



State of California – Natural Resources Agency
CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
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EDMUND G. BROWN, Jr., Governor
CHARLTON H. BONHAM, Director



April 9, 2014

Mark Cowin, Director
Department of Water Resources
1416 Ninth Street, 11th Floor
Sacramento, CA 95814

Subject: Confirmation of Coverage under the California Endangered Species Act
(CESA) Consistency Determinations

Dear Mr. Cowin:

I am writing in response to your memorandum dated April 8, 2014, requesting confirmation of ongoing authorizations for the California Department of Water Resources' (DWR) operation of the State Water Project (SWP) for incidental take of species listed as threatened or endangered under the California Endangered Species Act (CESA). Your request was made in relation to DWR's implementation of the "Central Valley Project and State Water Project Drought Operations Plan and Operational Forecast: April 1, 2014, through November 15, 2014," (Drought Operations Plan), and associated correspondence with federal fish and wildlife agencies regarding implementation of the Drought Operations Plan under the U.S. Fish and Wildlife Service (FWS) 2008 Biological Opinion (BiOp) for Delta smelt and the National Marine Fisheries Service (NMFS) 2009 *Biological Opinion and Conference Opinion on the Long-term Operations of the Central Valley Project and the State Water Project* for marine species including winter-run and spring-run Chinook salmon and DWR's request to the State Water Resources Control Board (SWRCB) for an amendment to the January 31, 2014, temporary urgency change order, as subsequently modified, affecting Water Rights Decision 1641.

As you know, prior to and following the Governor's Proclamation of a Drought State of Emergency on January 17, 2014, our departments have been working closely with the SWRCB and the federal agencies to coordinate responses to this year's extreme drought conditions and to identify potential impacts to aquatic species and available measures to minimize those impacts. The California Department of Fish and Wildlife (CDFW) has been participating in ongoing discussions through the Real Time Drought Operations Management Team, established under the SWRCB's temporary urgency change order, and has provided extensive input on the Drought Operations Plan.

On April 8, 2014, DWR and the U.S. Bureau of Reclamation (Reclamation) finalized the Drought Operations Plan, which describes proposed actions and a likely range of coordinated operations of the SWP and Central Valley Project (CVP) from April 1 through November 15, 2014. The Drought Operations Plan identifies water operations that would be implemented pursuant to contingency planning provisions. With respect to the NMFS BiOp's Reasonable and Prudent Alternatives, the Drought Operations Plan

modifies Action IV.2.1, an action to protect emigrating steelhead¹ during April and May by establishing an inflow to export ratio relating to San Joaquin River inflow. Prior to initiation of an approximately 31-day Stanislaus River pulse flow between April 7 and April 15, increased export pumping would capture abandoned or natural flows in the Delta, up to Old and Middle River (OMR) limits. All other BiOp requirements would remain in effect, including salvage density triggers for winter- and spring-run Chinook salmon, and Smelt Working Group advice concerning OMR flow criteria. During the pulse, the inflow-to-export ratio would be 1:1, as prescribed in Action IV.2.1. Following the pulse flow and through May 31, exports may again capture abandoned or natural flows in the Delta in the event such flows are available, as described above. Operations under the Drought Operations Plan would continue to adhere to provisions of the SWRCB's temporary urgency change order, as modified.

The Drought Operations Plan describes additional measures that may be taken to offset effects of operations to steelhead. The plan also includes a Winter-run Drought Contingency Plan, describing enhanced monitoring and actions to be taken in the event temperature conditions warrant rescuing fish, a Preliminary Delta Smelt and Longfin Smelt Drought Monitoring Plan and a Preliminary Science Plan for Anadromous Fish Monitoring and Technology Improvements.

No additional modifications to the FWS BiOp, or to the Incidental Take Permit (ITP No. 2081-2009-001-03) CDFW issued to DWR for longfin smelt on February 23, 2009 (Longfin ITP), are proposed in the Drought Operations Plan.

The Drought Operations Plan anticipates the potential construction of three temporary emergency drought barriers on West False River, Steamboat Slough and Sutter Slough, depending on hydrological conditions. Whether the barriers are installed or not, DWR and Reclamation will make additional requests to the SWRCB for changes to certain Delta salinity standards under the temporary urgency change order.

On April 8, 2014, Reclamation requested that NMFS and FWS confirm that operations under the Drought Operations Plan are within the limits of the federal BiOps and that the Drought Operations Plan serves as a contingency plan under NMFS BiOp Action I.2.3.C. In a memorandum responding on the same day, FWS concurred that the Drought Operations Plan's provisions for April and May operations will have no additional adverse effects on Delta smelt, but reserved its concurrence regarding effects of June 1 through November 15 operations to Delta smelt and requested additional information. In its letter responding to Reclamation's request, NMFS determined that the incidental take associated with the Drought Operations Plan falls within its BiOp's incidental take statement.

Through its correspondence, FWS provided confirmation that implementation of the Drought Operations Plan through May 31, 2014 is within the range of effects previously analyzed and is otherwise within the scope of its BiOp. Similarly, NMFS provided

¹ Central Valley Steelhead (*Oncorhynchus mykiss*) is listed as threatened pursuant to the federal Endangered Species Act, but is not listed under CESA.

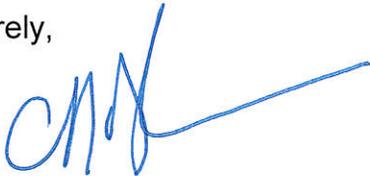
confirmation that implementation of the Drought Operations Plan through November 15, 2014 is within the range of effects previously analyzed and is otherwise within the scope of its BiOp.

Because FWS and NMFS have determined that these modifications to project operations are within the scope of the operative BiOps and their Reasonable and Prudent Alternatives, for the time periods specified in their correspondence, and based on CDFW's review of the Drought Operations Plan and attached Biological Reviews for Salmonids and Sturgeon and Delta Smelt and Longfin Smelt, CDFW hereby confirms that the existing consistency determinations² remain in effect and no further authorization is necessary for DWR to take CESA-listed Delta smelt during April and May, 2014, and winter-run and spring-run Chinook salmon through November 15, 2014, in accordance with those BiOps and as implemented through the Drought Operations Plan.

You also requested confirmation that the operations under the Drought Operations Plan do not impact CESA coverage under the Longfin ITP. This will confirm that the conditions in the Longfin ITP are not affected by the Drought Operations Plan.

We appreciate the close coordination of our departments under these extreme drought circumstances. If you have questions regarding this letter, please contact Carl Wilcox, Policy Advisor to the Director for the Delta, at (707) 944-5517 or by email at carl.wilcox@wildlife.ca.gov.

Sincerely,



Charlton H. Bonham

CC: Carl Wilcox, Policy Advisor to the Director for the Delta, CDFW
Thomas Gibson, General Counsel, CDFW
Laura King Moon, Chief Deputy Director, DWR
Cathy Crothers, Chief Counsel, DWR
Felicia Marcus, Chair, SWRCB
Tom Howard, Executive Director, SWRCB
Craig Wilson, Delta Watermaster, SWRCB
Les Grober, Water Rights Division, SWRCB
David Murillo, Regional Director, Mid-Pacific Region, USBR
Ron Milligan, Operations Manager, Central Valley Office, USBR

² The SWP is currently authorized under an October 14, 2011 consistency determination for the FWS BiOp and an April 26, 2012 consistency determination for the NMFS BiOp.

