



EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIGUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

JUL 30 2018

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR YUBA RIVER DEVELOPMENT PROJECT, FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246; YUBA, SIERRA, AND NEVADA COUNTIES

Dear Secretary Bose:

On May 30, 2018, the Federal Energy Regulatory Commission (FERC) issued the Draft Environmental Impact Statement (Draft EIS) for Yuba County Water Agency's Yuba River Development Project (Project), FERC Project No. 2246, and an accompanying notice that FERC is accepting comments on the Draft EIS. The State Water Resources Control Board (State Water Board) appreciates the opportunity to comment on the Draft EIS. State Water Board staff provides timely comments on the Draft EIS in Attachment A.

If you have questions regarding this letter or the attachment, please contact me at (916) 341-5408 or by email at Philip.Choy@waterboards.ca.gov. Written correspondence should be directed to:

State Water Resources Control Board
Division of Water Rights - Water Quality Certification Program
Attention: Philip Choy
P.O. Box 2000
Sacramento, CA 95812-2000

Sincerely,

Philip Choy, Environmental Scientist
Water Quality Certification Unit
Division of Water Rights

Enclosure: Attachment A –Comments on the Draft Environmental Impact Statement for the Yuba River Development Project

FELICIA MARCUS, CHAIR | EILEEN SOBECK, EXECUTIVE DIRECTOR

JUL 30 2018

cc: Mr. Curt Aikens
Yuba County Water Agency
1220 F Street
Marysville, CA 95901

Mr. James Lynch
HDR Inc.
2379 Gateway Oaks Drive, Suite 200
Sacramento, CA 95833

Mr. Thomas Holley
Nation Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Ms. MaryLisa Cornell
Department of Fish and Wildlife
1701 Nimbus Road
Rancho Cordova, CA 95670

Ms. Alison Willy
U.S. Fish and Wildlife Service
650 Capitol Mall, Room 8-300
Sacramento, CA 95814

Ms. Amy Lind
Tahoe and Plumas National Forests
631 Coyote St.
Nevada City, CA 95959

Mr. Adam Laputz
Central Valley Regional Water Quality
Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Mr. Geoff Rabone
Yuba County Water Agency
1220 F Street
Marysville, CA 95901

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

State Water Resources Control Board (State Water Board) staff provides the following comments on the Federal Energy Regulatory Commission's (FERC or Commission) Draft Environmental Impact Statement (Draft EIS or DEIS) for the Yuba River Development Project (Project), FERC Project No. 2246. Yuba County Water Agency (YCWA or Licensee) owns and operates the Project.

General Comments

1. In accordance with a Memorandum of Understanding (MOU) executed between the Commission and the State Water Board on November 19, 2013, State Water Board staff provided comments and preliminary terms and conditions in response to the Commission's Notice of Ready for Environmental Analysis (REA). The purpose of this coordination between the Commission and the State Water Board is to facilitate the issuance of environmental documents that satisfy legal requirements of National Environmental Policy Act and California Environmental Quality Act and meet the Commission's and State Water Board's needs.

In the Draft EIS, the Commission references State Water Board staff's preliminary conditions but often states that the preliminary condition is not adequately specific to analyze environmental impacts (e.g., specific minimum instream flows are not identified). State Water Board staff suggests the Commission consider and analyze State Water Board staff's preliminary terms and conditions in the context of State Water Board staff's REA comments. State Water Board staff's REA comments provide additional specificity regarding the preliminary terms and conditions.

2. The Commission's integrated relicensing process promotes collaboration between the applicant, resource agencies, and the public. During the relicensing process for the Project, YCWA, resource agencies¹, and non-governmental organizations representing environmental and recreational interests have contributed a significant level of effort (over 200 meetings) since 2009 to develop license measures that balance the various interests represented. YCWA's Amended Final License Application (Amended FLA), dated June 4, 2017, includes more than 30 "agreed-upon"² protection, mitigation, and enhancement (PM&E) measures for any license issued for the Project. Subsequent to the Amended FLA filing, YCWA continued to meet with stakeholders and filed with the Commission an additional three agreed-upon PM&E measures that replaced previous PM&E measures contained in the Amended FLA³.

¹ Resource agencies include United States Forest Service (USFS), United States Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), Bureau of Land Management, and National Marine Fisheries Service (NMFS). State Water Board staff has participated in the relicensing discussions to provide guidance regarding the State Water Board's regulatory requirements, but did not approve or agree to any measures.

² For purposes of this comment letter, "agreed-upon" measures are those which the Licensee and staff from at least one of the following agencies agreed to: USFS, USFWS, and CDFW.

³ YCWA submitted the following agreed-upon measures to the Commission subsequent to submission of the Amended FLA: GS3 (on April 12, 2018), WR3 (on April 27, 2018), and AR9 (on April 27, 2018).

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

The State Water Board exercises the authority under, inter alia, the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act,⁴ to balance beneficial uses of water. State Water Board staff generally supports the agreed-upon proposed measures as providing such a balance. Many of the agreed-upon PM&E measures minimize Project impacts to resources and help determine whether new license measures adequately protect resources.

State Water Board staff is concerned that the Commission is not giving the agreed-upon measures sufficient weight in light of the considerable effort and agreement they represent.

3. The Draft EIS appears to group components of agency proposed/recommended measures in its analyses. State Water Board staff requests the Commission analyze the incremental impact of each specific measure (e.g., Comment 22)
4. The FERC Staff Alternative reduces key components of or did not include many of the agreed-upon proposed PM&E measures that require monitoring. Commission staff's primary reasons for removing or reducing monitoring-related PM&E measures are that:
 - a. Monitoring does not determine license compliance or changes to license requirements;
 - b. Monitoring is not needed to quantify the probable benefits or verify the status quo of resources (i.e., Proposed measures are anticipated to be beneficial; and therefore, monitoring is not necessary);
 - c. Monitored resources are influenced by Project factors and environmental factors (that are unrelated to project operations), and the monitoring cannot distinguish between the two factors.

State Water Board staff generally supports the agreed-upon proposed PM&E measures that require monitoring.

In response to (a): Monitoring is integral to determining license compliance. In general, State Water Board water quality certifications (certification) include conditions that require compliance with water quality standards, and State Water Board staff uses data collected from Project monitoring to compare resources in the Project-affected area to standards. Thus, monitoring directly relates to compliance with common certification conditions.

In addition, monitoring supports an adaptive management approach which can provide greater certainty in addressing uncertain impacts and reduce costs of measures that are required based on actual operations, as opposed to over-prescribing conditions to protect resources or under-prescribing conditions to avoid costs. One approach in developing adaptive management plans is to set forth a formal process at licensing that identifies specific measures or criteria. Although a formal adaptive management process was not included in State Water Board staff's preliminary conditions, State

⁴ 33 U.S.C. §§1251-1387; Water Code, section 13000 et. Seq.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Water Board staff is not opposed to the Commission including a formal adaptive management process in the license.

Another approach is to reserve the authority to reopen the license based on the results of monitoring. The Commission, as well as mandatory conditioning agencies, have the authority to amend their respective Project requirements through this reservation of authority (see preliminary condition 29 and 35). Monitoring is necessary to inform preliminary condition 29 and 35. State Water Board staff notes that the Ecological Group (YCWA Proposed Condition GEN 1) provides an opportunity for the Licensee, resource agencies, and the public to discuss potential adaptive management actions in the context of monitoring data.

In response to (b): A certification must evaluate a projects' effects on water quality over the life of the Project, including ongoing or prior effects. In this context, evaluation of status quo is relevant, as is evaluation of benefits vis-à-vis the status quo. Moreover, State Water Board staff cannot reliably project that cumulative effects will be constant during the term of a 30 – 50 year license. Monitoring can identify the potential need to revise license measures or require additional PM&E measures to adequately protect resources (see discussion regarding adaptive management above).

In response to (c): All resources are impacted, to an extent, by environmental and non-Project factors. Monitoring within the Project area focuses on key resources that are likely impacted by Project operations and maintenance. Non-Project factors can often be estimated using data collected by non-Project requirements (e.g., non-licensee funded monitoring or scientific research). The analysis of data from multiple sources (as necessary) can help isolate potential impacts from Project operations and maintenance on resources. The State Water Board must evaluate Project impacts to resources through the term of the license to monitor the effectiveness/adequacy of PM&E measures.

In addition, monitoring data informs on a current or recent condition and is necessary to determine the level of adverse impact to resources from an authorized or unauthorized license deviation. State Water Board certifications typically contain monitoring requirements for aquatic resources that have the potential to be significantly impacted by the Project.

Finally, relicensing studies often provide data collected over a short one to two year period of time. Although this data is extremely informative to the relicensing process, it is often difficult to determine specific project impacts and develop associated PM&E measures to ameliorate such impacts based on this limited data set. Data collected during the term of a license will more comprehensively inform the next relicensing for the project.

5. Pacific Gas and Electric Company (PG&E) and Nevada Irrigation District (NID) are currently relicensing the Yuba-Bear, Upper Drum-Spaulding, Lower Drum, and Deer Creek Projects (FERC Project Nos. 2266, 2310, 14531, and 14530 respectively) (collectively referred to as Yuba-Bear/Drum Spaulding projects). The Yuba-Bear/Drum Spaulding projects release water into the Middle Yuba River and South Yuba River,

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

which both flow into the Project area. The Commission issued the final Environmental Impact Statement (final EIS) for the Yuba-Bear/Drum Spaulding projects on December 19, 2014. The final EIS includes recommendations for increased streamflow requirements that would “allow more water to be available for YCWA to provide proposed minimum instream flows downstream of Englebright Reservoir.” (DEIS Page 3-204). These changes are therefore reasonably foreseeable. State Water Board staff requests an analysis of the effects and potential reduced costs that the Yuba-Bear/Drum Spaulding projects’ recommended flows would have on the Project, including proposed Project PM&E measures and Project-affected aquatic resources.

6. State Water Board staff requests the Commission consider the current energy market in California when estimating costs to a licensee from implementation of license measures. The Commission currently evaluates a hydroelectric project’s cost by comparing the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using the likely alternative source of power for the region (cost of alternative power). This evaluation may be an inappropriate comparison because the revenue from power is highly variable throughout the day and year due to the onset of non-controllable, variable generation energy sources (e.g., wind and solar) in California.

For example, overgeneration may occur where the revenue for energy from hydropower can be negative. During these times, it may be more economical for a hydropower project to spill water instead of generate power if the forebay is at full capacity (i.e., defer generation). The Commission’s current economic evaluation does not address this scenario.

7. The absence of State Water Board comments on particular analyses, topics, or sections in the Draft EIS does not indicate support for those particular analyses, topics, or sections.

Specific Comments (referenced as “Comment” through this document)

Existing Project (Draft EIS Section 2.1)

1. *“Although the Narrows 2 Powerhouse uses flows from the Englebright Reservoir, the [United States Army Corps of Engineers] operates and maintains the Englebright Dam and Reservoir.”* (Page 2-9)

Please clarify how the United States Army Corps of Engineers (USACE) operates Englebright Dam and Reservoir. The only outlets from Englebright Dam (other than passive spill over the dam crest) are intakes for YCWA’s Narrows 2 Powerhouse and PG&E’s Narrows 1 Powerhouse⁵.

The State Water Board concluded that Englebright Reservoir serves as an afterbay for New Colgate Powerhouse and a forebay for Narrows 2 Powerhouse (State Water Board Revised Decision 1644 - Section 3.3.1). In addition, per REA Comment 3, State Water

⁵ The Narrows 1 Powerhouse is a facility of the Narrows Hydroelectric Project (FERC Project No. 1403).

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Board staff determined that Englebright Dam water elevation is controlled, in part, by Project operations upstream and at the Narrows 2 Powerhouse.

FERC Staff Alternative (Draft EIS Section 2.3)

2. *“[Commission staff] do not recommend organizing an ecological group meeting [(YCWA Proposed Measure GEN 1)] because standard Commission practices would require YCWA to consult with agencies during the preparation of monitoring reports that are components of Commission-approved management plans, and annual meetings alone would not provide additional benefits to environmental resources to warrant the cost.”* (Page 2-37)

State Water Board staff supports a forum for stakeholders to be informed of Project activities and elements impacted by the Project. Such a practice can improve operations and facilitate communication, as well as provide access to non-institutional input relevant to Project impacts. Such a condition is particularly appropriate in this proceeding in light of the extensive non-governmental participation in the relicensing process. The State Water Board has issued certifications that require the licensee to provide an opportunity for public/non-governmental organization participation during various project-related activities for the following projects that do not have settlement agreements: Big Creek No. 4 Hydroelectric Project (FERC Project No. 2017); Pit 3, 4, and 5 Hydroelectric Project (FERC Project No. 233); Poe Hydroelectric Project (FERC No. 2107); and DeSabra-Centerville Hydroelectric Project (FERC No. 803).

3. *“[Commission staff] do not recommend a license condition requiring annual employee training [(YCWA Proposed Measure GEN 3)], because licensees are expected to train their employees to the extent needed for the licensee to maintain compliance with a license.”* (Page 2-37)

The Licensee proposed annual employee training to ensure the Project will be in compliance with the FERC license. Since the Licensee suggests this measure is necessary to ensure compliance, State Water Board staff supports annual employee training.

4. *“[Commission staff] do not recommend the coordinated operations plan [(YCWA Proposed Measure GEN 4)] because it is not needed to implement the other proposed measures and because any conflicts between YCWA’s Yuba River Development Project and PG&E’s Narrows Project would be addressed through standard Commission practices.”* (Page 2-37)

The Licensee proposed the coordinated operations plan to assure implementation of the flow-related conditions in the Project license, including maintenance of flow requirements during normal operations, scheduled outages, and unscheduled outages. Because the Licensee suggests this measure is necessary to ensure license compliance, State Water Board staff supports a coordinated operations plan.

In addition, it is unclear how the Commission determined a coordinated operations plan is not needed for implementation of license measures when on Page 2-12 of the Draft

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

EIS, the Commission states that “YCWA and PG&E coordinate releases from the Narrows 2 Powerhouse, the Narrows 2 partial bypass, and PG&E’s Narrows 1 Powerhouse in accordance with the streamflow requirements in Article 33 of YCWA’s existing license for the Yuba River Development Project to ensure compliance with downstream minimum flows on the Yuba River and to manage inflows into Englebright Reservoir.” State Water Board staff notes that a coordinated operations plan may also be necessary to comply with lower Yuba River ramping rates (YCWA Proposed Measure AR9).

5. “[Commission staff] do not recommend a Water Temperature Monitoring Plan [(YCWA Proposed Measure WR7)] because YCWA’s proposed flow-related measures are expected to generally maintain or reduce water temperatures in project-affected waters and support resident and anadromous coldwater fishes, similar to what has occurred under existing operation. There appears to be little basis for requiring water temperature monitoring to verify the status quo or the probable improvements in water temperature that would occur. There would be no value, from a license compliance perspective, to a comprehensive, long-term water temperature record that would result from YCWA’s proposal and the Water Board’s specification.” (Page 2-37)

State Water Board staff supports the Water Temperature Monitoring Plan. The Commission states that flow-related measures are expected to “generally maintain or reduce water temperatures” and uses this as rationale to reject the proposed plan. General expectation that proposed measures will not adversely impact a resource is an inadequate basis on which to reject monitoring, in light of uncertainty. Monitoring, as described in the proposed plan, is needed to assess habitat conditions and impacts to aquatic resources, and to determine whether beneficial uses are protected over the term of the license. The plan is designed to ensure that resources are adequately protected in the future despite changes in weather, climate, and Project operation and maintenance. In addition, water temperature is a fundamental environmental parameter that State Water Board staff evaluates to determine potential impacts to resources from authorized or unauthorized license deviations. A long-term water temperature record is necessary to best evaluate specific impacts of such a deviation.

6. “[Commission staff] do not recommend a Water Quality Monitoring Plan [(YCWA Proposed Measure WR8)] because YCWA’s operation of the project with the facility modifications and proposed flow-related measures are not expected to adversely affect water quality or bioaccumulation in aquatic organisms. There would be no value, from a license compliance perspective, to monitor water quality or bioaccumulation to identify unexpected water quality issues under a new license.” (Page 2-37)

State Water Board staff supports the Water Quality Monitoring Plan. The Commission states that flow-related measures are “not expected to adversely affect water quality or bioaccumulation in aquatic organisms” and uses this as rationale to reject the proposed plan. Expectation that proposed measures will not adversely impact a resource is an inadequate basis on which to reject monitoring, in light of uncertainty. Monitoring, as described in the proposed plan, is needed to assess habitat conditions and, impacts to aquatic resources, and to determine whether beneficial uses are protected over the term of the license. The plan is designed to ensure that resources are adequately protected

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

in the future despite changes in weather, climate, and Project operation and maintenance. In addition, water quality is a fundamental environmental parameter that State Water Board staff evaluates to determine potential impacts to resources from authorized or unauthorized license deviations. A recent baseline of water quality is necessary to best evaluate specific impacts of such deviations.

7. “[Commission staff] do not recommend an Upper Yuba River Aquatic Monitoring Plan [(YCWA Proposed Measure AR7)] because the proposed plan includes monitoring but does not provide any mechanisms for isolating project effects from non-project effects on monitored resources. Additionally, the plan does not identify how monitoring results would affect project operations.” (Page 2-37)

State Water Board staff supports the Upper Yuba River Aquatic Monitoring Plan. The Commission suggests the plan is not necessary because the plan does not isolate Project effects from non-Project effects. Using an adaptive management framework, the State Water Board must first identify if there is an impairment to a resource prior to determining appropriate remediation or locating the source of the impairment. The Upper Yuba River Aquatic Monitoring Plan provides the mechanism to identify if an unanticipated impairment exists as a cost-effective first step that can trigger a more complex evaluation of causation and identification of remedial actions, if necessary. If the Project is determined to inadequately protect aquatic resources, the State Water Board may amend its certification with appropriate PM&E measures through a reservation of authority (preliminary conditions 29 and 35).

8. Commission staff recommends modifications to the Drought Management Plan (YCWA Proposed Measure WR9) to define a drought based on local conditions, rather than state-wide conditions. (Page 2-38)

State Water Board staff supports the Commission’s recommendation. Based on the State Water Board letter to the Commission regarding drought⁶, dated March 11, 2014, State Water Board staff also recommends YCWA’s Proposed Condition WR9 include the following information in each specific Drought Management Plan to facilitate agency review and approval:

- A. Quantification of water that would be preserved by the proposed license condition variance(s):
 - I. The quantity of water that is expected to be saved for later use that would not be available without the variances(s);
 - II. The location where the saved water will ultimately be used; and
 - III. The purpose of for which the saved water will be used.

