June 15, 2012
E-Filed

Don Pedro Project
FERC No. 2299-075

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

RE: Filing on behalf of Turlock Irrigation District and Modesto Irrigation District's Don Pedro Project - FERC Project No. 2299
Final Meeting Notes and Relicensing Participants Comments on the April 10, 2012 Salmonid Information Synthesis Workshop No. 1

As part of the ongoing ILP Relicensing Studies for the Don Pedro Project (FERC Project No. 2299-075), the Districts held a relicensing participant meeting (Workshop No. 1) on April 10, 2012 as proposed in the Salmonid Populations Information Integration and Synthesis Study Plan (W&AR-5) and approved by FERC in its December 22, 2011 Study Plan Determination.

The workshop was held to summarize and update existing salmonid information originally provided to relicensing participants on January 17, 2012 and to provide an opportunity for relicensing participants to propose additional literature and data sources for use in this Salmonid Populations Information Integration and Synthesis Study ("Synthesis Study"). Materials for the meeting were distributed one week prior to the meeting for participants review and Draft Meeting notes were provided on April 20, 2012 for review and comment. During the 30-day review period, comments were received by the California Department of Fish and Game ("CDFG"), Conservation Groups[1], and the U.S. Fish and Wildlife Service ("USFWS"). In accordance with Appendix B of FERC's December 22, 2011 Study Plan Determination, this letter provides Draft and Final meeting notes, as well as relicensing participants comments as attachments A through E below:

Attachment A: Final Meeting Notes – W&AR-5 Salmonid Information Synthesis Workshop No. 1,
Attachment B: Draft Meeting Notes and Workshop Materials – W&AR-5 Salmonid Information Synthesis Workshop No. 1
Attachment C: California Dept. of Fish and Game comments regarding the April 10, 2012 Salmonid Information Synthesis Workshop

[1] American Rivers, American Whitewater, California Sportfishing Protection Alliance, California Trout, Inc., Central Sierra Environmental Resource Center, Environmental Defense Fund, Friends of the River, Golden West Women Flyfishers, Northern California Council Federation of Fly Fishers, Merced Fly Fishing Club, Pacific Coast Federation of Fishermen's Associations, Trout Unlimited, Tuolumne River Trust, and Water 4 Fish

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Attachment D: Conservation Groups Comments regarding the April 10, 2012 Salmonid Information Synthesis Workshop
Attachment E: U.S. Fish and Wildlife Service comments regarding the April 10, 2012 Salmonid Information Synthesis Workshop

Comments by California Department of Fish and Game

In their letter of May 16, 2012 (Attachment C), CDFG provided five comments on factors contributing to the "current decline of anadromous fish populations on the Tuolumne River." The comments provided below, excerpted from direct testimonies of Mr. Timothy Heyne and Dr. Andrew Gordus (Attachment C, Exhibits DFG-2 and DFG-4, respectively), were previously submitted in support of the September 2009 Administrative Law Judge (ALJ) proceeding on interim conditions pending relicensing.[2]

CDFG comments excerpted from ALJ testimony of Timothy Heyne (See Attachment C, Exhibit DFG-2 for complete text):

- "[c]urrent flow releases to the lower Tuolumne River required under Article 37 of the Project license are insufficient to conserve fall-run Chinook salmon and steelhead" (DFG-2, page 2).
- "The single most important impact of Project operations affecting anadromous fish populations is the manipulation of flows in the Tuolumne River" (DFG- 2, page 4).
- "Providing more flow to the river at specific times of the year will improve habitat and water temperature for fall-run Chinook and steelhead" (DFG-2, page 7).
- Inadequate spring flows "have been identified repeatedly as the principle limiting factor on fall-run Chinook salmon populations in the Tuolumne River" (DFG-2, page 14).

CDFG comments excerpted from ALJ testimony of Andrew Gordus (See Attachment C, Exhibit DFG-4 for complete text):

- "Elevated water temperatures contribute to the ongoing decline [of] fall-run Chinook salmon in the Tuolumne River by: (1) inducing adult mortality as adults migrate into the San Joaquin River and adjacent tributaries to spawn (i.e. pre-spawn mortality); (2) reducing egg viability for eggs deposited in stream gravels; (3) increasing stress levels, thereby reducing survival of juveniles within the tributary nursery habitats; and (4)

[2] Turlock Irrigation District and Modesto Irrigation District, Order on Rehearing, Amending License, Denying Late Intervention, Denying Petition, and Directing Appointment of a Presiding Judge for a Proceeding on Interim Conditions, 128 FERC ¶ 61,035 (2009) (July 2009 Order).

> reducing salmon smolt out-migration survival as smolts leave the nursery habitats within the tributaries to migrate down the San Joaquin River to Vernalis and through the south Delta" (DFG-4, page 12).

The Districts do not agree with the characterizations regarding "declining" salmonid populations and point to recent April 19, 2012 FERC Order Clarifying Proceeding on Interim Conditions (139 FERC ¶ 61,045), which stated that the recent decline of the Tuolumne River fall-run Chinook salmon could not be attributed to the Article 37 flow regime, and that more information was needed to determine flow requirements for steelhead as to whether higher flows may result in higher steelhead production. Despite these and other limitations, the comments above will be considered in evaluating the relative importance of contributing factors to various life history outcomes of Tuolumne River salmonids as well as which of the factors to include in subsequent salmonid production models as part of the interrelated Tuolumne River Chinook Salmon Population Model (W&AR-6) and the *O. mykiss* Population (W&AR-10) studies.

In addition to the comments above, CDFG also provided eighteen citations to reports and analyses (Attachment C) that were largely provided as part of the 2009 ALJ proceeding as well as the 2008 biennial review of water quality information in support of the California Central Valley Regional Water Quality Control Board's Integrated Report pursuant to Sections 303(d), 305(b), and 314 of the Clean Water Act. The citations may be grouped into broad topical areas addressing limiting factors affecting Tuolumne River salmonids, fry and juvenile Chinook salmon survival, salmon population modeling, floodplain habitat use studies, as well as attainment of various regional water temperature standards. Although comparisons of historical water temperature data with various water temperature standards is the subject of a separate Temperature Criteria Assessment for Chinook Salmon and *O. mykiss* Study (W&AR-14), all of the referenced information provided by CDFG will be reviewed for primary data sources for use in this Synthesis Study.

Comments by Conservation Groups

In their letter of May 18, 2012 (Attachment D), Conservation groups submitted comments regarding the 2012 workshop schedule presented in the March 20, 2012 Consultation Process for Workshops remaining in 2012 (See Attachment B, sub-Attachment 3). Conservation Groups commented that the initial population modeling workshops for studies W&AR-6 and W&AR-10, currently scheduled for November 15, 2012, were not consistent with the preliminary schedules presented in the approved individual study plans. Conservation Groups encouraged the Districts to conduct an initial workshop for studies W&AR-6 and W&AR-10 prior to the planned November 15 workshop.

In planning the work to be conducted by the Districts for 2012 after receipt of FERC's Study Plan Determination in December 2011, it became apparent that the two-month time period between Workshop No. 1 and Workshop No. 2 for W&AR-6 and -10 was insufficient to allow integration of the Workshop Consultation Process required by the FERC Determination. The subsequent study dispute notices and study disputes filed by three agencies also required significant additional attention from the same study plan teams involved in the Workshops. For these reasons, the Districts made the decision to keep the W&AR-5 Workshops on the original schedule, but to provide additional time preparing for and between Workshops No. 1 and No. 2 for W&AR-6 and -10. The schedule for the final report for these two studies remains unchanged.

In addition to the comments above, Conservation Groups submitted nine citations to reports and analyses (Attachment D), including citations to direct testimony used in the 2009 ALJ Proceedings as well as materials submitted as part of the 2008 biennial review of water quality information in support of the California Central Valley Regional Water Quality Control Board's Integrated Report pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act. In addition to the recommended substitution of the 2009 peer-reviewed literature version of the Zimmerman et al 2008 data report on *O. mykiss* anadromy, the supplied citations include the USFWS (2008) overbank flow analyses, the USFWS (2008) Draft Limiting Factor analysis for Tuolumne River salmonids, as well as several documents related to attainment of water temperature standards by CDFG. Although evaluation of historical water temperature data with respect to various water temperature standards is the subject of a separate Temperature Criteria Assessment for Chinook Salmon and *O. mykiss* (W&AR-14), all of the referenced information provided by Conservation Groups will be reviewed for primary data sources for use in this Synthesis Study.

Comments by U.S. Fish and Wildlife Service

In an e-mail of May 7, 2012 (Attachment E), USFWS provided six citations to reports on factors affecting Tuolumne River and Central Valley salmonids, hyperlinks to annual data reports on Tuolumne River rotary screw trap monitoring, as well as hyperlinks to Mossdale trawl data on the lower San Joaquin River. All of the referenced information provided by USFWS will be reviewed for primary data sources for use in this Synthesis Study.

Sincerely,

John Devine

John Devine, P.E.
Project Manager

Attachment A
Final Meeting Notes
W&AR-5 Salmonid Information Synthesis Workshop No. 1

Don Pedro Project Relicensing
W&AR-5 Salmonid Information Synthesis Workshop No. 1
Final Meeting Notes

Tuesday, April 10, 2012

Attendees

Peter Barnes - State Water Resources Control Board (SWRCB), *by phone*	Bill Johnston - MID
Jenna Borovansky - HDR	Patrick Koepele - Tuolumne River Trust (TRT)
Steve Boyd - Turlock Irrigation District (TID)	Ellen Levin - CCSF, *by phone*
Allison Boucher - Friends of the Tuolumne (FOT), *by phone*	Carin Loy - HDR
John Devine – HDR	Mike Maher - SWRCB
Greg Dias - Modesto Irrigation District (MID)	Annie Manji - California Department of Fish and Game (CDFG), *morning only*
Karl English - LGL Limited	Bob Nees - TID
Donn Furman - City and County of San Francisco (CCSF)	Tim O'Laughlin - MID, *by phone*
Art Godwin – TID	Dale Stanton - CDFG, *morning only*
Bethany Hackenjos – Stillwater	Joy Warren - MID
Noah Hume – Stillwater	Scott Wilcox - Stillwater
Zach Jackson - U.S. Fish and Wildlife Service (FWS)	Ron Yoshiyama - CCSF

Introductions and Background – 10:30 AM to 11:00 AM

1. John Devine made introductions, described the workshop consultation process developed in response to the FERC Study Determination, and emphasized the overall purpose of the meeting was to:

   - reach agreement on information to used in the synthesis study, and
   - provide an opportunity for relicensing participants to propose additional literature and data sources for use in this synthesis study.

2. Noah Hume provided an overview of the W&AR-5 study plan, described the relationship to other salmonid studies (i.e., population model development under studies W&AR-6 and W&AR-10), and discussed recommendations adopted from the FERC Study Determination.

- Study Plan Overview and Relationship to Other Studies - *See November 22, 2011 Revised Study Plan, Study Process Diagram (Attachment 1), and meeting overview slides (Attachment 2).*

- Recommendations adopted from FERC Study Determination:

    i. Address association between flows, water temperature, habitat conditions, predation, and response of in-river salmonid life-stages – *To be addressed by this W&AR-5 synthesis, as well as development of associated population models in studies W&AR-6 and W&AR-10.*

    ii. Establish an efficient structure for consultation – *See consultation process described as part of the March 20, 2012 Consultation Workshop held at MID offices (Attachment 3).*

    iii. Adopt guidelines similar to the June 2011 Salmonid Integrated Life Cycle Model (ILCM) Workshop - *See meeting overview slides (Attachment 2)*

    iv. Describe how interested participants and Turlock Irrigation District and Modesto Irrigation District (collectively, the Districts) would achieve consensus on issues – *See consultation process described as part of the March 20, 2012 Consultation Workshop (Attachment 3).*

    v. Make information available to participants (on electronic media) for review – *See workshop materials e-mailed to Relicensing Participants (RP) by Rose Staples (HDR) on April 2, 2012 (Attachment 4).*

    vi. Allow additional workshops as necessary – *As discussed in the March 20, 2012 Consultation Workshop, the need for additional workshops will be determined as issues arise within the scheduled workshops.*

3. Noah Hume discussed the W&AR-5 Study reference list (Attachment 4), which updates the preliminary reference list originally distributed on January 17, 2012. Only 4-5 new citations were included in the reference list and up-to-date literature compilations were made available to meeting attendees on CD-ROM (Revision 2 dated April 2012). In addition, criteria for assessing relevancy of existing data and reports for inclusion in the W&AR-5 study were presented and discussed (Attachment 5).

Overview of Don Pedro Fish Study Programs – 11:00 AM to 12:00 PM

1. Noah Hume presented an overview of fish monitoring and studies required under various FERC Orders from 1971 to the present, including additional fish monitoring and studies by the Districts, fish resource agencies, Tuolumne River Technical Advisory Committee

(TRTAC), and various habitat restoration project monitoring by CALFED and local non-governmental organizations – *See monitoring summary (Attachment 6).*

2. Allison Boucher highlighted a change in sampling designs in the annual snorkel surveys in the early 2000s that may have resulted in higher relative abundance than in the period 1982–2000. Noah Hume agreed and suggested these data, termed "reference count" surveys, were to be used to establish presence/absence and river-wide distribution in various years, and only the 2008–2011 population estimate surveys would be used to assess abundance. [Not discussed at the meeting, Ford and Brown (2001) provide a summary of changes in methods and gear types in various historical salmonid monitoring efforts.]

3. Donn Furman asked whether or not it would be helpful to look at the status of other fish species to determine overall health of the river. Noah Hume referred to the citation list item Brown and Ford (2002), which examined changes in native and nonnative fish species distribution in various years and water year types.

4. At the conclusion of the presentation, John Devine solicited additional reference materials not included in the list distributed to RPs. Patrick Koepele suggested the Districts should review the reference materials provided by Conservation Groups during the development of the Pre-Application Document (PAD) in 2010.

Action Item: The Districts will review references submitted by Conservation Groups during development of the PAD for consideration in the W&AR-5 information synthesis.

Action Item: Relicensing Participants will review the existing reference list and suggest any additional references for inclusion in the W&AR-5 information synthesis within 30 days (May 10, 2012).

Lunch Break – 12:00 PM to 1:00PM

Discussion of Issues Affecting Tuolumne River Salmonids – 1:00 PM to 2:30 PM

1. RPs were asked to identify specific issues affecting various life stages of Tuolumne River salmonids and any supporting information that could be provided. Because no issues affecting salmonids were raised during this meeting, Noah Hume suggested organization of an informal discussion by life stage to facilitate Relicensing Participant input on additional data sources or concerns.

2. Noah Hume suggested that the W&AR-5 report would be generally organized by life stage. Based on this, he led a broad discussion of various potential issues identified in historical monitoring documents, primarily discussing Chinook salmon:

    - Upstream Migration – Potential issues are primarily related to historical water quality concerns in the Sacramento San-Joaquin Delta (Delta), specifically low dissolved oxygen (DO) at the Stockton Deepwater Ship Channel (DWSC), as well as more recent concerns regarding water temperature raised in recent SWRCB 303(d) listings.

        - Noah Hume suggested that the Hallock et al. (1970) study was the only historical document examining water quality barriers to migration with only anecdotal information related to either pre-spawn mortality of up-migrating fish or reduced viability following egg deposition.