Will Stelle, Regional Administrator, West Coast Region, NMFS
Maria Rea, Assistant Regional Administrator, California Central Valley Office,
NMFS
Ren Lohofener, Regional Director, Pacific Southwest Region, FWS
Dan Castleberry, Fisheries Assistant Regional Director, Pacific Southwest
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United States Department of the Interior



FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife Office
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Sacramento, California 95814

In reply refer to:
81420-2008-F-1481-10

APR 08 2014

MEMORANDUM

To: Central Valley Office Operations Manager, Bureau of Reclamation Mid-Pacific Region, Central Valley Office

From: Field Supervisor, U.S. Fish and Wildlife Service, Bay Delta Fish and Wildlife Office, Sacramento, California *Mike Chikuma*

Subject: Reinitiation of Endangered Species Act Consultation on the Coordinated Operations of the Central Valley Project and the State Water Project

This memo is in response to your April 8, 2014, memo requesting reinitiation of the December 15, 2008, Biological Opinion (2008 BiOp) on the Coordinated Operation of the Central Valley Project (CVP) and State Water Project (SWP) (Projects) to include the drought responses under the proposed *CVP and SWP Drought Operations Plan and Operational Forecast April 1, 2014 through November 15, 2014* (Plan). Specifically, Reclamation requests concurrence that the drought response actions proposed by Reclamation and the California Department of Water Resources (DWR) in the Plan will result in no additional adverse effects to delta smelt or its critical habitat for the remainder of water year (WY) 2014 and the beginning of WY 2015 beyond those analyzed in the 2008 BiOp. The 2008 BiOp included a provision for the Bureau of Reclamation (Reclamation) to reinitiate consultation if the WY is classified as dry or critically dry for a second consecutive (or more) year(s). This response is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).

The following sources of information were used to develop this response: (1) your January 29, 2014, memo to the U.S. Fish and Wildlife Service (Service) with attached supporting information, including the January 29, 2014, Petition for Temporary Urgency Change (TUC Petition); (2) the January 31, 2014, State Water Resources Control Board (SWRCB) TUC Petition Order; (3) the February 7, 2014, revised SWRCB TUC Petition Order; (4) the January 17, 2014, Governor's Proclamation of a State of Emergency; (5) your February 27, 2014, memo to the Service with attached supporting documents; (6) the February 28, 2014, modified SWRCB TUC Petition Order; (7) your March 14, 2014, memo to the Service with the interim Plan and attached supporting documents; (8) your April 8, 2014, memo to the Service with the Plan and attached supporting documents and (9) other information available to the Service.

On January 29, 2014, Reclamation and the DWR submitted a Temporary Urgency Change Petition Regarding Delta Water Quality (TUC Petition), requesting the SWRCB to temporarily modify requirements of water rights decision D-1641 for 180 days, with specific requests for

February related to the Delta outflow and Delta Cross Channel (DCC) standards described in D-1641, Table 3. In response to the TUC Petition, the SWRCB issued an Order on January 31, 2014. Approval of the TUC Petition by the SWRCB has enabled changes in operations that will provide minimum human health and safety supplies and conserve water for later protections of instream uses and water quality. On January 31, 2014, Reclamation requested reinitiation and concurrence from the Service that there would be no additional adverse effects on delta smelt or its critical habitat from the drought response actions proposed by Reclamation and DWR for the month of February than those previously analyzed in the 2008 BiOp. The Service issued a concurrence that the proposed modifications will have no additional adverse effects on delta smelt or its critical habitat on January 31, 2014.

On February 7, 2014, the SWRCB issued a revised TUC Petition Order that provided for increased exports (limited to natural or abandoned flow) during such times when D-1641 requirements were met. On February 27, 2014 Reclamation requested the extension of the February actions related to Delta outflow and DCC gate operations through March 31, 2014, be considered as part of the amended project description for drought response actions and requested concurrence that extension will result in no additional adverse effects on delta smelt or its critical habitat for the month of March beyond those previously analyzed in the 2008 BiOp. The Service issued a concurrence that the proposed modifications will have no additional adverse effects on delta smelt or its critical habitat on February 28, 2014.

Reclamation reinitiated consultation on March 14, 2014, to temporarily modify the 2008 BiOp's Reasonable and Prudent Alternative (RPA) regarding Old and Middle River (OMR) flows and additional changes to the TUC Petition Order regarding Delta outflow per D-1641 standards. The Service issued the amendment to the 2008 BiOp on the proposed modifications on March 14, 2014.

The Plan addresses a range of drought responses for the remainder of WY 2014 and the beginning of WY 2015. The following describes the proposed Delta drought response measures:

Proposed Delta Operations April-May 2014

A. National Marine Fisheries Service (NMFS) Biological Opinion (BiOp) Provisions

1. NMFS RPA Action IV.2.1 will be implemented with the following modification:

Before the approximately 31-day Stanislaus River pulse flow (to be initiated between April 7-15, 2014), Action IV.2.1 would be modified to allow for increased export pumping to capture abandoned or natural flows in the Delta, up to OMR limits, as provided in the NMFS BiOp (Action IV.2.3) and Service 2008 BiOp (Action 3). Action IV.2.1 will be implemented during the 31-day pulse flow period. Action IV.2.1 will likely be implemented following the Stanislaus River pulse flow, through May 31. However, in the unlikely event that there is abandoned or natural flows in the Delta during the latter half of May; exports would increase to capture those flows.

2. Schedule the Stanislaus River pulse flow release in coordination with releases from other San Joaquin River tributaries for 31 days, to begin sometime between April 7 and April 15. The exact timing and duration will be developed through the Stanislaus Operations Group (SOG) in coordination with the (Water Operations Management Team) WOMT and (Real Time Drought Operations Management Team) RTDOT processes. Reclamation and DWR will maintain a San Joaquin River inflow-to-export ratio of 1:1 (with a minimum combined export of 1,500 cubic feet per second (cfs)), for the duration of the pulse.
3. All OMR flow related actions, including those based on the NMFS salmonid density triggers, remain in place. The OMR Index Demonstration Project as specified in the NMFS concurrence letter continues.
4. Modification of DCC gate operations (NMFS RPA Action IV.1.2): If the Projects determine that the DCC gates must open to provide for salinity management in the Delta, the Projects will provide at least a 5-day notice to the fish and wildlife agencies so that enhanced monitoring can begin. The Projects will implement enhanced monitoring and triggers to open and close the gates, as needed for protection of listed species.

B. Service 2008 BiOp Provisions

No additional modifications, beyond March 31, to the Service's 2008 BiOp RPA actions are currently proposed under the Plan. All OMR flow related actions, including Service determinations based on entrainment risk, remain in place¹. The OMR Index Demonstration Project as specified in the Service's concurrence letter continues.

C. D-1641 Provisions

Reclamation and DWR may request further modifications of requirements contained in D-1641. Below is a description of those anticipated requests. These requests would be subject to approval by the SWRCB's Executive Director and potentially the SWRCB members. D-1641 provisions #1 and #2 (below) are intended to be an extension of existing TUC Order provisions 1(a) and 1(b), which terminate on March 31, 2014. D-1641 provisions #3 and #4 are considered within existing D-1641 flexibility and within the process of implementation defined therein. D-1641 provision #5 (below) will be defined through coordination with the NMFS BiOps provision #2 (above).

