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FIRM and AFFILIATE OFFICES

THOMAS M. BERLINER
DIRECT DIAL: +1 415 957 3333
PERSONAL FAX: +1 415 520 5835
E-MAIL: tmberliner@duanemorris.com

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VIA ELECTRONIC MAIL

April 1, 2015

Mr. Thomas Howard,
Executive Director
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Re: Comments of the San Joaquin River Exchange Contractors Water Authority to the March 30, 2015 Request from State Water Board to Reclamation for Refined Sacramento River Temperature Modeling Information and a Plan for New Melones Operations to Reasonably Protect Fish and Wildlife

Dear Mr. Howard:

The San Joaquin River Exchange Contractors Water on behalf of itself and its member agencies, the Central California Irrigation District, Columbia Canal Company, Firebaugh Canal Water District, and San Luis Canal Company Authority (collectively "Exchange Contractors"), submit the following comments to the March 30, 2015 Request from State Water Board to Reclamation for Refined Sacramento River Temperature Modeling Information and a Plan for New Melones Operations to Reasonably Protect Fish and Wildlife.

Pursuant to the March 5, 2015 Executive Director Order acting on a Temporary Urgency Change Petition and Order WR90-5, the Bureau of Reclamation has recently provided four temperature model operational runs for the Sacramento River for the purposes of evaluating potential alternative operations that both reduce temperature impacts and water supply impacts.

Finding a well-balanced model that meets numerous considerations, both biological and operational, is challenging. The submitted modeling runs were based on historic meteorological data, and, therefore, the forecasted water temperature data represent long-term annual averages that would not necessarily account for extreme seasonal meteorological events and also may not capture a potential "worst case" scenario given the continued trend of climate warming.

While each of the model run scenarios had merit in part, there are a number of factors that must be considered beyond looking primarily at what factors provide the lowest water temperature or greater storage in a single location. Considering a balance of significant biological components, the progressive approach in temperature model run 4 ("scenario 4") achieves traditional temperature goals of balanced water management while maintaining a significant coldwater pool throughout the season, with negligible biological impact, specifically to winter-run Chinook salmon. (See attached memorandum prepared by FISHBIO and incorporated into these comments). Overall, scenario 4 provides an environmentally responsible approach for maintaining upstream fisheries to meet water needs.

The Exchange Contractors appreciate the opportunity to comment on the results of the four temperature model operational runs submitted by the Bureau of Reclamation.

Sincerely yours,

Thomas M. Berliner

TMB:koj

cc: David Murillo, Bureau of Reclamation
Amy Aufdemberge, Bureau of Reclamation
Mark Cowin, Department of Water Resources
James Mizell, Department of Water Resources
Dan Nelson, San Luis & Delta-Mendota Water Authority
Terry Erlewine, State Water Contractors

TO: Tom Berliner
FROM: Gabriel Kopp, Matt Peterson, and Doug Demko
DATE: April 1, 2015
SUBJECT: Biological Review of Sacramento River Water Temperature Modeling Scenarios

The current 2015 Sacramento River water temperature model operational runs were reviewed to assess the potential for biological impact relative to responsibly managing limited storage. The Bureau of Reclamation should be acknowledged for not only providing the required three operational model runs, but also adding a fourth scenario. These runs were based on 86 years of historic meteorological data; therefore, the forecasted water temperature data represent long-term annual averages, not necessarily extreme metrological events that could occur on a seasonal basis. Additionally, the data also may not capture the worst scenario possible given the continued trend of climatic alteration due to warming.

In all fairness, finding a well-balanced model run to meet numerous considerations is challenging. There is merit in part for all of the modeled scenarios; however, there are a number of factors that must be considered beyond looking primarily at what provides the lowest water temperature or greater storage in a single location. Basing the assessment solely on a single factor like water temperature, in the circumstance of limited resources, would be shortsighted and not prudent. Rather considering the balance of many factors provides a more holistic and responsible approach.

Our review finds that the additional effort to add a progressive approach in model run 4 (scenario 4) was beneficial. Scenario 4 is supported by science that negligible biological impact (notably to winter-run Chinook) would occur, based on traditional temperature goals. According to the Bureau of Reclamation, the plan addresses the many water management needs of the Central Valley. The developers of the plan also suggest that it provides the benefit of achieving better overall system-wide security of balanced water management (i.e. both storage and release) and still maintains a significant coldwater pool throughout the season to provide an ability to react to unforeseen circumstances.