        - Art Godwin described current Total Maximum Daily Load (TMDL) efforts to control nutrients in the Delta (Denitrification at the Stockton Wastewater Treatment Plan) and DO (temporary barriers [i.e., the DO bubbler]).

        - Karl English asked if there were any other mechanisms in place. Noah Hume suggested that Vernalis flows in excess of 2,000 cubic feet per second (cfs) were shown to be effective in dispersing algae and low DO at the Stockton DWSC, and speculated that this may underlie decisions related to the application of fall attraction flows.

    - Spawning – Potential issues are well documented as they relate to spawning gravel availability and gravel quality.

        - Noah Hume discussed changes in redd distribution since the 1997 floods, apparent losses in spawning gravels, changes in redd superimposition, and the results of various redd trapping and survival-to-emergence studies. There are no data to indicate water temperature is affecting egg survival.

        - Karl English suggests that flows are not changing gravel quality until a flood event. Noah Hume says current estimates were that 3,000 to 4,000 cfs would be required to mobilize the gravels in the spawning reach.

        - Donn Furman asked about the relative contributions of the Tuolumne, Stanislaus, and Merced rivers to the overall spawning populations. Noah Hume responded that the Tuolumne River had historically contributed greater numbers, with these numbers falling in recent years, perhaps due to greater relative contributions of hatchery fish from the Merced River Fish Facility. Zack Jackson cautioned that current runs were lower than

historical returns. Tim O'Laughlin stated that the current runs are dominated by hatchery returns in all tributaries, citing the results of the "2012 Constant Fractional Marking Report" released by CDFG.

- Fry Production – Potential issues are well documented as they relate to gravel predation, with potential issues related to food availability.
    - Noah Hume stated that extensive seine data, recent rotary screw trap (RST) data, and predation studies have been conducted. Some invertebrate and feeding studies have been conducted, but comprehensive benthic macroinvertebrate data are limited to summer sampling periods. Karl English suggested that the RST data would provide the basis for calibration/validation of the population models.
- Smolt Production – Like fry and juveniles, potential issues relate to gravel predation and water temperature during outmigration.
    - Noah Hume stated that extensive, recent RST monitoring is available, as well as several predation and smolt survival studies. Karl English asked how predation would be incorporated. Noah Hume responded that this would likely be as a flow-based regression, either based upon the historical coded-wire tag evaluation by the TRTAC, or information from the ongoing predation study (W&AR-7).
    - Noah Hume pointed to the extensive amounts of pool habitat resulting from historical mining that underlies the predation issue. John Devine asked whether any channel realignment had been considered in the past. Allison Boucher described the re-working of the floodplain near La Grange as part of the construction of the Don Pedro Project and partially funded under the Davis-Grunsky Act, authorized in 1960 as part of the Burns-Porter Act.
    - Karl English suggested a potential relationship between hatchery fish recoveries in RST data and the relative proportion of "Jacks" in the spawner population.

Next Steps and Closure – 2:30 PM to 2:45 PM

1. John Devine summarized Action Items from the meeting. He noted that it will be most helpful if RPs provide any additional references within the next 30 days as the study will move toward developing preliminary conceptual models for the upcoming workshop in June.

2. Action Items:

    - The Districts will review references submitted by Conservation Groups during development of the PAD for consideration in the W&AR-5 information synthesis.

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3. Next Workshop: June 26, 2012 at MID Offices.

Attachment B
Draft Meeting Notes and Workshop Materials
W&AR-5 Salmonid Information Synthesis Workshop No. 1

Don Pedro Project Relicensing
W&AR-5 Salmonid Information Synthesis Workshop No. 1
Draft Meeting Notes – For Relicensing Participant Review

Tuesday, April 10, 2012

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2. Action Items:

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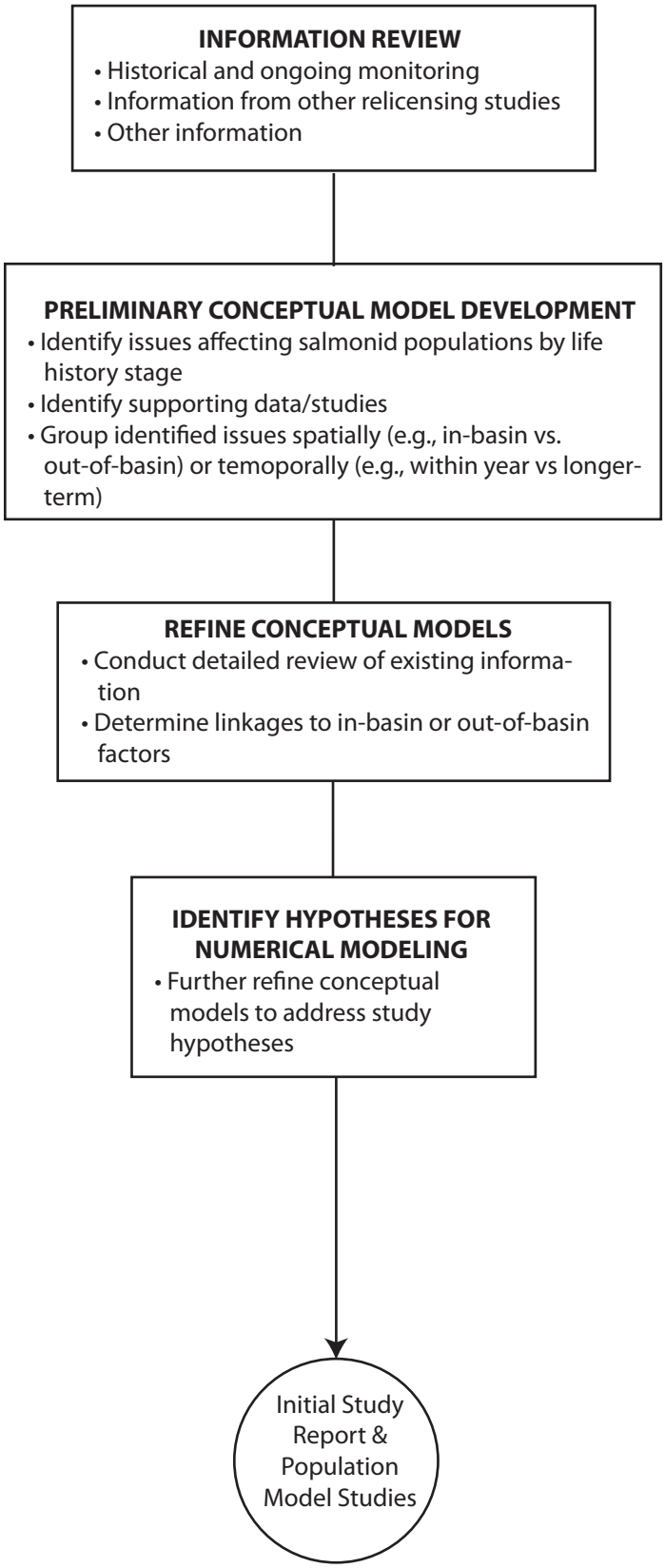
    - Districts will provide draft meeting notes. RPs to provide any comments or corrections to these study notes within 30 days of distribution.

3. Next Workshop: June 26, 2012 at MID Offices.

Attachment 1
W&AR -5 Study Process Diagram

Salmonid Information Synthesis Study Process



Attachment 2
April 10, 2012 Meeting Overview

Agenda/Overview

Introductions and Background

1. Purpose of Meeting
2. Overview of Study Plan and FERC Determination
3. Relationship to other studies
4. ILCM Workshop Process Recommendations

Don Pedro Fish Study Programs

1. Article 39 Study Program
2. 1986 Amended Fish Study Agreement
3. 1991 Article 39 Twenty-Year Fish Study Report
4. 2005 10-Year Summary Report
5. Monitoring under 2008 and 2009 Orders

Discussion of Issues Affecting Tuolumne River Salmonids

Next Steps and Closure

Introduction

Workshop No. 1 Purpose

Study Plan Overview and Relationships to other Studies

- Information Review (Study Plan Step 1)
- Conceptual Model Development (Study Plan Step 2)
- Hypotheses for Numerical Modeling (*W&AR-6 and -10 population modeling*) (Study Plan Step 2)

FERC Study Determination

ILCM Workshop Process Recommendations

Introduction

FERC Study Determination Recommendations

1. Address association between flows, water temperature, habitat conditions, predation, and response of in-river salmonid life-stages
2. Establish an efficient structure for consultation (March 20, 2012 Consultation Workshop)
3. Adopt guidelines similar to the June 2011 Salmonid Integrated Life Cycle Model Workshop (See next)
4. Describe how interested participants and the Districts would achieve consensus on issues (See Consultation Workshop process)
5. Make available sufficient information (on electronic media) for review.
6. Allow additional workshops as necessary.

Introduction

ILCM Workshop* Process Recommendations

- Standardized glossary of terms
- Tailor presentations/documentation to audience
- Peer review panel to provide feedback and advice (*Not formally adopted*)
- Develop any model as series of iterative steps from the questions to the formulation of the new model
- Transparency of available data used in calibration and validation
- Parallel data synthesis effort

* Rose, K., J. Anderson, M. McClure and G. Ruggerone. 2011. Salmonid Integrated Life Cycle Models Workshop. Report of the Independent Workshop Panel. Prepared for the Delta Stewardship Council.

Attachment 3
March 20, 2012 Consultation Workshop Process Materials

DRAFT
WORKSHOP CONSULTATION PROCESS
ON INTERIM STUDY PLAN DECISIONS

As part of certain studies to be undertaken in the Don Pedro Project relicensing, the Districts had proposed a series of workshops to share and discuss relevant data with Relicensing Participants (RPs). FERC has recommended that the Workshop Consultation process be formalized. In accordance with Appendix B of FERC's December 22, 2011 Study Plan Determination, the draft workshop consultation process outlined below has been developed to provide guidance for the decision-making process involved within the following study plans:

- W&AR-2 (Project Operations Model): Hydrology Workshop
- W&AR-5 (Salmonid Population Information Synthesis): Literature/Data Review Workshop and Conceptual Model Review Workshop
- W&AR-6 (Chinook Population Model): Conceptual Model Review Workshop and Modeling Approach Workshop
- W&AR-10 (*O.Mykiss* Population Model): Conceptual Model Review Workshop and Modeling Approach Workshop
- W&AR-14 (Temperature Criteria Assessment): Water Temperature Evaluation Criteria Workshop

The purpose of the eight workshops is to provide opportunity for RPs and the Districts to discuss relevant data sources, methods of data use and development, and modeling parameters at key points in the execution of these study plans. The goal of the workshops is for RPs and the Districts to reach agreement where possible after thorough discussion of data, methods and parameters. Consensus on decisions dealing with data acceptability, or study approaches or methods can only be achieved by the active and consistent in-person attendance and participation of interested Relicensing Participants. Additional workshops beyond those already specified above may be held as agreed to between the RPs and the Districts.

FERC has also directed the Districts to formalize the workshop process to define how interim decisions on model inputs and parameters will be made. To promote clear communication and informed participation, the Districts will make a good-faith effort to provide two (2) weeks before each workshop, in electronic format, information and presentation materials to be discussed at the workshops. For studies that involve resource modeling, presentation materials will be tailored to the audience at a level that assumes familiarity with the resource issues being addressed. To promote a common understanding of terms, a glossary of definitions will be prepared prior to each initial workshop, updated and expanded upon periodically, and included in the final study report. Prior to the initial workshops, the Districts will also prepare a logic diagram of the study steps from data selection through model development and numerical procedures to model scenario evaluation. This study "process diagram" will aid in promoting a common understanding of the step-wise approach being used in model development.

Following each workshop, draft meeting notes of the consultation workshop will be distributed to participants within approximately eight (8) working days. The notes will identify areas where participants reached agreement on data, methods and/or parameters, areas where there is disagreement among participants, and action items for any future meetings. Following a 30-day

comment period, the Districts will file with FERC a revised version of the consultation workshop notes describing areas of agreement, areas where agreement was not reached, copies of comments received, a discussion of how the Relicensing Participant comments and recommendations have been considered by the Districts, as well as the rationale for the Districts not adopting any Relicensing Participants recommendations.

The proposed schedule for workshops is included below. All meetings will be held at MID offices in Modesto.

March 2012
Mar 20 - 1:30 pm – 4:30 pm
Don Pedro Project Relicensing - Workshop on Consultation Process (as per Appendix B of FERC's Study Plan Determination)

April 2012
Apr 09 - 1:00 pm - 5:00 pm
Don Pedro Project Relicensing - Hydrology Workshop (W&AR-2)

Apr 10* - 10:30 am - 5:00 pm Don Pedro Project Relicensing - Salmonid Population Information Workshop (W&AR-5)

Apr 11 - 9 am – 12:00 pm Don Pedro Project Relicensing – Temperature Criteria Workshop (W&AR-14)

June 2012
Jun 26 - 9:00 am - 4:00 pm Don Pedro Project Relicensing - Salmonid Population Information Workshop (W&AR-5)

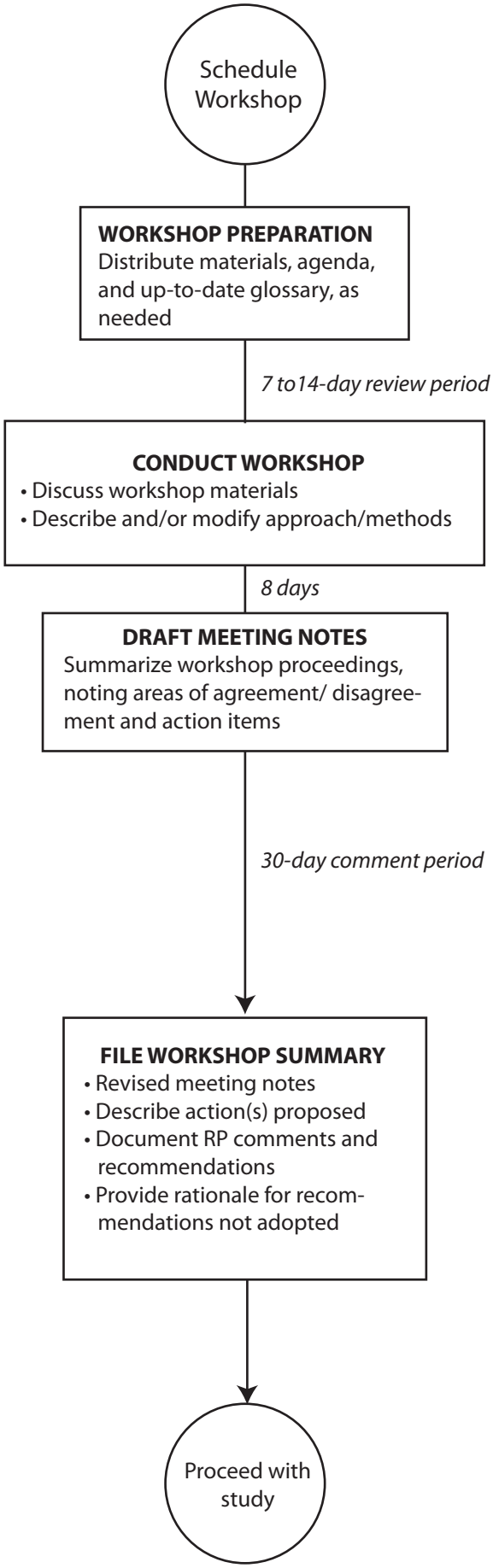
November 2012
Nov 15 - 9:00 am - 4:00 pm Don Pedro Project Relicensing - Chinook Population (W&AR-6) and O.mykiss Population (W&AR-10) Modeling Workshop

2013 (Dates to be determined)

March 2013 (preliminary) - 9 am to 4 pm Don Pedro Project Relicensing - 2nd Workshop Chinook Population (W&AR-6) and O.mykiss Population (W&AR-10) Modeling

***NOTE:** From 8:30 am to 10:15 am, the Districts will conduct an introduction to the MIKE3 reservoir temperature model for use in W&AR-3. The goal is to introduce the model platform, computation methods, model development, and data sources. This is not considered a formal workshop. The Districts are also planning to conduct a discussion and presentation of the reservoir temperature model validation results at a Relicensing Participant Meeting on September 18, 2012 from 9 am to 4 pm at MID. Please add this meeting to your calendars.