1. The minimum Delta Outflow levels specified in Table 3 are modified as follows:

The minimum monthly Net Delta Outflow Index (NDOI) described in Figure 3 of D-1641 during the months of April and May shall be no less than 3,000 average (mean) cfs.

¹ The CDFW 2081 permit criteria associated with longfin smelt remain in place.

2. The maximum Export Limits included in Table 3 of D-1641 are modified as follows:

During April and May when footnote 10 of D-1641 is not being met, or the DCC gates are open during a period inconsistent with footnote 23 of D-1641, the combined maximum SWP and CVP export rate for SWP and CVP contractors at the Harvey O. Banks and C.W. "Bill" Jones pumping plants will be no greater than 1,500 cfs on a 3-day running average. When precipitation and runoff events occur that allow the DCC to be closed and footnote 10 of D-1641 is being met [3-day average Delta Outflow of 7,100 cfs or electrical conductivity of 2.64 millimhos per centimeter on a daily or 14-day running average at the confluence of the Sacramento and the San Joaquin rivers (Collinsville station C2) if applicable²], but any additional Delta Outflow requirements contained in Table 4 of D-1641 are not being met, then exports of natural and abandoned flows are permitted up to D-1641 Export Limits contained in Table 3 and under the existing Biological Opinions (with implementation modifications or limits, as specified in BiOps section, above).

3. Continue to vary the averaging period of the Delta Export/Import (E/I) ratio pursuant to Footnotes 18, 19, and 20 of D-1641 as was approved in the March TUC Order. Operate to a 35 percent E/I ratio with a 3-day averaging period on the rising limb of a Delta inflow hydrograph, and operate to a 14-day averaging period on the falling limb of the Delta inflow hydrograph.
4. Implement combined export limitations as specified in Table 3, Footnotes 17 and 18 of D-1641. The timing and duration of this action is to be coincident with a coordinated pulse flow on the San Joaquin River system as described under NMFS BiOps #1 and #2 of up to but not to exceed 31 days.
5. D-1641 (5) Vernalis base flow and pulse flow are modified as follows:
 - April 1 to the start of the pulse flow period – maintain Vernalis flow at or above 700 cfs (3-day running average);
 - For the 31-day pulse flow period, create a 16-day pulse averaging 3,300 cfs at Vernalis with flows averaging 1,500 cfs at Vernalis for the remainder of the 31 days. The start date and flow schedule for the overall pulse flow volume of water may be modified (with concurrence with the fishery agencies);
 - From the end of the pulse flow period through May 31– maintain an average flow of 500 cfs for the period.
6. The compliance location for the D-1641 Agricultural Western Delta Salinity Standard at Emmaton (14-day running average of 2.78 millimhos per centimeter through August 15) is moved to Three Mile Slough on the Sacramento River.

² The Standard does not apply in May if the best available estimate of the Sacramento River Index for the water year is less than 8.1 MAF at the 90% exceedence level.

Proposed Delta Operations June-November 15, 2014**D. Emergency Drought Barriers**

If hydrologic conditions continue to be forecasted at a level of dryness similar to what is expressed in the March 90 percent forecast, emergency drought barriers would be constructed on West False River, Steamboat Slough, and Sutter Slough during May. The West False River barrier would be constructed first, with construction beginning approximately May 7. The Sutter and Steamboat slough barriers would be constructed second, with in-water construction starting no earlier than May 22. The barriers would be constructed primarily with rock fill. Four 48-inch culverts will be operable at the barriers in Sutter and Steamboat sloughs to allow fish passage and downstream flow when needed to improve water quality and stage. A boat portage facility will be operated at the Steamboat Slough barrier to allow boats less than 22 feet long to cross the barrier. Water quality and stage will be continuously monitored upstream and downstream of the barriers. The barriers will also be monitored for their effects on migrating adult and juvenile salmon and sturgeon and their designated critical habitats, as well as effects on delta smelt distribution and habitat and longfin smelt habitat. Initiation of barrier removal will begin no later than October 15, 2014, with the complete removal of the Sutter and Steamboat slough barriers by November 1, and complete removal of the West False River barrier by November 15.

The State and Federal agencies will employ a contingency approach to salinity barrier construction, which would allow a decision to be made as late as the end of April concerning the construction of the barriers. Should runoff projections and water quality conditions warrant, installation of the salinity barriers could be delayed or halted. Construction and operation of the culverts in the barriers will be achieved through DWR's application for a Clean Water Act section 404 U.S. permit with the Army Corps of Engineers (Corps), and accompanying section 7 consultation between the NMFS, Service and Corps, and applicable permits from California Department of Fish and Wildlife (CDFW).

The proposed modifications to CVP and SWP operations with the salinity barriers in place related to Delta outflow and water quality are addressed as part of the Plan. With the salinity barriers in place, it is estimated that a minimum monthly Delta outflow of 2,000 cfs, would be sufficient to maintain water quality for in-Delta uses and Project diversions, thereby conserving upstream storage that would have been necessary under a higher outflow requirement. However, this range of projected Delta outflow with barrier operation is estimated to be insufficient to meet the D-1641 Agricultural Western Delta Salinity Standard at Emmaton for critical year types (14-day running average of 2.78 millimhos per centimeter through August 15). Additional upstream releases would need to be expended in order to meet the Emmaton standard. In fact, due to the hydrodynamic changes associated with the operation of the proposed salinity barriers, slightly higher upstream releases would need to be expended to meet the Emmaton standard than if the barriers were not installed at all. Therefore, one of the primary objectives of barrier operation (conservation of upstream

storage), can only be achieved if barrier implementation is carried out in concert with modifications of various Delta salinity D-1641 requirements (see below).

E. NMFS BiOp Provisions

1. Modification of DCC gate operations (NMFS RPA Action IV.1.2): If the Projects determine that the DCC gates must open to provide for salinity management in the Delta, the Projects will provide at least a 5 day notice to the fish and wildlife agencies so that enhanced monitoring can begin. The Projects will implement enhanced monitoring and triggers to open and close the gates, as needed for protection of listed species.

F. Service BiOp Provisions

No modifications to the Service's 2008 BiOp RPA actions are currently proposed during June through November 15.

G. D-1641 Provisions

Reclamation and DWR may request further modifications of requirements contained in D-1641. Below is a description of those anticipated requests. These requests would be subject to approval by the State Water Board's Executive Director. The Plan describes provisions without the barriers in place but the current proposal that is considered for section 7 purposes is with barriers in place and will not be discussed further.

1. The minimum monthly Net Delta Outflow Index (NDOI) described in Figure 3 of D-1641 during the months of June through October shall be no less than 2,000 mean cfs.
2. During the month of June, continue to vary the averaging period of the Delta E/I ratio pursuant to Footnotes 18, 19, and 20 of D-1641 as was approved in the March TUC Order. Operate to a 35 percent E/I ratio with a 3-day averaging period on the rising limb of a Delta inflow hydrograph when storm runoff is occurring, and operate to a 14-day averaging period on the falling limb of the Delta inflow hydrograph.
3. Void the critical year D-1641 Agricultural Western Delta Salinity Standard at Emmaton (14-day running average of 2.78 millimhos per centimeter through August 15).
4. The number of required days for 150 mg/l Cl at Contra Costa Canal Intake shall be 56 days.
5. The mean monthly Rio Vista flow standard in September, October, and November shall be no less than 2,000 cfs.