⁶ The State Water Board letter to FERC regarding drought is available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/abrams_fer_c_03112014.pdf

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

- B. A discussion of anticipated or potential impacts to fish and wildlife species and water quality if the proposed license condition variance(s) are implemented.
- C. A description of any monitoring that would be conducted as appropriate by YCWA to identify the impacts of the proposed license variances on fish and wildlife species and water quality and temperature. Reporting requirements that ensure prompt notification to appropriate fish and wildlife and water quality regulatory agencies if impacts are greater than anticipated.
- D. A description of how and when the Project will return to its licensed conditions if the drought ceases or if local conditions improve such that regular operations may be reinstated.

In addition, State Water Board staff recommends consultation for specific drought management plans as follows: *If requested by Forest Service or State Water Board staff, YCWA will schedule a drought meeting(s), no later than 15 days from the date YCWA provided the draft Specific Drought Plan, with the Forest Service, State Water Board, USFWS, NMFS, and CDFW to discuss and attempt to reach consensus on the Specific Drought Management Plan. If requested by staff from the Forest Service or the State Water Board, YCWA shall hold additional drought meeting(s).*

- 9. State Water Board staff supports the Commission's additions to the Narrows Reach Fish Stranding Prevention Plan, as described on Page 2-38.
- 10. State Water Board staff generally supports the Commission's comprehensive [large woody material] enhancement plan, as described on Page 2-39.
- 11. State Water Board staff supports the Commission's modifications to the proposed Recreation Facilities Plan (RR1), as described on Page 2-40.

Commission staff included a provision to provide public vehicular access and parking below New Bullards Bar Dam. Whitewater boating flows begin at the confluence of the North Yuba River and the spillway flows, approximately 0.3 miles downstream of New Bullards Bar Dam.

State Water Board staff requests the Commission consider boater access to the whitewater boating flows originating from the New Bullards Bar Dam spillway. It is unclear whether boaters could safely float down the North Yuba River from the parking area to where the whitewater boating flows begin. A pedestrian access trail from the proposed parking area to the North Yuba River downstream from where the spillway flows enter the North Yuba River may be warranted.

FERC Staff Alternative with Mandatory Conditions (Draft EIS Section 2.4)

- 12. Commission staff interprets State Water Board preliminary condition 3 "to mean a plan for restoration of floodplain connectivity in the lower Yuba River." State Water Board staff clarifies that preliminary condition 3 is not limited to floodplain connectivity, but rather any habitat improvements within the Project affected area to protect or enhance aquatic

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

habitats, water quality, water temperature, vegetation, fish, wildlife, invertebrates, and other designed beneficial uses of water. However, floodplain connectivity in the lower Yuba River to promote natural processes and salmonids would likely be a major component of any such restoration plan described in preliminary condition 3.

Scope of Cumulative Effects Analysis (Draft EIS Section 3.2)

13. Commission staff states that *“for water and aquatic resources (with the exception of anadromous fish), riparian vegetation, and geology and soils, we define the geographic scope to encompass the North Yuba River extending downstream from the confluence of Slate Creek, the Middle Yuba River extending downstream from the high water line of Our House Diversion Dam impoundment, Oregon Creek extending downstream from the Lohman Ridge Diversion Tunnel, and the entire mainstem Yuba River extending downstream to the mixing zone of the Yuba River and the Feather River.”* (Page 3-2)

In addition, *“[Commission staff] have determined a cumulative geographic scope for anadromous fish and [essential fish habitat] that includes the Yuba River Basin downstream to the confluence with the Feather River, the lower Feather River to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay.”* (Page 3-3)

A comprehensive integrated flow regime that protects fish and wildlife, from natal streams out to the ocean, is necessary to adequately protect aquatic resources. As described in the October 2017 *Final Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows* (Science Report)⁷, Delta inflows, including a continuity of flows from tributaries (including the Yuba River), are needed to provide habitat conditions for anadromous fish and other fish and aquatic species that inhabit the Bay-Delta. Delta inflows are also needed to contribute to Delta outflows for the protection of native estuarine species. Therefore, State Water Board staff recommends the Commission extend the cumulative geographic scope for all water and aquatic resources to include the Yuba River watershed downstream to the confluence with the Feather River, the lower Feather River to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay. The Project has the potential to effect numerous aquatic species in these areas, in addition to anadromous fish.

Proposed Action and Action Alternatives (Draft EIS Section 3.3)

14. *“Most sediment transport occurs during large flood events, such as the 1986 and 1997 floods. These high energy flow events function as “reset” mechanisms in project-affected*

⁷ The Science Report is available at:

https://www.waterboards.ca.gov/water_issues/programs/peer_review/docs/scientific_basis_phase_ii/201710_bdphasell_sciencereport.pdf. Previously, in October 2016, State Water Board staff released a *Working Draft Scientific Basis Report for New and Revised Flow Requirements on the Sacramento River and Tributaries, Eastside Tributaries to the Delta, Delta Outflow, and Interior Delta Operations* for public comment.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

reaches by disturbing and reworking floodplain deposits, mid-channel bars, and historical mining material. These events also scour sediment from the impoundments of the diversion dams.” (Page 3-8)

State Water Board staff requests clarification on the Commission’s determination that large flood events transport most sediment and function as a “reset” mechanism in Project-affected reaches. As a result of large flow events, it is unknown how much sediment is scoured from or transported past the diversion dams, but it is known that sediment is heavily deposited in the impoundments. Following high flow events, YCWA typically removes sediment from the Log Cabin and Our House diversion dam impoundments (as stated in the Draft EIS on Page 3-6).

15. *“[Commission staff] have not identified any environmental benefit to a coordinated operations plan.” (Page 3-106)*

State Water Board staff supports a Coordinated Operations Plan in the license, as described in preliminary condition 28 and Comment 4, above. A coordinated operations plan between YCWA’s Narrows 2 Powerhouse and PG&E’s Narrows 1 Powerhouse could minimize environmental impacts should an unplanned outage occur (see Section 2.8 (b) of the 2016 Coordinated Operations Plan⁸).

16. *“[Commission staff] evaluated the effects of using the upper intake on water temperature using the same parameters used to evaluate the effects on water temperature of the proposed operations (i.e., mean monthly temperature, the frequency of exceeding 20 [degrees Celsius (°C)], and frequency of temperatures between 12 and 20°C) and present the results in appendix A (tables A-9 and A-10).” (Page 3-117)*

Improvements to water temperature from using the upper intake in combination with the lower intake may occur in drier water year types. Figure 1 below illustrates that water temperatures may decrease in the fall when both the upper and lower intakes are used. Reduced water temperatures in the fall could coincide with salmonid spawning and potentially create more favorable spawning conditions.

⁸ On April 19, 2016, YCWA and PG&E filed the Coordinated Operations Plan with FERC. The goal of this plan, in part, is “to meet the applicable regulatory requirements in the Narrows Project license and in the Yuba River Development Project license...”

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Figure 1. Modeled water temperatures in the lower Yuba River during 1977 using the lower intake only (green line at Smartsville, blue line at Daguerre), and using both intakes (black line at Smartsville, red line at Daguerre). The water year type in 1977 is classified as critically dry.



As discussed above, benefits to water temperature could be gained during drier water year types. Conducting an analysis that combines the average monthly water temperature across all water year types to estimate average temperature exceedance in a certain month, as the Commission has done, does not distinguish potential benefits that may be regularly obtained in drier water year types. State Water Board staff requests the Commission analyze simulated water temperatures based on water year type.

The Commission used simulated daily mean water temperature to analyze the frequency that conditions support salmonid growth (i.e., between 12 and 20°C) and the frequency of sub-optimal conditions for salmonids (i.e., exceeding 20°C). Frequency of daily mean temperatures are grouped by month and analyzed as percent occurrence. This level of analysis does not distinguish potential benefits that may be regularly obtained in drier water year types. State Water Board staff requests this analysis be further separated by water year type to distinguish potential temperature differences among water year types and to allow evaluation of benefits that may be gained during drier water year types.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

In addition, State Water Board staff is concerned with the level of accuracy of the model outputs and requests the Commission exercise caution when making determinations based upon the model outputs. During relicensing discussions, YCWA and YCWA's technical consultant (HDR) repeatedly stated that their model was not capable of modeling the operation of the upper penstock intake without recalibration. YCWA provides a description of the model's flaws below:

“During development of the Upper Temperature Model (UTM), calibration focused exclusively on the lower intake. No historical data using the upper intake were available. Calibration results using the lower intake to downstream release temperatures were very good, although, the UTM tends to under-represent surface warming. Using the lower intake only, the UTM indicates greater warming of the metalimnion and hypolimnion (upper and middle temperature zones in New Bullards Bar Reservoir) from drawdown of upper layers. These deviations do not impact model results using only the lower intake, but do reduce HDR's confidence in UTM results for water temperatures from the upper intake.” (YCWA October 2017 filing, Appendix 6, page 9 of 12)

17. The Commission suggests *“simulated daily mean temperatures also indicate that use of the upper intake for New Colgate Powerhouse in March through May would have virtually no effect on the frequency of supporting salmonid growth (i.e., between 12 and 20°C) or the frequency of sub-optimal conditions for salmonids (i.e., exceeding 20°C) in the Yuba River downstream of New Colgate Powerhouse.”* (DEIS page 3-117)

Commission staff evaluated salmonid growth based on the frequency of days with water temperatures between 12 and 20°C. This temperature range is very large and it is likely that salmonid growth is not constant through this temperature range (i.e., temperature affects metabolic rate, which can accelerate egg incubation and increase juvenile growth rates). Therefore, the agencies' stated goal of accelerating egg incubation and juvenile growth rates has not been analyzed. State Water Board staff requests the Commission analyze the two proposed scenarios (i) operation of the upper and lower intakes together; and (ii) operation of the lower intake only) and compare each scenario's effect on March through May water temperatures - specifically evaluating the frequency of days water temperatures increased from scenario (ii) to (i), and the quantity of days temperatures were outside the range of 12 and 20°C for each scenario.

Commission staff evaluated sub-optimal conditions for salmonids based on the frequency of days with water temperatures exceeding 20°C. State Water Board staff requests the Commission consider water temperature benefits from use of the upper intake at specific salmonid lifestages, rather than a general 20°C threshold. Specifically, use of the upper intake could provide cooler water temperatures during the fall months, when Spring-run and Fall-run Chinook salmon are spawning. According to EPA (2003), water temperatures for salmonid spawning should not exceed 13°C.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

State Water Board staff has referenced EPA (2003) water temperature criteria for salmonids in the lower Yuba River in past filings with the Commission. State Water Board staff requests the Commission include EPA (2003) criteria in its analysis.

18. Commission staff suggests *“that continued use of the lower intake [alone] would not deplete the pool of colder water in New Bullards Bar Reservoir (the hypolimnion) or result in warmer discharges from the New Colgate Powerhouse.”* (Page 3-118)

State Water Board staff requests the Commission’s analysis include years 2012 through 2016 (as opposed to 1970-2010). These years include a series of continuous drier water year types when implementation of the upper outlet may have more pronounced benefits to water temperature than those found when analyzing 1970-2010 data. During 2014 and 2015, portions of the lower Yuba River were not suitable for most or all of certain salmonid lifestages (see State Water Board staff REA Comment 18).

State Water Board staff also requests the Commission determine the estimated cost to repair, maintain, and operate the upper intake. YCWA’s estimate of \$1,100,000 per year appears high and no cost breakdown is provided.

19. Commission staff states that *“According to YCWA’s modeling results, the agencies’ recommended higher minimum flows would also lower the water surface elevation in New Bullards Bar Reservoir at a faster rate over time than the minimum flows proposed by YCWA, which could in turn reduce the amount of littoral habitat and terrestrial food resources available to reservoir fishes.”* (Page 3-132)

State Water Board staff requests the Commission consider that YCWA would reduce generation, as opposed to lowering reservoir surface elevation, to meet the agencies’ recommended higher minimum flows. State Water Board staff’s suggestion is similar to the Commission’s acknowledgment that flows can be supplied by both reservoir storage and reduced generation (footnote 61, DEIS Page 3-116).

In addition, State Water Board staff requests the Commission determine and analyze the specific and qualifiable amount of littoral habitat and terrestrial food resources available to reservoir fishes that would be reduced as a result of each recommended/proposed minimum flow. This analysis is requested for each flow-related recommendation individually (see Comment 22 below).

20. Commission staff states *“The agencies’ higher minimum flows could also affect recreation in New Bullards Bar Reservoir by decreasing the water surface elevation below the minimum functional use water surface elevation of 1,853.0 feet for the Cottage Creek boat ramp (see section 3.3.5.2, in the subsection, Minimum Streamflows below New Bullards Bar Dam).”* (Page 3-132)

State Water Board staff requests the Commission determine and analyze the number of days each year that water elevations would be below the functional use of each public boat ramp on New Bullards Bar Reservoir. This analysis is requested for each flow-related recommendation individually (see Comment 22 below).

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

21. The Commission staff states that *“to offset the effects of a decreased reservoir surface elevation [from the agencies’ recommended minimum streamflow], YCWA would likely have to reduce project generation at the New Colgate Powerhouse.”* (Page 3-132)

State Water Board staff requests the Commission quantify the amount of lost generation and revenue as a result from implementing each recommended/proposed minimum flow. This analysis is requested for each flow-related recommendation individually (see Comment 22 below).

22. Figure 3-29 of the Draft EIS contains water surface elevation in New Bullards Bar Reservoir under YCWA’s proposed minimum flows and the minimum flows recommended by the resource agencies. (Page 3-133)

It appears the Commission grouped the agency flow-related recommendations for all Project reaches together, and grouped YCWA’s flow-related recommendations for all Project reaches together in the analysis. This would include minimum flows and ramping rates for Oregon Creek below Log Cabin Diversion Dam, Middle Yuba River below Our House Diversion Dam, North Yuba River below New Bullards Bar Dam (New Bullards Bar Reach), and the Yuba River below Englebright Dam (lower Yuba River).

State Water Board staff requests that the Commission identify how each proposed/recommended flow-related measure impacts water surface elevation in New Bullards Bar Reservoir independently. After the Commission analyzes each measure independently, the Commission should group YCWA proposed measures that were not agreed to by the agencies, and the agencies’ recommended measures that were not agreed to by YCWA in order to identify the effects of each entities’ measures on water surface elevation in New Bullards Bar Reservoir.

23. Table 3-38 shows the percent of time that simulated daily mean temperatures exceed 20°C for various operational scenarios, water years 1970–2010 (DEIS page 3-140).

Based on the Commission’s current analysis, it is unclear whether temperatures regularly exceed 20°C every year or primarily during drier water year types. State Water Board staff requests the Commission analyze the quantity of years when simulated daily mean temperatures exceed 20°C for each operational scenario, and in which water year types they occur.

24. *“In the North Yuba River between New Bullards Bar Dam and the confluence with the Middle Yuba River, YCWA’s proposed minimum flows would slightly reduce (to 43 percent) the time that temperatures are [between 12°C and 20°C], while the agencies’ flow recommendation would decrease this to only 1 percent of the time. This reflects higher releases of colder water from the dam, resulting in water temperatures less than 12°C more of the time. In the Yuba River upstream of the New Colgate Powerhouse, the agencies’ flow recommendation would provide suitable temperatures for salmonids a greater percentage of the time, compared to the YCWA proposal.”* (Page 3-141)

The water released from New Bullards Bar Dam to provide minimum instream flows below New Bullards Bar Dam is typically stable, around 7 to 11°C year-round, due to the

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

location of the low-level outlet. Based on the magnitude of the release, the Commission identified that suitable water temperatures for salmonids could be extending further down the bypass reach (i.e., downstream of the confluence between the North Yuba River and Middle Yuba River). However, the higher releases from New Bullards Bar Dam may also potentially create conditions that are below the temperature criteria that supports salmonid growth (i.e., between 12 and 20°C) in the New Bullards Bar Reach. This negative impact was acknowledged during relicensing. Resource agencies assert that the benefits from increasing the extent of suitable water temperatures downstream outweighed the impact of suboptimal temperatures immediately below New Bullards Bar Dam.

The New Bullards Bar Reach is approximately 2.3 miles long, while the length of Yuba River downstream of the confluence of the North Yuba River and Middle Yuba River to New Colgate Powerhouse is approximately 6.1 miles. State Water Board staff requests the Commission consider analyzing the net amount of suitable habitat (in miles) that each flow proposal/recommendation would provide.

In addition, the Commission should also consider potential aquatic habitat improvements (large woody material and sediment) in the New Bullards Bar Reach that may offset impacts to aquatic species from lower water temperatures. The combination of higher flows below New Bullards Bar Dam and habitat improvements in the New Bullards Bar Reach could improve the quality of aquatic habitat through the length of the bypass reach (New Bullards Bar Dam to New Colgate Powerhouse).

25. Commission staff states that “[the State Water Board’s] preliminary 401 condition 1 states it would likely condition minimum flows, but does not specify what the flows would be (see table 3-40).” (Page 3-148)

State Water Board staff clarifies the minimum flows that are being considered by State Water Board staff per preliminary condition 1 are contained in State Water Board staff’s REA Comment 4. In REA Comment 4, State Water Board staff suggested that the Commission evaluate a range of flows for the lower Yuba River, as shown in Table 3 and Table 4 in the REA Comment 4. State Water Board staff continues to request the Commission evaluate these flow regimes.

Also, as discussed in REA Comment 4, the State Water Board is in the process of updating the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) to protect beneficial uses in the Bay-Delta watershed. The Sacramento/Delta update to the Bay-Delta Plan is focused on the Sacramento River and its tributaries (including the Yuba River and tributaries thereto), Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows. The Science Report prepared in support of the Sacramento/Delta update to the Bay-Delta Plan analyzes flows in a range of 35 to 75 percent of unimpaired flow year-round from major tributaries to the Sacramento River (including the Yuba River).

Consistent with the Science Report, in REA Comment 4, State Water Board staff recommended that the Commission consider evaluating a minimum of two flow regimes

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

within the range of 35 to 75 percent of unimpaired flow year-round (e.g., 35 to 45 percent of unimpaired flow, 45 to 65 percent of unimpaired flow, etc.), measured at Marysville. Commission staff did not evaluate these suggested flow regimes in the Draft EIS.

