured data was then used to formulate relationships between flow and temperature. These relationships were used to check the potential sensitivity of temperatures on the San Joaquin River arising from changes in flow on the Merced, Tuolumne and Stanislaus rivers seen in CalSim model results. These relationships are shown in Figure 6.0q below.

Summary

Records of flow rates and temperatures were compiled for the tributary rivers, as close to the confluences as could be found. The relationship between flow and temperature was not linear: the range of possible temperatures varied by +/- 10ºF, particularly during lower releases expected by the CalSim modeling under both No Action and Proposed Action. Conceptually, as water flows further from the dams, ambient air temperature conditions dominate over the flow rate in controlling the water temperature. At the confluence of the tributaries with the San Joaquin River, flow rates do not appear to influence temperatures at lower ranges of release. Changes in tributary flows to meet VAMP requirements as a result of WY 2011 Interim Flows are unlikely to change water temperatures because ambient air temperature conditions dominate.

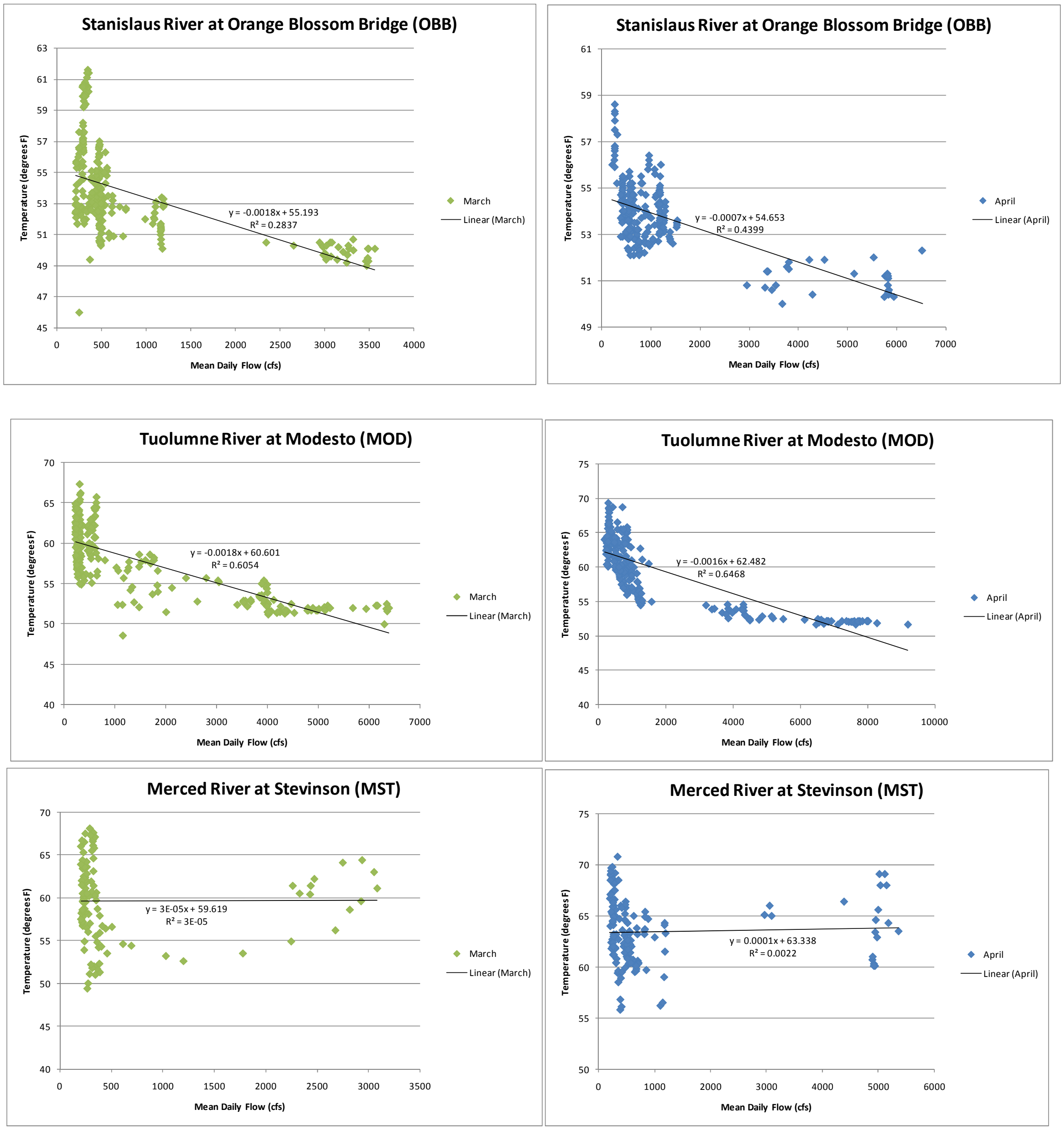


Figure 6.0q. Records and Linear Relationships Between Flow and Temperature for the Merced River at Stevinson, for March and April

Table 6.0l. Linear Relationships between Flow and Temperature

River	Month	Equation (x = flow, result = temperature)	R^2
Merced	March	-0.00003x + 59.619	0.00003
	April	-0.0001x + 63.338	0.0022
Tuolumne	March	-0.0018x + 60.601	0.6054
	April	-0.0016x + 62.482	0.6468
Stanislaus	March	-0.0018x + 55.193	0.2837
	April	-0.0007x + 54.653	0.4399