Emergency Fisheries Monitoring, Technology Improvement, and Science Plan

The State and Federal agencies commit to developing, and implementing as appropriate, a multi-objective emergency fisheries monitoring, technology improvement, and science plan to minimize, and to the extent possible, measure effects to listed species and improve understanding of biological effects associated with water operations during drought conditions. Drought year effects to be studied include, but are not necessarily limited to, effects associated with DCC gate and export facility operations, emergency drought barrier influence on smelt and associated habitat, and upstream flows and temperature management for anadromous fishes. This plan will:

1. Identify near-term extraordinary fish (salmonid, steelhead, sturgeon, and smelt) monitoring necessary to support and inform water operations during 2014 drought conditions;
2. Identify a winter-run Chinook contingency plan that includes: a) infrastructure needs at Livingston Stone National Fish Hatchery, b) increased monitoring of redds and temperature impacts, and c) rescue and relocation to more suitable habitats including Battle Creek;
3. Identify monitoring and studies to document the environmental effects of the drought, including: a) the effects of the proposed temporary salinity barriers and associated CVP/SWP operation on smelt habitat throughout the timeframe that the barriers are in place and b) the effect of the barriers on migrating salmon, steelhead, sturgeon, delta smelt, and longfin smelt and their habitats; and
4. Identify opportunities for longer-term anadromous fish monitoring to improve operations decision-making during drought as well as other year types.

This draft plan will be completed collaboratively by the Service, NMFS, CDFW, DWR, and Reclamation. It is expected that specific "action plans" for items 1, 2, and 3 above, because they are time sensitive due to drought operations, will be developed by April 15th so that implementation, as appropriate, can begin. Action plans for longer-term actions, such as item 4, will be developed by October 1, 2014, through a collaborative process led by NMFS and DFW in coordination with the other agencies. This process will include stakeholder input and scientific-peer review. The newly formed Interagency Ecological Program (IEP) Salmon Management, Analysis, and Synthesis Team (MAST) and the South Delta Salmonid Research Collaborative subgroup of the Collaborative Science and Adaptive Management Program (CSAMP) will be engaged prior to final decisions being made specific to long-term anadromous fish monitoring. Additionally, the CSAMP could, as appropriate, be engaged if long-term smelt monitoring efforts are undertaken and to address smelt issues that arise during implementation of the plan. Effects to delta smelt as a result of implementation of the science plan will be addressed under existing authorizations separate from the 2008 BiOp or a new section 7 consultation. Planning and implementation of the Emergency Fisheries Monitoring, Technology Improvement, and Science Plan are critical components in assisting in the understanding the biological effects to listed fishes associated with water operations during drought conditions.

To date this WY, the Service has determined that no changes in operations are necessary to protect adult or juvenile delta smelt under Components 1 or 2 of the 2008 BiOp RPA due to low risks of entrainment resulting from mostly low reverse OMR flows, consistently low turbidity in

the south and central Delta, favorable distribution of adult delta smelt outside of the south and central Delta, and the lack of observed salvage of adult delta smelt at the Projects' fish salvage facilities. These conditions can be attributed to extreme natural hydrologic drought conditions resulting in low Delta inflow and limited Project exports.

We understand the critical need for drought-related actions to continue through the coming months and have concluded that there is sufficient information provided to analyze effects to delta smelt for the months of April and May, 2014. Although the proposed departure from D-1641 was not anticipated in the Project Description of the BiOp, or the modeling in the biological assessment, the proposed relaxations, based on the provisions provided in the TUC Order, as amended, and existing hydrologic and biological conditions for the months of April and May appear to be within the range of effects previously analyzed in the 2008 BiOp. The Service, therefore, concurs with Reclamation's determination that the proposed modifications for April and May will have no additional adverse effects on delta smelt or its critical habitat.

The Service cannot, however, concur at this time with Reclamation's determination that the proposed Plan will have no additional adverse effects on delta smelt or its critical habitat for the remainder of the project time period, June 1 through November 15, 2014. Although the Plan calls for water operations that are consistent with the Service's RPA, the effects analysis provided by Reclamation does not contain sufficient information to adequately assess the effects of the Projects' operations with the Emergency Drought Barriers in place. In order to adequately assess the effects of the June-November drought-related actions, we request that Reclamation provide the following information in the delta smelt effects analysis associated with the Plan: (1) an updated effects analysis that incorporates updated forecasting and modeling as described in the Plan; (2) a thorough interpretation of the hydrodynamic effects and water quality effects on delta smelt and its critical habitat; and (3) updated Project operations based on D-1641 modifications as proposed in the Plan and how those changes may effect delta smelt and/or its critical habitat. This may not be an exhaustive list of additional information needs. We are committed to continuing to coordinate with Reclamation and DWR to ensure that all additional information necessary to complete reinitiation of drought-related actions for June through November can be developed as efficiently as possible.

We look forward to continued close coordination with you and your staff throughout this extremely challenging water year.

Please address any questions or concerns regarding this response to Mike Chotkowski, Field Supervisor, or Kim S. Turner, Assistant Field Supervisor at (916) 930-5603. Please refer to Service file number 81420-2008-F-1481-10 in any future correspondence regarding this project.



UNITED STATES DEPARTMENT OF COMMERCE
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NATIONAL MARINE FISHERIES SERVICE
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Mr. Mark Cowin
Director
California Department of Water Resources
1416 Ninth Street
Sacramento, California 95814

Re: Drought Operations Plan for the Central Valley Project and State Water Project from April 1 through November 15, 2014

Dear Mr. Murillo and Mr. Cowin:

This letter is in response to the U.S. Bureau of Reclamation's (Reclamation) April 8, 2014, letter, wherein Reclamation and the California Department of Water Resources (DWR) propose operations described in the Central Valley Project (CVP) and State Water Project (SWP) Drought Operations Plan (Plan) for April 1 through November 15, 2014. The Plan was developed in coordination with Reclamation, DWR, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, State Water Resources Control Board (State Water Board), and NOAA's National Marine Fisheries Service (NMFS, collectively "six agencies") and outlines a likely range of coordinated operations for the CVP and SWP through November 15, 2014, including modifications, as deemed prudent under the current low storage conditions, to several reasonable and prudent alternative¹ actions from NMFS' June 4, 2009, biological and conference opinion on the long-term operation of the CVP and SWP (NMFS BiOp). Reclamation has requested concurrence that the operations described in the Plan serve as the Contingency Plan for the remainder of Water Year 2014 in accordance with Reasonable and Prudent Alternative (RPA) Action 1.2.3.C and that the biological effects of implementing the Plan will be within the limits of the existing Incidental Take Statement. Additionally, Reclamation requests concurrence that CVP and SWP operations described in the Plan concerning RPA Action IV.2.1 are within the limits of the Incidental Take Statement.

¹ On April 7, 2011, NMFS issued an amended RPA
(http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf).



NMFS understands that California is continuing to experience unprecedented drought conditions, and is currently in its third straight year of below-average rainfall and very low snowpack. Calendar year 2013 was the driest year in recorded history for many parts of California, resulting in the low initial storage at the beginning of water year 2014. On January 17, 2014, the Governor of California announced an Emergency Proclamation, finding that “conditions of extreme peril to the safety of persons and property exist in California due to water shortage and drought conditions.” Since that declaration, NMFS has acted to provide the assistance needed to manage through drought conditions in California. NMFS has continued to work quickly and collaboratively with the other fish agencies and the operators of the CVP and SWP to protect health and safety while providing needed protections for and minimizing adverse effects to listed anadromous fish species under the Endangered Species Act (ESA), as demonstrated in the exchange of letters² in January, February and March regarding requested changes in specific operating parameters.