Workshop Consultation Process Diagram



Attachment 4
Workshop Materials Transmitted by e-mail on April 2, 2012

Salmonid Information Synthesis Workshop No. 1
Don Pedro Relicensing Study W&AR-5
April 10, 2012 – 10:30 a.m. to 5:00 p.m. - MID Offices

Conference Line Call-In Number 866-994-6437; Conference Code 5424697994

AGENDA

10:30 a.m. – 11:00 a.m.	**Introductions and Background** 1. Purpose of Meeting 2. Overview of Study Plan and FERC Determination 3. Relationship to other studies 4. ILCM Workshop Process Recommendations
11:00 a.m. – 12:30 p.m.	**Overview of Don Pedro Fisheries Programs** 1. Article 39 Study Program 2. 1986 Amended Fish Study Agreement 3. 1992 Article 39 Twenty-Year Fish Study Report 4. 2005 10-Year Summary Report under 1996 FERC Order 5. Ongoing Fisheries Monitoring
12:30 p.m. – 1:00 p.m.	**Lunch**
1:00 p.m. – 4:00 p.m.	**Discussion of Issues Affecting Tuolumne River Salmonids** 1. Supplements to January 2012 References 2. Relicensing Participants assessment of major issues affecting salmonid populations by species and life stage 3. Identify preliminary Conceptual Models
4:30 p.m. – 5:00 p.m.	**Next Steps and Closure**

Preliminary Reference List
Updated March 27, 2012

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Appendix 4: Instream flow data processing Tuolumne River, California. Prepared by Robert E. Meyer Consultants, Inc. August 1984

Appendix 5: Analysis of 1981 lower Tuolumne River IFIM data. Prepared by EA Engineering, Science and Technology. November 1991

Appendix 6: Lower Tuolumne River spawning gravel availability and superimposition report. Prepared by EA Engineering, Science and Technology. February 1992

Appendix 7: Lower Tuolumne River Chinook salmon redd excavation report. Prepared by EA Engineering, Science and Technology. November 1991

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Appendix 11: An evaluation of the effect of gravel ripping on redd distribution in the Lower Tuolumne River. Prepared by EA Engineering, Science and Technology. November 1991

Appendix 12: Data results: Seining of juvenile Chinook salmon in the Tuolumne, San Joaquin and Stanislaus Rivers, 1986-1989. Prepared by EA Engineering, Science and Technology. August 1991

Appendix 13: Preliminary juvenile salmon study: Report on sampling of Chinook salmon fry and smolts by fyke net and seine in the Lower Tuolumne River 1973-1986. Prepared by EA Engineering, Science and Technology. November 1991

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Appendix 16: Aquatic invertebrate studies report. Prepared by EA Engineering, Science and Technology. November 1991

Appendix 17: Preliminary Tuolumne River water temperature report. Prepared by EA Engineering, Science and Technology. November 1991

Appendix 18: Lower Tuolumne River instream temperature model documentation: Description and calibration. Prepared by EA Engineering, Science and Technology. November 1991

Appendix 19: Modeled effects of La Grange releases on instream temperatures in the Lower Tuolumne River. Prepared by EA Engineering, Science and Technology. September 1991

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Appendix 21: Possible effects of high water temperature on migrating Chinook salmon (Oncorhynchus tshawytscha) smolts in the San Joaquin River System. Prepared by EA Engineering, Science and Technology. November 1991

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Appendix 24: Effects of introduced species of fish in the San Joaquin River system. Prepared by EA Engineering, Science and Technology. November 1991

Appendix 25: Preliminary summary smolt survival index study. Prepared by Loudermilk, Fjelstad, Neillands, Wingett, Della Valle, Presher and Traylor, California Department of Fish and Game. July 1987

Appendix 26: Export mortality fraction submodel. Prepared by EA Engineering, Science and Technology. February 1992

Appendix 27: Tuolumne River summer flow study report 1988-1990. Prepared by EA Engineering, Science and Technology. November 1991

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General Criteria for assessing relevancy of existing data and reports for inclusion in the W&AR-5 Salmonid Information Integration and Synthesis Study

From the W&AR-5 Study Plan

"Information from previously conducted monitoring of Chinook salmon populations in the lower Tuolumne River will be supplemented with compilations of other relevant biologic, hydrologic, physical habitat, and water quality data information."

"The highest priority will be given to data and reports specific to the lower Tuolumne River, then to data and reports related to the San Joaquin and its major tributaries. Information from broader sources may be used to address specific data or information gaps identified as part of this process."

"A preliminary list of existing information included in the PAD will be provided to Relicensing Participants for review and …. will be updated in advance of a workshop (Section 6.0), with an opportunity for Relicensing Participants to provide additional relevant information following the workshop."

From the Preliminary Workshop 1 Materials transmittal of January 17, 2012

"These references provide information on factors affecting salmonid populations in the lower Tuolumne River. General salmonid life history references, as well as Tuolumne River specific information are included. The Districts would like to emphasize that the attached reference set is intended as an initial background survey of available information and some, or portions of some, of these references may not ultimately be required to be included in the final study report. In the course of this study, the reference list will be revised and/or supplemented as required in advance of the initial or subsequent workshops. Also, additional data resources will be reviewed and incorporated, if needed."

From the above, the semi-formal criteria for inclusion in the study are:

1. Literature should provide data or present findings using basin-specific data regarding issues affecting Tuolumne River salmonids.
2. Information from broader sources will be included if they address information needs not met from Tuolumne River specific information.
3. While not excluding documents that have not been peer-reviewed, peer-reviewed publications will be given priority over non-peer-reviewed publications.
4. Draft publications will be given a low priority and require a thorough examination of any analyses supporting a Draft report's conclusions.
5. Reports developed in response to various FERC Orders are considered acceptable for the purposes of characterizing factors affecting in-river life stages.

Attachment 5
Criteria for assessing relevancy of existing data and reports for inclusion in the W&AR-5 Study

General Criteria for assessing relevancy of existing data and reports for inclusion in the W&AR-5 Salmonid Information Integration and Synthesis Study

From the W&AR-5 Study Plan

"Information from previously conducted monitoring of Chinook salmon populations in the lower Tuolumne River will be supplemented with compilations of other relevant biologic, hydrologic, physical habitat, and water quality data information."

"The highest priority will be given to data and reports specific to the lower Tuolumne River, then to data and reports related to the San Joaquin and its major tributaries. Information from broader sources may be used to address specific data or information gaps identified as part of this process."

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1. Literature should provide data or present findings using basin-specific data regarding issues affecting Tuolumne River salmonids.
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4. Draft publications will be given a low priority and require a thorough examination of any analyses supporting a Draft report's conclusions.
5. Reports developed in response to various FERC Orders are considered acceptable for the purposes of characterizing factors affecting in-river life stages.

Attachment 6
Historical Salmonid Monitoring Summary

Don Pedro Fish Study Programs

New Don Pedro Project
FERC Project No. 2299

1972 Cooperative Article 39 fish study program (TID/MID/CDFG)

1986 Amended Article 39 studies, added Article 58 monitoring (TID/MID/CDFG/USFWS)

1991 Article 39 20 Year Study Report

1996 Amended Article 58 (1995 FSA: TID/MID/CDFG/USFWS/CSPA/FOT/TRE/TRPT/BAWUA)

2005 10-Year Summary Report

2008 FERC accepts 2005 10-Year Summary Report, additional Article 58 monitoring/*O. mykiss* studies

2009 Rehearing and ALJ Process/WT and IFIM studies

Don Pedro Fish Study Programs

Article 39 Fish Study Program (1971-1986)

- Annual spawning surveys, redd counts, sex composition
- Habitat transect surveys, air photos, temperature monitoring (3 normal and 3 dry year releases)
- Gravel condition, plant encroachment, BMI productivity (every 3 years)
- Flow fluctuation effects on redd dewatering and egg loss (5 times)
- Outmigrant timing (2 yrs normal flow, 2 yrs dry flow, 2 yrs flushing flow)

Don Pedro Fish Study Programs

1986 Amended Article 39 Fish Studies (1987-1996)

- IFIM Studies (Depth, Velocity, Substrate) for spawning, fry, and juvenile life stages
- Temperature monitoring
- Flow fluctuation effects on juvenile salmon and BMI
- Outmigrant timing (2 yrs normal flow, 2 yrs dry flow, 2 yrs flushing flow)
- Paired release smolt-survival studies (6 years)
- Spawning surveys, live and redd counts/distribution, sex composition, length-frequency distribution, spawning population estimate
- Juvenile salmon study (seining) in conjunction with CWT releases

Don Pedro Fish Study Programs

1996 Article 58 Monitoring (1997-2004)

- Spawning Surveys (No., size distribution, scale/otolith sampling)
- Quality and Condition of Spawning Habitat (gravel quality, survival to emergence)
- Relative Fry Density/Female Spawners (seine and spawner data)
- Fry Distribution and Survival (flow fluctuation)
- Juvenile Distribution and Temperature Relationships (seining)
- Smolt Survival (additional CWT studies)

Don Pedro Fish Study Programs

Monitoring Under 2008 and 2009 FERC Orders

- *O. mykiss* population estimates (2008-2011)
- *O. mykiss* tracking (2010-2011)
- *O. mykiss* anadromy (not completed)
- Water temperature modeling (2011)
- IFIM and 2D Floodplain Study (in progress)

Don Pedro Fish Study Programs

Tuolumne River monitoring/study reporting periods

- Spawning Surveys (1971 – present), Weir Counts (2009 – present), and Redd Distribution Studies (1996, 2012)
- Gravel Studies (1987 – 1989, 1991 – 1993, 2000) and BMI monitoring (1989 – 1993, 1996, 2002 – 2009)
- Fyke Net/Seine Surveys (1973 – 2012) and RST Monitoring (1995 – present)
- Fluctuation and Stranding Assessments (1992, 1996 – 2002)
- CWT Smolt Survival (1992, 1996, 1998 – 2007) and Predation Studies (1992, 2006, 2012)
- *O. mykiss* riverwide distribution (1986 – 2011), population (2008-2011), and tracking (2010 - 2011)
- Water Temperature Monitoring (1987 – present) and modeling (1992 [1978 – 1988 data]; 2011 [1999 – 2008 data]; 2012 [1999 – 2011 data])
- IFIM (1981, 1992, 1995, 2012)

Other Studies

Tuolumne and San Joaquin River basin Chinook salmon Population Models (1992, 1996)

Resident Fish Community Assessments (1988 - 1994, 2001) show 38 species in 15 families, including 14 native spp. in 7 families

Tuolumne River Restoration Plan (2001)

Tuolumne River Coarse Sediment Management Plan (2004)

Fine Sediment Studies (Gasburg and Dominici Cr. Sources, 1992-1993 gravel cleaning analysis, survival-to-emergence)

TRTAC and other Restoration Project Monitoring (various)

Others

Attachment C
California Dept. of Fish and Game comments regarding the April 10, 2012 Salmonid Information Synthesis Workshop

State of California -The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
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EDMUND G. BROWN JR., Governor
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May 16, 2012

Robert Nees
Turlock Irrigation District
Post Office Box 949
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Greg Dias
Modesto Irrigation District
Post Office Box 4060
Modesto, California 95352

Subject: Turlock and Modesto Irrigation District's April 10, 2012 Salmonid Information Synthesis Workshop Don Pedro Hydroelectric Project (FERC Project No. 2299-075) Tuolumne River, California

Dear Messrs. Nees and Dias:

Representatives from the California Department of Fish and Game (Department) attended the morning session of the subject workshop hosted by the Turlock and Modesto Irrigation Districts (Districts) as part of Water and Aquatic Resources Study Plan (W&AR-5) Salmonid Information Synthesis, for the Don Pedro Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 2299-075 (Project). The Department has also reviewed the associated draft meeting notes prepared and distributed by the Districts. The Department provides the following comments in response to the salmonid information synthesis workshop and draft meeting notes.

Workshop and Draft Meeting Note Comments

The Department acknowledges the Tuolumne River watershed has been the subject of multiple fish studies and monitoring programs for well over 20 years. To synthesize this body of work into a single report identifying key hypotheses and areas of uncertainty, as well as assigning relative importance to limiting factors, will be a major undertaking. Such an effort will require many choices and will ultimately be shaped by the perceptions of the author(s). Different parties will likely have different opinions as to what data are "most appropriate" to be carried forward into subsequent analyses. Given

the variety of Relicensing Participants interested in this Project, the objective of achieving consensus on conclusions about the "in-river factors thought to be of greatest importance to salmonid population levels in the basin" may be overly optimistic.

As context, we refer to FERC's appointment of an Administrative Law Judge (ALJ) in 2009 to conduct an expedited, non-adversarial fact finding proceeding to evaluate possible interim measures to benefit the Tuolumne River salmonid populations and develop a more complete factual record. As part of the ALJ proceeding, the Department provided testimony that synthesized existing data and provided key hypotheses concerning in-river factors thought to be of greatest importance to the Tuolumne's salmonid populations. Other parties to the ALJ proceeding, namely the Districts, the City and County of San Francisco (CCSF), the Bay Area Water Users Association (BAWUA), fellow Resource Agencies and Conservation Groups, also filed testimony. On November 20, 2009, the ALJ issued her final report. The Districts, CCSF and BAWUA all filed comments in support of the judge's report while the Resource Agencies and Conservation Groups jointly filed comments in opposition to the judge's report.

As the April 19, 2012 Commission Order[1] notes: ". . . the testimony confirms that conflicting evidence exists on each topic" with parties disagreeing as to what "certain evidence was more probative than other evidence" (paragraph 57, page 16). The Order also notes the ALJ proceeding ultimately ended without agreement among the parties as to whether or not there was even a need for interim measures (paragraph 32, page 10). It is unclear to the Department how this current study plan effort involving essentially the same parties with access to the same information will now achieve consensus on what are the most appropriate elements of the existing data and literature.