Since the time of State Water Board staff's REA filing, the State Water Board released additional information further describing the proposed Sacramento/Delta updates to the Bay-Delta Plan. On July 6, 2018, the State Water Board released a framework providing additional detail about potential updates to flow requirements for the Sacramento River, its tributaries (including the Yuba River), and the Delta and its tributaries, including the Calaveras, Cosumnes and Mokelumne rivers (Sacramento/Delta Framework or Framework). The Framework describes the proposed preferred alternative for updating the Bay-Delta Plan that will be evaluated in an upcoming draft Staff Report. The draft Staff Report will be released for public review and comment later this year and will include a thorough analysis and evaluation of the potential water supply, environmental, economic, and related effects of both the preferred alternative and a range of other alternatives. The preferred new inflow, cold water habitat, and inflow-based Delta outflow objectives identified in the Framework that will be further described in the Staff Report are identified below (there are also other proposed Delta outflow objectives and other objectives described in the Framework not described below). All water users throughout the Sacramento/Delta watershed, including diverters upstream of dams and in the Delta, would be subject to the proposed inflow, cold water habitat, and Delta outflow requirements for the Sacramento/Delta watershed (with the exception of de minimis diversions).

The preferred new inflow objective is as follows:

Maintain inflow conditions from the Sacramento River/Delta tributaries sufficient to support and maintain the natural production of viable native fish populations and to contribute to Delta outflows. Inflow conditions that reasonably contribute toward maintaining viable native fish populations include, but may not be limited to, flows that more closely mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, quality and spatial extent of flows as they would naturally occur.

Maintain inflows from the Sacramento/Delta tributaries at 55% of unimpaired flow, within an allowed adaptive range between 45 and 65% of unimpaired flow.

The preferred new cold water habitat objective is as follows:

Maintain stream flows and reservoir storage conditions on Sacramento River/Delta tributaries to protect cold water habitat for sensitive native fish species, including Chinook salmon, steelhead, and sturgeon. Cold water habitat conditions to be protected include maintaining sufficient quantities of habitat with suitable temperatures on streams to support passage, holding, spawning, incubation, and rearing while preventing stranding and dewatering due to flow fluctuations.

The preferred new inflow-based Delta outflow objective is as follows:

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

The inflows required above, including for the Sacramento/Delta tributaries and San Joaquin River are required as outflows with adjustments for downstream natural depletions and accretions.

Based on the above, State Water Board staff continue to recommend that the Commission evaluate flow regimes consistent with potential updates to the Bay-Delta Plan. More specifically, State Water Board staff recommends the Commission analyze flow regimes that are consistent with the proposed new inflow, cold water habitat, and inflow-based Delta outflow objectives described in the Framework, including a flow regime within the range of 45 to 65 percent of unimpaired flow (at Marysville) that is consistent with the implementation provisions described in the Framework. Those implementation provisions include provisions that indicate that unless other measures are implemented to protect fish and wildlife (e.g., habitat restoration), flows would be required to be 55 percent of unimpaired flow. Table A (provided at the end of Attachment A) contains simulated Yuba River near Marysville monthly flow data for 35, 45, 55, 65, and 75 percent of unimpaired flow. Table A monthly time-series simulations were developed for water years 1922-2015 using the Sacramento Water Allocation Model (SacWAM). State Water Board staff suggests that the SacWAM Yuba River unimpaired flow data contained in Table A or other Yuba River unimpaired flow data could provide the basis for this evaluation. In cases where the Licensee proposed-measures require higher flows than the designated percent of unimpaired flow, the Licensee proposed flow measure would be analyzed.

State Water Board staff requests the Commission analyze the various flow scenarios (as discussed in REA Comment 4 and above) for the lower Yuba River in order to provide a robust level of analysis that will not restrict the extent of pertinent information presented before the State Water Board. The State Water Board must evaluate multiple flow scenarios to effectively compare and measure the benefits and impacts of each flow scenario and to ultimately determine the most appropriate flow scenario.

Project-affected tributaries to the lower Yuba River include the North Yuba River, Middle Yuba River, and Oregon Creek. Although this comment and REA comments regarding the Sacramento/Delta update to the Bay-Delta Plan have focused on the lower Yuba River, an appropriate flow regime would also be necessary for other Project-affected tributaries to meet the preferred new inflow, cold water habitat, and inflow-based Delta outflow objectives.

26. Commission staff suggests that *“providing short-duration (up to 48 hours), moderate magnitude, spring pulse flows in the lower Yuba River could facilitate outmigration and increase the survival of juvenile salmon and steelhead, particularly during periods of high turbidity associated with spill events from Englebright Reservoir.”* (Page 3-156)

State Water Board staff requests the Commission include references that support the expectation that short term, moderate magnitude, spring pulse flows are effective at increasing juvenile salmonid survival.

State Water Board staff also requests the Commission clarify how the Licensee could implement this flow requirement. The Project has limited control of flows during spring in

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

wetter year types and it is unclear how the Licensee would incorporate flow inputs from the South Yuba River and Deer Creek (non-Project controllable factors), manage a short duration pulse flow (up to 48 hours), provide a moderate magnitude flow (up to 3,500 cubic feet per second (cfs)), and implement this requirement while Englebright is spilling (limited control of Englebright spills). Also, please identify the number of pulse flows that would be required each year.

The Commission's recommended pulse flows would not mimic a natural hydrograph or meet the intentions of NMFS's or CDFW/USFWS's recommended flows. It appears the objective of the Commission's spring pulse flows is to facilitate juvenile salmonid emigration to increase survival. In addition to facilitating emigration, size at emigration is a significant factor in determining juvenile survival, especially through the delta. The CDFW/USFWS recommended flows coupled with the CDFW/USFWS recommended lower Yuba River restoration, which would provide higher flows for emigration and more (inundated) juvenile rearing habitat to increase the size of emigrating salmonids, appear to more effectively meet the ultimate objective of the Commission's spring pulse flows.

27. Commission staff suggests *"the agencies' recommended significantly higher floodplain inundation flows would not substantially increase floodplain inundation, nor would they improve off-channel habitat availability because of the ongoing effects of past hydraulic mining and relocation, reconfiguration, and channelization of the lower Yuba River. In addition, in the absence of substantial floodplain modifications (see Lower Yuba River Habitat Restoration and Large Woody Material Management), the resource agencies recommended spring pulse and floodplain inundation flows would not markedly increase the amount of estimated juvenile salmonid rearing habitat in the lower river during the spring period..."* (Page 3-156)

State Water Board staff encourages the Commission to consider the agencies' floodplain inundation flows as "bankzone⁹ inundation flows." Important juvenile rearing habitat is available at flows below the floodplain¹⁰ but above baseflow. The Project has reduced bankzone inundation, as described in the Draft EIS on Page 3-154; and therefore, the Project should mitigate for this impact.

The lower Yuba River flow requirements alone will not inundate the floodplain because the Narrows 2 Powerhouse release capacity (3,500 cfs) is less than bankfull (5,000 cfs). Therefore, a combination of appropriate flows and habitat restoration (lowering and rehabilitation) is necessary to provide additional juvenile rearing habitat in the bankzone. CDFW and USFWS specifically designed their proposed lower Yuba River flows and restoration to be implemented together. State Water Board staff requests the Commission analyze the CDFW/USFWS lower Yuba River flows and restoration proposal in the context of one another.

⁹ The bankzone in the lower Yuba River is defined as the area that will be inundated between baseflows and 5,000 cfs.

¹⁰ Bankfull in the lower Yuba River occurs at a discharge of 5,000 cfs. Flows greater than 5,000 cfs are required to inundate the floodplain (Pasternack 2017).

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

For example, the Hammon Bar Restoration Project on the lower Yuba River (visited during a FERC Environmental Site Inspection on July 11, 2018) showed the viability and benefit of riparian planting as an effective restoration tool in the lower Yuba River. However, Hammon Bar is positioned on the floodplain and is infrequently inundated by flows (i.e., does not provide consistent aquatic habitat for juvenile salmonids). As recommended by the CDFW/USFWS proposals, a combination of both flows and habitat restoration is necessary to provide additional juvenile rearing habitat in the lower Yuba River.

The Project shares in the responsibility for the current habitat conditions and level of floodplain and bankzone inundation in the lower Yuba River. The Project regulates flows in the lower Yuba River, which promotes channelization that restricts river heterogeneity, reduces channel migration, and prevents floodplain connectivity. The magnitude of flood flows that occur or is exceeded every 1.5 years was reduced by 67 percent (i.e., from 20,100 cfs to 6,700 cfs) at the Smartsville gage location after construction of New Bullards Bar Dam. The magnitude of flood flows with a five-year return period was reduced by 40 percent (i.e., from 61,400 cfs to 36,900 cfs) (CBEC et al. 2010). As discussed in State Water Board staff REA Comment 3, Project operations impact lower Yuba River resiliency and this impact is likely to continue during the new license term. The current state of the lower Yuba River, which is in part due to the Project, should not be a reason for the Commission to reject flow and habitat improvements.

Furthermore, per the Narrows Project¹¹ license, the Commission required the implementation of the Narrows Project Restoration Fund. The rationale for the Narrows Project Restoration Fund from the Narrows Project license is as follows: *“the salmonid resource in the Yuba River has been negatively affected by loss of habitat from dam construction and stream channelization; unfavorable flow and water temperature regimes; and loss of fish at unscreened diversions. The development of a habitat improvement plan would help the state of California meet its goal of improving anadromous fish habitat in the Sacramento River basin at a small project cost. Article 404 requires PG&E to consult with CDFG and FWS in developing a plan to provide fry and juvenile habitat in the lower Yuba River.”* The Commission identified a clear nexus between the Narrows Project and impacts to lower Yuba River salmonid habitat, and the Commission should do the same for the Project. In determining a level of Project mitigation, the Commission should consider all Project impacts to the lower Yuba River, including but not limited to, Narrows 2 Powerhouse discharge, Project water storage, Project diversions, and Project impacts to water quality and water temperature.

28. *“[Commission staff] question whether the implementation of the conditional winter pulse flows would improve the adult steelhead upstream passage rate because 13 years of empirical data describing adult steelhead upstream passage at Daguerre Point Dam and associated flows demonstrate that a conditional winter pulse flow is not needed to facilitate adult steelhead upstream passage.”* (Page 3-156)

¹¹ PG&E’s Narrows Project include the Narrows Powerhouse, which is downstream of the Project’s most-downstream powerhouse, the Narrows 2 Powerhouse.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Winter pulse flows resulting from precipitation events are a recurrent component of a natural hydrograph. However, these flows are often captured in Project owned (or influenced) reservoirs. The Commission references 13 years of empirical data that suggests a conditional winter pulse flow is not needed to facilitate adult steelhead (upstream) passage. As an alternative to analyzing 13 years of information cumulatively, State Water Board staff requests the Commission analyze appropriate years of data specific to the winter pulse flow recommendation. The winter pulse flow recommendation is constrained to Schedule 5, 6, and Conference Years; therefore, the Commission should analyze those types of water years without confounding data from wetter water year types. CDFW's REA filing (pages 97-101) isolates the appropriate water years and graphs. CDFW's rationale suggests that at low magnitude baseflows, winter pulse flows may be an important cue for steelhead migration into the Yuba River and above Daguerre Point Dam.

29. Commission staff rejected the CDFW/USFWS Lower Yuba River flow proposal because, in part, *"information regarding the potential benefits of the recommended adult spring-run Chinook salmon attraction flows is limited, and these increased flows may result in the increased straying of Feather River Fish Hatchery origin Chinook to the Yuba River (HDR and Grinnell, 2017f; RMT, 2013)."* (DEIS page 3-156)

State Water Board staff cautions the Commission's use of the River Management Team's¹² (RMT) draft Interim Monitoring and Evaluation Report (M&E Report) to evaluate the proposed PM&E measures for the Project, as discussed extensively in State Water Board staff's REA comment regarding State Water Board Order WR 2008-0014. Evaluation of the Lower Yuba River Accord based on this report is inappropriate because the report is an interim draft. Furthermore, it is unclear if this report should be considered authored by the RMT, as USFWS' comments, dated June 19, 2014, on the draft interim report have yet to be incorporated and the RMT includes the USFWS.

State Water Board staff requests the Commission use data evaluated in the draft Interim M&E Report, but not the conclusions. Specific to Feather River Hatchery salmonids straying into the Yuba River, the Commission should also consider wild salmonid productivity and hatchery practices. For example, Feather River salmonid stray rate is likely negatively correlated to wild salmon productivity in the lower Yuba River (i.e., relative proportion of hatchery fish to wild fish decreases) and positively correlated to the distance Feather River Hatchery salmon are trucked for release (i.e., greater distance released from natal stream). Both variables likely influence stray rates.

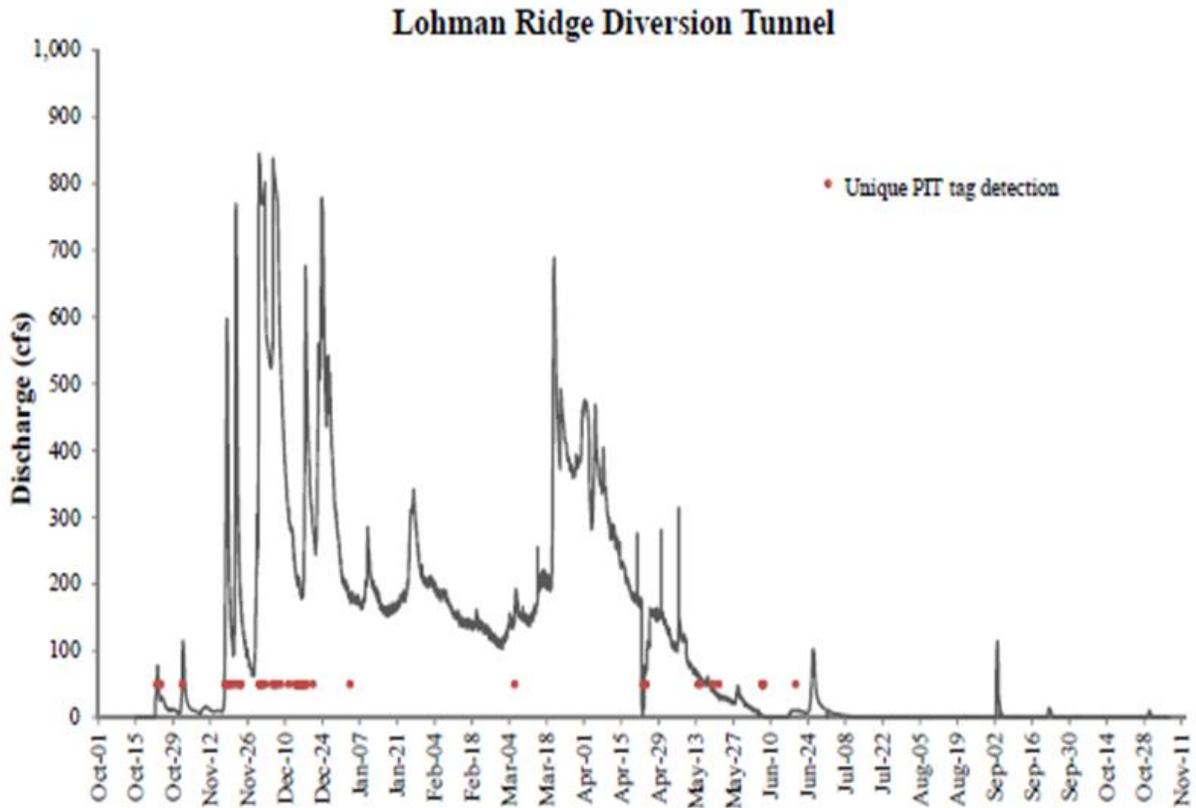
30. FERC staff suggests that *"no evidence supports mass fall movements of rainbow trout in the project area."* (DEIS page 3-177)

State Water Board staff requests the Commission consider the graph documenting entrainment rates in the Lohman Ridge Diversion Tunnel presented in State Water Board staff's REA comments 8 (graph provided below for convenience - see Graph 1). Entrainment appears to be concentrated during both the spring and fall seasons.

¹² The RMT was established to collect scientific data to monitor the effects of the Yuba Accord flow regime.

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Graph 1. Graph displaying instream flow and rainbow trout detections in the Lohman Ridge Diversion Tunnel from 2012-2013.



State Water Board staff also requests the Commission consider the economic impact to YCWA from closing the Lohman Ridge Diversion Tunnel in the fall, as recommended by CDFW and USFWS. CDFW provides an economic analysis in its 10(j) filing on pages 150-156 that suggests water diverted through the Lohman Ridge Diversion Tunnel in fall is often spilled at New Bullards Bar Dam.

State Water Board staff is evaluating whether diversion of water from Middle Yuba River and Oregon Creek to New Bullards Bar Reservoir and spilling water that season is an unreasonable use of diverted water (California Constitution Article X, sec. 2). That water may be put to greater beneficial use if allowed to flow down the source stream.