Over the last two weeks, the six agencies have been engaged in intense and extensive discussions towards the development of a comprehensive Plan that will chart out operations, given the current hydrology and modeling, through November 15, 2014. We have had extensive discussions about the predicted effects on ESA-listed fish resulting from the drought, including limited cold-water pools and carryover storage in the major CVP and SWP reservoirs that limit the ability to provide for adequate water quality throughout the life cycle of the anadromous fish in freshwater habitat. In light of real-time physical and biological data, both on hydrology and fish distribution, NMFS has examined all the required RPA actions, and endeavored to balance water needs while not deepening the harm to listed species. In order to augment storage south of the Delta in San Luis Reservoir for future critical needs, the operators of the CVP and SWP have requested flexibility to export water above health and safety levels during rain pulses, and then to taper off quickly to minimum combined 1,500 cfs exports. NMFS has engaged Reclamation and DWR on this flexibility while also clearly identifying the highest risks to species this year, including the possible loss of an entire year class of endangered winter-run Chinook salmon on the Sacramento River due to poor storage conditions in Shasta Reservoir.

It has been advantageous to look at real-time conditions and the operation of the CVP and SWP as a whole. Throughout these six agency discussions, we have focused on the highest priority opportunities and needs to minimize adverse effects of operations within the framework of the NMFS BiOp. As a result of these discussions, we have reached agreement on the following key improvements for fish that would not have otherwise occurred.

1. Winter-run Chinook salmon viability and Sacramento Settlement Contractor deliveries: Reclamation is working with Sacramento River Settlement Contractors on options to shift a significant portion of their diversions this year out of the April and May period and into the time frame where Keswick releases are higher to achieve temperature objectives on the upper Sacramento River. The willingness and cooperation of the settlement contractors in this effort would allow a modified diversion pattern and create the benefit of increased Shasta Reservoir storage at the beginning of the temperature control

² All NMFS letters regarding 2014 drought operations are posted online under “Biological Opinion Actions” at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/

operations and increased availability of water to these senior water rights holders in this critically-dry year. This deferral of irrigation would allow implementation closer to the lower range of the Keswick release schedule for April and May, as identified in Section V of the DOP. During April and May, estimates of water volume differences if the revised (lower) maximum, rather than the original maximum, releases are implemented could translate to gains of up to 151-174 thousand acre-feet (TAF) in Shasta storage. From April through September, implementing the revised minimum, rather than the revised maximum, releases represents a water volume difference that could translate to gains of up to 544-556 TAF in Shasta Reservoir. These calculations, summarized in the enclosure, are estimates of the *maximum* potential storage gain – more modest storage gains are expected to be actually realized. Given this large range, NMFS intends to work closely with Reclamation and the affected water districts to achieve April and May Keswick releases towards the lower end of the range, if at all possible. As forecasts are updated, NMFS also intends to work closely with Reclamation and the Sacramento River Temperature Task Group to optimize June – September releases within the identified range for temperature management for winter-run, while also being mindful of effects on end of September storage.

In addition, the delivery of water for the purpose of decomposition of rice straw will not be made available from the CVP this year unless hydrologic conditions change substantially. This measure will benefit winter-run, spring-run and fall-run Chinook salmon by preserving storage and, perhaps, helping to avoid large flow fluctuations during spawning and egg incubation seasons.

2. Listed species needs and timing of emergency drought barriers: DWR has agreed to defer the start of in-water construction of the drought barriers at Sutter and Steamboat sloughs to no earlier than May 22, which is largely outside of the emigration window for listed anadromous fish species into the Delta (see Table 6-34 on page 402 in the NMFS BiOp³; end of mandatory DCC gate closure in RPA Action IV.1.2). They have also agreed to remove the Sutter and Steamboat drought barriers by October 31, 2014, which again is largely outside of the range of impacts to this year's juvenile listed species emigration into the Delta. These drought barriers may not be necessary at all, given the recent rains, and their necessity will continue to be evaluated by DWR.
3. San Joaquin River steelhead offset measures: Reclamation and DWR have agreed to offset the desired flexibility in implementing the San Joaquin inflow-to-export ratio Action IV.2.1 with two additional measures not included in the RPA, as written, and that were not previously analyzed. These measures provide benefits to San Joaquin River origin steelhead (the Southern Sierra Nevada Diversity group of the California Central Valley steelhead distinct population segment):
 - a. Provide for additional flows in the San Joaquin River in a subsequent year to benefit outmigration of San Joaquin steelhead: Reclamation and DWR will make an amount of water equivalent to half the volume of increased exports realized over the

³http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/nmfs_biological_and_conference_opinion_on_the_long-term_operations_of_the_cvp_and_swp.pdf

- April/May 2014 period available in a future year to provide for a larger pulse flow, for the fishery agencies to shape, in the next “dry” or better water year type⁴ for the San Joaquin River Basin. For example, if there is a 60 TAF gain in exports above the 1:1 I:E ratio (or minimum health and safety diversion of 1,500 cfs, whichever is greater), then 30 TAF of additional water (from some source within the San Joaquin River Basin in addition to the Appendix 2-E flows or that required to meet in-river regulatory obligations on the other tributaries) would be made available in a future year for the spring pulse flow on the San Joaquin River. The release timing of this additional flow would be scheduled at the discretion of the fishery agencies.
- b. Shift exports to Jones Pumping Plant (CVP) for all of April and May up to the federal capacity (either pumping or canal capacity); remainder of exports to be pumped at the Banks Pumping Plant (SWP) up to the operable constraint (likely the OMR limit before the pulse period; I:E ratio (or minimum 1,500 cfs) after the pulse period unless wet). Slight adjustments would be allowed to maintain minimal deliveries to the SWP South Bay Aqueduct, if necessary. The rationale for this action is that loss at the Banks Pumping Plant is much higher than at the Jones Pumping Plant, therefore the shift in exports is expected to minimize take associated with increased exports. This action was developed and vetted by a team of interagency staff in 2011.
4. Other key points of the Plan for species protection include:
- a. Conserving storage in Shasta Reservoir by limiting releases from Keswick Dam to no greater than 3,250 cfs, or as determined necessary to reasonably target no more than 4,000 cfs at Wilkins Slough, unless necessary to meet nondiscretionary obligations or legal requirements. In addition, Keswick releases will not be increased to directly support CVP Delta diversions;
 - b. Minimum human health and safety pumping (as defined in the NMFS Biop as 1,500 cfs) throughout the April 1 to May 31 timeframe when there is no natural or abandoned flow in the Delta;
 - c. Utilizing power bypasses at Trinity Dam and Shasta Dam to access colder water, as necessary;
 - d. A commitment to implement the two pulse flows in Clear Creek to attract adult spring-run Chinook salmon, as provided in RPA Action I.1.1, and per advice from the Clear Creek Technical Team; and
 - e. Consideration of increasing flows into the American River as hydrology improves to improve in-river conditions this spring, summer, and fall for salmonids; and decrease the reliance on Shasta Reservoir for meeting Delta legal requirements. Temperature model runs are forthcoming to help us better manage and balance the trade-offs between providing improved in-river conditions now and maintaining a limited cold water pool in Folsom Reservoir for management this summer.