However, given FERC's determination that this study should go forth, some key hypotheses and conclusions prepared by the Department are reiterated here. Based on Department experience within the watershed, we conclude the Project's manipulation of flows (particularly spring flows), and the Project's role in elevating water temperatures are two fundamental limiting factors contributing to the current decline of anadromous fish populations on the Tuolumne River. The following statements, taken from the Direct Testimony of two Department representatives before the ALJ, are provided in a format intended to complement the broad issues and life stage organization of the

[1] Turlock Irrigation District and Modesto Irrigation District, Order Clarifying Proceeding On Interim Conditions, 139 FERC ¶ 61,045 (2012).

W&AR-5 draft meeting notes. Copies of the complete testimonies which synthesize field data and ecological concepts from a variety of sources are attached for reference.

Excerpts from the Direct Testimony of Mr. Timothy Heyne, Senior Environmental Scientist with the Department's anadromous fishes program in the San Joaquin River, (Department's Exhibit 2 for Project No. 2299, filed on September 14, 2009 with FERC's Secretary):

- "[c]urrent flow releases to the lower Tuolumne River required under Article 37 of the Project license are insufficient to conserve fall-run Chinook salmon and steelhead" (page 2).

- "The single most important impact of Project operations affecting anadromous fish populations is the manipulation of flows in the Tuolumne River" (page 4).

- "Providing more flow to the river at specific times of the year will improve habitat and water temperature for fall-run Chinook and steelhead" (page 7).

- Inadequate spring flows "have been identified repeatedly as the principle limiting factor on fall-run Chinook salmon populations in the Tuolumne River" (page 14).

Excerpt from the Direct Testimony of Dr. Andrew Gordus, Water Quality Biologist with the Department's Central Region (Department's Exhibit 4 for Project No. 2299, also filed with FERC's Secretary on September 14, 2009):

- "Elevated water temperatures contribute to the ongoing decline [of] fall-run Chinook salmon in the Tuolumne River by: 1) inducing adult mortality as adults migrate into the San Joaquin River and adjacent tributaries to spawn (i.e,. pre-spawn mortality); 2) reducing egg viability for eggs deposited in stream gravels; 3) increasing stress levels, thereby reducing survival of juveniles within the tributary nursery habitats; and 4) reducing salmon smolt out-migration survival as smolts leave the nursery habitats within the tributaries to migrate down the San Joaquin River to Vernalis and through the south Delta" (page 12).

References Not Included in the W&AR-5 Study Plan or Workshop Materials

In support of the preceding statements, Mr. Heyne and Dr. Gordus provided numerous references in their respective testimonies. Some of the sources they cited are contained in the references of the W&AR-5 study plan or the workshop materials, but some are not. Below is a list of the subject references we did not find listed in the study plan or workshop materials. Again, these references were filed on September 14, 2009 by the Department as Exhibits in the docket for Project No. 2299 and are available in their entirety on FERC's website.

California Department of Fish and Game. 1987. The Status of San Joaquin Drainage Chinook Salmon Stocks, Habitat Conditions and Natural Production Factors.

California Department of Fish and Game. 2009. Tuolumne River Water Temperature and Chinook Salmon. Tables 1 through 4. 8 pp.

Central Valley Regional Water Quality Control Board. 2009a. Draft 2008 California 303(d)/305(b) Integrated Report-Supporting Information for Regional Board 5-Central Valley Region. Staff Report to the California Central Valley Regional Water Quality Control Board Documenting Evidence to List Water Temperature as Impaired in the Tuolumne River. (excluding appendices)

Central Valley Regional Water Quality Control Board. 2009b. Clean Water Act Section 305(b) and 303(d) Integrated Report for the Central Valley Region-May 2009 Draft Final Report, Appendix A. Staff Report to CVRWQB Regarding Proposed Additions to and Deletions from the 303(d) list for the Central Valley Region.

Fuller, A. and C. Sonke. 2006. Report 2006-5: 2006 Lower Tuolumne River Annual Report - Rotary Screw Trap Summary Update.

Jager, H., H. E. Cardwell, M. J. Sale, M. S. Bevelhimer, C. C. Coutant, W. Van Winkle. 1997. Modelling the linkages between flow management and salmon recruitment in rivers. Ecological Modelling 103 (1997) 171-191.

Jeffres, C.A., J.J. Opperman, and P.B. Moyle. 2008. Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in a California river. Environ Biol Fish (2008) 83:449-458 DOI 10.1007/s10641-008-9367-1.

Marston, D., T. Heyne, A. Hubbard, W. Getz, L. Rachowicz, M. Daugherty, A. Dotan, I. Mlaker and R. Starfield. 2008. California Department of Fish and Game San Joaquin

River Fall-run Chinook Salmon Population Model Peer Review: Response to Peer Review Comments Initial Response. California Department of Fish and Game Report to the California State Water Resources Control Board.

Marston, Dean D. 2005. FINAL DRAFT 11-28-05 San Joaquin River Fall-run Chinook Salmon Population Model. San Joaquin Valley Southern Sierra Region November 2005.

Mesick, Carl. 2008. The Moderate to High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Tuolumne River due to Insufficient Instream Flow Releases. USFWS Report.

Myrick, C. and J. Cech Jr. 2001. Temperature Effects on Chinook Salmon and Steelhead: A Review Focusing on California's Central Valley Populations. Bay Delta Modeling Forum Technical Publication 01-1.

National Marine Fisheries Service. 2009. Tuolumne River Salmonid Habitat Mapping, Figures 1 through 4.

Newman, K. 2008. An Evaluation of Four Sacramento-San Joaquin River Delta Juvenile Salmon Survival Studies. Report to the CalFed Science Program (Project Number SCI-06-G06-299).

Rich, A. A. 2007. Impacts of water temperature on fall-run Chinook salmon (Oncororhynchus tshawytsca) and steelhead (O. mykiss) in the San Joaquin River system. A. Rich and Associates. Fisheries and Ecological Consultants. San Anselmo, California 94960.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. Canadian Journal of Fisheries and Aquatic Sciences 58:325-333.

United States Environmental Protection Agency (EPA). 2003. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. 49 pp.

Yoshiyama, R.M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2001. Historical and Present Distribution of Chinook Salmon in the Central Valley Drainage of California.

Conclusion

Thank you for the opportunity to provide comments on the salmonid information synthesis workshop for the subject study. If you have questions regarding these comments, please contact Annie Manji, Staff Environmental Scientist, at (530) 225-2315, or Dean Marston, Environmental Program Manager, at (559) 243-4014

Sincerely,

Andrew D. Gordus, Ph.D.

for Jeffrey R. Single, Ph.D.
Regional Manager
Central Region

Attachments

cc: Kimberly D. Bose, Secretary
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EXHIBIT NO. DFG-2

BEFORE THE U.S. FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ADMINISTRATIVE LAW JUDGES

Turlock Irrigation District and Modesto Irrigation District New Don Pedro Project FERC Projects Nos. 2299-065 and 2299-053	))))))	DIRECT TESTIMONY OF TIMOTHY HEYNE ON BEHALF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

DIRECT TESTIMONY OF TIMOTHY HEYNE

ON BEHALF OF CALIFORNIA DEPARTMENT OF FISH AND GAME

My name is Timothy Heyne. My address is California Department of Fish and Game, 1234 East Shaw Avenue, Fresno, California 93710. I have been employed by the California Department of Fish and Game (DFG) for nearly 20 years. Currently, I am a Senior Environmental Scientist responsible for supervising staff assigned to DFG's anadromous fishes program in the San Joaquin River. All of my work experience with DFG has been in the southern portion of California's Central Valley.

I hold a Bachelor of Science degree in environmental science and a Master of Science degree in biology from California State University at Fresno. I have planned, lead or participated in scientific evaluations of salmonid life history and factors limiting their abundance, the toxicity of trace elements to San Joaquin River fishes, juvenile life history of striped bass in the San Joaquin River-Sacramento Delta (Delta) and its tributaries, reservoir fishes biology in the Central Valley, and a variety of other aquatic biology evaluations.

My testimony relates to the following issues that Presiding Administrative Law Judge Charlotte J. Hardnett identified in her August 13, 2009, Order on Scope and Proceedings and Setting Due Dates in the above-referenced proceeding: 1) the effects of the operation of the Don Pedro Project (Project) on the fishery resources for the near term pending relicensing; and 2) the views of the parties regarding proposals for interim protective measures and any reasonable alternatives that may be considered necessary or desirable to address those effects, including possible changes in project facilities or operations.

I explain, with regard to the effects of the Project on fishery resources, that: 1) California Central Valley fall-run Chinook salmon and California Central Valley steelhead occur in the Tuolumne River, a part of the Central Valley; 2) fall-run Chinook salmon and steelhead in the lower Tuolumne River are in serious decline; and 3) current flow releases to the lower Tuolumne River required under Article 37 of the Project license are insufficient to conserve fall-run Chinook salmon and steelhead. This last fact frames the majority of my testimony because DFG considers the insufficient flow releases from the Project to be the dominant factor limiting populations of fall-run Chinook salmon and steelhead in the Tuolumne River.

In regard to measures that would protect these fish species on an interim basis, increasing flows in the lower Tuolumne River would benefit fall-run Chinook salmon and steelhead. The interim measures proposed by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) in this proceeding (Exhibit No. DFG-1 (National Marine Fisheries Service and U.S. Fish

and Wildlife Service Interim Measure Elements) would increase flows in the lower Tuolumne River. Because that would represent an improvement over existing conditions, DFG supports the measures NMFS and FWS have proposed on an interim basis for the purpose of this proceeding. However, as NMFS and FWS emphasize, the interim measures represent *minimum* flows in an effort to prevent the continuing decline of fall-run Chinook salmon and steelhead in the short-term. Different measures will be required to meet DFG's longer-term objective to recover these and other fish species to sustainable population levels. The recommendations DFG makes in the relicensing proceeding for the Project, and in any other proceeding that relates to the lower Tuolumne River, including those before the State Water Resources Control Board, will be based on that longer-term objective.

Fall-run Chinook salmon and steelhead occur in the Tuolumne River, a part of the Central Valley. Over several decades, the numbers of both fall-run Chinook salmon and steelhead found in the Tuolumne River have dramatically declined, as reflected by the fact that steelhead is listed as a threatened species under the Endangered Species Act (ESA) and fall-run Chinook salmon in the Central Valley is categorized as a federal species of concern. Identifying factors that contribute to these declines has been an important objective for DFG and other fish management agencies.

Extensive research has been conducted into the complex interactions of abundance and distribution for the various life stages of anadromous salmonids and the multiple factors affecting those that are found in the Tuolumne River. This

research includes long-term monitoring of young and adult fish including population sizes, health, and distribution. In addition to fish monitoring, data have been collected to monitor indicators of habitat quality, with streamflow, sediment, and water temperature being identified as some of the most critical. Studies have also been performed to understand how streamflow and sediment conditions affect the geomorphic processes that maintain and shape fish habitat on the Tuolumne River. As a result of these efforts, DFG asserts that Project operations are partly responsible for the Tuolumne River fall-run Chinook salmon and steelhead population declines. The single most significant impact of Project operations affecting the anadromous fish populations is the manipulation of flows in the Tuolumne River. The following sections identify some of the fundamental information in support of this conclusion and other related facts.

Figure 1. View of California's Central Valley Showing the Various Rivers Within the Central Valley and the Two Primary Sub-Basins: Sacramento (Northern) and San Joaquin (Southern)

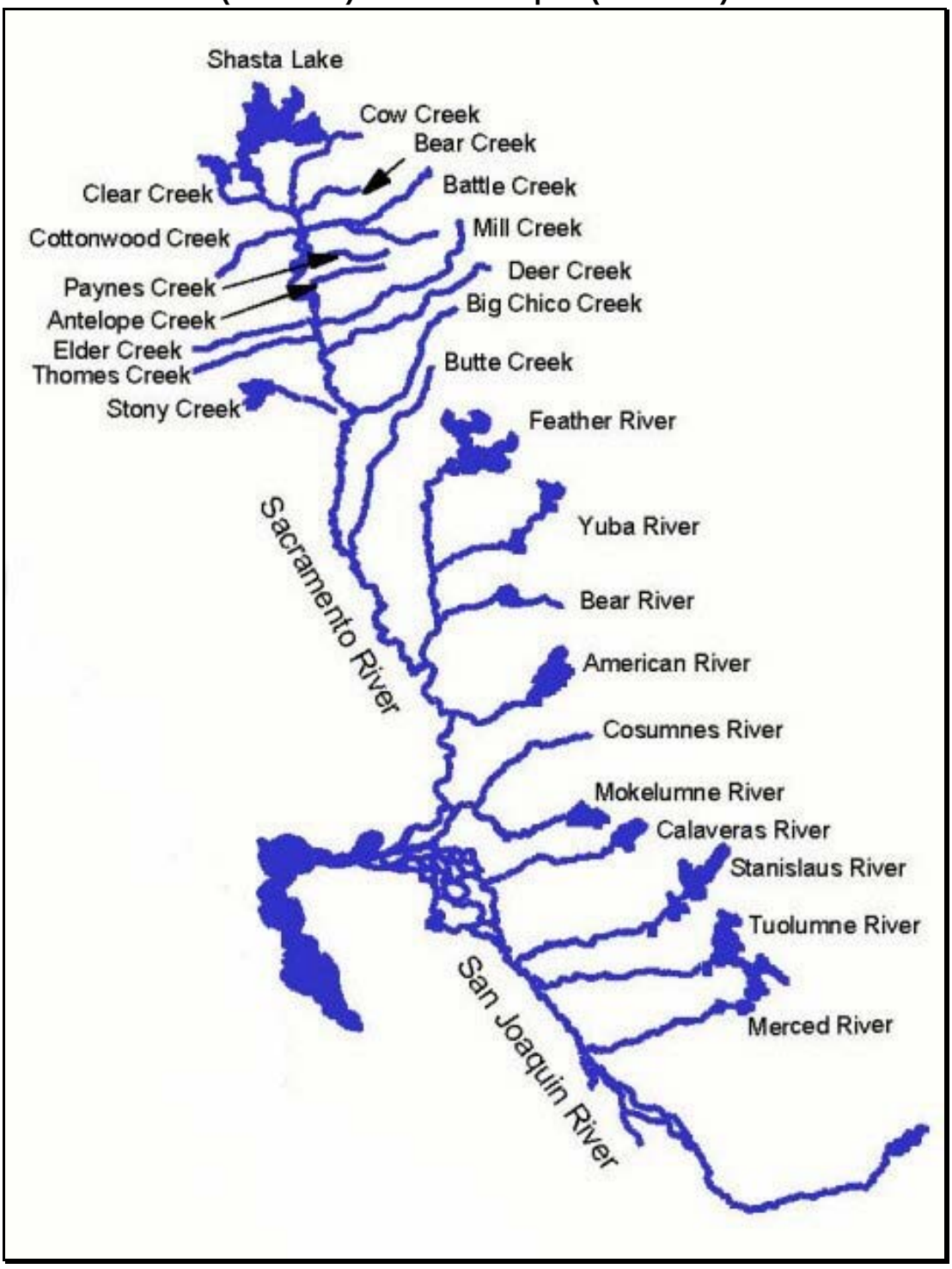
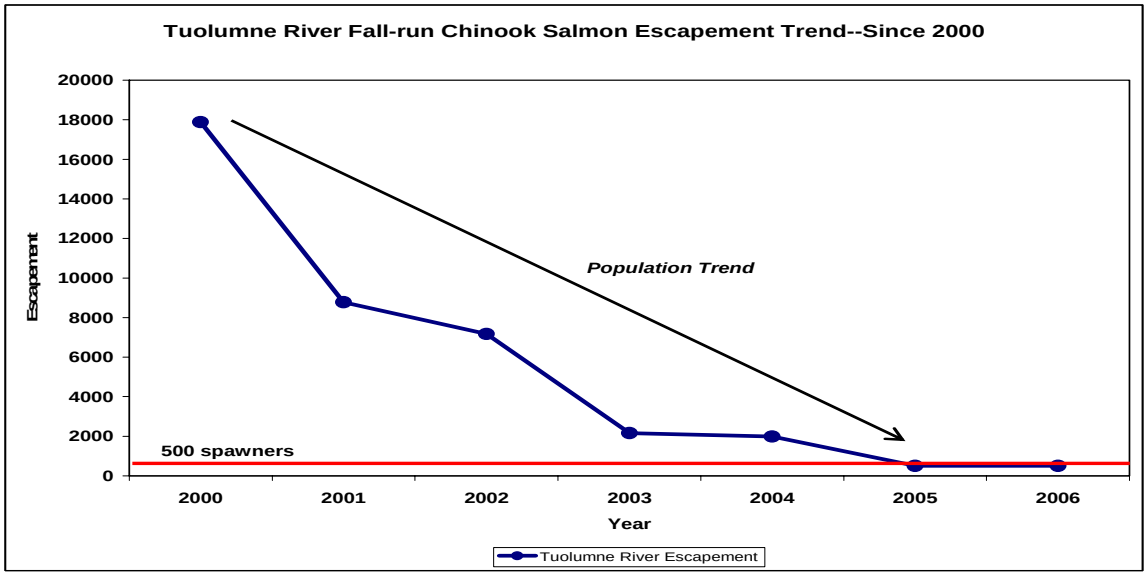