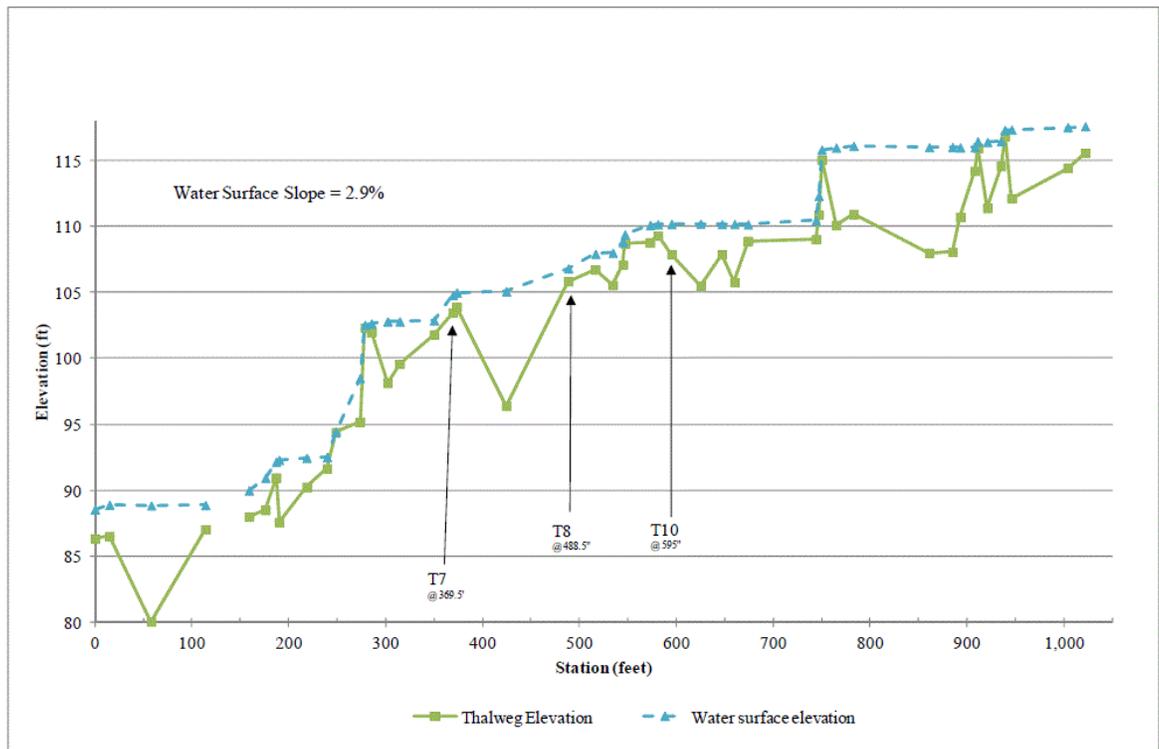
31. Commission staff suggests that *“The agencies’ recommended Large Woody Material (LWM) placement in the North Yuba River downstream of the dam could enhance habitat for fishes, including rainbow trout. However, as mentioned in section 3.3.1.2, in the subsection, Sediment Transport in the North Yuba River, the North Yuba River downstream of the New Bullards Bar Dam has a steep gradient (2.0 percent on average, with sections as steep as 5.5 percent) that makes this reach subject to high-velocity flow events. Subsequently, with the steep gradient and regular high flows present in this*

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

reach, it is likely that high-velocity, turbulent conditions would act to prevent long-term residence of LWM within the reach.” (Page 3-180)

State Water Board staff requests clarification on the Commission’s classification of the transport capacity in the New Bullards Bar Reach. The New Bullards Bar Reach has a two percent on average gradient, and stream channel gradients less than three percent are typically considered to be transport limited (Montgomery and Buffington 1997). The Commission should consider Graph 2, extracted from Figure 19 from Technical Memorandum 1-1, which depicts the longitudinal profile of the North Yuba River below New Bullards Bar Dam. The longitudinal profile for the New Bullards Bar Reach contains primarily depositional reaches with short stretches of transport reaches (i.e., visual estimate from the Graph 2 – approximately 700 feet of the 1000-foot reach has a gradient around one percent and approximately 200 feet of the 1000-foot reach has a gradient around two percent).

Graph 2. North Yuba River downstream of New Bullards Bar Dam – Site 7 longitudinal profile with locations of channel morphology transects. (Excerpt from Figure 19 in Technical Memorandum 1-1)



The Commission appears to contribute a majority of the responsibility for a lack of sediment and LWM in the New Bullard Bar Reach to the overall transport capacity of the reach. However, the Commission should also consider that New Bullards Bar Dam captures and prevents sediment and LWM from entering the New Bullards Bar Reach. In 2017, YCWA removed approximately 70,000 cubic yards of floating wood from New

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Bullards Bar Reservoir that would have been available to the New Bullards Bar Reach (and further downstream) without the Project. Technical Memorandum 01-01 identified that the North Yuba River at New Bullards Bar sediment yield without-Project is 346,070 tons/mi²/year and the bedload yield is 51,911 tons/mi²/year. However, the sediment yield and bedload yield with the Project is 0 tons/mi²/year. Based on the impacts of New Bullards Bar Dam on LWM and sediment transport, the impaired habitat in the New Bullards Bar Reach may be a result from the lack of sediment and LWM supply.

32. Commission staff suggests that *“To maximize the effectiveness of anchored LWM to enhance aquatic habitat, the material would typically have to be anchored close to the channel thalweg to remain mostly submerged during non-spill lower flow releases. These areas, however, would also be subject to the highest flow velocities, and any anchored material would have the highest probability of becoming dislodged relative to material placed along shorelines in more shallow areas.”* (Page 3-180)

The Commission staff suggests a limited benefit of a LWM augmentation program below New Bullards Bar Reservoir because Project facilities and operations provide flow conditions that are not suitable for long-term LWM placement. State Water Board staff requests the Commission include in its analysis the potential for reduced spill flows in the New Bullards Bar Reach as a result of other potential license measures (e.g., Lohman Ridge Diversion tunnel closures; Oregon Creek and Middle Yuba River minimum instream flows and ramping rates; North Yuba River minimum instream flows; New Bullards Bar Dam ramping rates; operation of the New Bullards Bar Dam Auxiliary Flood Control Outlet; etc.). Reduced spill flows would likely increase the residence time of LWM and sediment in the New Bullards Bar Reach.

33. Commission staff suggests that *“Because the [New Bullards Bar Reach] has a steep gradient, regular high flows, and boulders and bedrock dominate the channel topography and limit habitat suitability, the agencies’ recommendation to anchor 14 pieces of LWM in the reach would only slightly improve aquatic habitat in the reach.”* (page 3-180)

As stated in Comment 31 above, State Water Board staff disagrees with the Commission’s determination that the geomorphology of the New Bullards Bar Reach is a transport reach.

In addition, State Water Board staff disagrees that habitat improvements in the New Bullards Bar Reach would only slightly improve aquatic habitat. Despite large inputs of LWM from upstream sources, Technical Memorandum 06-01 identified that LWM was largely absent in the New Bullards Bar Reach. Technical Memorandum 01-01 identified that North Yuba River below New Bullards Bar Dam sediment yield and bedload yield with the Project is 0 tons/mi²/year as a result of New Bullards Bar Dam. Due to the lack of quality habitat in the New Bullards Bar Reach, any input of sediment and LWM is likely to be highly beneficial and utilized by aquatic species.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

34. *“This monitoring and replenishment would help maximize the effectiveness of the gravel and LWM at enhancing aquatic habitat, however, as mentioned¹³ previously, repeated access to this streambed and transporting the necessary heavy equipment and material would be difficult and costly.”* (Page 3-180 to 3-181)

The Commission estimated the cost of sediment augmentation below New Bullards Bar Dam using YCWA’s analysis, which used helicopter flights from an unknown starting location. The agencies’ recommendation did not specify the method of sediment transportation. State Water Board staff requests the Commission perform additional analyses of the cost to implement sediment augmentation in the New Bullards Bar Reach. Other means available to more cost-effectively transport sediment below the New Bullards Bar Dam spillway include, but are not limited to, a) sediment is trucked to New Bullards Bar Dam area and then flown via helicopter below the spillway, or b) sediment is trucked to the access road (that leads to the base New Bullards Bar Dam) and sluiced below the spillway¹⁴.

35. Commission staff determined that *“additional gravel/cobble would need to be placed into the [North Yuba River below New Bullards Bar Dam] at frequent intervals to meet the agency recommendations for sediment enhancement downstream of the reservoir.”* (Page 3-181)

State Water Board staff agrees with the Commission’s determination that sediment augmentation may need to occur fairly frequently; however, this measure should not be dismissed based on the frequency of supplemental augmentation because New Bullards Bar Dam traps sediment annually. State Water Board staff requests the Commission analyze the gravel/cobble quantity in the North Yuba River upstream of New Bullards Bar Reservoir (i.e., no Project impacts) relative to the quantity of gravel/cobble in the New Bullards Bar Reach. Information regarding gravel abundance in the North Yuba River upstream of New Bullards Bar Reservoir can be found in the Yuba Salmon Forum Summary Habitat Analysis¹⁵ (Addley et al. 2013) and Yuba-Bear (FERC Project No. 2266) Technical Memorandum 3-1¹⁶.

¹³ “Assuming a Chinook helicopter carries a load of 14 tons of gravel per trip and an average of 3 hours per trip from the sediment stockpile area to the deposit site, YCWA estimates that it would take approximately 350 trips over a total of 134 days for the helicopter to place 5,000 tons of sediment in the river. Both the number of trips and the cost would be high.” (Page 3-20)

¹⁴This method of sediment injection is currently being conducted by the United States Army Corps of Engineers as part of their gravel injection project in the lower Yuba River.

¹⁵The Yuba Salmon Forum Summary Habitat Analysis can be found online at http://yubariver.org/wp-content/uploads/2015/02/01_YSF-SummaryHabAnalysisRpt_draft-092313_low-res.pdf

¹⁶ Technical Memorandum 3-1 can be found online at: <http://www.eurekasw.com/NID/Technical%20Memoranda/2009,%202010%20and%202011%20Technical%20Memoranda/Technical%20Memorandum%2003-01%20-%20Stream%20Fish%20Populations/Tech%20Memo%203-1%20-%20Stream%20Fish%20Populations.pdf>

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

In addition, sediment and LWM that is displaced from the New Bullards Bar Reach has the potential to enhance downstream habitat. Because LWM and sediment is blocked by New Bullards Bar Dam, mitigation for this impact should extend to downstream areas beyond the North Yuba River. Sediment and LWM displaced out of the New Bullards Bar Reach would continue to mitigate for Project impacts downstream.

36. Commission staff suggests *“Historical activities unrelated to project effects are responsible for the current geomorphic characteristics of the lower Yuba River. These transformative activities include hydraulic mining, sediment management, and subsequent dam building for sediment control by the California Debris Commission, and historical flood control channelization. Even prior to mining, the river had already been highly altered by sedimentation, agriculture, and engineering projects. Furthermore, riparian conditions in the lower Yuba River are essentially unchanged or perhaps slightly improved from pre-project conditions. Therefore, project operation appears to have a relatively small influence on floodplain connectivity and off-channel habitat availability in the lower Yuba River.”* (DEIS Page 3-186)

State Water Board staff requests the Commission consider riparian recovery since non-Project perturbations to the lower Yuba River began to subside. Although a slight increase in riparian conditions may be observed since pre-project conditions, this slight increase would be expected to have been significantly more if the Project was not in place. State Water Board staff suggests the Commission compare the level of riparian recovery in the lower Yuba River to other appropriate California streams that experienced similar non-Project perturbations.

State Water Board staff also requests the Commission consider how the Project has altered the natural flow regime that limits the lower Yuba River’s ability to recover from past non-Project perturbations. State Water Board staff described this Project impact in State Water Board staff’s REA Comment 3.

In addition, it is unclear how the Commission came to the determination that *“project operation appears to have a relatively small influence on floodplain connectivity and off-channel habitat availability in the lower Yuba River.”* This determination contradicts the following statements in the Draft EIS, which identify clear Project impacts to floodplain connectivity and off-channel habitat availability in the lower Yuba River:

- a) *“Under existing conditions, flows during May in the lower Yuba River have been reduced by 33 percent across all water years as a result of the project... Similar decreases in magnitude have occurred in April in the lower Yuba River with median monthly flows dropping from 3,921 cfs to 2,048 cfs, a decrease of 48 percent. Flows in June have slightly increased across all water years as a result of the project, with slight decreases in flow during dry and critical years.”* (Page 3-154)
- b) *“According to CBEC (2013), flows in the lower Yuba River during March through June, a period significant for salmonid rearing and emigration, have decreased significantly as a result of project operation.”* (Page 3-154)

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

- c) *“The results of YCWA’s indicators of hydrologic alteration analyses also indicate that operation of the project has reduced the magnitude and duration (number of days) of high pulse flows in the lower river, as measured at both the Smartsville and Marysville gages (tables 3-44 and 3-45).” (Page 3-154)*
 - d) *“While the above [Table 3-44 and 3-45] noted reduction in peak flows has likely created a stable channel condition with little scour, low and stable flows during the spring...”. (Page 3-155)*
 - e) *“Project operation has reduced the frequency and duration of spring peak flows in the lower Yuba River. Over time, this has created a relatively stable channel with little scour...”. (Page 5-19)*
37. Commission staff suggests that *“Since the recommended habitat improvement measures cannot change the fundamental reshaping of the geomorphic and riparian conditions in lower Yuba River that occurred as a result of these historical influences, any improvements would be transitory at best.” (Page 3-186)*

State Water Board staff acknowledges that habitat improvement projects are subject to environmental conditions and have an inherent risk of being altered by natural phenomenon. However, proper site planning and maintenance would increase the lifespan of habitat restoration projects. Non-transitory habitat measures can provide significant benefits to a river system, especially in the lower Yuba River.

38. Commission staff recommends to not include YCWA’s proposed Upper Yuba River Aquatic Monitoring Plan, in part, because *“the best available science indicates that YCWA’s proposed measures for increasing sediment transport and increasing LWM at the Our House and Log Cabin Diversion Dams would provide net benefits to aquatic resources in Oregon Creek and the Middle Yuba River.” (DEIS Page 3-190)*

State Water Board staff requests the Commission consider that scientific knowledge is continually improving. A FERC license typically is a 30 - 50 year term, and it is reasonably foreseeable that scientific knowledge will improve during this period. For example, PM&E measures are significantly more protective at this time than 50 years ago, largely in part due to our scientific understanding and tools. Basing license measures solely on the current scientific knowledge and removing monitoring that verifies adequate resource protection is needlessly risky.

39. Commission staff states that *“YCWA’s proposed upstream fish passage monitoring program at Daguerre Point Dam would provide year-round data on the abundance, size, passage efficiency, and migration timing of hatchery and wild anadromous fish entering the Yuba River, it is unclear how these data would specifically be used to address project effects on the resource or to inform changes in future project operation. It is well known that the annual abundance of adult salmon and steelhead entering any river system can be highly variable and is influenced by ocean and estuary conditions, annual hatchery augmentation, state and federal fishery management, and the operation of other dams and diversions in the watershed. All of these factors are outside YCWA’s control.” (Page 3-195)*

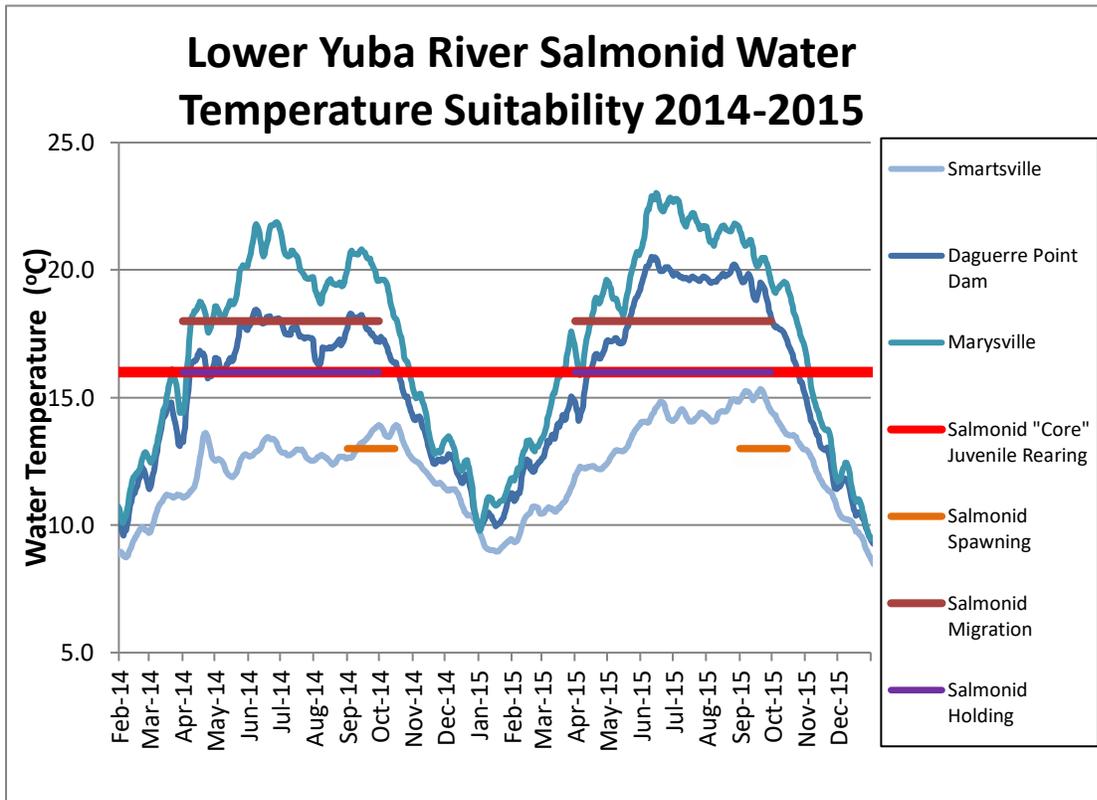
ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

State Water Board staff agrees that non-Project factors likely impact salmonid returns to the lower Yuba River. However, these factors influence the returns of anadromous fish in the entire Central Valley. Comparing passage information at Daguerre Point Dam relative to other rivers in the Central Valley and across time can expose Project-related impacts to the resource and assist in evaluating the adequacy of PM&E measures.

40. Commission staff suggests that “While project operation does affect flows and water temperatures in the lower Yuba River, and these conditions, in turn, affect the quality and quantity of available spawning and rearing habitat, based on our analysis, YCWA’s proposed minimum flows (as modified by staff) should adequately protect salmon and steelhead downstream of Englebright Dam.” (Page 3-195)

State Water Board staff requests the Commission consider State Water Board staff REA Comment 18 regarding lower Yuba River water temperatures, which includes a graph showing impaired water temperature suitability in the lower Yuba River for salmonids (graph provided below for convenience – see Graph 3).

Graph 3. Lower Yuba River water temperatures and salmonid lifestage summer maximum water temperature criteria, in degrees Celsius (°C), shown as Maximum 7-Day Average of the Daily Maximums in Degrees*.



* Salmonid water temperature criteria is referenced from the summer maximum temperature criteria in EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards, dated April 2003. Salmonid lifestage timing is referenced from Relicensing Study 07-02 for spring-run Chinook salmon.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

41. *“The Water Board did not provide any additional details or specific monitoring programs beyond the plan’s description above. As such, the Water Board’s plan is too vague and cannot be evaluated further.”* (Page 3-196)

Lower Yuba River PM&E measures were designed with a primary focus to benefit salmonids, including salmonid habitat and food. The Lower Yuba River Aquatic Monitoring Plan includes monitoring frequency and methods to help determine if lower Yuba River PM&E measures will adequately protect salmonids during the term of any new license issued for the Project. State Water Board staff is considering inclusion of the Lower Yuba River Aquatic Monitoring Plan in the Project certification.

