

Enclosure 2

Detailed Comments on NMFS Draft Administrative Memorandum Document

(Enclosure 3 to NMFS January 19, 2017 Transmittal)

March 22, 2017

General/Summary – The National Marine Fisheries Service (NMFS) provided a draft administrative memo in support of its draft proposed amendment to the components of the reasonable and prudent alternative (RPA) related to Shasta Dam operations from the 2009 Biological Opinion (BiOp) as the third enclosure to its January 19, 2017 transmittal. Reclamation is supportive of a shift to biologically based objectives, but as described below, does not believe there is a basis identified in the draft administrative memo document for the particular values identified in the draft proposed amendment. Reclamation believes there are similar issues with limited or absent supporting data and information in the draft administrative memo for the establishment of other compliance metrics and values contained in the draft proposed amendment. Having this information will be critical in achieving compliance with Sections 4004(a)(6)(A) and (B) of the Water Infrastructure Improvements for the Nation (WIIN) Act. In addition, information supporting the feasibility of meeting the proposed operational criteria is limited or absent, as is any information regarding impacts to CVP/SWP operations, other legal users of water, and river conditions for other fish species throughout the Central Valley (given that other rivers are impacted by Shasta Dam operations due to the integrated nature of the complete system).

In developing our comments on the documents, Reclamation worked with CVP stakeholders to learn more about their thoughts and concerns with the documents and concepts. As part of their comments, several of the stakeholders noted significant concerns with the temperature-dependent egg mortality model and the survival estimates used as a major component of the model calibration, which are both outlined in the draft administrative memo. Reclamation also has concerns with the model, which are discussed in the detailed comments section below. Stakeholder comments include concerns with calibration of the mortality model based on uncertainties in the estimates of egg numbers as well as periods of time when out-migrating juveniles are missed due to sampling outages and techniques. They also include concerns on underlying hypotheses of the mortality model, and potential for other factors to be involved with egg and fry mortality as echoed in Reclamation's comments below. Because of the concerns from both Reclamation and various stakeholders with these key components of the NMFS draft proposal, Reclamation recommends that these issues be discussed, analyzed, and resolved.

Additional detailed comments follow.

Page 1; Paragraph 1 – The document states that water temperatures that rose to “sub-lethal and lethal levels” were in part the result of “competing water demands”. Reclamation does not believe that water demands resulted in the temperature issues, as there was simply not enough inflow to the reservoir to support temperature operations during those years. Reclamation recommends deleting reference to “competing water demands”.

Page 1; Paragraph 1 - The document states that the “NMFS Southwest Fisheries Science Center

(NMFS-SWFSC) found that temperature dependent mortality alone resulted in the loss of approximately 77% and 85% of the population, respectively”. These numbers appear to be estimates based on modeling that has not been peer-reviewed or published. Reclamation recommends revising the statement to clarify those caveats, and notes that additional questions on temperature dependent mortality estimates contained in the document can be found in other comments below.

Page 1; Paragraph 2 – The document notes that “severe temperature-related effects were not avoided in 2014 and 2015”, and states that the lessons learned during the drought the basis for the adjustment to the RPA Action Suite. Reclamation notes that recently published studies^{1,2} based on proxy data such as tree ring histories indicate that for large portions of the state encompassing many components of the CVP/SWP, by some measures the 2014 drought by itself may have been a multicentury-scale event, and the full 2012-2015 drought sequence leading to the conditions in 2014 and 2015 may have been at a multimillennial-scale or beyond. Though the information gained from these events is valuable in evaluating how to manage through future droughts, the low likelihood of a repeat event should be taken into consideration to ensure that an amended or future RPA protects the species within the reasonable bounds of expected future conditions.

Page 3 – The CalSim-II temperature compliance location and Shasta storage percentages listed rely heavily on the statistical stationarity of model performance which does not include the implementation of the NMFS 2009 or US Fish and Wildlife Service 2008 RPA actions.

Page 3/4; Table 1 and supporting discussion: As outlined above, for five of the eight years being cited in the table as having fallen short of the previous storage performance metrics, California was enduring a severe drought with a significantly low return frequency. Using this very short sample period at a time when an extreme event occurred as a measure of the ability to meet storage metrics in the long run is not appropriate.

Page 4/5 – The discussion of Reclamation’s April/May storage analysis indicates that certain minimum storages must be met in order to meet temperature compliance. This is not the case nor intent of the analysis; the storages merely provide an early indication of the potential to meet certain temperature targets based on past data. Actual performance to any temperature metrics would be dependent on strategies taken during the course of a particular season using the supply available and conditions experienced.

Page 5; Footnote 2 – Reclamation notes that work remains to be completed to determine whether the 53° F daily average temperature at CCR performs as a surrogate for a 55° seven day average daily maximum criteria. Also, it is our understanding that the use of seven day average daily maximum criteria is different from the criteria used by NMFS in assessing temperature-dependent mortality (e.g. daily average temperature), which is generated in predictive models.