Although recent storms in February and March have relieved some of the most urgent water needs, NMFS recognizes that if the drought conditions continue beyond water year 2014, the CVP and SWP must continue minimum operations, as needed, in water year 2015, to provide for minimum human health and safety, and also minimum protections for ESA-listed anadromous fish species.

⁴ Year type according to the San Joaquin Basin Hydrologic Index, based on the 75% forecast.

Flexible drought provisions were built in to the NMFS BiOp and RPA, which anticipated these types of conditions. RPA Action I.2.3.C (pages 26-27 of the 2009 RPA with 2011 amendments) provides drought exception procedures and requires that Reclamation develop and submit to NMFS a drought contingency plan if the February forecast, based on 90 percent hydrology, shows that the Clear Creek temperature compliance point or 1.9 million acre feet end of September storage at Shasta Reservoir is not achievable. The rationale for this action explicitly recognizes that in drought conditions, there is potential for conflict between the need to maintain storage at Shasta Reservoir and other legal and ecological requirements in the Delta, including outflow and salinity standards. Our ESA review of the proposed 8-month Plan is a continuation of the interim contingency plans that were provided for February and March 2014, with specific linkages to the underlying NMFS BiOp, as follows:

1. RPA Action I.2.3.C: Based on the most recent assessments of Shasta, Trinity, Whiskeytown, and Folsom Reservoirs, and Delta operations under this provision, as supported by Reclamation’s biological review for salmonids and green sturgeon provided as Appendix G of the Plan (Biological Review), NMFS finds that these proposed operations are consistent with Action I.2.3.C of the NMFS BiOp and meets the specified criteria for a drought contingency plan.

2. RPA Action IV.2.1: The RPA provides for flexibility in modifying operational elements, as provided in section 11.2.1.1 (pages 8-9 in the 2009 RPA with 2011 amendments). In addition, the proposed modification to RPA Action IV.2.1 (specifically, to increase export pumping to capture abandoned or natural flows in the Delta for a duration of 10-30 days during April 1-May 31) was vetted through the Real-Time Drought Operations Management Team, which was convened as a result of the State Water Board’s first Order on January 31, 2014. NMFS has reviewed the proposed operational modification and evaluated differences as compared to the RPA language in IV.2.1, including the biological rationale, action statement, implementation procedures, and related components of the Incidental Take Statement. NMFS also evaluated the two proposed offsetting measures described above, and which are not included in the RPA. Our analysis reviewed whether the modified action and the two proposed offsetting measures provided roughly equivalent protection to that of Action IV.2.1. These two additional measures provide benefits to San Joaquin River origin steelhead [the Southern Sierra Nevada Diversity group of the California Central Valley (CCV) steelhead distinct population segment (DPS)], and meet the objectives of Action IV.2.1⁵, as follows:
 - a. Additional flows in the San Joaquin River: One of the objectives of Action IV.2.1 is to provide greater net downstream flows. This measure is intended to partially offset reductions in flow during this critically dry year with increases in flow in a future year. The Biological Review (page 27) states that, “Part of the action includes a measure to provide an additional Spring pulse of water down the San Joaquin River in

⁵ The objectives of Action IV.2.1 are, “To reduce the vulnerability of emigrating CV steelhead within the lower San Joaquin River to entrainment into the channels of the South Delta and at the pumps due to the diversion of water by the export facilities in the South Delta, by increasing the inflow to export ratio. To enhance the likelihood of salmonids successfully exiting the Delta at Chipps Island by creating more suitable hydraulic conditions in the main stem of the San Joaquin River for emigrating fish, including greater net downstream flows.

a future year to benefit outmigration of San Joaquin steelhead. The release timing would be scheduled at the discretion of the fishery agencies. This measure will have no effect on steelhead in WY 2014, but could increase run-time diversity and outmigration survival down the San Joaquin through the Delta to benefit the emigrating cohort in the year that it occurs.”

- b. Shift exports to Jones Pumping Plant: The Biological Review (pages 36-37) states that, “An element of the proposed action to offset potentially greater exports during April and May 2014 than would occur under an unmodified RPA Action IV.2.1 is a facility shift in exports so that minimal pumping will occur at the SWP Banks Pumping Plant and the majority will occur at the CVP Jones Pumping Plant. This export shift, because it will not increase combined exports and is not expected to increase overall entrainment, will increase survival of salmonids through these facilities, since fewer fish will enter the SWP, where loss has been measured to range between 63-99% for Chinook (Gingras 1997) and 44-100% for steelhead (Clark et al. 2009). Loss at the SWP is higher due to substantial pre-screen mortality associated with Clifton Court. Based on the values and equations used by agencies to estimate loss, shifting exports from equivalent (e.g. 700 SWP and 800 CVP) to six-times greater exports at the CVP than SWP (e.g. 700 SWP and 4200 CVP) may increase overall survival from 42% to 59% (an approximately 40% increase in survival). There is a low level of uncertainty in this conclusion.”

Based on the above, NMFS concludes that the additional steelhead conservation measures will ensure that the operation of Action IV.2.1, modified from the way the RPA was written in 2009, will have roughly equivalent effects as what was previously analyzed in the NMFS BiOp and will result in a level of take that is within the incidental take authorized by the NMFS BiOp. As noted above, the additional flows in the San Joaquin River will not provide protection to those juvenile steelhead emigrating this year, but will provide extra protection to those emigrating in a future year, thereby providing protections to the Southern Sierra Nevada diversity group as a whole.

The Biological Review includes status updates on the abundance and distribution in water year 2014 of ESA-listed salmonids and sturgeon covered by the NMFS BiOp, and summarizes the generalized effects of project operations, including most of the proposed modifications, on those species. Inherent in the Plan is the objective to meet multiple needs with limited water resources. Most of the adverse effects to species identified in the Biological Review (*e.g.*, the potential for reduced survival of outmigrating salmonids from the Sacramento Basin due to modifications to outflow criteria in D-1641) are the consequences of actions intended to result in conditions (*e.g.*, greater Shasta Reservoir storage and a greater cold water pool) that will pre-empt more severe adverse effects to species (*e.g.*, potentially running out of cold water in Shasta Reservoir to meet the needs of winter-run and spring-run egg incubation throughout the temperature management season). Some adverse effects to species identified in the Biological Review (*e.g.*, the potential for reduced survival of outmigrating steelhead from the San Joaquin Basin due to modifications to the I:E ratio implementation period) are the consequences of actions intended to result in conditions (*e.g.*, greater south-of-delta storage) that will pre-empt adverse effects to non-fish-and-wildlife beneficial uses of CVP and SWP project water (*e.g.*, municipal and agricultural

purposes). The latter trade-offs are offset by some of the “additional” actions described above in 2a and 2b.

The Biological Review describes the direction of effect expected and assigns a qualitative level of certainty to each effect conclusion. Quantifying the specific effects of any particular Plan element, or of the full suite of proposed actions, is difficult as a result of combined uncertainties relating to:

- specific timing and duration of any particular component of the modified action (for example, it is not known when or if the DCC might open, though the opening is provided for under certain conditions; hydrology will play an important role in whether or not the modification to the I:E ratio will be in effect in late May).
- specific migration timing of listed species and presence in the “footprint” of any particular component of the modified action (for example, if temperatures in the lower San Joaquin and delta are unsuitable for salmonid migration in late May, few listed salmonids may be exposed to the effects of implementing a modified I:E action).
- uncertainty in the quantitative relationship between any underlying factor (*e.g.*, outflow) and the response variable of interest (*e.g.*, survival).