42. *“PG&E and Nevada Irrigation District are currently in the processes of relicensing the hydroelectric facilities as part of the Yuba-Bear, Upper Drum-Spaulding, Lower Drum, and Deer Creek Projects (FERC Project Nos. 2246, 2310, 14531, and 14530) that regulate flows into...”* (Page 3-204)

State Water Board staff clarifies the FERC Project numbers in this parenthetical should be corrected to: FERC Project Nos. 2266, 2310, 14531, and 14530.

43. Commission staff discusses ramping rates for riparian recruitment in the lower Yuba River on page 3-242 of the Draft EIS. FERC staff analyzed proposed condition AR9 that was included in YCWA’s Amended FLA, dated June 4, 2017.

State Water Board staff clarifies that YCWA filed an updated proposed condition AR9 in a letter to the Commission, dated April 27, 2018. This revised version of proposed condition AR9 was agreed to by CDFW, USFWS, and Foothill Water Network (FWN). State Water Board staff generally supports the revised proposed condition AR9, dated April 27, 2018.

44. Commission staff states that *“The resource agencies’ recommended measure would remove floodplain sediments to lower 340 acres of floodplain that is currently inundated above bankfull (> 5,000 cfs) so that it would be inundated at flows between 1,500 and 3,000 cfs. [FERC staff] do not discount the potential ecological benefits of this recommendation, but we question its high cost and the lack of a project nexus.”* (Page 3-245)

State Water Board staff requests the Commission consider allocating a level of responsibility to the Project for the current habitat conditions and lack of floodplain access in the lower Yuba River (i.e., restoration as nexus to the Project). As discussed in Comment 27 and 36 above, there is a Project impact on habitat in the lower Yuba River.

In addition, USFWS 10(j) filing stated *“the Emigrating Salmonid Habitat Estimation model found that the amount of rearing habitat needed to support [Central Valley Project Improvement Act] salmon doubling goals in the lower Yuba River is 1,230 acres with 100% habitat suitability. In reality, habitat suitability ranges widely, but in the San Joaquin River it was found to range from 7%- 37%. Even when a high range of 50-75%*

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

suitability per acre is assumed, 1,640-2,460 acres of rearing habitat are needed in the lower Yuba River to support a target salmon population.” In this context, the resource agencies’ recommendation (for 340 acres of restoration) suggests the Project is responsible for a portion of habitat perturbation in the lower Yuba River, but not all. To determine an appropriate amount of restoration acres, USFWS quantified the level of Project impact through an analysis of acres of inundation with the Project and without the Project on pages 58-59 in its REA filing. The USFWS analysis documents a clear Project nexus.

Furthermore, the Commission identifies that the Project reduces the magnitude of flows (that would likely cause floodplain inundation) and duration of those inundation flows on page 3-154 of the Draft EIS. Since the Project is reducing flows, and therefore also reducing aquatic habitat, the Project nexus to provide additional habitat is apparent.

45. Commission staff states that *“Riparian habitat restoration and enhancement, in the form of riparian plantings, would be a reasonable way to mitigate for reductions in above bankfull inundation. The resource agencies’ recommendation of planting of 251 acres of sparsely vegetated floodplain with cottonwood and willow would undoubtedly benefit fish and wildlife in and along the lower Yuba River. However, YCWA’s study results support observations that constraints on riparian vegetation development in the lower Yuba River are the result of historical land use practices (hydraulic mining, channelization, and sediment control) that have legacy effects on the potential plant communities. These studies also indicate that YCWA’s proposed recession rates would produce more days of suitable germination and establishment conditions for woody vegetation along the lower Yuba River. Therefore, existing project effects on riparian habitat along the lower Yuba River are minimal in comparison to past activities.”* (DEIS Page 3-245)

State Water Board staff agrees that YCWA’s proposed recession rates would likely benefit the riparian community. However, riparian vegetation will take some time to become established and provide benefits to the aquatic ecosystem in the lower Yuba River. Planting vegetation would accelerate habitat improvement in the lower Yuba River and is *“a reasonable way to mitigate for reductions in above bankfull inundation.”* Furthermore, riparian planting is feasible in the lower Yuba River and has been demonstrated to be successful (Hammon Bar Project, as seen during a FERC Environmental Site Inspection on July 11, 2018).

46. *“In May through September, the agency flow recommendations [for minimum streamflows below New Bullards Bar Dam] would reduce the amount of usable water surface area by five times more than the YCWA proposal in wet water years, 10 to 15 times more in above normal water years, 12 to 29 times more in below normal water years, and 34 to 39 times more in dry water years.”* (Page 3-334)

The metric of comparison the Commission used is inappropriate and misleading because it does not identify the specific impacts of each scenario. State Water Board staff suggests the Commission analyze specific impacts to resources (e.g., days of boat ramp accessibility, thermocline depth, etc.).

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

47. *“The rationale for this measure ([Large Woody Material and Sediment Enhancement and Management Plan for the North Yuba River]) is to improve fish habitat; [Commission staff] analyze this measure in section 3.3.2, Aquatic Resources. If supplementing sediment and LWM in the reach improves fish habitat, as the agencies and FWN suggest, there may be more fish in the reach. However, the angling quality for the overall reach would probably remain low because the steep canyon walls and predominance of private land limit access up and down the river shoreline for angling.”* (Page 3-335)

State Water Board staff clarifies that preliminary condition 11 and 12 enhances habitat in the North Yuba River below New Bullards Bar Dam to benefit multiple aquatic resources, not solely fish abundance for angling purposes. As stated in State Water Board staff’s REA comment 9, LWM and sediment is scarce in this reach and the lack of quality habitat likely contributes to the overall low population levels of aquatic species¹⁷.

Furthermore, the Commission identifies limited angling access to the New Bullards Bar Reach. State Water Board staff clarifies that there are multiple public access points to this reach (see Figure 2):

- a) New Colgate Powerhouse access road¹⁸;
- b) New Colgate Powerhouse public river access point; and
- c) Yuba Rim and Yuba Drop¹⁹ trails.

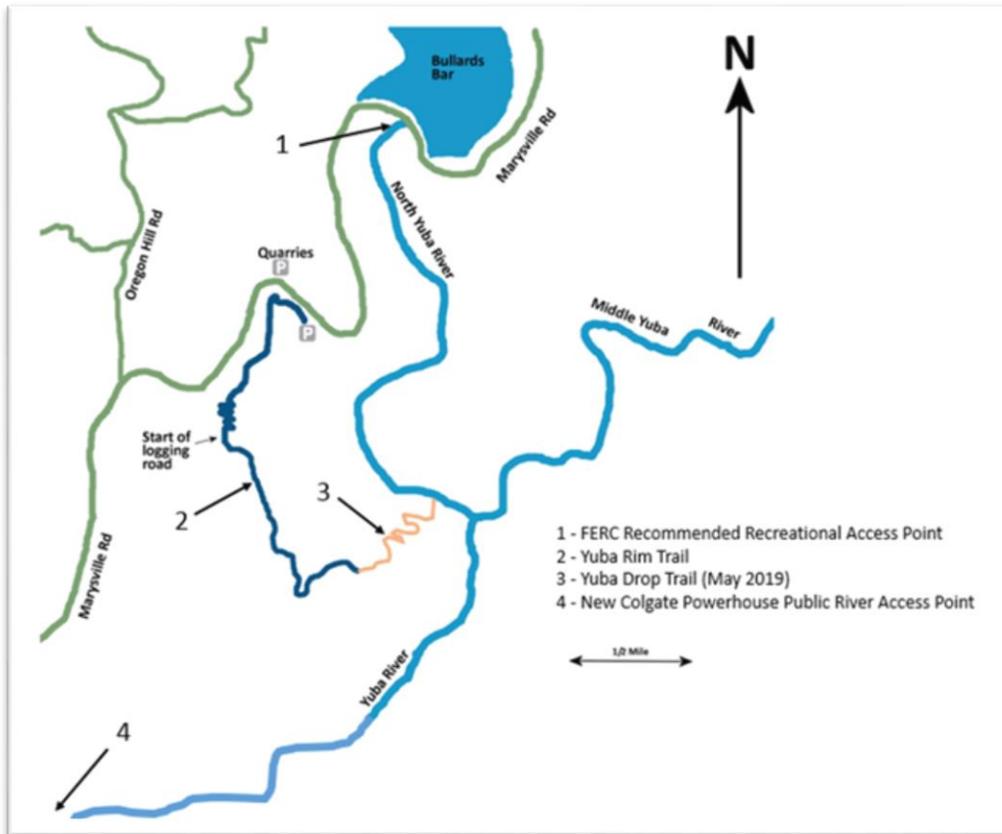
¹⁷ Rainbow trout population and biomass estimates in the North Yuba River from relicensing studies were substantially lower than biomass estimates of average North Sierra streams of the same width (see Gerstung 1973). No Foothill Yellow Legged Frog were found during two years of surveys and no incidental sightings were made in the reach.

¹⁸ As proposed by FERC staff in the DEIS on page 5-29.

¹⁹ The Yuba Drop trail will be open to the public in May 2019.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Figure 2. Map of the public access routes to the North Yuba River below New Bullards Bar Dam.



Developmental Analysis (Section 4.0)

48. Table 4-3 suggests State Water Board staff's preliminary condition 29 supports GEN2 - *Annual review of special-status species lists and assessment of new species on NFS lands.* (Page 4-6)

State Water Board staff agrees preliminary condition 29 supports GEN2; however, preliminary conditional 29 also includes newly identified Project-related impacts.

49. Table 4-3 suggests State Water Board staff's preliminary condition 12 supports a PM&E measure to *Develop shot rock²⁰ removal and stabilization and gravel augmentation plan for the Englebright Dam Reach.* (Page 4-10)

²⁰ Shot rock is irregular-shaped angular cobbles and boulders blasted from surrounding hillsides (Pasternack et al. 2010)

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

State Water Board staff clarifies that preliminary condition 12 is focused on sediment management below Project dams above Englebright Reservoir. However, preliminary condition 3 *Restoration Plan* includes the entire Project affected area. Potential restoration in the vicinity of the Narrows 2 Powerhouse could include measures to address shot rock.

The presence of shot rock below Englebright Dam is, in part, a result of construction and ongoing operation of Project facilities. ESA (2015) notes that the “*entire hillslope of the Narrows II access road is still eroding...*”

During a FERC Environmental Site Inspection on July 11, 2018, State Water Board staff identified shot rock lining the channel. It is unclear whether shot rock also comprises the majority of the main channel. Regardless, shot rock is likely inhibiting salmonid spawning potential and success in the lower Yuba River in the vicinity of the Narrows 2 Powerhouse. California Department of Water Resources and PG&E (2010) identified “*the quantity and quality of salmonid spawning habitat in [the lower Yuba River extending from Englebright Dam downstream through the Narrows] has been significantly reduced by the deposition of large, consolidated rock fragments (i.e., “shot-rock”) downstream of Englebright Dam.*”

State Water Board staff requests the Commission analyze appropriate measures to address past, current, and future Project impacts to aquatic habitat from shot rock. Appropriate measures include, but are not limited to:

- a) Stabilize hillside above and below the Narrows 2 Powerhouse access road;
- b) Shot rock removal; and
- c) Gravel/ cobble augmentation.

50. Table 4-3 suggests the State Water Board supports Proposed Condition AR3. (Page 4-16)

State Water Board staff requests the Commission remove the State Water Board as an entity that supports Proposed Condition AR3. State Water Board staff requests the Commission consider State Water Board staff’s REA Comment 4, which requests the Commission analyze a range of flows in its environmental analysis for the Project. Please note that State Water Board staff provided updated information to REA Comment 4 in Comment 25 of this document.

51. Table 4-3 suggests the State Water Board supports Proposed Condition AR4. (Page 4-17)

State Water Board staff is generally in support of Proposed Condition AR4. However, State Water Board staff, per REA Comment 4, suggests a revision to the plan that defines spills as flows through the spill gates and/or the proposed New Bullards Bar Auxiliary Flood Control Outlet.

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

52. Table 4-3 suggests the State Water Board supports Proposed Condition AR9 (Page 4-20).

State Water Board staff does not support the proposed condition AR9, as described in the Draft EIS. State Water Board staff REA Comment 5 suggested an analysis of a riparian recession rate that extended from April 1 through August 31.

However, State Water Board staff clarifies that YCWA filed an updated proposed condition AR9 in a letter to the Commission, dated April 27, 2018. This revised version of proposed condition AR9 was agreed to by CDFW, USFWS, and FWN. State Water Board staff generally supports the revised proposed condition AR9, dated April 27, 2018.

53. Table 4-3 suggests the State Water Board supports Proposed Condition AR11. (Page 4-21)

State Water Board staff clarifies that State Water Board staff does not support YCWA's proposed condition AR11. State Water Board staff's REA Comment 8 states "...proposed condition AR11 may not provide adequate protections to the beneficial uses of the Middle Yuba River."

Additional Measures Recommended by Commission Staff (Section 5.2)

54. In addition to YCWA's proposed measures, Commission staff recommends YCWA, as part of any license issued for the Project, "*Develop a comprehensive LWM enhancement plan for the project to increase salmonid habitat diversity that (1) identifies sources of LWM in the project reservoirs; (2) includes provisions for storing and transporting collected LWM; (3) identifies suitable LWM size classes for placement; (4) identifies locations for placement in the lower Yuba River; (5) details a consultation process to determine LWM placement that includes relevant agencies and whitewater boating interests; and (6) contains a monitoring and mapping process to provide an indication of the stability of these enhancements once within the first 3 years of license issuance and then in license year 10 and every 10 years thereafter (i.e., license years 20 and 30).*" (Page 5-7)

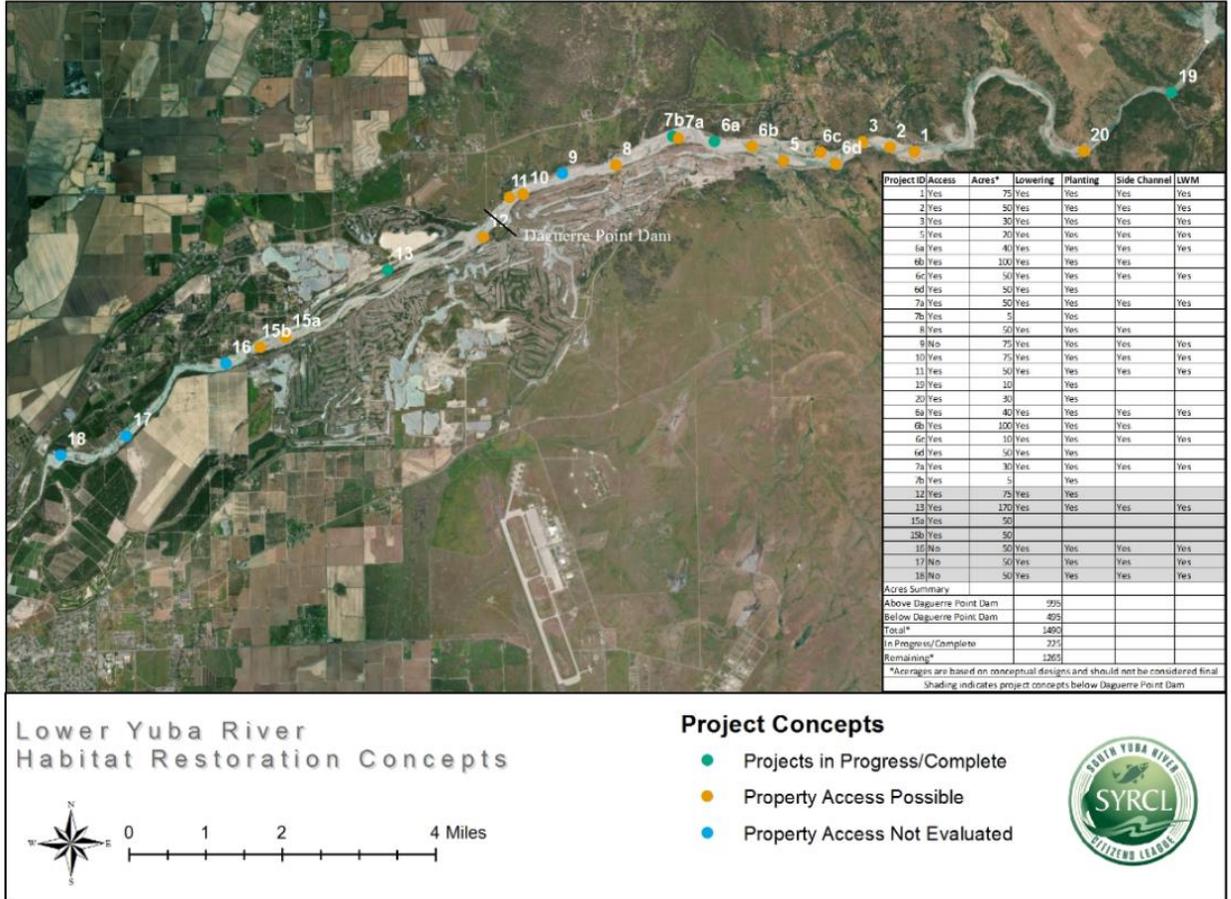
State Water Board staff requests clarification on the number of LWM placed and stored. It is also unclear how the Commission intends to address Project impacts to LWM supply (from New Bullards Bar Dam) for the reach of river from New Bullards Bar Dam to Englebright Dam.

Although this measure would increase habitat quality in the lower Yuba River, the quantity of juvenile rearing habitat would remain roughly the same. As discussed in Comment 44 above, additional habitat may be needed to mitigate for Project impacts to juvenile salmon rearing habitat availability/abundance. Therefore, State Water Board staff requests the Commission consider habitat restoration that lowers the floodplain (i.e., increase the quantity of juvenile rearing habitat) and increases habitat quality (i.e., LWM placement, riparian planting, side channel construction). Figure 3 provides a

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

graphic identifying potential restoration sites in the lower Yuba River and appropriate restoration methods at each potential restoration site.

Figure 3. Map of potential habitat restoration sites and feasible restorations methods in the lower Yuba River.



55. “[Commission staff] estimate the plan to provide spring pulse flows would have a levelized annual cost of \$591,390, and the benefits to anadromous fish would be worth the cost.” (Page 5-14)

State Water Board staff requests clarification of this cost estimate. Based on information provided in Article 405 (in the DEIS on Page B-4 through B-5) and questions in Comment #26 above, it is unclear how the Commission estimated a cost.