Figure 2 illustrates that over the last decade the numbers of fall-run Chinook salmon found in the Tuolumne River have dramatically declined. Current fall-run Chinook salmon adult escapement abundance for the Tuolumne River is only one quarter to one third of targeted population goals and fall-run Chinook salmon are considered to be in poor condition. Steelhead still exist in the lower Tuolumne River (Exhibit No. DFG-26 Zimmerman et al., 2008), but have reached such low numbers as to barely be detected by monitoring, as evidenced by licensee's annual reports to the Commission.

Figure 2. Tuolumne River Annual Salmon Escapement Trend 2000 to 2006, Showing the Recent Downward Trend for Tuolumne River Fall-Run Chinook Salmon Adult Populations



Salmon escapement refers to the number of adult salmon escaping ocean harvest and returning to fresh water to spawn. Since a peak escapement in the year 2000 (over 17,000 spawners), escapement of fall-run Chinook salmon in the Tuolumne River has dropped sharply to less than 500 spawners for both the 2005 and 2006 escapement years. This recent crash in escapement population occurred well before a decline in ocean conditions during 2005 and occurred concurrently

with a substantial decline in Project spring time flow releases during the 1999 to 2004 time period.

The portion of the Tuolumne watershed that currently can be used by these fish for migration, spawning, incubation, and rearing is limited by several impassable dams, including the Project's 585-foot high Don Pedro Dam. Currently, anadromous fish are blocked from accessing over 50 percent of their historic range on the Tuolumne River by these dams (Exhibit No. DFG-25 Yoshiyama et al., 2001).

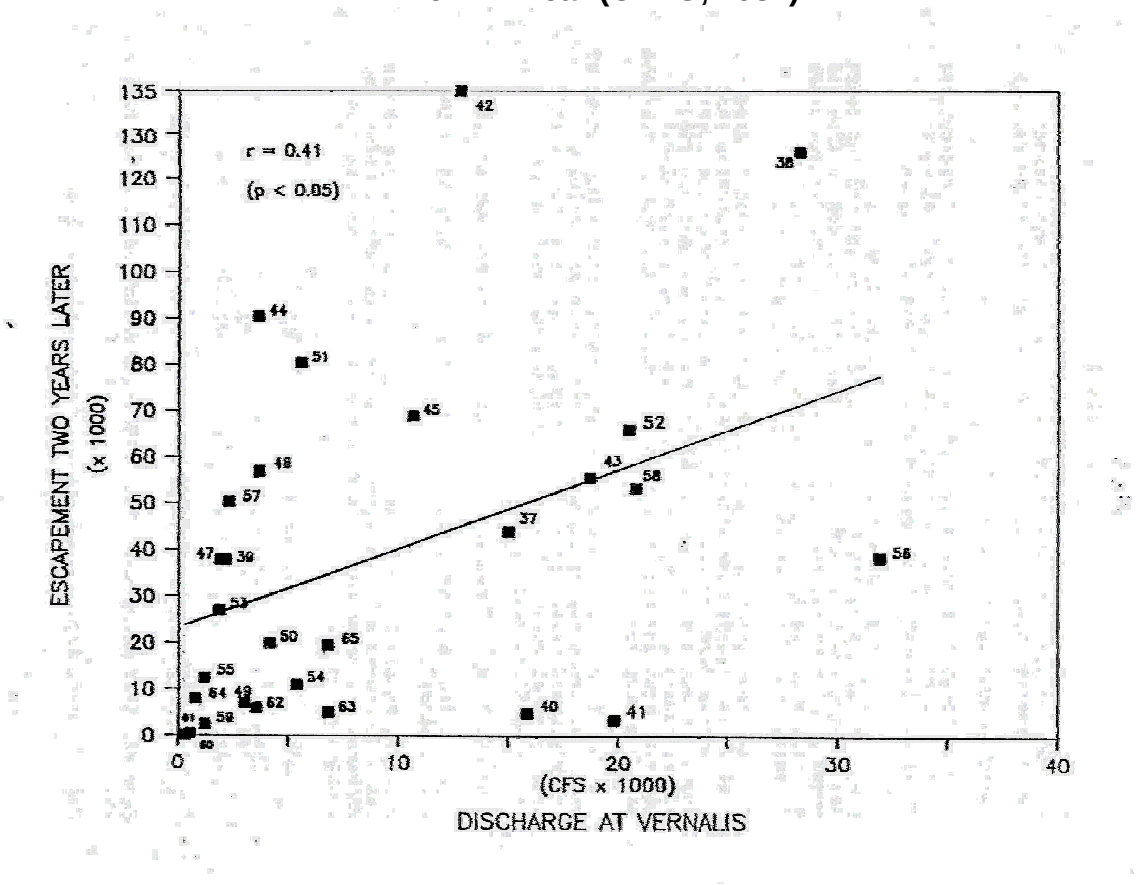
The Project substantially contributes to impaired flow in the lower Tuolumne River. In addition to reducing instream flows overall, the Project changes the times of year when flows peak. Where unimpaired flow levels were once highest (on average) in the spring (during juvenile out-migration), the Project now releases the highest flows in the winter (during egg incubation and fry emergence).

Neither past nor present instream flow schedules implemented by the Project have resulted in the restoration of fall-run Chinook salmon or steelhead in the Tuolumne River or kept these fish populations from experiencing an ever-worsening decline. Interim actions to assist in recovery of fall-run Chinook and steelhead are warranted. Providing more flow to the river at specific times of the year will improve habitat and water temperatures for fall-run salmon Chinook and steelhead.

These declines in population have been occurring at least since the original licensing of the Project. DFG began trying to identify the causes of the declines beginning in the early 1970s through the 1980s, culminating in a submittal of an

assessment to the State Water Resources Control Board on the relationship of fall-run Chinook salmon population numbers to spring streamflows (Exhibit No. DFG-6 California Department of Fish and Game, 1987). Figure 3 is from that report.

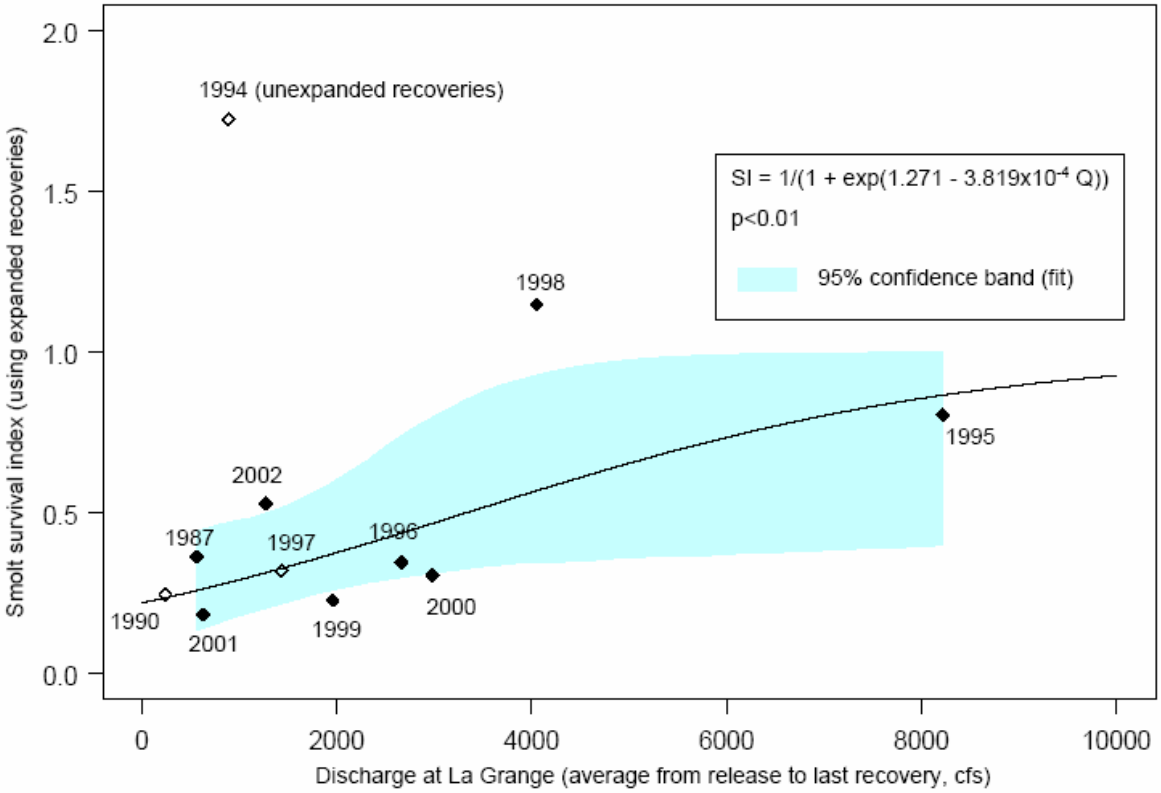
Figure 3. Number of Adult Chinook Returning Compared to Spring Flows in Their 1st Year (CDFG, 1987)



Annual spawning surveys for fall-run Chinook salmon have been performed for more than 55 years. Analysis of these data by the 1980s showed a relationship between spring flows and the number of adults returning several years later as a result of those flows. This relationship indicated that the numbers of salmon returning to the river to spawn were much increased when spring streamflows in the first year the fish's life were high (Figure 3).

The Project licensees asserted that there were other factors affecting the number of salmon returning to spawn. In response, DFG agreed to pursue additional evaluations, particularly assessments that focused on specific sections of the river system so that flows needs could be identified on a reach-by-reach basis. Beginning in the 1980s, DFG in cooperation with the licensees began performing a tagging program for hatchery juvenile fall-run Chinook salmon that strategically planted the fish throughout the San Joaquin River basin (including the Tuolumne River) in order to assess survival in all sections of the river system at a variety of flows. After a number of years of study and a joint evaluation by all parties, including the licensees, on the Tuolumne River, a report was produced that the licensees filed in their 2004 report to the Commission that documented a relationship indicating increased flow in the spring resulted in increased numbers of smolts surviving out of the Tuolumne River (Figure 4).

Figure 4. Tuolumne River Smolt Survival Relationship



Figures 3 and 4 illustrate the benefits increased spring time flows can provide for the fall-run Chinook salmon population. However, the spring stream flow levels provided by the Project are grossly deficient (in terms of flow magnitude, flow duration, and elevated flow frequency) and do not produce an adequate supply of smolts to conserve the fall-run Chinook salmon population. The artificially low flows cause the juveniles to stop migrating and also cause excessive warming of water as flow level recedes. Low flows during the spring out-migration also impact smolts moving through the Delta where predation and water quality are significant sources of mortality. The losses of smolts associated with current Project releases in the spring are a significant impact on the fishery and have been correlated with fewer

adults returning to spawn. Given the current Project flow releases into the lower Tuolumne River, currently there are simply not enough juveniles getting out of the basin to sustain the population.

Additional data supporting the conclusion that current spring flows are insufficient come from analyses of smolts collected in rotary screw traps, seines, and trawls in the lower Tuolumne and Delta. These smolt production evaluations have been performed since the early 1980s, with the rotary screw trap estimates beginning in mid 1990s. Observed trends in smolt number, size, and river mile have been correlated with spring flow conditions as well as water temperature. Data from all of these long term evaluations demonstrate that fish production is heavily dependent on river flows. To maximize smolt production, spring flows must be elevated during the smolt out-migration season, which, as demonstrated by the licensees' juvenile monitoring, occurs from about mid-March to mid-June. Elevated flows (defined as increased flow magnitude, flow duration, and flow level frequency) during this spring time would maximize smolt survival and reduce water temperature, both of which would substantially enhance likelihood of smolt survival out of the Tuolumne River.

The licensees raised a concern on the smolt survival evaluations about the use of hatchery fish. Due to the concerns regarding how well hatchery fish represent wild fish and a desire to understand the migration and abundance of wild fall-run Chinook salmon smolts, DFG had already begun (1995) a program of using a capture device called a rotary screwtrap at the mouth of the Tuolumne to document the numbers of fish leaving the Tuolumne River. This program, too, was

operated in conjunction with the licensees. The result of screw trapping is an estimate of the number of juvenile fall-run Chinook salmon leaving the river each year. These estimated number of outmigrants are presented in the table below (Table1) with the estimated number of eggs that produced those outmigrants. The egg estimates are produced by DFG each year after they perform adult spawning surveys. When you divide the outmigrants by the eggs produced and then multiply by 5,000 you have an estimate of the number of outmigrants that make it out of the river per average female. By comparing the "high" production years and low production years to streamflow it is clear that streamflow has a large impact on production, affecting the number of outmigrants/female making out of the river.

Table 1. Evaluation of Production of Outmigrant Juveniles per Spawning Female Compared Spring Flows in the Tuolumne River.