¹ Robeson, S.M. (2015), Revisiting the recent California drought as an extreme value, *Geophys. Res. Lett.*, 42, 6771-6779, doi:10.1002/2015GL064593

² Griffin, D., and K. J. Anchukaitis (2014), How unusual is the 2012–2014 California drought?, *Geophys. Res. Lett.*, 41, 9017–9023, doi:10.1002/2014GL062433

Page 7 – The document identifies required spring and storage targets without any analysis for the specific benefits, feasibility, or impacts of meeting these targets, particularly in the year types identified. In addition, no analysis is provided to show that both the September storage targets and seasonal temperature targets can be met given the spring storage targets.

In addition, it should be noted that the use of spring storage targets by year type will require the use of runoff forecasts, which will introduce uncertainty and possibly intra-seasonal operational shifts in the event of variability within the year type, or change of year type while operating through the late winter/early spring operational season.

Page 7/8; Table 4 and supporting discussion – As outlined above, for five of the seven years being cited in the table as having fallen short of the temperature performance metrics, California was enduring a severe drought with a significantly low return frequency. Using this very short sample period at a time when an extreme event occurred as a measure of the ability to meet temperature metrics in the long run is not appropriate.

Page 8; Paragraph 1 – The document notes that a 55° F seven day average daily maximum (or equivalent) metric must be met over the most downstream redd location in every year. Reclamation questions the feasibility of this given that it simply could not be accomplished in years like 2014 and 2015 given the available water supply (as noted on Page 22 of the document), and recommends that other strategies should be developed and employed in severe drought years to maximize survivorship.

Page 9; Table 5 – The table identifying conceptual objectives contains objectives for “recovery” and “enhancement” in Below Normal and Above Normal/Wet year types. Reclamation believes additional dialog and analysis need to be completed on the meaning, intent, and implementation of the priorities identified for these categories in the table.

In addition, though Reclamation supports the goal of enhancement of the species, Reclamation questions the use of enhancement objectives in the development of an RPA.

Page 9; Paragraph 1 – Reclamation questions the use of a “newly developed” model which has not yet been subject to peer review or publication as the basis for the development of regulatory actions that have the potential to impact other beneficial uses of the water supply from Shasta Dam. In addition, based on the description, the study focuses on developing estimates of temperature dependent mortality based on modeling of temperature exposure of eggs, and comparing those to field-based fry survival estimates that result from any number of factors affecting survival. Reclamation requests additional discussion/description as to whether other (non-temperature based) factors might play a role in the survival estimates, and how those might factor in to the temperature dependent mortality modeling to produce the most accurate estimate of direct temperature impacts. Reclamation also requests additional discussion regarding access to the models and results summarized in this paragraph.

Page 10; Paragraph 2 – The document discusses historic temperature dependent mortality as if the values had been formally and accurately determined; the document should clarify that these

are estimates based on the previously discussed model, and should be caveated with associated model limitations. Further, it is not clear how these estimates support or link to any of the proposed actions in the draft proposal.

Page 10; Paragraph 4 – The document establishes biological objectives, but does not provide a basis for these objectives, and notes (as highlighted in footnote 4) that these estimates are “preliminary and subject to further analysis to understand whether the population can withstand this level of mortality and still be viable.” Reclamation believes that the scientific basis for specific values contained in the objectives needs to be further refined prior to initial implementation to ensure the values are feasible and meet the objective of avoiding jeopardy to continued existence of the species.

Page 14; Paragraph 2 through Page 16; Paragraph 2 – The document states that drought conditions “over the last five years have highlighted the uncertainties in Reclamation’s SRWQM and its inability to meet the regulatory requirements outlined in the CVP/SWP operations Opinion.” It is not clear which regulatory requirements this statement refers to, but under any reference, Reclamation does not believe the model has failed to meet regulatory requirements. If the reference is to the inability to meet temperature objectives in 2014 and 2015, the model is not at fault, but rather the lack of water supply itself (indicating infeasibility of the requirements in certain years). The model has produced information as specified in the current BiOp, thus it is not clear what this statement refers to.

The document states that in order to make accurate forecasts “for the entire season for all of the scenarios, Reclamation needs to have all of the environmental input variables accurate: the reservoir inflows, weather, operations (gate changes, etc.), and reservoir dynamics over a 6-month period.” These inputs are independent of the modeling system, and thus do not indicate fundamental flaws with the current modeling system. In addition, uncertainties inherent in these parameters will impact the ability for any modeling system to predict future outcomes.

The document states that the model “has a difficult time reflecting actual release temperature and conditions when the critical reservoir thermocline of about 52°F approaches the elevation of the TCD side gates and/or reservoir outlet works.” Reclamation believes this situation represented a new understanding of the operational limitations of the physical infrastructure, not a modeling flaw.