This review will focus on a scientific critique and support for the adequacy and consideration reflected in scenario 4 based on several critical biological components. These components include the viability of winter-run Chinook reproduction based on: (1) expected peak water temperature, (2) frequency and duration of elevated water temperature exposure, and (3) the distribution and timing of reproduction (i.e. redds) relative to expected water temperatures.

<u>Expected Peak Water Temperature</u>

Scenario 4 would increase the target temperature at Shasta from 52 to 53°F and result in brief instances of peak water temperature exceeding the historic target of 56°F at the

Oakdale Office
1617 S. Yosemite Ave.
Oakdale, CA 95361
PH: (209) 847-6300
FAX: (209) 847-1925

Chico Office
180 East 4th Street, Suite 160
Chico, CA 95928
PH: (530) 892-9686
FAX: (530) 892-9860

Laos Office
Ban Wat Chan Unit 15
House number 143
Vientiane, Laos PDR

Clear Creek compliance location. Peak modeled temperature would be less than 57.3°F overall and create a less than two degree variation from the historic temperature target.

The basis for the 56°F compliance temperature is grounded in a USFWS published laboratory study of temperature effects on the early life history (ELH) of winter- and fall-run Chinook salmon (USFWS, 1999). The "two preliminary studies" tested a range of water temperature exposure from 50 to 60°F (in 2°F increments) on developing Chinook salmon. The study found that survival from egg to alevin was optimal at 56°F and then decreased from 58 to 60°F.

Less cumulative mortality was observed in early developmental stages of winter-run Chinook than in later stages. No increases of cumulative mortality were observed for cleavage eggs between temperature treatment groups until the experimental unit reached 64°F. However, the high water temperatures experienced early in development came with a cost, as later stages in this treatment group experienced 100% mortality. Similar increases in "latent mortality" were observed in treatment groups reared at 60°F and 62°F. Most notably, while an increase in mortality among pre-emergent alevins (9%) was documented between treatment groups reared at 56°F and 58°F, the difference was not significantly different.

Only slight increases in cumulative mortality were observed in the second portion of the study with alevins that were initially reared at 56°F, then transferred to units with water temperatures held at 60°F. While increases in cumulative mortality of 6%, 4%, and 16% were observed, none of these were significantly different than the control (USFWS 1999; Table 10, p. 19).

Based on the results of the USFWS (1999; their Tables 9 and 10), a 1°F increase in water temperature from 56°F to 57°F would not be likely to result in a significant increase in mortality of eggs, embryos, pre-emergent alevins, or alevins.

Frequency and Duration of Elevated Water Temperature Exposure

The biological impact of temperature is influenced by not only the instance of peak temperature, but also the frequency and duration it is expected to occur (McCullough 1999). Long or frequent temperature excursions can accumulate stressful events and lead to mortality. Based on the forecasted water temperatures of scenario 4 would have few limited days over 56°F. Water temperatures would be expected to exceed 56°F at the Clear Creek compliance point (RM 285) seven times from mid-May to early October. Based on that same data, water temperatures would exceed 57°F four times (by less than 0.4 degrees) and were only predicted to occur from late May to late August. The duration of these excursions are brief (generally less than 3 days). These limited instances are not prolonged and therefore are unlikely to create a compounded effect.

Distribution and Timing of Reproduction

The timing and distribution of spawning activity also will influence the potential exposure to elevated water temperature. Based on redd distribution data compiled from 2005, 2007, 2008 and 2013, about 90% of the winter-run Chinook redds were observed from Keswick Dam to the Highway 44 Bridge (CDFG, 2006; CDFG, 2008; CDFG, 2009; SRTTG, 2013). Over the same time period about 8% of redds were observed in the reach between Highway 44 Bridge and Airport Road. Most notably, in 2013, 99% of winter-run redds were observed in these two most upstream reaches.

In 2013, the majority (>95%) of redd deposition in the two upstream-most reaches occurred from early June to early August (SRTTG, 2014). If this period is assumed to be an approximate average duration of spawning activity of winter-run Chinook, water temperatures would be expected to exceed 56°F and 57°F three and two days, respectively, during this particular period.

Conclusion

The resultant findings of this technical review indicate that selecting scenario 4 would provide an environmentally responsible approach for maintaining upstream fisheries to meet water needs. Smartly considering biological needs, but also providing consumptive releases while ensuring coldwater storage are all important requisites. While there is not any one perfect solution during such a challenging resource-strained setting, our findings conclude that scenario 4 will meet the needs of the upstream fishery resource and more.

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