Outmigration Year	Potential Eggs	RST Outmigrants	% Leaving River	Outmigrants / Avg. Female	Spring Flow Apr-Jun
1998	21,520,864.77	1,615,673	7.507%	375	3931
1999	22,640,987.17	1,073,669	4.742%	237	1381
2000	18,842,659.42	132,017	0.701%	35	1029
2001	68,954,846.59	111,644	0.162%	8	467
2002	30,833,259.73	14,540	0.047%	2	388
2003	23,220,487.01	7,261	0.031%	2	453
2004	7,939,399.75	13,134	0.165%	8	503
2005	5,227,439.49	74,471	1.425%	71	4426
2006	2,813,709.71	178,034	6.327%	316	6703
2007	1,802,677.00	937	0.052%	3	338
2008	543,200.66	3,283	0.604%	30	448

I submit that after three major and substantially independent evaluation programs, all reaching the same conclusion, it is time to act on the information available. Current spring flows are inadequate and need to increase to keep the fall-run Chinook salmon populations from declining to zero (extinction). This is not to say that spring flows are the only area that needs improvement, but it is the best

studied and the studies provide a consistent answer. Even a consultant hired by the Federal Energy Regulatory Commission (Commission) in the 1980s to work on modeling the actions needed to improving the Tuolumne River fall-run Chinook salmon populations identified increased spring flows as the number one priority to improve fall-run Chinook salmon populations (Exhibit No. DFG-12 Jaeger et al., 1997).

Based on the long-term evaluation data, the likely mechanisms for higher flows enhancing smolt out-migration include: 1) improved water quality (e.g., water temperature, contaminants, and dissolved oxygen) in the lower river and Delta which reduces mortality causal factors (e.g., disease and starvation); 2) out-migration transit time is reduced through the lower Tuolumne River and Delta; 3) predation, by native Sacramento pikeminnow and introduced black bass and striped bass, is reduced as water temperature declines, water velocity increases, and turbidity increases; and 4) entrainment and impingement in the lower river and Delta is reduced. The following references detail the relationships between low spring flow, elevated temperature and smolt production and survival: Exhibit No. DFG-10 (Fuller and Sonke, 2006); Exhibit No. 12 (Jager et al. 1997); Exhibit No. DFG-14 (Marston et al., 2008); Exhibit No. DFG-17 (Mesick, C., et al., 2008); Exhibit No. DFG-16 (Mesick, C., 2008); Exhibit No. DFG-18 (Myrick, C. and J. Cech Jr., 2001); Exhibit No. DFG-20 (Newman, K., 2008); and Exhibit No. DFG-23 (Turlock Irrigation District and Modesto Irrigation District, 2005).

The discussion above has focused on the spring flows because these have been identified repeatedly as the principle limiting factor on fall-run Chinook salmon

populations in the Tuolumne River. However, other time periods have significant flow issues including winter, summer and early fall. In summer, low flows can be shown to have a negative impact on the number of steelhead in the river using the seine data developed by the licensees. This area will be addressed by several other witnesses in this proceeding.

Winter flows are also an issue for fall-run Chinook salmon fry and while there is not a great deal of information available some literature indicates that this is a critical issue for juvenile fall-run Chinook salmon as well. The Project's winter (or salmon fry rearing) flow releases are inadequate to inundate or maintain floodplain habitat, thereby limiting fry rearing habitat, food, and therefore survival. The amount of fry habitat that is wetted under current operations is very limited, serving as a bottleneck and contributing to the overall decline in fall-run Chinook salmon and steelhead populations. Additionally under the current flow schedule, channel forming flows (referred to as geomorphic flows) are very limited. This results in the deterioration of the in-river habitats and floodplain habitats. Currently the U.S. Fish and Wildlife Service is proposing a study program for floodplain wetting that DFG supports in principle.

If the Project were to provide higher flows beginning in February and extending into late-May, a higher percentage of juveniles would survive as a result of: 1) increased rearing habitat quantity and quality as floodplain habitat increases; 2) increased food availability from inundated floodplains; 3) improved water quality (including water temperature, contaminants, and dissolved oxygen) which reduces mortality from other stressors (e.g., disease, contaminates, and starvation); and 4)

reduced predation by Sacramento pikeminnow, black bass and striped bass. The following references detail the relationship between floodplain inundation, geomorphic flows and fry density: Exhibit No. DFG-13 (Jeffres, C.A., J.J. Opperman, and P.B. Moyle, 2008); Exhibit No. DFG-17 (Mesick, C., et al., 2008); and Exhibit No. DFG-22 (Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer, 2001).

The Project currently has requirements to release fall pulse flows. The pulse flows are intended to attract adults into the Tuolumne and keep water temperatures cool to promote successful spawning by the returning adults. These fall pulse flows typically occur the last two weeks of October and vary in volume, based on water year type. In some years, very little fall attraction flow water is released, providing little to no improvement. The minimum flow schedule for the Project does not require any fall pulse flow in 4 of the 10 water year types and relatively minor pulse flows in Intermediate Dry-Below Normal and Median Below Normal water year types such that 6 out of 10 years has little to no fall pulse flows. These flows are insufficient to support adult migration, by consistently reducing the straying of adults, or preventing high water temperatures and low dissolved oxygen.

Analysis of coded wire tags recovered in both the Sacramento and San Joaquin watersheds supports the conclusion that higher fall flows are needed to reduce straying rates. Water temperature monitoring in the mainstem San Joaquin and Tuolumne has demonstrated the release of fall pulse flows can significantly lower water temperatures. The following references detail the relationships between low fall flow releases and adult Chinook straying rates and elevated water

temperatures: Exhibit No. DFG-8 (Central Valley Regional Water Quality Control Board, 2009a); Exhibit No. DFG-9 (Central Valley Regional Water Quality Control Board, 2009b); Exhibit No. DFG-15 (Marston, D., 2007); Exhibit No. DFG-14 (Marston et al., 2008); and Exhibit No. DFG-17 (Mesick, C., et al., 2008).

Higher fall migration pulse flow releases from the Project, especially in drier water years, are warranted. Providing additional fall pulse flows is the first step towards increasing fall-run Chinook salmon production in the Tuolumne River. If adult migration into the Tuolumne can be maximized by sufficient fall attraction flows, fry production will substantially increase.

In conclusion there is a strong connection between elevated spring flow level and: 1) fall-run Chinook salmon smolt habitat quality; 2) smolt out-migration abundance; and 3) future year adult fall-run Chinook salmon production. Having the Project release substantially improved spring flows (across years) would have compounding benefit effects downstream of the Tuolumne River in that more smolts would likely survive the entrance into and their migration through the South Delta. More Tuolumne River origin juvenile (smolt) salmon arriving at Jersey Point will increase the likelihood that adult production would increase as well. Additionally the current scientific information on Central Valley salmonids indicates that increases in winter and early spring flows would improve fall-run Chinook salmon populations and increases in summer flows would increase steelhead populations as well as over-summer fall-run Chinook salmon juveniles.

Because fall-run Chinook salmon in the lower Tuolumne River is at an elevated risk of extinction it is imperative that the stream flows in the Tuolumne

River are substantially improved now to maximize lower Tuolumne River fall-run Chinook salmon smolt, thence adult, production. Producing substantially larger numbers of escaping salmon is needed immediately to restore (build) and sustain (establish) a healthy adult salmon population level that can reduce the likelihood of extinction and put the lower Tuolumne River fall-run Chinook salmon population on a path to dramatically improve public trust in-river and ocean fishery harvest.

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Exhibit No. DFG-8: Central Valley Regional Water Quality Control Board. 2009a. Draft 2008 California 303(d)/305(b) Integrated Report-Supporting Information for Regional Board 5-Central Valley Region. Staff Report to the California Central Valley Regional Water Quality Control Board Documenting Evidence to List Water Temperature as Impaired in the Tuolumne River. (excluding appendices)

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Exhibit No. DFG-15: Marston, Dean D. 2005. FINAL DRAFT 11-28-05 San Joaquin River Fall-run Chinook Salmon Population Model. San Joaquin Valley Southern Sierra Region. California Department of Fish and Game. Fresno CA.

Exhibit No. DFG-16: Mesick, C. 2008. The Moderate to High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Tuolumne River due to Insufficient Instream Flow Releases. USFWS Report.

Exhibit No. DFG-17: Mesick, C., et al. 2008. Limiting Factor Analyses & Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River.

Exhibit No. DFG-18: Myrick, C. and J. Cech Jr. 2001. Temperature Effects on Chinook Salmon and Steelhead: A Review Focusing on California's Central Valley Populations. Bay Delta Modeling Forum Technical Publication 01-1.

Exhibit No. DFG-20: Newman, K. 2008. An Evaluation of Four Sacramento-San Joaquin River Delta Juvenile Salmon Survival Studies. Report to the CalFed Science Program (Project Number SCI-06-G06-299).

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Exhibit No. DFG-23: Turlock Irrigation District and Modesto Irrigation District. 2005. 2005 Ten Year Summary Report pursuant to Paragraph (G) of the 1996 FERC Order issued July 31, 1996. Report on the Don Pedro Project (FERC Project No. 2299-024) prepared for the Federal Energy Regulatory Commission. April 1, 2005.

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BEFORE THE U.S. FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ADMINISTRATIVE LAW JUDGES

Turlock Irrigation District and Modesto Irrigation District New Don Pedro Project FERC Projects Nos. 2299-065 and 2299-053	DIRECT TESTIMONY OF TIMOTHY HEYNE ON BEHALF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

DECLARATION CERTIFYING DIRECT WRITTEN TESTIMONY OF TIMOTHY HEYNE

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct. Executed on this 10th day of September, 2009

Timothy Heyne

EXHIBIT NO. DFG-4

BEFORE THE U.S. FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ADMINISTRATIVE LAW JUDGES

Turlock Irrigation District and	)	DIRECT TESTIMONY OF
Modesto Irrigation District	)	ANDREW G. GORDUS ON BEHALF OF
New Don Pedro Project	)	THE CALIFORNIA DEPARTMENT OF
Project Nos. 2299-065	)	FISH AND GAME
and 2299-053	)	

DIRECT TESTIMONY OF ANDREW G. GORDUS, Ph. D.

ON BEHALF OF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

My name is Andrew G. Gordus. My address is California Department of Fish and Game, 1234 East Shaw Avenue, Fresno, California 93710. My occupation is a Water Quality Biologist. For the past nine years, I have been employed by the California Department of Fish and Game (DFG), Central Region. I hold a Bachelor of Science degree in Wildlife Management and Master of Science degree in Natural Resources with a Wildlife Management emphasis from Humboldt State University, and a Ph. D. from the University of California at Davis in Comparative Pathology. My specialties are waterfowl and wetland habitat management, wildlife diseases (i.e., pathology) and toxicology, ecotoxicology, water quality, and most recently food safety in relation to wildlife bacterial contamination (*E. coli* O157:H7 and *Salmonella*) of leafy green vegetables from wildlife.

My testimony relates to the following issues that Presiding Administrative Law Judge Charlotte J. Hardnett identified in her August 13, 2009, Order on Scope and Proceedings and Setting Due Dates in the above-referenced proceeding: 1) the effects of the operation of the Don Pedro Project (Project) on the fishery resources for the near term pending relicensing; and 2) the views of the parties regarding proposals for interim protective measures and any reasonable alternatives that may be considered necessary or desirable to address those effects, including

possible changes in project facilities or operations. In regard to the effects of the Project on fishery resources, California Central Valley fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and California Central Valley steelhead (*O. mykiss*) in the lower Tuolumne River are in decline (Exhibit No. DFG-2 (Direct Testimony of Tim Heyne)) and elevated water temperatures in the lower Tuolumne River during critical life stages of these species are a significant factor in that decline. In regard to measures that would protect these fish species on an interim basis, increasing flows in the lower Tuolumne River would benefit fall-run Chinook salmon and steelhead by reducing water temperatures to levels suitable to these fish species at all life stages. The interim measures proposed by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) in this proceeding (Exhibit No. DFG-1 (National Marine Fisheries Service and U.S. Fish and Wildlife Service Interim Measure Elements) would increase flows in the lower Tuolumne River that would reduce water temperatures. Because that would represent an improvement over existing conditions, DFG supports the measures NMFS and FWS have proposed on an interim basis for the purpose of this proceeding. However, as NMFS and FWS emphasize, the interim measures represent *minimum* flows in an effort to prevent the continuing decline of fall-run Chinook salmon and steelhead in the short-term. Different measures will be required to meet DFG's longer-term objective to recover these and other fish species to sustainable population levels. The recommendations DFG makes in the relicensing proceeding for the Project, and in any other proceeding that relates to the lower Tuolumne River, including those before the State Water Resources Control Board, will be based on that longer-term objective.

In February 2007, DFG responded to the Central Valley Regional Water Quality Control Board's (CVRWQCB) "Public Solicitation of Water Quality Data and Information for 2008

Integrated Report – List of Impaired Waters and Surface Water Quality Assessment," which CVRWQCB prepared pursuant to Sections 303(d) and 305(b) in the Clean Water Act. In summary, DFG asserted that elevated water temperatures in the San Joaquin, Stanislaus, Tuolumne, and Merced Rivers are contributing to the decline of salmon and steelhead in those rivers and provided temperature data, an analysis of those data, and other information in the form of a report to support our conclusion, in summary, that water temperatures in these rivers are too warm for anadromous fish during all of their life stages. The CVRWQCB completed its own analysis and reached the same conclusion. In doing so, the CVRWQCB used the same temperature data DFG used in its analysis, but used a different methodology to analyze those data. The Central Valley Regional Water Quality Control Board (CVRWQCB) approved the listing of the Tuolumne River as water temperature impaired (Exhibit No. DFG-8, CVRWQCB 2009a, Exhibit No. DFG-9, CVRWQCB 2009b).

Table 1 below summarizes the information supporting my testimony that the Tuolumne River does not meet (cool) temperature water quality standards to protect anadromous fish beneficial uses. It represents a summary of the total number of weeks of water temperature impairment for anadromous fish using the Tuolumne River from 1998 through 2006.

Table 1. Summary of Water Temperature Impairment for Anadromous Fish in Tuolumne River: 1998-2006

Life Stage	Season	Number of Weeks	Criteria °C (°F)	Number of weeks above threshold/Total weeks (%)
Chinook Adult Migration	Sep 1 – Oct 31	8	18 (64.4)	53/72 (73.6)
Chinook Spawning	Oct 1 - Dec 15	11	13 (55.4)	63/99 (63.6)
Chinook Smoltification	Mar 15 – Jun 15	14	15 (59.0)	74/126 (58.7)
Steelhead Summer Rearing	Jun 15 – Sep 15	14	18 (64.4)	65/126 (51.6)

As mentioned above, water temperatures in the lower Tuolumne River are to warm for fall-run Chinook salmon and steelhead during all of their life stages. DFG reached this conclusion by comparing the temperature criteria recommended by the U.S. Environmental Protection Agency's Region 10 (EPA) to protect salmon and trout (Exhibit No. DFG-24, EPA 2003). Those criteria are listed in Tables 1 and 2. DFG relied on these criteria because the EPA completed a very thorough literature review for water temperatures to protect cold water fish species (trout and salmon), referencing 41 sources that included five issue papers. The issue papers, in turn, referenced approximately 700 citations. As a result, EPA's recommendations are grounded in a broad spectrum of the scientific literature across North America for developing chronic protective temperature criteria for anadromous fish populations across multiple generations. This is consistent with the emphasis by DFG on the reproduction and recruitment success of an entire population across each generation, as compared to the survival of a group of individuals across a short time period under high temperature conditions, recognizing the evolution and importance of the multi-year class life history strategy of salmon and steelhead. For the purpose of determining when temperatures exceeded the temperature criteria, temperature data were collected in the field from 1998 to 2006 at specific river mile points using the data reporting metrics normally utilized by the EPA (i.e., seven-day average of daily maximum temperatures).