The document describes that given “the significant simplification of the input data (which is derived from a 12-month operations outlook), the unknowns regarding future meteorological conditions, and the fact that the actual TCD does not have infinite adjustability, the model can only realistically provide a broad brush picture of future operations and cannot provide sufficient precision to determine future operations.” Reclamation believes that given the complexity of the CVP/SWP, uncertainties inherent in variables such as the weather at timescales of months in the future, and fundamental limitations of simulation modeling, that no model can possibly be capable of “determining future operations” at the resolution and lead times being contemplated by these statements.

The document concludes that as a result of the perceived limitations in modeling, Reclamation

“has historically overestimated their ability to meet the temperature compliance point”. Reclamation does not agree with this statement and the supporting values and figures, and believes that if these assertions are to remain a part of an administrative record for any amendments to the RPA, that a focused discussion between the agencies on this subject should occur to ensure that any statements regarding historic compliance issues represent a complete picture of the decisions and factors leading to historic performance.

The document describes buffers to address uncertainty in modeling, including the joint use of conservative meteorological inputs and hydrologic forecasts. Reclamation notes that though the use of conservatism in forecasting is appropriate given the long lead times being considered in the forecasts as well as the uncertainty in components of the forecasting, the use of these conservative inputs has the potential to increase the joint probability of the overall resultant forecast to a level that is no longer within the realm of reasonability. Instead, Reclamation recommends the two agencies continue to discuss the potential for an alternative mechanism to address early season forecasting, such as the one identified in Enclosure 1 of this response. In addition, Reclamation looks forward to working with NMFS on future modeling improvement opportunities such as those discussed in Enclosure 3 of this response.

Page 16; Paragraph 3 through Page 19 – The document contains a large amount of data regarding historic flowrates and temperatures, but it is not clear how this information supports the conclusion on page 19 that Keswick releases should be limited, and does not contain any supporting information regarding the specific flow rates contained in Table 10. In addition, this proposed maximum flow schedule does not relate to any specific action in the draft proposed amendment, thus Reclamation would recommend removal of this section of the document. Should a maximum release schedule be considered, Reclamation notes that it would require evaluation for its impacts to CVP/SWP operations, other legal users of water, and river conditions for other fish species.

Page 20; Paragraph 2 – With respect to spring holding temperature management, Reclamation questions the feasibility and effectiveness of meeting a seven day average daily maximum (7 DADM) metric as opposed to a daily average temperature (DAT) metric, which will be further explored as part of this year’s evaluation. Reclamation believes that in certain instances, due to the averaging function and lag times associated with the metric’s response to actual conditions, this metric will have the effect of driving specific operations that may provide for compliance with the metric, but be undesirable for ecosystem needs for both short term and seasonal approaches. The temperature metric, location, and value concepts from the proposal are anticipated to be further explored during this year’s system-wide evaluation for their effectiveness, and potential to cause impacts to the CVP/SWP, other legal users of water, and river conditions for other fish species.

Page 21, Paragraph 3 – With respect to summer temperature management, Reclamation questions the feasibility and effectiveness of meeting a 7 DADM metric as opposed to DAT metric, which will be further explored as part of this year’s evaluation. Reclamation believes that in certain instances, due to the averaging function and lag times associated with the metric’s response to actual conditions, this metric will have the effect of driving specific operations that may provide for compliance with the metric, but be undesirable for ecosystem needs for both

short term and seasonal approaches. In addition, Reclamation questions the feasibility of meeting the specific revised compliance value and location, particularly during Critically Dry years. The temperature metric, location, and value concepts from the proposal are anticipated to be further explored during this year's system-wide evaluation for their effectiveness, and potential to cause impacts to the CVP/SWP, other legal users of water, and river conditions for other fish species.

In addition, in developing our comments on the document, Reclamation worked with CVP stakeholders to learn more about their thoughts and concerns. As part of their comments, one of the stakeholders noted similar concerns to those raised by Reclamation regarding the temperature compliance concepts. The stakeholder provided an analysis detailing how temperature-related mortality objectives could still be attained at higher temperatures. As part of this year's analyses and stakeholder engagement processes, Reclamation believes the agencies should further explore the concepts being developed by this and other stakeholders.

Page 22; Paragraphs 2 and 3 – Reclamation supports targeting temperature management at a logical location in segments of the river where spawning is occurring, and the use of an operational metric that reduces the likelihood of unintended operations such as those described in the paragraphs above pertaining to the 7DADM metric.

Page 22/23 – The document provides no supporting information for the selection of the less restrictive temperatures in certain year types. Reclamation recommends that as part of any future science workplan (as discussed in Enclosure 3 to this response), the agencies work to establish strategies for drought conditions that will maximize survivorship based on the amount of cold water resources available.

Page 24 – The document provides no supporting information for the selection of October 15 as a key date for full side gate access. Reclamation suggests this operation should be adaptively managed based on the conditions existing in any particular year.