NMFS supports the general conclusions in the Biological Review, though notes that the effects are, for the most part, considered singly rather than in concert. As we have noted above, it is difficult to assess the cumulative effect of the Plan because of the uncertainties described. While the Biological Review does not draw a conclusion about the balancing embedded in the Plan, NMFS supports the implementation of the Plan as a reasonable approach to minimize adverse effects to species given the constraints this water year. NMFS is particularly concerned about winter-run Chinook salmon temperature management and has developed a winter-run Chinook salmon contingency plan if the actions to preserve Shasta storage are not sufficient to protect some extent of spawning habitat through fry emergence. Specifically, the state and federal agencies have developed a winter-run Chinook salmon contingency plan that includes: (1) infrastructure needs at Livingston Stone National Fish Hatchery, (2) increased monitoring of redds and temperature impacts, and (3) rescue and relocation to more suitable habitats including Battle Creek. This contingency plan will protect winter-run Chinook salmon from an entire year class failure.

In conclusion, Reclamation and DWR have proposed a drought operations plan for April 1 through November 15, 2014, that includes adjustments in the implementation of several operating criteria in the NMFS BiOp and RPA to address changing conditions associated with the drought. Reclamation has characterized the effects of the drought operations plan as follows:

“Cumulatively, the continuation of modification to the D-1641 flow and operational criteria and modification of the I:E ratio (Action IV.2.1) may reduce through-Delta survival of juvenile listed salmonids, steelhead and green sturgeon, and may modify their designated critical habitat during April and May. The reductions of juvenile survival on the majority of outmigrating BY13 Winter-run, BY 13 Spring-run Chinook salmon, and outmigrating steelhead would occur primarily in the Sacramento River and North Delta, if outflow levels drop below D-1641 flow and operational criteria due to limited releases of CVP/SWP storage during April and May. Increased exports during April and May, as part of the proposed

action, may also reduce survival of these populations by increasing loss at the CVP/SWP collection facilities and from exposure in the interior Delta to degraded habitats and predaceous invasive species. The offsetting action to shift exports from the SWP to the CVP during the spring reduces the risks associated with entrainment loss for the remainder of the WY 2014 salvage season compared to the RPA baseline with normal export operations.

Changes in Sacramento River outflow during April and May may delay adult Winter-run and Spring-run Chinook and green sturgeon migration. Additionally, adult migration of these species may be affected to a lesser extent by operation of three drought barriers in June and July. These drought barriers are unlikely to have an appreciable effect on juvenile outmigration of these species or Central Valley steelhead. Modification to D-1641 Municipal and Industrial and Agricultural water quality standards in the Delta between April and November will not affect Winter-run or Spring-run Chinook, steelhead, or green sturgeon.

Current reservoir storage levels and forecasted operations are likely to impact temperatures in the upper Sacramento River, Trinity River, Clear Creek, American River, and Stanislaus River. While the proposed drought operation plan incorporates numerous operational actions to minimize temperature effects compared to normal CVP/SWP operations, egg mortality of BY14 Winter-run may be substantial in the upper Sacramento River. Even improved temperature conditions may have substantial effects on the Winter-run Chinook salmon population since two brood classes are being impacted by WY 14 operation during winter and summer. Temperature effects on Clear Creek and in the Upper Sacramento may lead to substantial pre-spawn mortality of adult Spring-run Chinook. Temperature effects on the Clear Creek, Stanislaus, American, and Trinity rivers may exceed that expected under RPA actions regarding temperature compliance, but may still be able to provide restricted coolwater refugia for juvenile *O. mykiss*, Spring-run Chinook and Coho salmon. If temperature compliance points are not met on the Trinity River, the amount of habitat available to rearing coho salmon is expected to be lower than it would otherwise, and the probability of mortality of returning adults will increase.

Listed juvenile salmonids still to enter the Delta, particularly young-of-the-year Spring-run Chinook salmon (approximately 50-75%) and San Joaquin origin steelhead (approximately 70%) may have reduced survival due to increased residence times in the interior Delta. The offsetting action to augment flow on the San Joaquin River in the next dry or better year may improve freshwater, and possibly south Delta, survival compared to the RPA baseline without these augmented flow. Hydrodynamic changes in the Delta increasing the risk of entrainment into the Old and Middle River corridors as these flows become more negative may increase loss at the CVP/SWP fish collection facilities, if they enter the South Delta. Similar to the existing biological opinion, exports will conform to existing BiOps when NMFS BiOp Action IV.2.3's fish triggers are exceeded. While the proposed action may increase the likelihood of exceeding these triggers, it does not pose any additional risk to exceeding the annual take limit of Winter-run or Spring-run Chinook salmon or steelhead.”

Based on the proposed drought operations plan and summary of effects provided above, and described in detail in the Biological Review, NMFS has determined that the anticipated incidental take associated with the drought operations plan falls within the incidental take

statement issued as part of the NMFS BiOp. In addition, NMFS evaluated the drought operations plan, and specifically Reclamation's proposed adjustments in the implementation of one or two RPA actions, for a limited duration in 2014, due to existing circumstances of the drought.

We look forward to continued close coordination with you and your staff throughout this extremely challenging water year. If you have any questions regarding this letter, please contact me at will.stelle@noaa.gov, (206) 526-6150, or contact Maria Rea at (916) 930-3600, maria.rea@noaa.gov.

Sincerely,



William W. Stelle, Jr.
Regional Administrator

Enclosure:

1. Estimates of Potential Storage Gains in Shasta Reservoir under Drought Operations Plan

cc: Copy to file 151422SWR2006SA00268

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Estimates of Potential Storage Gains in Shasta Reservoir under Drought Operations Plan

Comparison #1 – Potential Storage Gains in Shasta Reservoir during April and May Due to Revision of the Forecasted Release Range.

Recent revisions in the proposed operations, summarized in Table 1, lower the high end of the forecasted release range in recognition of the ongoing discussions with settlement contractors to postpone at least some diversions of water for irrigation of rice fields. In the 50% exceedance scenario for April, the low end of the forecasted release range is also lowered.

Table 1. Revised range of Keswick Reservoir releases (in cubic feet per second), with the unrevised forecasted release range in parentheses.

	90% Exceedance With Salinity Barriers	90% Exceedance Without Salinity Barriers	50% Exceedance Without Salinity Barriers
April	4000-6500 <i>(4000-7800)</i>	4000-6500 <i>(4000-7900)</i>	3800-6500 <i>(4000-7750)</i>
May	4500-7000 <i>(4500-8300)</i>	4500-7200 <i>(4500-8300)</i>	4500-7000 <i>(4500-8615)</i>

These revised ranges of releases result in the potential for increased storage in Shasta Reservoir. A range of potential storage gains can be estimated by comparing the water volume necessary to support the maximum release as originally proposed to the water volume necessary to support both the low and high end of the revised release ranges. Those comparisons result in a range of estimated potential storage gains, for April and May combined, summarized in Tables 2 and 3.