The temperature water quality criteria necessary to protect cold water salmonid fisheries beneficial uses for the Tuolumne River are presented in Tables 2 through 4, herein. Table 2 presents a summary overview of life stage seasons, water temperature criteria, and available river habitat measured by river miles from the confluence of the San Joaquin River (i.e., the mouth) to the La Grange Dam for the Tuolumne River. The river mile points for the locations where the

temperature data were collected (except at the confluence) in the Tuolumne River are listed in Table 3. (For reference, the Tuolumne River confluence at the San Joaquin River is 85 miles from the confluence of the San Joaquin River at the Sacramento River.) Table 4 identifies the temperature threshold levels as identified by the EPA (2003) (Exhibit No. DFG-24).

Table 2. Summary of Tuolumne River Seasons, Available River Habitat, and Temperature Thresholds

River	Location	Season	Life Phase (Beneficial Use)	Threshold (ºC)	Available River Habitat (Miles)
Tuolumne	Mouth	9/1 - 10/31	Adult/Egg	18	52
	Waterford	10/1 - 12/15	Egg	13	24
	Mouth	3/15 - 6/15	Smolt	15	52
	Turlock State Recreation Area	6/15 – 9/15	Steelhead Summer Rearing	18	10

Table 3. Tuolumne River Mile Points From the Confluence of the San Joaquin River to La Grange Dam

Site Name	River Mile
La Grange Dam	52
Basso Bridge	47
Turlock State Recreation Area	42
Waterford	32
Fox Grove	26
Shiloh	4
San Joaquin River Confluence	0

Table 4. EPA Temperature Thresholds for Pacific Migratory Salmonids and Life Stages

Salmonid Life History Phase Terminology	EPA-Based Recommended Temperature Thresholds to Protect Salmon and Trout[1]
Adult migration	<64°F (<18°C) for salmon and trout migration
	<68°F (<20°C) for salmon and trout migration - generally in the lower part of river basins that likely reach this temperature naturally, if there are cold-water refugia available [but no evidence of such refugia are available for the Tuolumne River]
Incubation	<55°F (<13°C) for salmon and trout spawning, egg incubation, and fry emergence
Juvenile rearing (early year)	<61°F (<16°C) for salmon "core" juvenile rearing - generally in the mid- to upper part of river basins
Smoltification	<59°F (<15°C) for salmon smoltification
	<57°F (<14°C) for steelhead smoltification (for composite criteria steelhead conditions are applied)
Juvenile rearing (late year)	<64°F (<18°C) for juvenile salmon and steelhead migration plus non-Core Juvenile Rearing - generally in the lower part of river basins

[1]Criteria are based on the 7-day average of the daily maximum values. The EPA identified temperature unit is seven-day average of the daily maximum water temperature .

Adult Chinook salmon migration season

Adult fall-run Chinook salmon migrate upstream through the San Joaquin and Tuolumne Rivers from approximately September 1st through October 31st. The overall mean maximum weekly temperature for the Tuolumne River was above the maximum threshold (18°C) for most weeks across all years (Exhibit No. DFG-7, Table 1). The area of impaired water temperature of the river during this same period ranged from two to 49 miles (4% to 94%) of the river's length (Exhibit No. DFG-7, Table 1). In most years, the last one to two weeks of the primary migration season had suitable (i.e., cool) water temperatures for the adult salmon. Adults continue to migrate through December; however if spawning/egg incubation temperatures are met (13°C), by

default, adult migration temperatures (18°C) will be met. Exhibit No. DFG-19, Figure 1 provides a visual summary of the percent of habitat-impaired areas within the entire 52-mile reach downstream from La Grange Dam. The figure shows the extreme length of impairment across weeks for all years including above normal and wet water years.

Spawning/Egg Incubation Season

The Chinook salmon spawning/egg incubation season in the Tuolumne River occurs from approximately October 1st through December 15th. The overall mean maximum weekly temperatures across years were above the maximum threshold (13°C) for weeks 40 through 46 for the Tuolumne River (Exhibit No. DFG-7, Table 2). The area of impaired river miles ranged from one to 24 (4% to 100%) miles of available spawning habitat on the Tuolumne River. The period of time water temperatures are too warm for this life stage is approximately two-thirds of the spawning season and includes up to 100 percent of the available habitat in any given year. Exhibit No. DFG-19, Figure 2 provides a visual summary of the percent of habitat impaired areas within the 24-mile reach down stream from La Grange Dam. Except for the last three to four weeks in the season (i.e., December, weeks 47 to 50), length of impairment across years including above normal and wet water years is extreme.

Smoltification

The Chinook salmon smoltification period in the Tuolumne River occurs from approximately March 15th through June 15th. The overall *mean* maximum water temperature across all years is above the maximum threshold (15°C) for 11 of the 14 weeks on the Tuolumne River (Exhibit No. DFG-7, Table 3). Overall impaired habitat is approximately 7 to 52 (13% to 100%) miles of the river's length during below normal and dry water (precipitation) years and most notably during weeks 20 through 24 (Exhibit No. DFG-7, Table 3). Thus, during May and

June (the last one-third of the season), the water temperature during this life-stage season is above the threshold for smoltification/smolt survival for the Tuolumne River. Exhibit No. DFG-19, Figure 3 provides a visual summary of the percent of habitat-impaired areas within the entire 52-mile reach down stream from the La Grange Dam. The differences of impairment across weeks between the wet years (1998, 2005, 2006) are extreme compared to the dry years (2001, 2002, 2004).

Smolt Outmigration Season

Chinook salmon smolt outmigrate occurs from approximately March 15th through June 15th. Habitat temperature requirements for smolt migration are similar to what is required for successful smoltification and discussed above. Similar to the conditions described above, the second half of the migration season has water temperatures above this threshold (Exhibit No. DFG-7, Table 3) with impairment occurring over one-third of the available outmigration habitat. This downstream warm temperature creates a barrier preventing smolts from outmigrating to the San Joaquin River and to the Delta Region.

Specific information about thermal requirements necessary to maximize smolt out-migration habitat quality is presented in Figures 1 and 2 below. The figures demonstrate that increased spring flows are strongly associated with reduced water temperatures and that as spring flows increase, water temperatures substantially decrease. This supports DFG position that reducing spring water temperatures is necessary to maximize smolt out-migration habitat quality, which is a precursor to maximizing smolt out-migration abundance.

Figure 1. Comparison of Tuolumne River Water Temperature With Instream Flow Levels

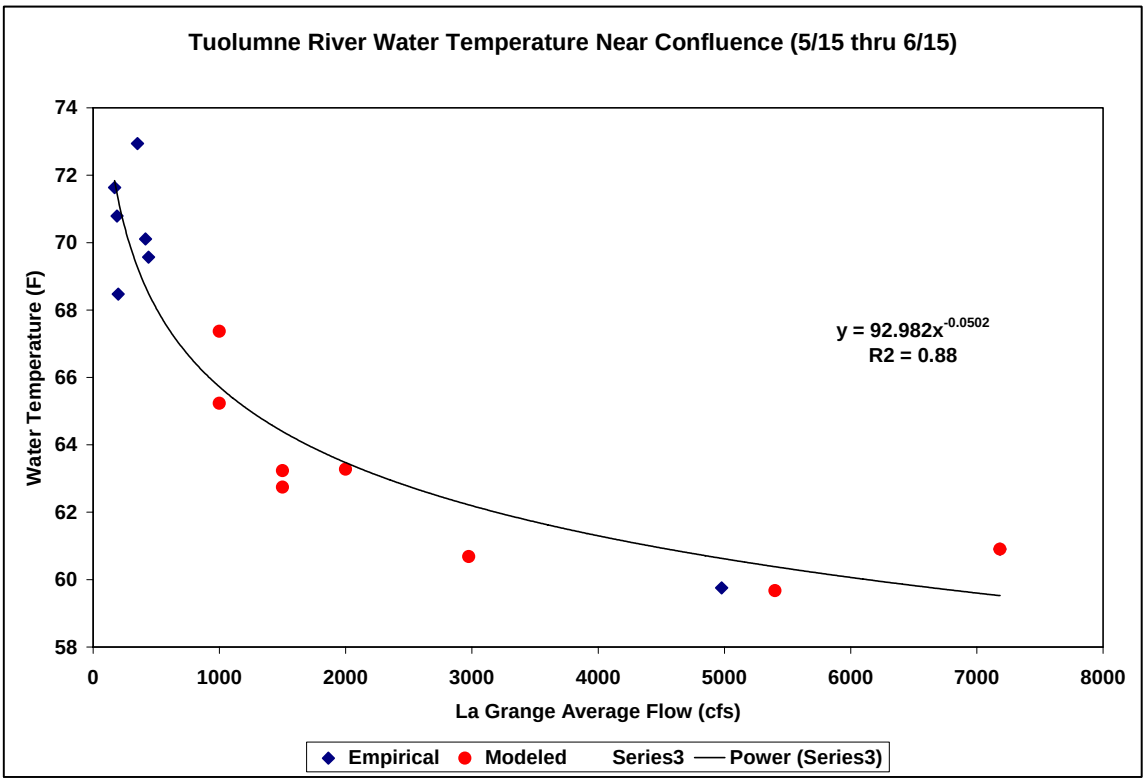

Figure 1 data points include historical flow and water temperature response results for years 1999 through 2006 (e.g., time frame is May 15 to June 15). May 15 is the approximate date the water districts begin to decrease flows, yet approximately 30 percent of the smolts are still present in the river. The data points are either empirical (real field data), shown as blue diamonds, or modeled, shown as red circles, per the San Joaquin River Basin HEC5Q Water Temperature Model Developed for the CalFed Ecosystem Restoration Program. Each empirical data point represents the 32 day average (May 15 to June 15) of daily maximum water temperatures. For the modeled data, the data point represents temperatures at 1800 hours (on a daily basis) which corresponds to the daily maximum water temperature. The non-linear (power) (i.e., curved line instead of a straight "linear" line) is derived from the combined empirical and modeled generated data sets. The smoltification water temperature criterion is 15°C (59°F).

Figure 2. Spring Tuolumne River Water Temperature as Function of Flow Level.

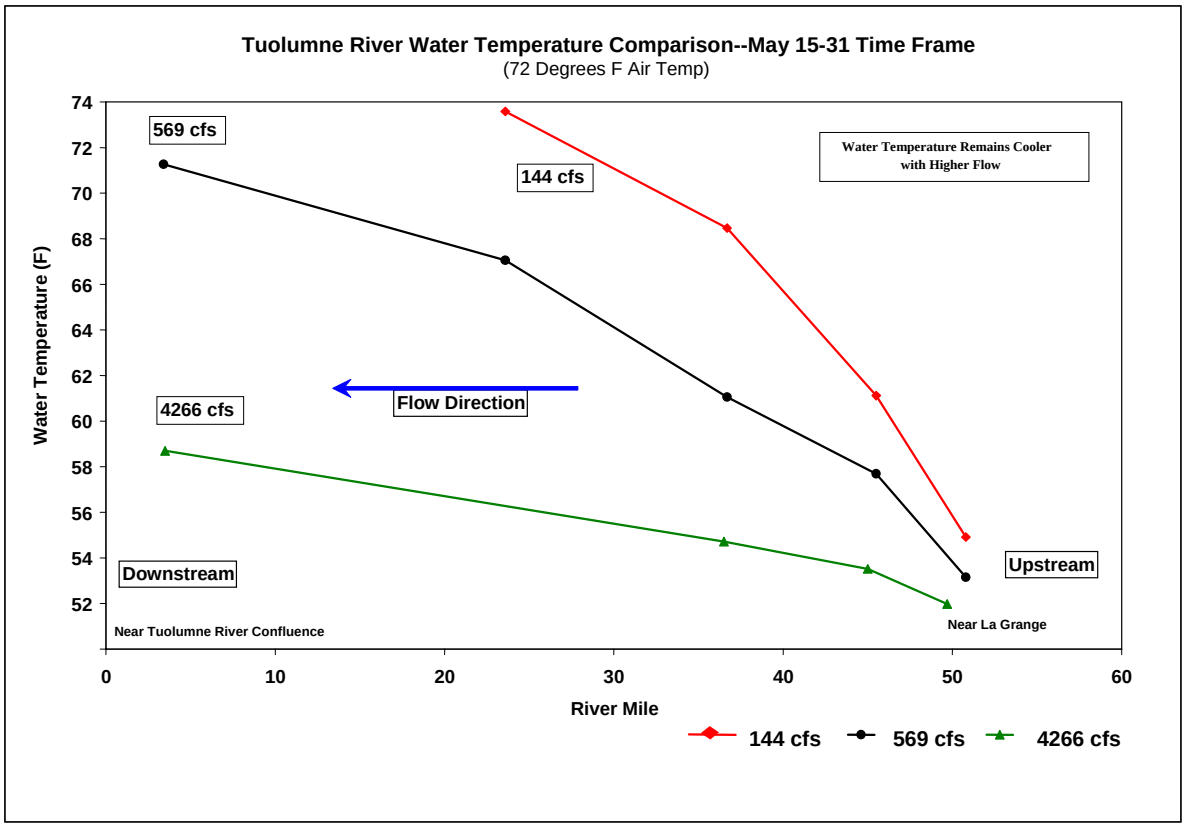

Figure 2 shows the relationship between La Grange Dam water release volumes and water temperatures. There is an inverse relationship with increased flow releases resulting in decreasing water temperatures downstream of La Grange Dam. This cooling of the water temperatures is seen from the dam to the mouth of the river during the late spring time period when salmon smolts are migrating out of the Tuolumne River. Both the reduced and elevated flow levels depicted in this figure occurred during similar meteorological conditions (approximately 72ºF). In general, elevated flows have the ability to withstand meteorologically induced thermal warming of the water as it moves downstream in the Tuolumne River. The presence of colder water prolongs the smolt outmigration window which increases smolt outmigration survival and abundance.

Steelhead Summer Rearing Season

The steelhead summer rearing season occurs from approximately June 15th through September 15th. For the Tuolumne River, the entire rearing season maximum mean temperatures were above the threshold (18°C) the entire season for three of the nine years analyzed (Exhibit No. DFG-7, Table 4). Temperatures were met during wet years, indicating more flows improved water temperatures during the summer months. During years of impairment, the area of impaired river during this life stage ranged from one to eight miles (10% to 80%) of the Tuolumne River's length that is available for rainbow trout and steelhead (Exhibit No. DFG-7, Table 4). Exhibit No. DFG-19, Figure 4 provides a visual summary of the percent habitat impaired areas within the first 10 miles down stream from the La Grange Dam. The differences of impairment across weeks between the wet years (1998, 2005, and 2006) are extreme compared to the dry years (2001, 2002, 2004).

Summary of Temperature Impacts

My testimony emphasizes chronic temperature protections for the last remaining reach (downstream from the dams), for all life stages, for the last remaining genetic population of Chinook salmon and steelhead in the San Joaquin River Basin. Anadromous fish once could migrate up to higher elevation cooler waters, but today are blocked by dams.