56. The Commission states that “Project operation has reduced the frequency and duration of spring peak flows in the lower Yuba River. Over time, this has created a relatively stable channel with little scour; however, these low and stable flows during the spring have the potential to negatively affect juvenile salmonid outmigration rates and survival in the lower river.” (Page 5-19)

ATTACHMENT A:
COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

The reduced frequency and duration of spring peak flows in the lower Yuba River should be expanded to potential impacts to lower Yuba River habitat, including riparian recruitment and geomorphic processes (floodplain connectivity, fine sediment deposition, and incised channels). State Water Board staff requests the Commission consider the current quantity and quality of available juvenile salmonid rearing habitat in the lower Yuba River compared to other river systems in the Central Valley.

57. “[Commission staff] do not recommend sediment or LWM enhancement measures in the bypassed reach between the New Bullards Bar Dam and the Middle Yuba River confluence...” in part, because “the aquatic habitat in [the North Yuba River downstream of New Bullards Bar Dam to the Yuba River confluence] does not provide quality habitat for fish.” (Page 5-38)

State Water Board staff agrees that the current aquatic habitat in this reach may be impaired. However, this impairment is a result of Project operations (and historic non-Project impacts to a much lesser extent). Project operations alter the natural flow regime and prevent inputs of sediment and LWM into the reach. The Commission should not abandon PM&E measures because the Project has greatly reduced the quality of aquatic habitat. Rather, the Commission should develop and recommend appropriate PM&E measures to ameliorate ongoing Project impacts.

58. Table 5-1 suggests the Commission adopted the 10(j) recommendations for Schedule 6 water year type summer minimum flows.

The Draft EIS does not contain an analysis of the 10(j) recommendations for Schedule 6 water year type summer minimum flows. State Water Board staff requests the Commission include and analyze these flows and the associated costs of implementation.

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Table A. Percent Unimpaired Flow (UF) near Marysville (source: State Water Resources Control Board model results at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/sacwam/docs/peer_review/sacwam_1.052_unimpaired.WEAP).

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1921	Oct	232	299	365	432	498
1921	Nov	280	360	440	520	600
1921	Dec	490	630	770	910	1050
1922	Jan	659	847	1035	1223	1411
1922	Feb	1088	1399	1710	2021	2332
1922	Mar	1323	1700	2078	2456	2834
1922	Apr	2577	3313	4049	4785	5521
1922	May	5815	7477	9138	10799	12461
1922	Jun	4078	5243	6409	7574	8739
1922	Jul	785	1010	1234	1459	1683
1922	Aug	359	462	565	667	770
1922	Sep	265	340	416	492	567
1922	Oct	311	400	489	578	667
1922	Nov	406	522	638	754	871
1922	Dec	1220	1568	1916	2265	2613
1923	Jan	1048	1348	1647	1947	2247
1923	Feb	884	1137	1390	1642	1895
1923	Mar	1128	1450	1772	2094	2416
1923	Apr	2172	2793	3414	4035	4655
1923	May	2608	3353	4098	4843	5588
1923	Jun	1238	1592	1946	2300	2653
1923	Jul	530	681	833	984	1136
1923	Aug	313	402	491	581	670
1923	Sep	291	375	458	541	624
1923	Oct	283	363	444	525	606
1923	Nov	238	306	374	442	510
1923	Dec	257	330	403	477	550
1924	Jan	309	398	486	574	663
1924	Feb	766	985	1204	1423	1642
1924	Mar	323	415	507	599	691
1924	Apr	631	811	991	1171	1351
1924	May	377	485	593	701	808
1924	Jun	157	202	247	292	337

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1924	Jul	110	141	173	204	236
1924	Aug	90	116	141	167	193
1924	Sep	105	135	165	195	225
1924	Oct	264	340	415	491	567
1924	Nov	361	464	567	671	774
1924	Dec	527	678	828	979	1129
1925	Jan	618	795	972	1148	1325
1925	Feb	3226	4147	5069	5990	6912
1925	Mar	1389	1785	2182	2579	2975
1925	Apr	2122	2729	3335	3941	4548
1925	May	1917	2464	3012	3559	4107
1925	Jun	697	896	1095	1294	1493
1925	Jul	261	336	410	485	560
1925	Aug	211	271	332	392	452
1925	Sep	212	273	334	394	455
1925	Oct	237	305	373	441	509
1925	Nov	305	392	479	566	653
1925	Dec	431	554	677	800	924
1926	Jan	448	575	703	831	959
1926	Feb	1637	2105	2573	3040	3508
1926	Mar	1234	1586	1939	2291	2644
1926	Apr	2125	2732	3339	3946	4553
1926	May	933	1200	1466	1733	1999
1926	Jun	317	408	498	589	680
1926	Jul	161	208	254	300	346
1926	Aug	142	182	223	263	303
1926	Sep	144	185	226	267	308
1926	Oct	218	280	342	404	466
1926	Nov	1425	1832	2239	2646	3053
1926	Dec	954	1226	1499	1771	2043
1927	Jan	1222	1571	1920	2269	2618
1927	Feb	4279	5502	6725	7947	9170
1927	Mar	2458	3161	3863	4565	5268
1927	Apr	2799	3598	4398	5197	5997
1927	May	3014	3875	4736	5597	6458
1927	Jun	2138	2749	3360	3971	4582
1927	Jul	532	684	836	988	1140

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1927	Aug	293	377	461	545	628
1927	Sep	253	326	398	471	543
1927	Oct	274	353	431	509	588
1927	Nov	832	1070	1308	1545	1783
1927	Dec	560	720	880	1040	1200
1928	Jan	776	997	1219	1441	1662
1928	Feb	985	1267	1548	1830	2112
1928	Mar	5634	7244	8854	10464	12073
1928	Apr	2372	3049	3727	4405	5082
1928	May	2171	2792	3412	4032	4653
1928	Jun	452	581	710	839	968
1928	Jul	237	304	372	440	507
1928	Aug	182	234	286	338	390
1928	Sep	184	237	290	342	395
1928	Oct	196	253	309	365	421
1928	Nov	245	315	385	455	525
1928	Dec	346	445	544	643	742
1929	Jan	287	369	451	533	615
1929	Feb	432	555	679	802	925
1929	Mar	688	885	1081	1278	1475
1929	Apr	960	1234	1508	1783	2057
1929	May	1393	1791	2189	2587	2985
1929	Jun	611	786	961	1136	1310
1929	Jul	203	261	318	376	434
1929	Aug	141	182	222	263	303
1929	Sep	138	177	217	256	296
1929	Oct	163	209	256	302	348
1929	Nov	158	203	248	293	338
1929	Dec	1887	2426	2965	3505	4044
1930	Jan	789	1015	1240	1466	1691
1930	Feb	1407	1810	2212	2614	3016
1930	Mar	1653	2125	2597	3070	3542
1930	Apr	1985	2552	3119	3687	4254
1930	May	1428	1836	2244	2652	3060
1930	Jun	681	876	1070	1265	1459
1930	Jul	239	307	375	443	511
1930	Aug	183	236	288	341	393

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1930	Sep	196	252	308	364	420
1930	Oct	175	225	275	325	375
1930	Nov	291	375	458	541	625
1930	Dec	209	268	328	388	447
1931	Jan	349	449	549	648	748
1931	Feb	406	522	638	754	870
1931	Mar	757	973	1189	1405	1621
1931	Apr	739	951	1162	1373	1584
1931	May	517	665	813	960	1108
1931	Jun	223	287	350	414	478
1931	Jul	117	150	184	217	251
1931	Aug	84	108	132	156	180
1931	Sep	98	126	154	182	210
1931	Oct	184	236	289	341	393
1931	Nov	207	266	325	384	443
1931	Dec	641	824	1007	1190	1373
1932	Jan	656	843	1030	1218	1405
1932	Feb	922	1186	1449	1713	1976
1932	Mar	1719	2210	2702	3193	3684
1932	Apr	2237	2877	3516	4155	4794
1932	May	3240	4166	5092	6018	6944
1932	Jun	1840	2365	2891	3417	3942
1932	Jul	402	517	632	747	861
1932	Aug	223	287	351	415	479
1932	Sep	190	244	299	353	407
1932	Oct	176	226	276	326	376
1932	Nov	188	242	296	349	403
1932	Dec	225	289	353	418	482
1933	Jan	234	300	367	434	501
1933	Feb	268	344	421	497	574
1933	Mar	690	887	1084	1281	1478
1933	Apr	1398	1797	2197	2596	2996
1933	May	1621	2084	2547	3010	3473
1933	Jun	1390	1787	2184	2581	2979
1933	Jul	253	326	398	471	543
1933	Aug	150	193	235	278	321
1933	Sep	145	186	228	269	311

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1933	Oct	206	264	323	382	441
1933	Nov	213	274	335	396	456
1933	Dec	502	646	789	933	1076
1934	Jan	674	867	1059	1252	1444
1934	Feb	925	1189	1454	1718	1982
1934	Mar	1377	1770	2164	2557	2951
1934	Apr	970	1247	1524	1801	2078
1934	May	477	614	750	887	1023
1934	Jun	226	290	355	419	484
1934	Jul	126	162	199	235	271
1934	Aug	103	132	162	191	221
1934	Sep	116	149	182	216	249
1934	Oct	152	195	238	282	325
1934	Nov	364	468	572	676	780
1934	Dec	391	503	614	726	838
1935	Jan	648	833	1019	1204	1389
1935	Feb	940	1208	1477	1745	2014
1935	Mar	1005	1292	1579	1867	2154
1935	Apr	4118	5294	6470	7647	8823
1935	May	3338	4292	5246	6200	7154
1935	Jun	1727	2221	2714	3208	3702
1935	Jul	359	461	564	666	769
1935	Aug	214	276	337	398	459
1935	Sep	187	240	293	347	400
1935	Oct	218	280	343	405	467
1935	Nov	220	283	345	408	471
1935	Dec	240	309	378	447	515
1936	Jan	1954	2512	3070	3628	4186
1936	Feb	3005	3864	4723	5581	6440
1936	Mar	2074	2667	3259	3852	4444
1936	Apr	3026	3890	4755	5619	6484
1936	May	2647	3403	4159	4915	5672
1936	Jun	1297	1667	2037	2408	2778
1936	Jul	363	467	571	675	778
1936	Aug	235	302	369	436	503
1936	Sep	220	283	346	409	472
1936	Oct	188	241	295	349	402

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1936	Nov	196	252	308	364	420
1936	Dec	209	269	328	388	448
1937	Jan	258	332	406	480	554
1937	Feb	1132	1455	1779	2102	2426
1937	Mar	1447	1860	2274	2687	3101
1937	Apr	2530	3252	3975	4698	5421
1937	May	3318	4266	5213	6161	7109
1937	Jun	1160	1491	1823	2154	2485
1937	Jul	305	392	479	566	653
1937	Aug	197	254	310	366	423
1937	Sep	178	229	280	331	382
1937	Oct	168	216	264	312	360
1937	Nov	599	771	942	1113	1284
1937	Dec	2924	3759	4594	5430	6265
1938	Jan	765	984	1202	1421	1639
1938	Feb	2450	3150	3850	4550	5250
1938	Mar	4153	5340	6527	7713	8900
1938	Apr	3588	4613	5638	6663	7688
1938	May	4734	6086	7438	8791	10143
1938	Jun	2965	3813	4660	5507	6354
1938	Jul	720	926	1132	1338	1544
1938	Aug	321	413	505	597	689
1938	Sep	255	328	401	474	547
1938	Oct	305	392	479	567	654
1938	Nov	359	462	564	667	770
1938	Dec	345	444	542	641	739
1939	Jan	355	457	558	660	762
1939	Feb	369	475	581	686	792
1939	Mar	1085	1394	1704	2014	2324
1939	Apr	1414	1819	2223	2627	3031
1939	May	662	852	1041	1230	1419
1939	Jun	255	328	401	474	547
1939	Jul	147	189	230	272	314
1939	Aug	118	152	185	219	253
1939	Sep	131	169	206	243	281
1939	Oct	186	239	292	346	399
1939	Nov	152	195	239	282	326

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1939	Dec	214	275	337	398	459
1940	Jan	2145	2758	3371	3984	4597
1940	Feb	3742	4811	5880	6949	8018
1940	Mar	4394	5650	6905	8161	9416
1940	Apr	2809	3611	4414	5216	6019
1940	May	2237	2876	3516	4155	4794
1940	Jun	776	998	1220	1442	1663
1940	Jul	280	359	439	519	599
1940	Aug	202	260	318	376	434
1940	Sep	214	275	336	398	459
1940	Oct	220	283	346	409	472
1940	Nov	447	575	703	831	958
1940	Dec	1772	2278	2785	3291	3797
1941	Jan	1879	2416	2953	3490	4027
1941	Feb	3057	3930	4803	5677	6550
1941	Mar	2424	3116	3809	4501	5194
1941	Apr	2180	2803	3426	4049	4672
1941	May	3719	4782	5845	6908	7970
1941	Jun	1457	1874	2290	2707	3123
1941	Jul	476	612	748	884	1020
1941	Aug	289	372	454	537	620
1941	Sep	250	322	393	465	537
1941	Oct	225	289	354	418	482
1941	Nov	245	315	385	454	524
1941	Dec	2070	2661	3252	3843	4435
1942	Jan	2841	3653	4464	5276	6088
1942	Feb	3422	4399	5377	6355	7332
1942	Mar	1360	1749	2137	2526	2914
1942	Apr	3062	3937	4812	5687	6562
1942	May	3065	3941	4816	5692	6568
1942	Jun	2374	3052	3731	4409	5087
1942	Jul	627	807	986	1165	1344
1942	Aug	343	441	538	636	734
1942	Sep	234	301	368	435	502
1942	Oct	188	242	296	349	403
1942	Nov	739	950	1161	1372	1583
1942	Dec	1580	2031	2483	2934	3385

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1943	Jan	3431	4411	5392	6372	7352
1943	Feb	2013	2588	3164	3739	4314
1943	Mar	3621	4656	5690	6725	7760
1943	Apr	2831	3640	4449	5258	6067
1943	May	1967	2529	3091	3652	4214
1943	Jun	1086	1396	1707	2017	2327
1943	Jul	357	459	561	664	766
1943	Aug	255	327	400	473	546
1943	Sep	239	307	375	444	512
1943	Oct	334	430	525	621	716
1943	Nov	243	312	381	451	520
1943	Dec	302	389	475	562	648
1944	Jan	354	455	556	657	758
1944	Feb	740	952	1163	1374	1586
1944	Mar	1232	1584	1937	2289	2641
1944	Apr	1154	1483	1813	2143	2472
1944	May	2015	2590	3166	3742	4317
1944	Jun	903	1161	1419	1677	1935
1944	Jul	334	429	524	620	715
1944	Aug	234	300	367	434	500
1944	Sep	244	313	383	452	522
1944	Oct	254	327	400	473	545
1944	Nov	472	607	742	877	1011
1944	Dec	842	1082	1323	1563	1803
1945	Jan	580	746	911	1077	1243
1945	Feb	2860	3677	4494	5312	6129
1945	Mar	1204	1548	1892	2236	2580
1945	Apr	1702	2189	2675	3162	3648
1945	May	2352	3024	3695	4367	5039
1945	Jun	1128	1451	1773	2096	2418
1945	Jul	437	562	686	811	936
1945	Aug	345	443	541	640	738
1945	Sep	287	369	451	533	615
1945	Oct	289	372	454	537	620
1945	Nov	499	642	784	927	1069
1945	Dec	2801	3602	4402	5202	6003
1946	Jan	1532	1970	2408	2846	3284

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1946	Feb	928	1193	1458	1724	1989
1946	Mar	1366	1756	2146	2536	2926
1946	Apr	2144	2757	3369	3982	4594
1946	May	2374	3052	3730	4408	5086
1946	Jun	897	1153	1409	1665	1921
1946	Jul	415	534	653	771	890
1946	Aug	314	404	493	583	673
1946	Sep	300	386	472	558	643
1946	Oct	277	357	436	515	594
1946	Nov	437	561	686	811	936
1946	Dec	558	718	877	1037	1196
1947	Jan	367	472	577	682	787
1947	Feb	958	1232	1506	1779	2053
1947	Mar	1633	2100	2567	3033	3500
1947	Apr	1330	1709	2089	2469	2849
1947	May	858	1103	1349	1594	1839
1947	Jun	557	716	875	1034	1194
1947	Jul	277	356	436	515	594
1947	Aug	283	363	444	525	606
1947	Sep	235	302	369	436	504
1947	Oct	246	316	387	457	527
1947	Nov	223	287	350	414	478
1947	Dec	263	338	413	488	563
1948	Jan	1038	1334	1630	1927	2223
1948	Feb	445	572	699	827	954
1948	Mar	717	922	1127	1331	1536
1948	Apr	2774	3567	4359	5152	5945
1948	May	2778	3572	4365	5159	5953
1948	Jun	1784	2293	2803	3313	3822
1948	Jul	414	532	650	768	886
1948	Aug	272	349	427	504	582
1948	Sep	215	276	338	399	461
1948	Oct	222	285	348	412	475
1948	Nov	275	354	433	511	590
1948	Dec	412	530	648	765	883
1949	Jan	368	473	578	683	789
1949	Feb	547	703	859	1016	1172

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1949	Mar	1411	1814	2218	2621	3024
1949	Apr	2203	2832	3462	4091	4721
1949	May	1881	2419	2957	3494	4032
1949	Jun	702	903	1104	1304	1505
1949	Jul	275	354	432	511	589
1949	Aug	237	304	372	439	507
1949	Sep	161	207	253	299	345
1949	Oct	88	113	139	164	189
1949	Nov	203	261	318	376	434
1949	Dec	296	381	466	551	635
1950	Jan	1279	1645	2010	2376	2741
1950	Feb	2144	2756	3369	3981	4594
1950	Mar	1685	2166	2647	3129	3610
1950	Apr	2557	3287	4018	4748	5479
1950	May	2550	3278	4006	4735	5463
1950	Jun	1297	1667	2038	2408	2779
1950	Jul	371	477	583	689	796
1950	Aug	231	298	364	430	496
1950	Sep	361	464	568	671	774
1950	Oct	388	499	610	721	832
1950	Nov	3792	4876	5959	7043	8126
1950	Dec	4621	5941	7261	8581	9902
1951	Jan	2492	3204	3915	4627	5339
1951	Feb	2432	3127	3822	4517	5212
1951	Mar	1706	2193	2681	3168	3656
1951	Apr	1897	2439	2981	3523	4065
1951	May	2017	2593	3169	3745	4321
1951	Jun	684	879	1074	1270	1465
1951	Jul	312	402	491	580	669
1951	Aug	314	404	494	584	673
1951	Sep	295	379	463	547	632
1951	Oct	489	629	769	908	1048
1951	Nov	479	616	753	890	1027
1951	Dec	1899	2442	2985	3527	4070
1952	Jan	1966	2528	3090	3652	4213
1952	Feb	3225	4146	5067	5989	6910
1952	Mar	2079	2673	3267	3861	4455