Table 2. Estimates of water volume differences that could translate to gains (of up to 460-488 TAF) in Shasta storage if the revised minimum, rather than the original maximum, releases are implemented during all of April and May. These calculations are estimates of the *maximum* potential storage gain – more modest storage gains are expected to be realized.

Original Maximum vs. Revised Minimum Daily Keswick Reservoir Releases (cubic feet per second)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	Minimum release (revised)	Maximum release (original)	Minimum release (revised)	Maximum release (original)	Minimum release (revised)	Maximum release (original)	Minimum release (revised)	Maximum release (original)
April	4,000	7,800	4,000	7,900	NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		3,800	7,750
May	4,500	8,300	4,500	8,300			4,500	8,615
Original Maximum vs. Revised Minimum Daily Keswick Reservoir Releases (thousand acre-feet*)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	Minimum release (revised)	Maximum release (original)	Minimum release (revised)	Maximum release (original)	Minimum release (revised)	Maximum release (original)	Minimum release (revised)	Maximum release (original)
April	8	15	8	16	NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		8	15
May	9	16	9	16			9	17
* Daily thousand acre-feet (TAF) of release calculated as: Daily average release in cfs*Number of seconds per day*conversion factor in TAF per cfs, which is equivalent to: Daily average release in cfs*(60 secs/min*60 mins/hr*24 hrs/day)*(1 TAF per 43,560,000 cfs)								
Potential Storage Gain in Shasta Reservoir -- Original Maximum vs. Revised Minimum (thousand acre-feet**)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	If revised minimum, rather than original maximum, releases implemented		If revised minimum, rather than original maximum, releases implemented		If revised minimum, rather than original maximum, releases implemented		If revised minimum, rather than original maximum, releases implemented	
April	226		232		NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		235	
May	234		234				253	
Total	460		466				488	
** For each month and scenario, the Potential Storage Gain is calculated as: (Original maximum daily release, in TAF - Revised minimum daily release, in TAF) * Number of days in month								

Table 3. Estimates of water volume differences that could translate to gains (of up to 151-174 TAF) in Shasta storage if the revised maximum, rather than the original maximum, releases are implemented during all of April and May. These calculations are estimates of the *maximum* potential storage gain – more modest storage gains are expected to be realized.

Original Maximum vs. Revised Maximum Daily Keswick Reservoir Releases (cubic feet per second)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	Maximum release (revised)	Maximum release (original)	Maximum release (revised)	Maximum release (original)	Maximum release (revised)	Maximum release (original)	Maximum release (revised)	Maximum release (original)
April	6,500	7,800	6,500	7,900	NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		6,500	7,750
May	7,000	8,300	7,200	8,300			7,000	8,615
Original Maximum vs. Revised Maximum Daily Keswick Reservoir Releases (thousand acre-feet*)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	Maximum release (revised)	Maximum release (original)	Maximum release (revised)	Maximum release (original)	Maximum release (revised)	Maximum release (original)	Maximum release (revised)	Maximum release (original)
April	13	15	13	16	NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		13	15
May	14	16	14	16			14	17
* Daily thousand acre-feet (TAF) of release calculated as: Daily average release in cfs*Number of seconds per day*conversion factor in TAF per cfs, which is equivalent to Daily average release in cfs*(60 secs/min*60 mins/hr*24 hrs/day)*(1 TAF per 43,560,000 cfs)								
Potential Storage Gain in Shasta Reservoir -- Original Maximum vs. Revised Maximum (thousand acre-feet**)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	If revised maximum, rather than original maximum, releases implemented		If revised maximum, rather than original maximum, releases implemented		If revised maximum, rather than original maximum, releases implemented		If revised maximum, rather than original maximum, releases implemented	
April	77		83		NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		74	
May	80		68				99	
Total	157		151				174	
** For each month and scenario, the Potential Storage Gain is calculated as: (Original maximum daily release, in TAF - Revised maximum daily release, in TAF) * Number of days in month								

Since there is considerable overlap in the original and revised ranges, it is possible that no storage gains will be achieved. However, it is expected that the recent discussions with rice growers about rescheduling deliveries will allow for reduced releases during April and May relative to the releases that would otherwise have been implemented, which will result in improved storage and cold water pool conditions in Shasta Reservoir. The estimated gains provided above are high-end estimates to indicate the maximum potential storage gain if the extremes of the operating range were implemented – a gain in between 0 TAF and these maximum estimates is what is expected to be realized.

Comparison #2 –Potential Storage Gains in Shasta Reservoir Through End of September due to Implementation of the Minimum, Rather than the Maximum, Release Within the Proposed Operating Range

The full range of proposed operations through September, including the revised release ranges in April and May, demonstrates important storage and flow tradeoffs, with an overall maximum potential gain in Shasta storage of approximately 550 TAF (Table 4, bottom panel) by the end of September. Because it is expected that the actual releases will likely not be at either extreme of the release range for an extended period, NMFS emphasizes that the calculations in Table 4 (as in Tables 2 and 3) are estimates of the *maximum* potential storage gain – more modest storage gains are expected to be realized.

Table 4. Estimates of water volume differences that could translate to gains (of up to 544-556 TAF) in Shasta storage if the revised minimum, rather than the revised maximum, releases are implemented through September. These calculations are estimates of the *maximum* potential storage gain – more modest storage gains are expected to be realized.

Range of Proposed Daily Keswick Reservoir Releases (cubic feet per second)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	Minimum release	Maximum release	Minimum release	Maximum release	Minimum release	Maximum release	Minimum release	Maximum release
April	4,000	6,500	4,000	6,500	NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		3,800	6,500
May	4,500	7,000	4,500	7,200			4,500	7,000
June	9,000	10,000	10,000	11,000			9,000	10,000
July	9,000	10,000	10,000	11,000			9,000	10,000
August	7,000	8,000	7,000	8,000			8,000	9,000
September	4,000	5,000	4,000	5,000			5,000	6,000
Range of Proposed Daily Keswick Reservoir Releases (thousand acre-feet*)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	Minimum release	Maximum release	Minimum release	Maximum release	Minimum release	Maximum release	Minimum release	Maximum release
April	8	13	8	13	NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		8	13
May	9	14	9	14			9	14
June	18	20	20	22			18	20
July	18	20	20	22			18	20
August	14	16	14	16			16	18
September	8	10	8	10			10	12
* Daily thousand acre-feet (TAF) of release calculated as: Daily average release in cfs*Number of seconds per day*conversion factor in TAF per cfs, which is equivalent to Daily average release in cfs*(60 secs/min*60 mins/hr*24 hrs/day)*(1 TAF per 43,560,000 cfs)								
Maximum Potential Storage Gain in Shasta Reservoir (Intermediate Effect expected) (thousand acre-feet**)								
90% Exceedence					50% Exceedence			
With Salinity Barriers		Without Salinity Barriers			With Salinity Barriers		Without Salinity Barriers	
Month	If minimum, rather than maximum, releases implemented	If minimum, rather than maximum, releases implemented			If minimum, rather than maximum, releases implemented		If minimum, rather than maximum, releases implemented	
April	149	149			NA -- under 50% hydrology, it is expected that no salinity barriers will be necessary		161	
May	154	166					154	
June	60	60					60	
July	61	61					61	
August	61	61					61	
September	60	60					60	
Total	544	557					556	
** For each month and scenario, the Maximum Potential Storage Gain is calculated as: (Maximum daily release, in TAF - Minimum daily release, in TAF) * Number of days in month								