There is an inverse relationship between water temperature and dissolved oxygen in the water. Warm water temperatures can decrease dissolved oxygen in the water and can act as an oxygen barrier to migration (Exhibit No. DFG-11, Hallock et. al. 1970). Increased water temperatures can decrease the availability of dissolved oxygen to the eggs, decrease egg hatchability, and decrease the survival of fry once they emerge from the eggs. On the Tuolumne River, water temperatures are too warm during the last one-third of the season (greater than

15°C), including above normal and wet water years, to support successful smoltification. Warm temperatures can decrease, inhibit, or reverse the physiological function or events of smoltification, as well as decrease available oxygen to the smolt. Similar to adult migrants, warm water temperatures can also act as a movement barrier to migrating smolts moving downstream, decrease physiological function and growth, and decrease dissolved oxygen availability to the fish.

Steelhead require appropriate water temperatures on a year-round basis. DFG evaluated the rearing period because this is considered the most critical life stage/period for steelhead survival. The other time periods overlap with Chinook salmon, which if salmon water temperatures are met, by default, steelhead water temperatures criteria will also be met. Tuolumne River water temperatures were very warm (greater than 18°C) 100 percent of the time for three of the nine-year study period (1998-2006) during this critical life stage.

Elevated water temperatures contribute to the ongoing decline fall-run Chinook salmon in the Tuolumne River by: 1) inducing adult mortality as adults migrate into the San Joaquin River and adjacent tributaries to spawn (i.e., pre-spawn mortality); 2) reducing egg viability for eggs deposited in stream gravels; 3) increasing stress levels, thereby reducing survival of juveniles within the tributary nursery habitats; and 4) reducing salmon smolt out-migration survival as smolts leave the nursery habitats within tributaries to migrate down the San Joaquin River to Vernalis and through the south Delta (Exhibit No. DFG-21, Rich 2007). Each of these factors has the capacity, individually and cumulatively, to lower adult salmon escapement abundance. Escapement is the ability of a fish surviving to reproductive age and migrating back to its spawning grounds. For steelhead and rainbow trout, excessively warm water temperatures have the potential to limit population abundance by restricting juvenile and adult resident over-

summer rearing habitat to very short stream reaches due to downstream thermal regimes (i.e., high water temperature areas) (Exhibit No. DFG-17, Mesick et. al. 2008). As a result, too few miles of suitable habitat exist to sustain healthy population levels.

Secondary effects occur as well, especially in predator-rich systems like Central Valley rivers. As thermal optima for salmon/steelhead/rainbow trout are exceeded at temperatures above 64 to 65°F (17.7°C to 18.3°C), major predators like pikeminnow (*Ptychocheilus grandis*) (native to California), striped bass (*Morone saxatilis*) (non-native to California), and black bass (*Micropterus* sp.) (non-native to California) are just entering their thermal optima (Exhibit No. DFG-18, Myrick and Cech 2001). As cold water fish become stressed at temperatures above 64°F, salmon and trout become more vulnerable to predation.

Fish are exothermic (e.g., physiologically controlled by ambient water temperature levels). As such, water temperature controls everything about a fish's life, such as physiological function (oxygen/carbon dioxide exchange, blood chemistry/pH, organ function, heart rate, egg and sperm viability), basic survival, food consumption, rearing location preference, ability to successfully spawn, spawning location preference, growth rates, stress factors, immune function, disease resistance, and predator avoidance (Exhibit No. DFG-18, Myrick and Cech 2001). Water temperature is as important to fish as air quality is to humans.

As such, the EPA's temperature criteria presented above is a chronic threshold to protect a population of anadromous fish across multiple generations. In addition, this is an average, meaning a range of values, not constant values, were used to calculate the criteria values. Using daily temperatures that are elevated across seven days indicates the fish are *not* being briefly exposed across time. As such, the daily water temperature range is narrow (on the higher temperature scale) in the Tuolumne River, thus the fish are not briefly exposed to elevated

temperatures, but are chronically exposed to warm temperatures across both a temporal (time) and spatial (space) continuum. In addition, the temperature monitoring results do not indicate that fish have the luxury of a brief exposure to optimal cool temperatures (i.e., cool temperature refugia) during a 24-hour period in the San Joaquin Valley Basin river systems. These fish require extended cool water exposure over the length of the river system to successfully complete its complex life cycle. Without changes in the flow regime and water temperatures, anadromous fish populations will continue to decline and remain potentially at risk of extinction (Exhibit No. DFG-16, Mesick 2008).

References

Exhibit No. DFG-8. Central Valley Regional Water Quality Control Board (CVRWQCB). 2009a. Draft 2008 California 303(d)/305(b) Integrated Report-Supporting Information for Regional Board 5-Central Valley Region. Staff Report to the California Central Valley Regional Water Quality Control Board Documenting Evidence to List Water Temperature as Impaired in the Tuolumne River. (excluding appendices).

Exhibit No. DFG-9. Central Valley Regional Water Quality Control Board (CVRWQCB). 2009b. Clean Water Act Section 305(b) and 303(d) Integrated Report for the Central Valley Region-May 2009 Draft Final Report, Appendix A. Staff Report to CVRWQB Regarding Proposed Additions to and Deletions from the 303(d) list for the Central Valley Region. http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/impaired_waters_list/303d_list.shtml (On web page see Appendix A, *Proposed changes to the 303(d) list*).

Exhibit No. DFG-11: Hallock, R.J., R.F. Elwell, and D.H. Fry, Jr . 1970. Migrations of adult king salmon *Oncorhynchus tshawytscha* in the San Joaquin Delta as demonstrated by the use of sonic tags. State of California, The Resources Agency, Department of Fish and Game. Fish Bulletin 151.

Exhibit No. DFG-16: Mesick, C. 2008. The Moderate to High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Tuolumne River due to Insufficient Instream Flow Releases U.S. Fish and Wildlife Service, Stockton Fishery Resource Office, Stockton, California.

Exhibit No. DFG-17. Mesick, C., J. McLain, D. Marston, and T. Heyne. 2008. Limiting factor analyses & recommended studies for fall-run Chinook salmon and rainbow trout in the Tuolumne River. Anadromous Fish Restoration Program, U.S. Fish and Wildlife Service, Office of the National Marine Fisheries Service. Sacramento, California, and California Department of Fish and Game, Fresno, California.

Exhibit No. DFG-18. Myrick, C.A., and J.J. Cech, Jr. 2001. Temperature effects on Chinook salmon and steelhead: a review focusing on California's Central Valley populations. Bay-Delta Modeling Forum Technical Publication 01-1

Exhibit No. DFG-21. Rich, A.A. 2007. Impacts of water temperature on fall-run Chinook salmon *(Oncorhynchus tshawytscha) and* steelhead *(O. mykiss*) in the San Joaquin River system. A. Rich and Associates. Fisheries and Ecological Consultants. San Anselmo, California 94960.

Exhibit No. DFG-24. United States Environmental Protection Agency (EPA). 2003. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. 49 pp.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct. Executed on this 11th day of September, 2009.

Andrew G. Gordus, Ph.D.

Andrew G. Gordus, Ph. D.

Attachment D
Conservation Groups comments regarding the
April 10, 2012 Salmonid Information Synthesis Workshop

May 18, 2012

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Modesto Irrigation District
PO Box 4060
Modesto, CA 95352

RE: Don Pedro Project (FERC Project P-2299) Comments Regarding W&AR-5: Salmonid Population Information Synthesis

Dear Mr. Devine,

American Rivers, American Whitewater, California Sportfishing Protection Alliance, California Trout, Inc., Central Sierra Environmental Resource Center, Environmental Defense Fund, Friends of the River, Golden West Women Flyfishers, Northern California Council Federation of Fly Fishers, Merced Fly Fishing Club, Pacific Coast Federation of Fishermen's Associations, Trout Unlimited, Tuolumne River Trust, and Water 4 Fish (collectively, "Conservation Groups") submit these comments regarding study W&AR-5: Salmonid Population Information Synthesis.

Background

On April 10, 2012, the Turlock Irrigation District and Modesto Irrigation District (collectively the Districts) conducted a workshop to reach agreement on information to be used in the synthesis study, and to provide an opportunity for relicensing participants to propose additional literature and data sources for use in this synthesis study. This workshop was conducted in accordance with the Salmonid Population Information Integration and Synthesis Study Plan as contained in the Revised Study Plan for the Don Pedro Project (Project) prepared by the Districts, and approved by the Federal Energy Regulatory Commission (FERC) in its December 22, 2011 Study Plan Determination (SPD). Section 7.0, Schedule, of the study plan contained a task to conduct a Literature and Data Review Workshop to present, discuss, and review the information and data that will be used in W&AR-6 and W&AR-10 studies.

Comments

Conservation Groups participated in the April 10, 2012 workshop and have reviewed the meeting notes and other related materials and have the following comments regarding the information presented during the April 10, 2012 workshop.

Conservation Groups believe that the information and dataset would be significantly enhanced with the addition of the following literature and data:

1. Instead of Zimmerman, et. al. 2008, please use the following peer-reviewed version of this study: Zimmerman CE, Edwards GW, Perry K. 2009, Maternal origin and migratory history of steelhead and rainbow trout captured in rivers of the Central Valley, California, Trans Amer Fish Society 138: 280-291.
2. U. S. Fish and Wildlife Service. 2008. Flow-overbank Inundation Relationship for Potential Fall-Run Chinook Salmon and Steelhead/Rainbow Trout Juvenile Outmigration Habitat in the Tuolumne River. 15 p.
3. Rich, A.A. 2007. Impacts of water temperature on fall-run Chinook salmon (Oncorhynchus tshawytscha) and steelhead (O. mykiss) in the San Joaquin River system. A. Rich and Associates. Fisheries and Ecological Consultants. San Anselmo, CA. Prepared for the California Department of Fish and Game as expert opinion and testimony to the California Regional Water Quality Control Board, Central Valley Region. Sacramento, CA.
4. Mesick, C., McLain, J., Marston, D and T. Heyne. 2008. Limiting Factor Analyses & Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. US Fish and Wildlife, National Marine Fisheries Service, California Department of Fish and Game.
5. Gordus, A. 2009. Direct testimony of Andrew G. Gordus, Ph. D. on behalf of the California Department of Fish and Game. Before the U.S. Federal Energy Regulatory Commission Office of Administrative Law Judges.
6. Gordus, A. 2009. Exhibit number 7 to direct testimony of Andrew G. Gordus, Ph.D. on behalf of the California Department of Fish and Game. Before the U.S. Federal Energy Regulatory Commission Office of Administrative Law Judges.
7. Gordus, A. 2009. Exhibit number 19 to direct testimony of Andrew G. Gordus, Ph.D. on behalf of the California Department of Fish and Game. Before the U.S. Federal Energy Regulatory Commission Office of Administrative Law Judges.
8. Myrick, C.A., and J. J. Cech. Bay-Delta Modeling Forum Technical Publication 01-1: Temperature Effects on Chinook Salmon and Steelhead: A Review Focusing on California's Central Valley Populations. Published electronically by the Bay-Delta Modeling Forum.
9. Temperature Water Quality Standards for the Protection of Anadromous Fish in the Stanislaus River, Merced River, Stanislaus River (sic), Tuolumne River and the San Joaquin River, Feb 28, 2007 Report. Department of Fish and Game, Region 4, Fresno. Report to Regional Water Quality Control Board by W.E. Loudermilk.

As described in the meeting schedule presented in the Consultation Workshop Process Meeting on March 20, 2012, the Districts currently propose to conduct a second W&AR-5 workshop on June 26, 2012, and the first workshops for W&AR-6 and W&AR-10 on November 15. This schedule is not consistent with the schedules presented in the approved individual study plans for W&AR-6 and W&AR-10. We encourage the Districts to conduct a first workshop for W&AR-6 and W&AR-10 prior to the

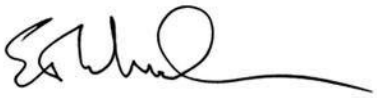
November workshop to discuss modeling alternatives and come to a consensus on the modeling approach that will best work for this study.

Additionally, we encourage the Districts to work with relicensing participants to collectively identify dates for all the workshops that will allow the greatest participation possible, giving special consideration to the resource agencies. The workshops that the districts conducted in early April coincided with a number of other high-profile meetings, including other relicensing proceedings and State Water Board hearings that required the attention of many Don Pedro relicensing participants. As such, participation was not as great as it might have otherwise been.

Finally, the Conservation Groups would like to express our support the comments and recommendations by the California Department of Fish and Game (DFG) in a letter dated May 16, 2012. We request that the Districts respond to these specific requests in their filing with FERC on revised meeting notes.

The Conservation Groups appreciate the Districts' consideration of our comments. If there are any questions, they can be directed to Patrick Koepele, Tuolumne River Trust, 209-588-8636 or patrick@tuolumne.org.

Sincerely,



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Attachment E
U.S. Fish and Wildlife Service comments regarding the
April 10, 2012 Salmonid Information Synthesis Workshop

From: Zachary_Jackson@fws.gov [mailto:Zachary_Jackson@fws.gov]
Sent: Monday, May 07, 2012 5:56 PM
To: Staples, Rose
Cc: Ramon_Martin@fws.gov; Deborah_Giglio@fws.gov
Subject: Re: Don Pedro W-AR-5 Meeting Notes for 30-day Review

Hi Rose,

Here is a list of information sources that should be included:

Lindley, S.T., R.S. Schick, E. Mora, P.B. Adams, J.J. Anderson, S. Greene, C. Hanson, B.P. May, D.R. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2007. Framework for assessing viability of threatened and endangered salmon and steelhead in the Sacramento- San Joaquin Basin. *San Francisco Estuary and Watershed Science* Volume 5, Issue 1 [February 2007], article 4.

Mesick, C.F. 2009. The High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Tuolumne River due to Insufficient Instream Flow Releases. Report prepared for the U.S. Fish and Wildlife Service, Sacramento, CA.

Anadromous Fish Restoration Program, U.S. Fish and Wildlife Service, Sacramento Office of the National Marine Fisheries Service, and Fresno Office of the California Department of Fish and Game. 2008. *DRAFT* Limiting Factor Analyses & Recommended Studies for Fall-run Chinook Salmon and Rainbow Trout in the Tuolumne River. Report submitted to the Tuolumne River Technical Advisory Committee and FERC in 2007. A revised draft was distributed to the TRTAC in 2008.

Stillwater Sciences and McBain and Trush. 2006. Lower Tuolumne River Predation Assessment. Final Report. Prepared for The Tuolumne River Technical Advisory Committee, Turlock and Modesto Irrigation Districts, USFWS Anadromous Fish Restoration Program and California Bay-Delta Authority. June 2006.

Nichols, K and J.S. Foott. 2002. Health Monitoring of Hatchery and Natural Fall-run Chinook Salmon Juveniles in the San Joaquin River and Tributaries, April – June 2001. Report produced by the U.S. Fish & Wildlife Service, California- Nevada Fish Health Center, Anderson, CA. November 2002.

Tuolumne River Rotary Screw Trap Reports: can be accessed at http://www.tuolumnerivertac.com/documents.htm

San Joaquin River Group Authority Annual Technical Reports include Mossdale trawl information (Chapter 6) and can be accessed at http://www.sjrg.org/technicalreport/default.htm

Regards,

Zac Jackson
Anadromous Fish Restoration Program/
San Joaquin River Restoration Program
US Fish and Wildlife Service
4001 N. Wilson Way
Stockton, CA 95205