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1952	Apr	3892	5004	6116	7228	8340
1952	May	5130	6595	8061	9526	10992
1952	Jun	3343	4298	5253	6208	7163
1952	Jul	1291	1659	2028	2397	2765
1952	Aug	396	509	623	736	849
1952	Sep	385	495	605	715	825
1952	Oct	348	448	548	647	747
1952	Nov	222	286	349	413	476
1952	Dec	496	638	780	921	1063
1953	Jan	3136	4032	4928	5824	6720
1953	Feb	1020	1312	1603	1895	2186
1953	Mar	1303	1675	2048	2420	2792
1953	Apr	2121	2727	3333	3939	4545
1953	May	2299	2956	3612	4269	4926
1953	Jun	2382	3063	3743	4424	5104
1953	Jul	764	982	1200	1418	1636
1953	Aug	326	419	512	605	698
1953	Sep	269	346	423	500	577
1953	Oct	345	443	542	641	739
1953	Nov	389	501	612	723	834
1953	Dec	373	479	586	692	799
1954	Jan	707	909	1111	1314	1516
1954	Feb	1503	1932	2361	2791	3220
1954	Mar	2124	2731	3338	3945	4552
1954	Apr	2633	3385	4137	4890	5642
1954	May	1727	2221	2714	3208	3701
1954	Jun	589	757	925	1093	1261
1954	Jul	344	442	541	639	737
1954	Aug	356	458	560	661	763
1954	Sep	676	869	1062	1255	1448
1954	Oct	162	208	254	300	346
1954	Nov	261	336	410	485	560
1954	Dec	469	603	737	871	1005
1955	Jan	513	659	806	952	1099
1955	Feb	510	656	802	948	1094
1955	Mar	704	906	1107	1308	1509
1955	Apr	1065	1369	1673	1977	2281

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1955	May	2173	2794	3415	4036	4657
1955	Jun	1010	1298	1587	1876	2164
1955	Jul	321	413	505	597	689
1955	Aug	320	412	503	595	686
1955	Sep	189	243	297	351	404
1955	Oct	127	163	199	235	272
1955	Nov	224	288	352	416	480
1955	Dec	6637	8533	10430	12326	14222
1956	Jan	4578	5885	7193	8501	9809
1956	Feb	1995	2565	3135	3705	4275
1956	Mar	1520	1954	2389	2823	3257
1956	Apr	1908	2453	2999	3544	4089
1956	May	3248	4177	5105	6033	6961
1956	Jun	1893	2433	2974	3515	4055
1956	Jul	518	666	814	962	1110
1956	Aug	393	506	618	731	843
1956	Sep	296	381	466	550	635
1956	Oct	342	439	537	635	732
1956	Nov	251	323	395	467	539
1956	Dec	286	368	449	531	613
1957	Jan	322	414	506	598	690
1957	Feb	1851	2379	2908	3437	3965
1957	Mar	2246	2888	3530	4171	4813
1957	Apr	1481	1904	2327	2750	3174
1957	May	2784	3580	4375	5171	5966
1957	Jun	1232	1584	1937	2289	2641
1957	Jul	346	444	543	642	741
1957	Aug	314	404	494	583	673
1957	Sep	267	344	420	497	573
1957	Oct	271	348	425	502	580
1957	Nov	310	399	487	576	664
1957	Dec	659	847	1035	1224	1412
1958	Jan	1086	1397	1707	2018	2328
1958	Feb	4494	5778	7062	8345	9629
1958	Mar	2520	3240	3960	4680	5400
1958	Apr	3549	4564	5578	6592	7606
1958	May	4454	5727	6999	8272	9544

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 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1958	Jun	2455	3157	3858	4559	5261
1958	Jul	599	771	942	1113	1285
1958	Aug	336	432	528	624	720
1958	Sep	361	464	567	670	773
1958	Oct	235	302	369	436	503
1958	Nov	180	231	282	334	385
1958	Dec	218	280	342	404	467
1959	Jan	893	1149	1404	1659	1915
1959	Feb	1439	1850	2261	2672	3083
1959	Mar	1094	1406	1719	2031	2344
1959	Apr	1325	1703	2082	2460	2839
1959	May	950	1222	1493	1765	2036
1959	Jun	444	570	697	824	951
1959	Jul	242	312	381	450	520
1959	Aug	245	315	385	455	525
1959	Sep	195	251	307	363	419
1959	Oct	157	202	247	292	336
1959	Nov	145	186	227	269	310
1959	Dec	124	159	195	230	265
1960	Jan	356	457	559	661	762
1960	Feb	2488	3198	3909	4620	5331
1960	Mar	2440	3137	3834	4531	5228
1960	Apr	1796	2309	2822	3335	3848
1960	May	1452	1867	2282	2697	3111
1960	Jun	726	933	1141	1348	1556
1960	Jul	274	352	430	509	587
1960	Aug	244	313	383	453	522
1960	Sep	212	273	334	394	455
1960	Oct	178	229	280	331	382
1960	Nov	255	328	401	474	547
1960	Dec	329	423	517	611	705
1961	Jan	272	350	428	506	583
1961	Feb	888	1141	1395	1649	1902
1961	Mar	998	1283	1568	1853	2138
1961	Apr	1268	1630	1993	2355	2717
1961	May	1401	1801	2202	2602	3002
1961	Jun	661	849	1038	1227	1416

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1961	Jul	236	303	370	437	505
1961	Aug	221	285	348	411	475
1961	Sep	147	189	230	272	314
1961	Oct	180	231	283	334	385
1961	Nov	197	254	310	367	423
1961	Dec	349	449	549	649	749
1962	Jan	289	372	454	537	620
1962	Feb	2765	3555	4345	5135	5925
1962	Mar	1305	1678	2050	2423	2796
1962	Apr	2640	3394	4149	4903	5657
1962	May	2005	2578	3151	3724	4297
1962	Jun	1277	1641	2006	2371	2735
1962	Jul	307	394	482	570	657
1962	Aug	243	313	383	452	522
1962	Sep	231	297	363	429	495
1962	Oct	2623	3372	4122	4871	5620
1962	Nov	487	626	766	905	1044
1962	Dec	1437	1848	2259	2669	3080
1963	Jan	1473	1894	2315	2736	3157
1963	Feb	3835	4931	6026	7122	8218
1963	Mar	1196	1538	1879	2221	2563
1963	Apr	3356	4315	5274	6233	7192
1963	May	3454	4441	5428	6415	7402
1963	Jun	1195	1536	1877	2218	2560
1963	Jul	400	514	628	742	856
1963	Aug	295	380	464	548	633
1963	Sep	239	307	375	443	512
1963	Oct	265	340	416	492	567
1963	Nov	1110	1427	1745	2062	2379
1963	Dec	449	578	706	834	963
1964	Jan	782	1006	1229	1453	1676
1964	Feb	699	899	1099	1299	1499
1964	Mar	719	925	1131	1336	1542
1964	Apr	1451	1865	2280	2694	3109
1964	May	1773	2279	2786	3292	3799
1964	Jun	854	1098	1343	1587	1831
1964	Jul	285	367	448	529	611

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1964	Aug	218	280	342	404	467
1964	Sep	229	295	361	426	492
1964	Oct	296	381	465	550	634
1964	Nov	344	443	541	640	738
1964	Dec	7613	9788	11963	14138	16313
1965	Jan	4031	5183	6335	7486	8638
1965	Feb	1542	1983	2424	2864	3305
1965	Mar	1130	1453	1776	2099	2422
1965	Apr	2923	3758	4593	5428	6263
1965	May	2500	3214	3928	4642	5356
1965	Jun	1550	1993	2436	2879	3322
1965	Jul	460	591	722	854	985
1965	Aug	315	405	495	586	676
1965	Sep	245	315	385	455	525
1965	Oct	243	313	382	452	521
1965	Nov	390	501	612	724	835
1965	Dec	443	570	696	823	950
1966	Jan	726	933	1141	1348	1556
1966	Feb	628	807	986	1166	1345
1966	Mar	1318	1695	2072	2448	2825
1966	Apr	2345	3015	3685	4355	5024
1966	May	1626	2091	2555	3020	3484
1966	Jun	390	502	614	725	837
1966	Jul	227	292	357	422	487
1966	Aug	195	251	307	363	418
1966	Sep	132	169	207	245	282
1966	Oct	192	246	301	356	410
1966	Nov	614	790	965	1141	1316
1966	Dec	1663	2139	2614	3089	3564
1967	Jan	2339	3008	3676	4344	5013
1967	Feb	1671	2148	2626	3103	3581
1967	Mar	2491	3202	3914	4625	5337
1967	Apr	1763	2267	2770	3274	3778
1967	May	3825	4918	6010	7103	8196
1967	Jun	3472	4463	5455	6447	7439
1967	Jul	1101	1416	1730	2045	2360
1967	Aug	447	575	703	830	958

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1967	Sep	299	385	470	556	641
1967	Oct	182	234	286	338	390
1967	Nov	181	233	285	336	388
1967	Dec	307	395	482	570	658
1968	Jan	682	876	1071	1266	1461
1968	Feb	2840	3652	4463	5274	6086
1968	Mar	1584	2037	2489	2942	3394
1968	Apr	1396	1795	2194	2593	2992
1968	May	1250	1608	1965	2322	2679
1968	Jun	505	649	793	937	1081
1968	Jul	217	279	341	403	465
1968	Aug	324	417	509	602	694
1968	Sep	110	141	172	204	235
1968	Oct	177	227	277	328	378
1968	Nov	458	589	720	851	982
1968	Dec	699	898	1098	1298	1497
1969	Jan	5581	7175	8769	10364	11958
1969	Feb	2571	3306	4041	4775	5510
1969	Mar	1606	2065	2523	2982	3441
1969	Apr	3063	3938	4813	5689	6564
1969	May	4385	5637	6890	8143	9395
1969	Jun	2160	2777	3394	4011	4628
1969	Jul	570	732	895	1058	1221
1969	Aug	302	388	475	561	647
1969	Sep	198	254	310	367	423
1969	Oct	267	344	420	497	573
1969	Nov	235	303	370	437	504
1969	Dec	2042	2626	3209	3792	4376
1970	Jan	7225	9289	11353	13418	15482
1970	Feb	1760	2263	2766	3269	3772
1970	Mar	1703	2190	2676	3163	3649
1970	Apr	999	1285	1570	1856	2141
1970	May	1614	2075	2536	2998	3459
1970	Jun	774	995	1217	1438	1659
1970	Jul	293	377	461	545	629
1970	Aug	207	267	326	385	444
1970	Sep	141	182	222	263	303

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1970	Oct	245	315	385	455	525
1970	Nov	1094	1407	1719	2032	2345
1970	Dec	1936	2489	3042	3595	4148
1971	Jan	1528	1964	2401	2837	3274
1971	Feb	1320	1698	2075	2452	2829
1971	Mar	2307	2966	3626	4285	4944
1971	Apr	2040	2623	3206	3789	4372
1971	May	2835	3646	4456	5266	6076
1971	Jun	2443	3141	3839	4537	5235
1971	Jul	740	951	1163	1374	1585
1971	Aug	304	391	478	565	651
1971	Sep	199	256	313	370	427
1971	Oct	270	347	424	502	579
1971	Nov	372	478	585	691	797
1971	Dec	610	785	959	1133	1308
1972	Jan	775	997	1218	1440	1662
1972	Feb	1137	1462	1787	2112	2437
1972	Mar	2191	2817	3443	4069	4695
1972	Apr	1652	2124	2595	3067	3539
1972	May	1894	2435	2976	3517	4059
1972	Jun	775	997	1218	1440	1661
1972	Jul	239	308	376	445	513
1972	Aug	191	245	300	355	409
1972	Sep	233	300	367	433	500
1972	Oct	341	439	536	634	732
1972	Nov	850	1092	1335	1578	1820
1972	Dec	1410	1813	2215	2618	3021
1973	Jan	2980	3831	4683	5534	6385
1973	Feb	2336	3004	3671	4339	5006
1973	Mar	1862	2394	2927	3459	3991
1973	Apr	1995	2565	3136	3706	4276
1973	May	2777	3570	4364	5157	5950
1973	Jun	871	1120	1369	1618	1867
1973	Jul	251	323	394	466	538
1973	Aug	189	242	296	350	404
1973	Sep	224	288	352	416	480
1973	Oct	275	354	433	511	590

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1973	Nov	3293	4233	5174	6115	7055
1973	Dec	2338	3006	3674	4342	5010
1974	Jan	4071	5234	6398	7561	8724
1974	Feb	1246	1602	1958	2314	2670
1974	Mar	4014	5160	6307	7454	8601
1974	Apr	2968	3816	4664	5512	6359
1974	May	2831	3639	4448	5257	6066
1974	Jun	1840	2365	2891	3416	3942
1974	Jul	603	776	948	1120	1293
1974	Aug	278	358	437	517	596
1974	Sep	291	375	458	541	624
1974	Oct	199	255	312	369	426
1974	Nov	180	231	283	334	386
1974	Dec	344	442	540	638	736
1975	Jan	513	660	806	953	1100
1975	Feb	1969	2532	3095	3658	4220
1975	Mar	2384	3065	3746	4428	5109
1975	Apr	1588	2042	2495	2949	3403
1975	May	3558	4574	5591	6607	7623
1975	Jun	2653	3410	4168	4926	5684
1975	Jul	604	776	948	1121	1293
1975	Aug	288	370	453	535	617
1975	Sep	257	330	404	477	550
1975	Oct	489	629	768	908	1048
1975	Nov	479	615	752	889	1026
1975	Dec	354	455	556	657	758
1976	Jan	298	383	468	553	638
1976	Feb	466	599	732	866	999
1976	Mar	747	960	1174	1387	1600
1976	Apr	713	917	1121	1325	1529
1976	May	805	1035	1265	1495	1725
1976	Jun	262	337	412	487	561
1976	Jul	167	215	262	310	358
1976	Aug	150	193	235	278	321
1976	Sep	108	138	169	200	231
1976	Oct	99	127	156	184	212
1976	Nov	103	133	162	192	221

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1976	Dec	104	133	163	192	222
1977	Jan	148	190	232	275	317
1977	Feb	194	250	305	361	416
1977	Mar	216	277	339	400	462
1977	Apr	312	402	491	580	669
1977	May	467	600	733	867	1000
1977	Jun	276	354	433	512	591
1977	Jul	109	140	171	202	233
1977	Aug	75	97	118	140	161
1977	Sep	75	96	118	139	161
1977	Oct	61	79	97	114	132
1977	Nov	143	184	225	265	306
1977	Dec	1035	1331	1627	1923	2218
1978	Jan	3338	4292	5246	6200	7154
1978	Feb	1319	1696	2073	2449	2826
1978	Mar	3025	3889	4753	5617	6482
1978	Apr	2582	3320	4058	4795	5533
1978	May	2811	3614	4417	5220	6023
1978	Jun	1908	2453	2998	3543	4088
1978	Jul	523	673	822	971	1121
1978	Aug	226	291	356	420	485
1978	Sep	297	382	466	551	636
1978	Oct	164	211	258	305	352
1978	Nov	203	260	318	376	434
1978	Dec	192	246	301	356	411
1979	Jan	836	1075	1314	1552	1791
1979	Feb	1241	1596	1950	2305	2659
1979	Mar	1812	2329	2847	3364	3882
1979	Apr	1788	2299	2809	3320	3831
1979	May	2918	3752	4586	5419	6253
1979	Jun	791	1017	1243	1469	1695
1979	Jul	244	313	383	453	522
1979	Aug	188	241	295	349	402
1979	Sep	157	202	247	292	337
1979	Oct	285	367	448	530	611
1979	Nov	469	603	737	871	1005
1979	Dec	694	892	1091	1289	1487

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1980	Jan	5442	6997	8552	10107	11662
1980	Feb	3931	5055	6178	7301	8424
1980	Mar	1881	2419	2956	3494	4031
1980	Apr	1971	2534	3097	3661	4224
1980	May	2218	2851	3485	4119	4752
1980	Jun	1378	1772	2166	2560	2954
1980	Jul	509	655	800	946	1091
1980	Aug	212	272	333	393	453
1980	Sep	166	214	261	309	356
1980	Oct	190	244	298	353	407
1980	Nov	155	199	244	288	332
1980	Dec	376	483	590	698	805
1981	Jan	612	786	961	1136	1310
1981	Feb	1002	1289	1575	1861	2148
1981	Mar	1337	1719	2101	2483	2865
1981	Apr	1440	1851	2262	2674	3085
1981	May	1040	1337	1634	1931	2228
1981	Jun	341	439	537	634	732
1981	Jul	177	228	278	329	380
1981	Aug	109	140	171	202	233
1981	Sep	127	163	199	235	272
1981	Oct	340	437	534	631	729
1981	Nov	3614	4647	5679	6712	7745
1981	Dec	4674	6010	7345	8681	10016
1982	Jan	2179	2802	3424	4047	4669
1982	Feb	4434	5701	6967	8234	9501
1982	Mar	2758	3546	4333	5121	5909
1982	Apr	5329	6852	8375	9897	11420
1982	May	3648	4690	5732	6775	7817
1982	Jun	1818	2337	2856	3376	3895
1982	Jul	596	766	936	1106	1276
1982	Aug	251	323	395	467	539
1982	Sep	441	567	693	819	945
1982	Oct	608	782	956	1129	1303
1982	Nov	1176	1513	1849	2185	2521
1982	Dec	2263	2910	3557	4203	4850
1983	Jan	1904	2448	2992	3536	4080

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1983	Feb	3731	4797	5863	6929	7995
1983	Mar	5546	7131	8715	10300	11885
1983	Apr	2542	3268	3994	4720	5446
1983	May	4074	5237	6401	7565	8729
1983	Jun	4143	5326	6510	7694	8877
1983	Jul	1636	2103	2571	3038	3505
1983	Aug	439	565	690	816	941
1983	Sep	306	393	481	568	656
1983	Oct	403	518	634	749	864
1983	Nov	3235	4159	5083	6007	6932
1983	Dec	4792	6161	7530	8899	10268
1984	Jan	1854	2384	2914	3443	3973
1984	Feb	1562	2009	2455	2902	3348
1984	Mar	1859	2390	2921	3452	3983
1984	Apr	1557	2002	2447	2892	3337
1984	May	2251	2894	3537	4181	4824
1984	Jun	1069	1375	1681	1986	2292
1984	Jul	323	415	507	599	692
1984	Aug	216	278	340	401	463
1984	Sep	221	284	348	411	474
1984	Oct	236	303	371	438	505
1984	Nov	1047	1346	1645	1944	2243
1984	Dec	594	764	934	1104	1274
1985	Jan	325	418	511	604	697
1985	Feb	850	1093	1336	1579	1822
1985	Mar	959	1233	1508	1782	2056
1985	Apr	2035	2617	3199	3780	4362
1985	May	1363	1753	2142	2531	2921
1985	Jun	434	559	683	807	931
1985	Jul	214	275	336	398	459
1985	Aug	138	177	216	256	295
1985	Sep	222	285	349	412	475
1985	Oct	205	263	322	380	439
1985	Nov	315	405	495	585	675
1985	Dec	675	868	1061	1254	1447
1986	Jan	1619	2082	2545	3008	3470
1986	Feb	9168	11788	14407	17027	19647

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1986	Mar	4519	5810	7101	8392	9683
1986	Apr	1887	2426	2966	3505	4044
1986	May	1744	2242	2740	3239	3737
1986	Jun	951	1223	1494	1766	2038
1986	Jul	285	367	448	530	612
1986	Aug	204	262	320	379	437
1986	Sep	325	418	511	604	697
1986	Oct	268	345	422	498	575
1986	Nov	163	209	256	302	349
1986	Dec	154	198	243	287	331
1987	Jan	316	407	497	588	678
1987	Feb	1018	1308	1599	1890	2181
1987	Mar	1236	1589	1942	2295	2649
1987	Apr	1129	1451	1774	2096	2419
1987	May	662	852	1041	1230	1420
1987	Jun	214	275	336	397	458
1987	Jul	140	180	219	259	299
1987	Aug	132	170	208	245	283
1987	Sep	119	153	188	222	256
1987	Oct	111	143	175	206	238
1987	Nov	136	175	214	253	292
1987	Dec	835	1074	1313	1551	1790
1988	Jan	898	1154	1411	1667	1924
1988	Feb	639	821	1004	1186	1369
1988	Mar	805	1035	1264	1494	1724
1988	Apr	927	1192	1457	1722	1987
1988	May	716	921	1126	1331	1535
1988	Jun	354	456	557	658	759
1988	Jul	187	241	294	348	401
1988	Aug	118	151	185	218	252
1988	Sep	130	167	204	241	278
1988	Oct	97	125	152	180	208
1988	Nov	850	1092	1335	1578	1821
1988	Dec	420	540	660	780	900
1989	Jan	513	660	806	953	1100
1989	Feb	870	1119	1368	1616	1865
1989	Mar	5199	6685	8171	9656	11142

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1989	Apr	2759	3547	4335	5123	5911
1989	May	1655	2128	2601	3074	3547
1989	Jun	747	961	1174	1388	1601
1989	Jul	252	324	396	468	540
1989	Aug	204	262	320	379	437
1989	Sep	251	323	395	467	538
1989	Oct	417	536	655	774	893
1989	Nov	372	478	584	690	796
1989	Dec	259	333	406	480	554
1990	Jan	794	1021	1247	1474	1701
1990	Feb	655	842	1029	1216	1403
1990	Mar	1352	1738	2124	2511	2897
1990	Apr	1410	1812	2215	2618	3021
1990	May	1062	1365	1668	1972	2275
1990	Jun	773	994	1215	1436	1657
1990	Jul	231	297	363	429	495
1990	Aug	157	202	246	291	336
1990	Sep	151	194	237	280	323
1990	Oct	157	202	246	291	336
1990	Nov	134	172	210	248	286
1990	Dec	135	173	212	250	289
1991	Jan	118	152	186	220	254
1991	Feb	201	258	316	373	430
1991	Mar	1908	2453	2999	3544	4089
1991	Apr	1537	1976	2415	2854	3293
1991	May	1660	2134	2609	3083	3557
1991	Jun	842	1083	1324	1564	1805
1991	Jul	243	312	381	450	520
1991	Aug	162	208	254	301	347
1991	Sep	155	200	244	288	333
1991	Oct	206	265	324	383	442
1991	Nov	206	265	323	382	441
1991	Dec	203	261	318	376	434
1992	Jan	244	314	383	453	523
1992	Feb	1551	1995	2438	2881	3324
1992	Mar	1176	1512	1848	2184	2520
1992	Apr	1362	1751	2140	2529	2918

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1992	May	543	699	854	1009	1165
1992	Jun	186	240	293	346	399
1992	Jul	159	204	250	295	341
1992	Aug	120	155	189	224	258
1992	Sep	119	153	187	220	254
1992	Oct	200	258	315	372	430
1992	Nov	135	174	213	252	290
1992	Dec	662	851	1041	1230	1419
1993	Jan	2678	3444	4209	4974	5739
1993	Feb	1855	2385	2916	3446	3976
1993	Mar	3292	4233	5173	6114	7054
1993	Apr	2509	3226	3943	4659	5376
1993	May	3098	3983	4868	5753	6638
1993	Jun	2036	2617	3199	3781	4362
1993	Jul	500	642	785	928	1071
1993	Aug	261	335	409	484	558
1993	Sep	238	307	375	443	511
1993	Oct	342	440	538	636	733
1993	Nov	182	234	286	338	390
1993	Dec	339	436	532	629	726
1994	Jan	282	362	443	523	604
1994	Feb	663	853	1042	1232	1421
1994	Mar	1020	1312	1603	1895	2186
1994	Apr	1053	1354	1655	1956	2257
1994	May	1000	1285	1571	1856	2142
1994	Jun	304	391	478	565	652
1994	Jul	145	187	228	270	311
1994	Aug	110	141	173	204	235
1994	Sep	127	163	199	236	272
1994	Oct	179	230	281	332	383
1994	Nov	289	371	454	536	619
1994	Dec	781	1004	1227	1450	1673
1995	Jan	4749	6106	7462	8819	10176
1995	Feb	1684	2165	2646	3127	3609
1995	Mar	6322	8128	9934	11740	13547
1995	Apr	3300	4243	5186	6129	7072
1995	May	4765	6126	7487	8849	10210

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1995	Jun	3482	4477	5472	6467	7462
1995	Jul	1433	1842	2252	2661	3070
1995	Aug	349	448	548	648	747
1995	Sep	242	311	380	449	519
1995	Oct	193	249	304	359	415
1995	Nov	165	212	259	306	353
1995	Dec	1125	1446	1768	2089	2410
1996	Jan	1762	2265	2769	3272	3775
1996	Feb	5189	6672	8154	9637	11120
1996	Mar	2442	3140	3838	4536	5233
1996	Apr	2779	3573	4367	5161	5955
1996	May	4341	5581	6821	8062	9302
1996	Jun	1209	1555	1901	2246	2592
1996	Jul	375	482	589	696	803
1996	Aug	241	310	379	448	517
1996	Sep	190	244	298	352	406
1996	Oct	218	280	342	404	467
1996	Nov	688	885	1082	1278	1475
1996	Dec	5279	6788	8296	9805	11313
1997	Jan	8379	10773	13167	15560	17954
1997	Feb	1517	1950	2384	2817	3251
1997	Mar	1347	1732	2117	2502	2887
1997	Apr	1728	2221	2715	3208	3702
1997	May	1474	1895	2317	2738	3159
1997	Jun	594	764	934	1104	1273
1997	Jul	231	297	363	429	495
1997	Aug	191	246	300	355	410
1997	Sep	218	280	342	404	466
1997	Oct	217	279	341	403	465
1997	Nov	526	677	827	978	1128
1997	Dec	547	703	860	1016	1172
1998	Jan	2949	3791	4634	5476	6319
1998	Feb	3645	4687	5729	6770	7812
1998	Mar	2677	3442	4207	4971	5736
1998	Apr	2554	3283	4013	4743	5472
1998	May	3270	4204	5138	6073	7007
1998	Jun	3574	4595	5616	6637	7658

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
1998	Jul	1188	1527	1866	2205	2545
1998	Aug	376	483	591	698	805
1998	Sep	282	363	443	524	605
1998	Oct	247	317	388	459	529
1998	Nov	713	917	1121	1325	1529
1998	Dec	1176	1512	1848	2184	2520
1999	Jan	2068	2659	3250	3841	4432
1999	Feb	3398	4368	5339	6310	7281
1999	Mar	2146	2759	3372	3985	4598
1999	Apr	1836	2360	2885	3409	3934
1999	May	2684	3451	4218	4985	5752
1999	Jun	1618	2081	2543	3006	3468
1999	Jul	388	499	610	721	832
1999	Aug	259	333	407	480	554
1999	Sep	188	242	296	350	404
1999	Oct	215	277	338	400	461
1999	Nov	292	376	459	543	626
1999	Dec	251	323	395	467	539
2000	Jan	1526	1962	2398	2834	3271
2000	Feb	3504	4505	5507	6508	7509
2000	Mar	2336	3004	3672	4339	5007
2000	Apr	2219	2852	3486	4120	4754
2000	May	2088	2685	3282	3878	4475
2000	Jun	729	937	1145	1354	1562
2000	Jul	282	363	443	524	605
2000	Aug	164	211	258	305	352
2000	Sep	208	267	326	386	445
2000	Oct	230	295	361	427	492
2000	Nov	163	209	256	302	349
2000	Dec	280	360	440	520	601
2001	Jan	279	359	439	518	598
2001	Feb	613	788	963	1138	1313
2001	Mar	1201	1545	1888	2231	2574
2001	Apr	1210	1556	1902	2248	2594
2001	May	1191	1532	1872	2213	2553
2001	Jun	238	305	373	441	509
2001	Jul	148	190	232	274	317

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
2001	Aug	108	139	170	201	232
2001	Sep	139	178	218	257	297
2001	Oct	146	187	229	270	312
2001	Nov	422	543	663	784	904
2001	Dec	1113	1430	1748	2066	2384
2002	Jan	1340	1722	2105	2488	2871
2002	Feb	1214	1561	1908	2255	2602
2002	Mar	1647	2118	2589	3059	3530
2002	Apr	1937	2490	3044	3597	4151
2002	May	1604	2062	2520	2978	3437
2002	Jun	676	869	1062	1255	1448
2002	Jul	203	261	319	376	434
2002	Aug	146	188	230	271	313
2002	Sep	140	180	220	260	300
2002	Oct	137	176	215	254	293
2002	Nov	445	572	700	827	954
2002	Dec	1693	2177	2661	3144	3628
2003	Jan	1894	2435	2976	3517	4058
2003	Feb	1141	1467	1792	2118	2444
2003	Mar	1667	2143	2619	3096	3572
2003	Apr	2059	2647	3235	3823	4412
2003	May	3109	3997	4885	5773	6662
2003	Jun	1411	1814	2217	2620	3023
2003	Jul	315	405	495	586	676
2003	Aug	272	350	427	505	583
2003	Sep	211	271	331	392	452
2003	Oct	206	265	324	383	442
2003	Nov	224	288	352	416	480
2003	Dec	1078	1386	1694	2002	2310
2004	Jan	870	1119	1368	1616	1865
2004	Feb	1928	2478	3029	3580	4131
2004	Mar	2012	2587	3162	3736	4311
2004	Apr	1663	2138	2613	3088	3563
2004	May	1389	1786	2182	2579	2976
2004	Jun	461	593	725	857	989
2004	Jul	206	264	323	382	441
2004	Aug	173	223	272	322	371

ATTACHMENT A:
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 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
2004	Sep	163	209	256	302	349
2004	Oct	275	353	431	510	588
2004	Nov	258	332	406	480	554
2004	Dec	619	796	972	1149	1326
2005	Jan	1026	1319	1612	1905	2198
2005	Feb	1067	1371	1676	1981	2285
2005	Mar	2109	2711	3314	3917	4519
2005	Apr	1934	2486	3038	3591	4143
2005	May	4375	5625	6876	8126	9376
2005	Jun	1684	2165	2647	3128	3609
2005	Jul	437	562	687	812	937
2005	Aug	233	300	367	434	500
2005	Sep	226	290	355	419	484
2005	Oct	214	275	337	398	459
2005	Nov	393	505	618	730	842
2005	Dec	4529	5822	7116	8410	9704
2006	Jan	3060	3934	4809	5683	6557
2006	Feb	2508	3224	3941	4657	5374
2006	Mar	3060	3935	4809	5683	6558
2006	Apr	5134	6600	8067	9534	11001
2006	May	4181	5376	6571	7765	8960
2006	Jun	1561	2007	2453	2899	3346
2006	Jul	394	507	620	733	845
2006	Aug	242	312	381	450	519
2006	Sep	204	262	320	379	437
2006	Oct	178	228	279	330	381
2006	Nov	271	348	425	503	580
2006	Dec	671	863	1055	1247	1439
2007	Jan	516	663	810	957	1105
2007	Feb	1585	2037	2490	2943	3396
2007	Mar	1428	1836	2244	2652	3060
2007	Apr	1180	1517	1854	2191	2528
2007	May	1072	1378	1685	1991	2297
2007	Jun	350	451	551	651	751
2007	Jul	186	239	292	345	398
2007	Aug	144	186	227	268	309
2007	Sep	147	189	231	273	315

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
2007	Oct	242	311	380	449	518
2007	Nov	176	227	277	327	378
2007	Dec	305	392	479	566	654
2008	Jan	742	954	1166	1377	1589
2008	Feb	917	1179	1441	1704	1966
2008	Mar	1061	1364	1668	1971	2274
2008	Apr	1353	1740	2127	2514	2900
2008	May	1763	2267	2770	3274	3778
2008	Jun	466	599	732	865	998
2008	Jul	188	241	295	349	402
2008	Aug	164	211	257	304	351
2008	Sep	111	143	175	207	238
2008	Oct	190	244	298	353	407
2008	Nov	327	420	514	607	701
2008	Dec	241	309	378	447	516
2009	Jan	526	676	826	976	1126
2009	Feb	1467	1886	2306	2725	3144
2009	Mar	2187	2812	3437	4062	4686
2009	Apr	1499	1927	2355	2783	3212
2009	May	2833	3642	4451	5261	6070
2009	Jun	551	708	865	1023	1180
2009	Jul	221	284	347	410	473
2009	Aug	135	173	212	250	288
2009	Sep	147	188	230	272	314
2009	Oct	206	264	323	382	441
2009	Nov	176	226	276	326	376
2009	Dec	296	381	465	550	635
2010	Jan	812	1044	1276	1508	1739
2010	Feb	855	1099	1343	1587	1831
2010	Mar	1210	1556	1902	2248	2594
2010	Apr	1965	2526	3088	3649	4211
2010	May	2269	2917	3565	4214	4862
2010	Jun	2514	3232	3951	4669	5387
2010	Jul	480	618	755	892	1029
2010	Aug	216	278	339	401	463
2010	Sep	167	214	262	309	357
2010	Oct	505	649	793	937	1081

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
2010	Nov	564	726	887	1048	1209
2010	Dec	3154	4055	4956	5857	6758
2011	Jan	1244	1600	1955	2311	2666
2011	Feb	1243	1599	1954	2309	2665
2011	Mar	3535	4545	5555	6565	7574
2011	Apr	3503	4503	5504	6505	7506
2011	May	3136	4032	4928	5825	6721
2011	Jun	3764	4839	5915	6990	8065
2011	Jul	1540	1980	2420	2859	3299
2011	Aug	494	635	776	917	1058
2011	Sep	247	317	388	458	529
2011	Oct	348	448	548	647	747
2011	Nov	234	301	368	435	502
2011	Dec	187	240	294	347	401
2012	Jan	496	638	780	921	1063
2012	Feb	366	471	576	680	785
2012	Mar	2430	3124	3819	4513	5207
2012	Apr	2796	3595	4394	5193	5992
2012	May	1664	2140	2616	3091	3567
2012	Jun	483	621	759	897	1035
2012	Jul	214	275	336	397	458
2012	Aug	145	186	227	268	310
2012	Sep	122	157	192	227	262
2012	Oct	187	241	295	348	402
2012	Nov	967	1243	1519	1795	2071
2012	Dec	2994	3849	4704	5559	6415
2013	Jan	801	1029	1258	1487	1715
2013	Feb	638	821	1003	1186	1368
2013	Mar	992	1276	1559	1843	2126
2013	Apr	1116	1435	1754	2073	2392
2013	May	622	799	977	1155	1332
2013	Jun	279	359	439	519	599
2013	Jul	156	200	245	289	334
2013	Aug	110	142	173	204	236
2013	Sep	156	201	246	290	335
2013	Oct	187	240	293	346	400
2013	Nov	132	170	208	246	284

ATTACHMENT A:
 COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
 FOR THE YUBA RIVER DEVELOPMENT PROJECT
 FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

Year	Month	35% UF	45% UF	55% UF	65% UF	75% UF
2013	Dec	138	178	217	257	296
2014	Jan	147	188	230	272	314
2014	Feb	1220	1569	1918	2267	2615
2014	Mar	1389	1786	2182	2579	2976
2014	Apr	1160	1492	1823	2155	2486
2014	May	603	776	948	1121	1293
2014	Jun	209	268	328	387	447
2014	Jul	120	154	188	222	257
2014	Aug	122	157	192	227	262
2014	Sep	103	133	163	192	222
2014	Oct	136	175	213	252	291
2014	Nov	195	251	307	363	418
2014	Dec	1550	1993	2436	2879	3322
2015	Jan	440	566	691	817	943
2015	Feb	1402	1803	2204	2604	3005
2015	Mar	409	526	643	759	876
2015	Apr	365	469	573	677	782
2015	May	343	442	540	638	736
2015	Jun	183	235	288	340	392
2015	Jul	92	118	145	171	197
2015	Aug	93	119	146	172	198
2015	Sep	90	116	141	167	193

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COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE YUBA RIVER DEVELOPMENT PROJECT
FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 2246

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